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CONTENTS.

WE read not long ago in the New York *Herald* that "ample protection against loss of life by fire has at last been given to New York City." As the newspapers say, this piece of information would be highly "important if true," but an investigation entirely fails to disclose a state of things so delightful. To be "amply protected" against burning up in a hotel, school-house or theatre is possible only when the hotel, school-house or theatre is fireproof. Certain safeguards will lessen the risk in a building which is not fireproof, but the safeguards which are provided by the new law which excites the *Herald's* enthusiasm are ludicrously disproportionate to the claims made for them. So far as we can ascertain, they consist simply in the requirement that hotels and other public buildings shall have hose, axes and fire-extinguishers scattered about them, that watchmen shall be employed, and that all rooms above the first story shall have a *one-inch* manilla rope "securely fastened" to some part of them, by which the inmates of the rooms can descend to the sidewalk or back-yard. It is curious that so feeble an apology for a law to protect the lives of hotel guests should have been allowed to reach the Governor. Every insurance man knows that hose, as provided for the protection of buildings, is a miserable delusion. It is related of a hose-manufacturer, that he asked a customer one day whether he wanted the hose for use, or to hang up to satisfy the State Police Inspector; and it is notorious that even good hose, when long hung on the reels usually provided, becomes so flattened that the inner surfaces stick together, effectually cutting off whatever possibility there might once have been of forcing any water through it. It may be that the New York inspectors will see that hotel hose is of proper quality, and properly folded, — not coiled on a reel; but not even the inspectors can see that it is periodically tested, and that the hotel servants are practised in its use; and without this the hose is a mere deception. The case is much the same with axes and fire-extinguishers. Unless used with skill and knowledge, they are worse than useless, and few hotel servants have the necessary skill and knowledge to use them, even if they retain their presence of mind long enough to try to do so, which is rarely the case. On the occasion of the only fire in which we had a personal interest, the amateur firemen, whom we found one day in possession of our office, chopped with exemplary zeal nearly everywhere except where the fire was, and deluged with salt-and-water "grenades" the closet in which we kept our drawings and specifications, while the fire was actually burning under the floor near a large fireplace, some distance away. As to the watchmen, every hotel always has at least one, but they have not in the past prevented hotels, and the people in them, from burning up, and probably will not do so in the future. The only remaining appliance by which "ample protection against loss of life" is to be given is the one-inch manilla rope in the rooms. This part of the law is simply a reiteration of the present statute, but the fire in the Hotel Royal, where all the rooms are said to have had ropes in them, shows how little they helped to save life. Even if a woman, or a man, not a practised athlete, could get hold of such a rope, without falling out of the window in doing so, it would be utterly impossible for either to descend safely twenty feet by means of it. The ropes suspended in gymnasiums are from an inch and a half to two inches in diameter, and it takes an experienced gymnast, who can use his legs and feet, as well as his hands, to descend safely thirty feet by means of them, but to climb down an inch rope, even for an expert, is painful for the hands, and would be out of the question for any one else. The only use such an appliance would practically have, in the upper stories of a building, would be to knot around the body of a woman or child, in order that they might be lowered by some one remaining above, and the person who lowered them would have to be left to his fate. If ropes are the only things that can be used in such cases, they should be of large diameter, and knotted, at intervals of about two feet; or, if it is desirable to use an inch rope, so that it may occasionally be utilized to lower a person by tying it around them, large knots should be made upon it, at intervals of not more than a foot, so that the hands need not grasp the thin part of the rope at all. The help afforded the hands and feet by such knots is very great, and a much larger proportion of hotel guests could use them than the plain ropes; but the vast majority of mankind cannot climb down any kind of rope; and hotel guests will continue to be burned alive at short intervals until the only effectual law is passed — one prohibiting, after a certain time, the use of any building as a hotel unless it is fireproof throughout.

TWO more benefactions to the cause of artistic and technical education are announced. The widow and daughter of the distinguished portrait painter, Jacob H. Lazarus, who died recently, have given to the Metropolitan Museum of Art twenty-four thousand dollars, as a permanent fund, the income of which is to be used to maintain one or more students of art in Europe. To make the gift available, it is proposed to establish a class of advanced students of painting, under the direction of some distinguished artist, and in connection with the Museum, and to arrange an annual competition among a certain number of the ablest students in the class, the prize of which shall be the Lazarus Scholarship. Whether the winner of the prize shall be maintained abroad for more than one year, or whether the income of the fund shall be divided among two students, is not yet decided, and circumstances will probably determine this, as well as other points which may come up in actually carrying out the wishes of the generous donors. The other gift applies to technical education, and is of princely proportions. Fifteen years ago, a rich merchant, Mr. Allen C. Lewis, died in Chicago, leaving in trust a fund, which was, by the terms of the trust, to be allowed to accumulate, until it reached the amount of eight hundred thousand dollars; and was then to be used to establish a Polytechnic Institute. The fund reached the required amount some years ago, but the death of one of the trustees, and other circumstances, have prevented carrying out the plan until now. The difficulties, however, no longer exist, and the property, which has increased to nearly a million and a quarter, will be made available at once. A building is to be erected immediately, and several instructors have been engaged, who will, while the building is going on, decide upon the details of the curriculum. The school is to be known as the Lewis Institute, and, under this simple name, seems likely to be an important factor in technical education in this country.

THE Governor of New York has signed the bill providing for the establishment of the great Adirondack Park, which is to include as much as possible of the immense forest region about the head-waters of the Hudson. Few people, probably, realize that the Adirondack wilderness, now densely wooded, covers an area of more than five thousand square miles. A railway is at this moment being rapidly pushed into the territory, and, without interference from the public authority, it would not be many years before the timber would

have disappeared, to feed the Albany lumber-yards, and the insatiable pulp-mills which are now devastating with incredible rapidity the remaining forests of the Eastern States. Out of the entire Adirondack tract, the State already owns about nine hundred thousand acres, or nearly one-fourth, and the bill which has just become a law, although it makes no appropriation of money, provides that portions of its present possessions may be sold, and the proceeds applied to the purchase of other land, less commercially valuable, but more in need of protection from the wanton ravages of the tree-destroyers. In this way it is hoped that a large and compact area of forest land may be acquired, without expense to the State, which, if managed with such skill and care as are devoted to State forests in Europe, will become a source of revenue to the public treasury, without in the least diminishing its value as a conservator of pure air and water for the benefit of the inhabitants of the more thickly settled districts.

THE decline in the price of rolled-iron beams has been continued, and has been followed by a similar one in the price of steel beams, which can now be had in Pittsburgh and Chicago for two cents a pound. As steel beams, of proper sections, are stronger, weight for weight, than iron beams, this decline brings the cost of the iron used in building down to about half what it was two or three years ago, and to about one-third what it was fifteen years ago. As the price of steel beams abroad is higher than that of iron beams, it seems as if the present reduction in this country would bring the cost of importing beams, with freight and duty added, above the cost of the native product, which is in some respects desirable, as American beams, either of steel or iron, are, as a rule, better than the foreign ones. It is hardly necessary to say that every fluctuation in the price of iron beams is of great importance to the owners and insurers of buildings. Our methods of fireproof building are already very perfect, and are constantly being improved, but the enormous cost of the structural iron required has made it impossible to use those methods except in rare cases. Now, with lower prices for iron, its field of use will be greatly extended. Many a building will bring in rents sufficient to pay interest on the cost of fireproof construction, with iron at two cents a pound, which would not do so with iron at three cents; and the fireproof construction will be adopted, to the great advantage of all concerned.

A NEW manufacture has come into the market, in the shape of building-blocks of glass, which are arranged to interlock in such a way that they can be formed into a wall or dome of considerable extent. The blocks are blown in a mould, and, being hollow, are light, and very impervious to sound, and to heat and cold. For plant-houses of certain kinds they seem to be admirably adapted, as they form a continuous surface of glass, without sash-bars to obstruct the light, and, being almost perfectly non-conducting, they protect the plants from being affected by sudden changes of temperature in the outside air. It may, however, be a question, when used for such purposes, whether the joints can be made permanently so tight that moisture would not get into them, and, in severe frosts, injure the structure; and as the blocks are made with corrugations, which would disperse the sunlight in all directions, some plants would not thrive under them. For many other purposes the blocks seem also likely to be useful. It often happens that it is desirable to separate, for example, an office or counting-room, from a larger room, by means of a translucent, but sound-proof partition. Ordinary sashes do not shut out sound effectually, and the ground-glass, with which they are usually glazed, excludes something like three-quarters of the light, so that the new material, which saves practically all the light, undiminished even by sash-bars, and excludes sound, has just the qualities needed.

L'ARCHITECTURE discusses two legal points of interest to the profession, in regard to which it has been consulted by correspondents. In the first case, the architect had drawn up a certificate of the amount due the contractor, and the owner had offered this sum to the contractor, who refused to receive it as full payment, and sued for more. The court appointed an expert to determine what was due the contractor, and the expert awarded a sum larger than the architect's certificate. The owner was compelled to pay the sum fixed by the expert, with the costs of the suit, and thereupon claimed the amount of the costs from the architect, who, as he said, had involved him in the suit by his mistake. In answer to the letter of the architect, asking if he could be made responsible for the costs of the suit in this way, the editors of *L'Architecture* say decidedly that he cannot. They say that there are cases in the books where damages have been demanded from the architect, not only for making his first certificate smaller than the sum allowed by the court, but for making it larger, so that the owner had to pay more than the law required of him; but the law has always rejected the claim, on the ground that the certificate of the architect is not to be considered as a guaranty, but "as an opinion only, which does not involve responsibility," and that "the differences between the results of the examining and certifying of accounts by one person, and those which would be arrived at by another, are to be explained simply by the divergencies of personal judgment, which cannot be brought under any rule, and which the proprietor takes the risk of in choosing his architect." Our impression, from the decisions which have been given in this country in somewhat similar cases, is that American courts would generally take the same view of the certificate of an architect, although there are some precedents of a different aspect. Of course, however, an architect's certificate, to be satisfactory in the eye of the law, must be prepared with skill, attention and perfect honesty and impartiality to both parties; and a fraudulent or negligent award renders the architect liable for the damage caused thereby, just as fraud or negligence in any other transaction would make him liable.

THE other question, on which *L'Architecture* is asked to give its opinion, is whether the bankruptcy of a builder, and his subsequent discharge, frees him from obligation, imposed by contracts entered into previous to his failure, to make good defective work, in cases where the defects had not shown themselves until after his bankruptcy. In France, the Code imposes on builders the responsibility of their work for ten years, and, in certain cases, the architect is made a sort of endorser of the builder's obligations, so that if the builder cannot make defects good, the architect must; and it is, therefore, important for architects to know how and when the burden falls from the builder's shoulders upon theirs. In the particular case mentioned, a contractor, four years ago, built a gable wall, so badly, that it now overhangs the base by more than half of its own thickness. Under the French law, a wall in this condition must be condemned and taken down, or rebuilt, and the question is, who shall pay for the rebuilding. Under the Code, it would, of course, be for the contractor to make his work good, but it happens that, immediately after the completion of this particular structure, and before the gable wall had shown any sign of weakness, the builder failed, went through bankruptcy, and was discharged, resumed business, and is now very prosperous. To the request, however, that he should make good his bad work of four years ago, he replies that his bankruptcy has wiped out all such obligations; that "his past exists no longer," and that no claim can be made on him; and the editors of *L'Architecture* are requested to say whether this is really the case. In their answer, however, they differ totally with the builder in his conclusion, and say without hesitation, and with the support of some of the most eminent counsel in France, that he is still responsible for his bad work, and is bound to make it good. If, they say, the defects in the wall had shown themselves before his bankruptcy, the owner would have had to take his dividend on his claim for damage, with the other creditors, as the law makes no distinction in his favor; but as the defect had not then appeared, the owner's claim had not arisen, and, of course, could not be proved with the other debts of the bankrupt; and the discharge of the latter from his debts then existing did not discharge him from those accruing subsequently. That the subsequent claim proceeded from a contract entered into before the bankruptcy did not affect its validity, for the reason that a discharge in bankruptcy applies only to debts, and does not terminate the contracts which the bankrupt may have made, or release him from any of the obligations which he has assumed under them, except so far as those obligations may have taken shape as a definite debt before the bankruptcy proceedings. If a debt, in pursuance of these obligations, has accrued before the bankruptcy, the discharge releases the bankrupt from that debt, but it cannot release him from debts which do not arise until after the discharge.

FIREPLACES.[1]— III.

FIGURE 14 gives a fireplace by Germain Pilon, now at the Louvre. The mantel here also has the composition of an entablature; it is borne by two consoles representing fauns. This is the first example that we have encountered thus far in which the fireplace opening is surrounded by a frame distinctly defining it on three sides. As this opening had been gradually made smaller, successive modifications had been necessitated since the primitive days when piers projected but slightly from the wall, when almost entire trees were burned on the hearth, and when seats for several persons could be set under the mantel.

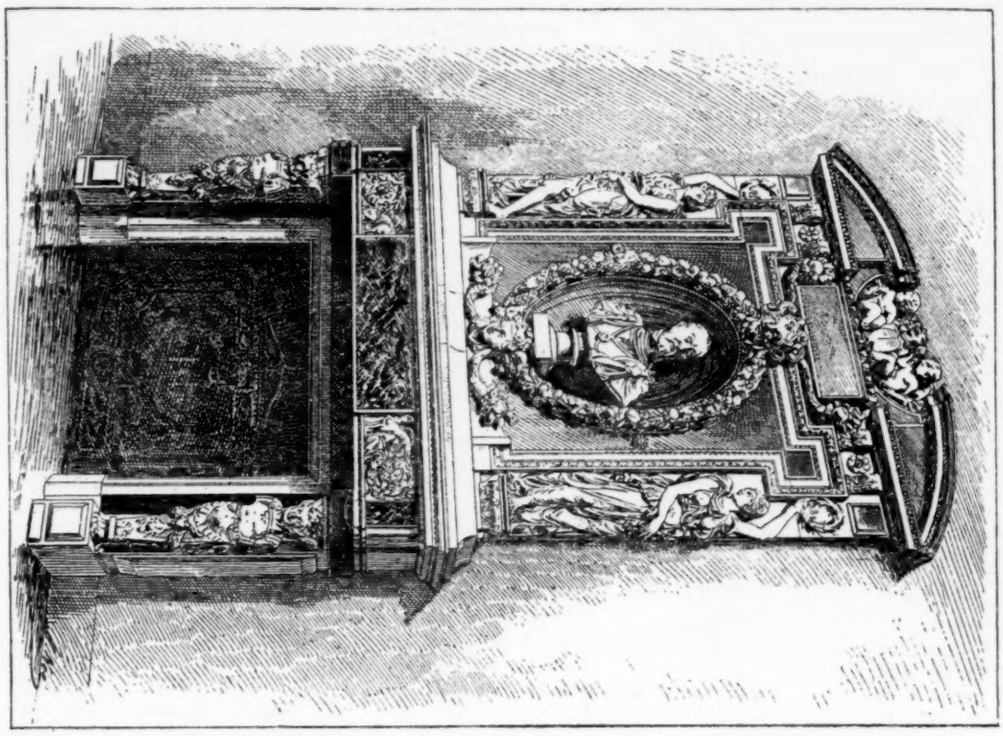


Fig. 14. Fireplace from the Château de Villeroy.

The part above the mantel recalls the hood, but the pediment crowning it would seem more in place on a roof than abutting against a ceiling. It is adorned with two charming female figures on either side and with a bust of Henri II, by Jean Goujon, in an oval niche in the centre. We must likewise note that this is our first example of the use of marble in these constructions. We shall find it constantly employed hereafter, but the projecting portion over the mantel will not be met with again. Among fireplaces made familiar to us by photographs and engravings, that of Cheverney is one of the latest offering a well-defined example of this disposition; but it is too well known to be reproduced here.

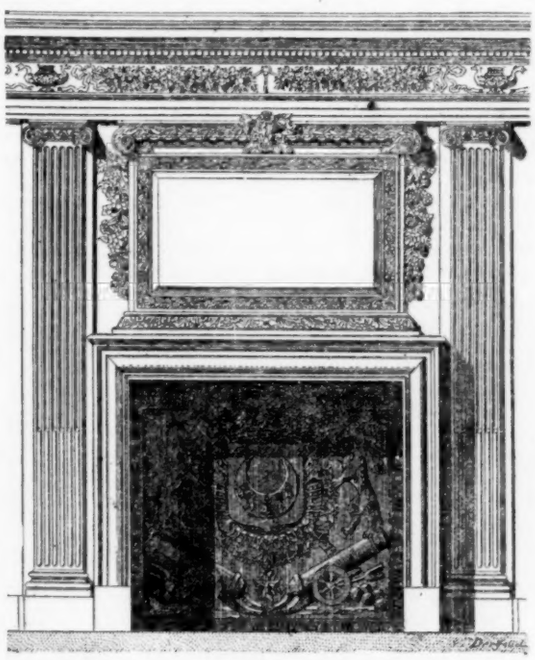


Fig. 15. From the Cabinet de Sully, at the Arsenal.

Fig. 16. From the Salon de Diane, Versailles.

Figure 15 represents the fireplace in the Cabinet de Sully in the Arsenal library. The constituent elements of the original fireplace have disappeared, as we have here merely a bay in the wall framed-in by a marble casing, and modestly occupying

[1] From the French of G. Aubry, in Planat's *Encyclopédie de l'Architecture et de la Construction*. Continued from No. 857, page 129.

a panel in the general decoration. The fireplaces in the Château de Vaux are all as inconsequential as this one.

In the Salon de Diane in the palace at Versailles (Fig. 16) much more is made of the surroundings of the fireplace-opening; the casing itself is of more importance, although it is

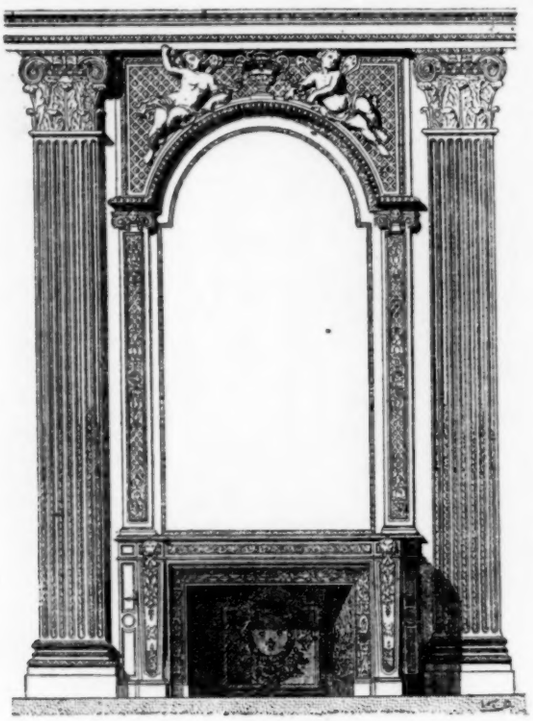


Fig. 17. From the Chambre du Roi, Versailles.

Fig. 18. From the Cabinet du Roi, Versailles.

little else than a veneering around a comparatively small bay. The extreme simplicity and the almost exclusive use of plain mouldings is accounted for by the character of the material; carving on colored marble is not effective, but rather detracts from the beauty of its polished surface. A still simpler fireplace may be seen in the same palace, in the *chambre du Roi* (Fig. 17). It is merely a marble frame, with not the slightest suggestion of the edicule of early times. From the eighteenth century the fireplace was no longer allowed to interfere with the general decoration, but was confined to a panel the greater part of which was, moreover, occupied by a mirror. The king, who, by letters patent in 1665, established the first manufactory of mirrors, desired to have his apartments adorned with them. Nothing more was needed to set the fashion, and even to the present day fireplaces are surmounted by mirrors, varying in size and sumptuousness according to the character of the room or the edifice.

Fig. 19. From the Château de Changy.

The remainder of our sketch should properly be restricted to a discussion of the immediate surroundings of the fireplace-opening, as the upper portion has ceased to be of interest from the architect's standpoint; we nevertheless give the entire disposition in Figures 18 and 19. The latter exhibits a very simple type but is quite in the style of the period.

The first of these marble framings were rectilineal in form. From the close of the reign of Louis XIV they were subjected to the same modifications that the decoration as a whole underwent; the profiles were more varied and more complicated, and a profusion of sculptural ornamentation was introduced. Several of these productions might be cited which, though not very pure as we now understand the term, are yet genuine works of art. In addition to carving, gilt bronze was used for still further enrichment.

Under Louis XVI artists returned to quieter lines. Figure 20 offers an example of one of the best types of this period. With the exception of the hood, it possesses the constituent elements of the primitive fireplace, all forming a connected whole of moderate dimensions, but giving the impression of a work of the time. Fireplaces of the last century are common in the market now; it is not our purpose to give illustrations of such.

Though the same types are constantly recurring in ordinary structures this is not the case in public edifices and private mansions. An architect engaged on a restoration must of course draw his inspiration from the general style of the monument and make the fireplaces harmonize with it. Figure 21 shows a fireplace executed under the direction of M. Lisch in the hôtel de ville at La Rochelle; Figure 22, one in the Château

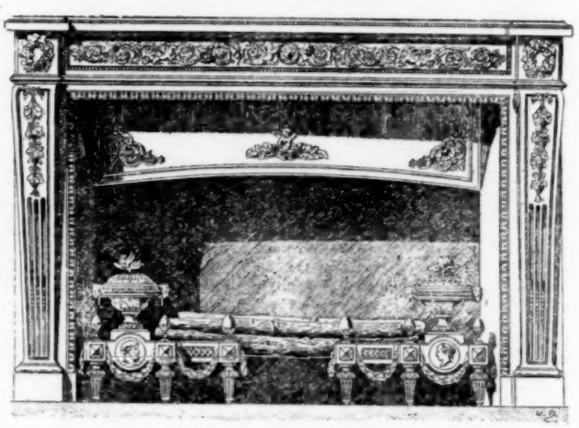


Fig. 20. From the Collection of M. Double.

de Saint-Germain, built in accordance with the orders of M. Millet; Figure 23, one from the Château de Chantilly, after the designs of M. Daumet, and decorated with Baudry's beautiful Saint Hubert. In the last case, though not a restoration, the

conditions were nevertheless similar, as the style of the construction was definitely dictated in advance. Since the advent of romanticism the taste for archæology has spread to such an

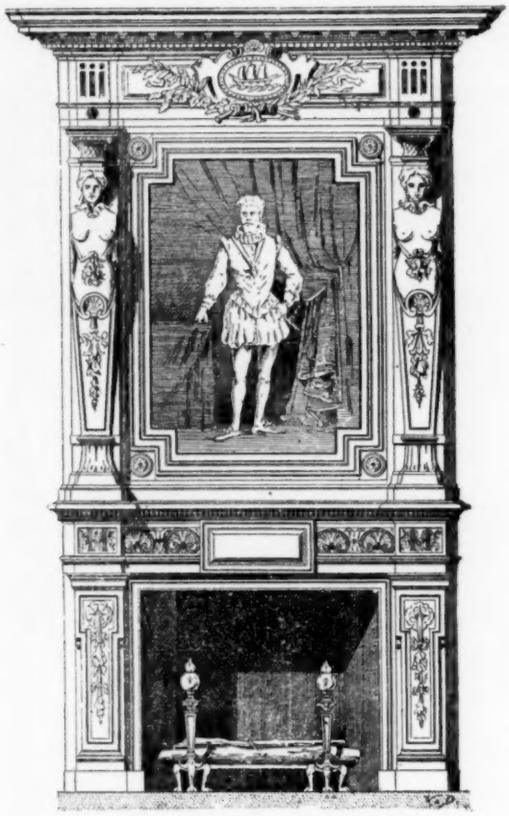


Fig. 21. From the Hôtel de Ville at La Rochelle.

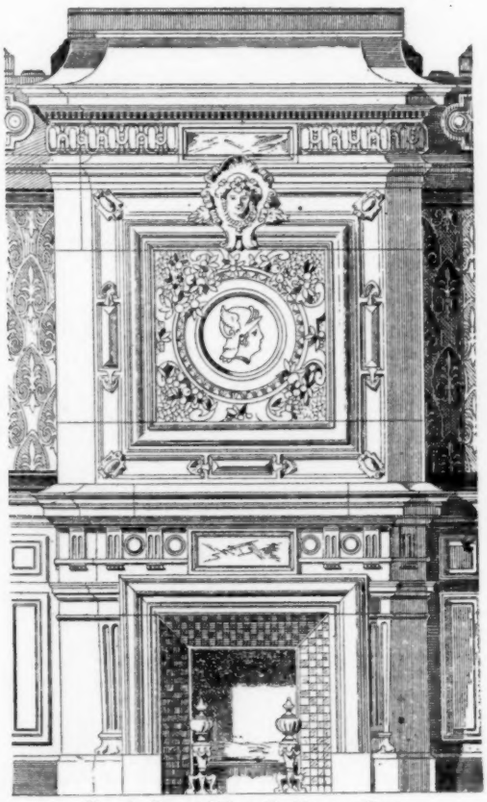


Fig. 24. From a Private Residence at Passy.

extent that in the construction of châteaux or residences the owner's stipulations include, not only the character and importance of the work, but the exact style. The architect is therefore usually forced to study, not a fireplace of the nineteenth century, but one of the Renaissance or Gothic period, or of whatever time it may please the proprietor of the dwelling to decree.

Figure 24 reproduces a remarkably fine example from a private residence at Passy. It is after designs by the late M. Benouville. It has been remarked that the dimensions of the fireplace-opening gradually diminished, especially after the seventeenth century; at that time, however, it was still very large. About the middle of the present century, when the craze for antique styles became so general, there was a demand for a return to monumental fireplaces; but no one was willing to go back to the custom of burning entire tree-trunks; it was therefore necessary to contrive some means of making the fireplace-opening even smaller than it was in the examples we have cited from the eighteenth century. Benouville got over the difficulty in a very skilful way. The *ensemble* of his fireplace is of monumental aspect while the hearth has only the dimensions required for the use of ordinary wood; yet there is no seeming incongruity in it.[1]

Fig. 25. From a Private Residence, Rue de Courcelles.

In Figure 27 we reproduce one of our own fireplaces, from the library of a friend who is a painter. The general disposition is mediæval, though with a variation which has no prototype among our illustrations of that period; we refer to the

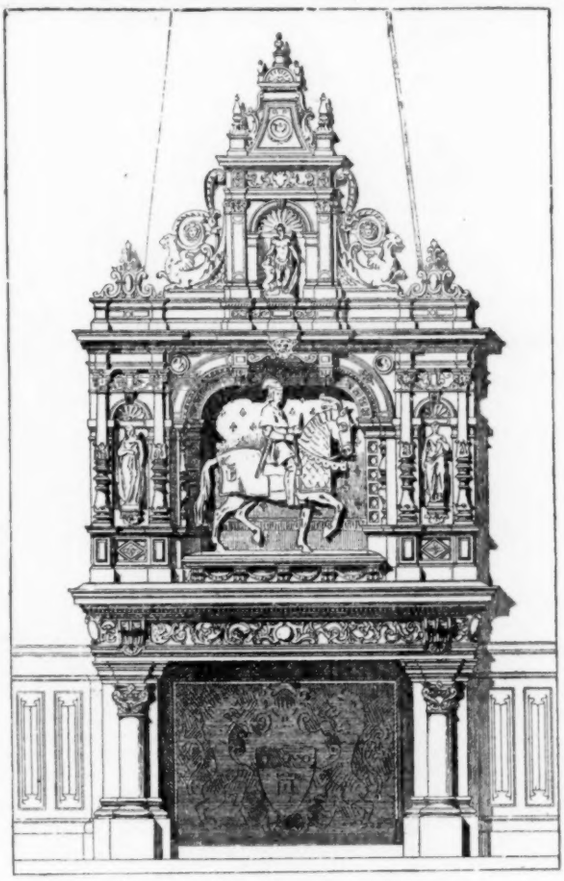


Fig 26. From a Private Residence, Parc Monceaux.

shelf over the mantel. Examples of this arrangement do exist, and, though we are not wholly satisfied with the effect,

[1] We also call attention to another fireplace of recent date by MM. H. and L. Parent (Fig. 26). P.

we can find justification in the documents of the time, as well as in the desire to gratify our friend, who insisted upon the shelf for certain objects of art, which were not all in place when this sketch was made.

M. Corroyer was entirely untrammelled in his composition of the fireplace shown in Figure 25. He has produced a work of great interest and has brought into it modern elements of ornamentation with good effect. The moulding in decorated faïence around the fireplace-opening could not be improved upon; it is peculiarly suited to its place.

The number of interesting examples that might be cited is so great and the limits of our space so narrow, that this article is of necessity fragmentary. We have, however, endeavored to trace clearly, through their successive periods, the various transformations which the fireplace has undergone, from the standpoint of decoration, in French palaces and dwellings. We trust that we have not fallen too far short of the accomplishment of our object.

G. Aubry.

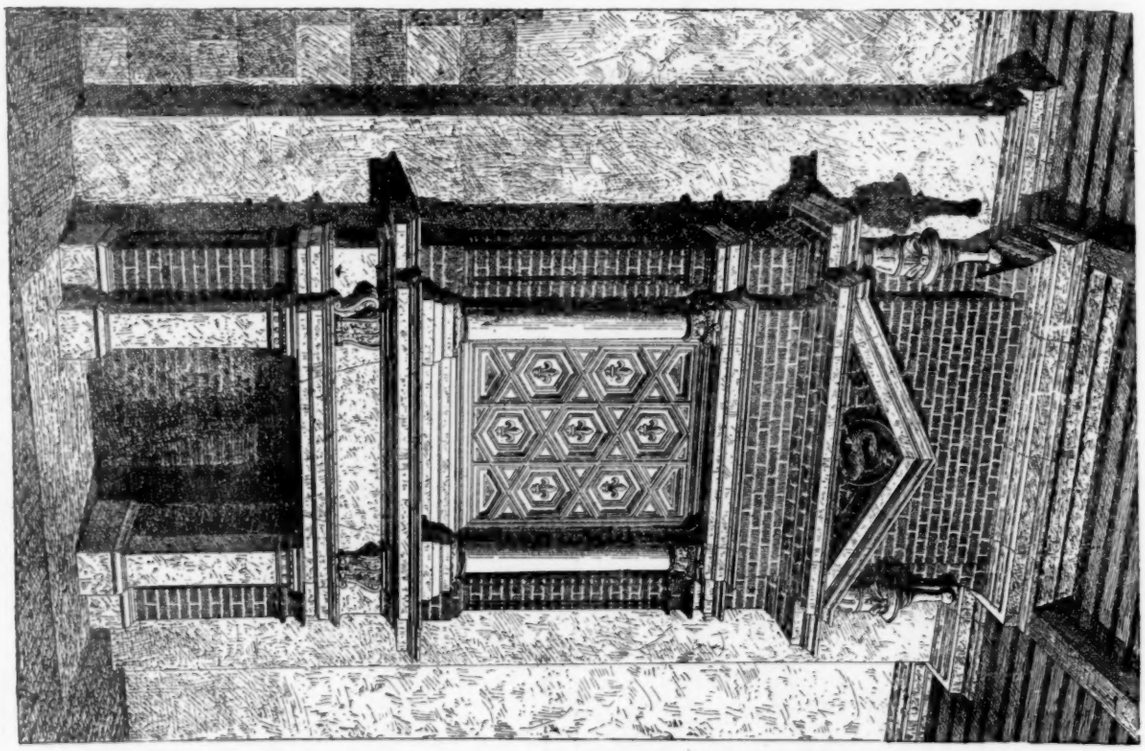


Fig. 22. From the Salle de Mars, Saint-Germaine-en-Laye.

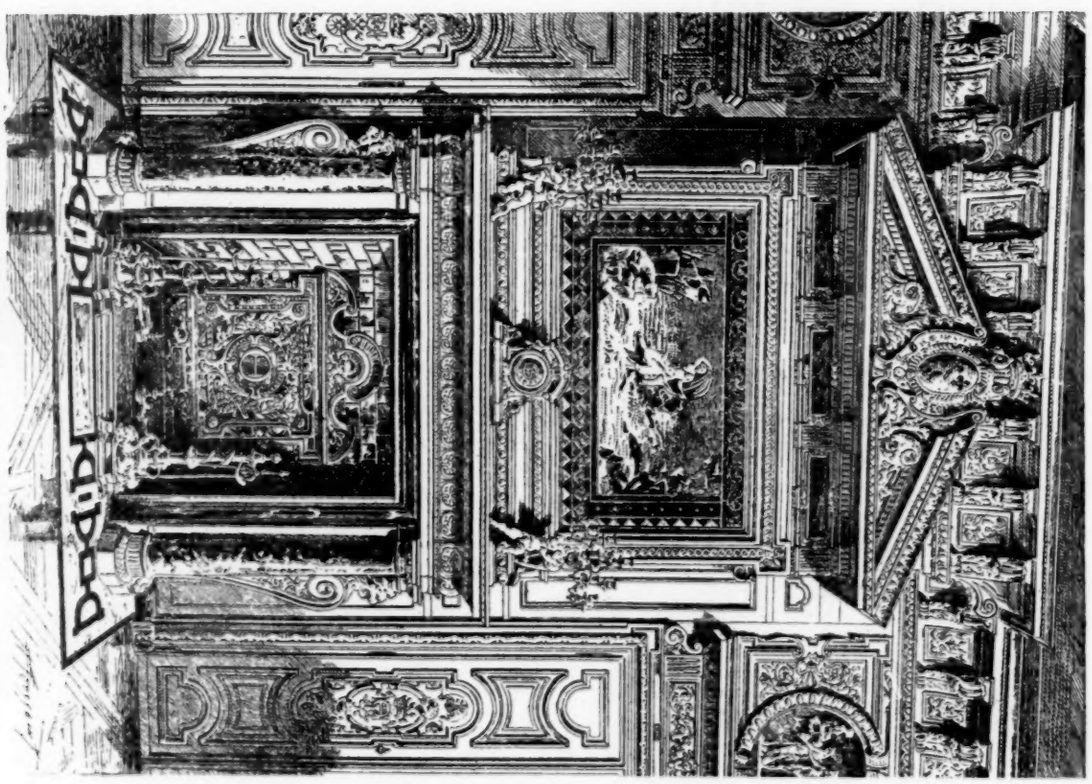


Fig. 23. From the Château de Chantilly.

LONDON

IMPORTANT MOVEMENT AGAINST THE INSTITUTE'S EXAMINATION POLICY.—WREN'S LIBRARY AT LINCOLN.—THE WELLINGTON MONUMENT.—STREET-CARS.

I think we are on the eve of a struggle in the architectural world in England which may have important events upon the progress of our art, and which threatens to bring into the arena, our three great architectural institutions, the Academy, the Institute and the Association.

The position is very briefly this. The policy of the Institute is, as you well know, one of examinations. Commencing with the voluntary examination for Associates, extending this into a compulsory examination, and later into three progressive examinations, viz: preliminary, intermediate and final, they now talk of going so far as to set up an examination for Fellows. The policy has been pursued energetically and has gained increasing popularity among students. It has the advantage of putting a definite course of study before them, and preparation for examination is attractive because it is is labor spent in the attainment of a tangible reward and the ordinary student likes this better than striving after education for its own sake. Whether, however, examination is good or bad it is the definite policy of the Institute, and this policy has naturally had considerable effect in various directions. One important development has been the new educational scheme of the Association, about which I have often told you. The Association found its students under the old voluntary system were dropping off and going to crammers instead. They therefore remodelled their system of education upon new lines, appointing a paid staff and starting studios. I have given you the details very fully in previous letters. The new scheme is to a certain extent modelled on the lines of the Institute progressive examinations which admittedly form its basis but not its limits.

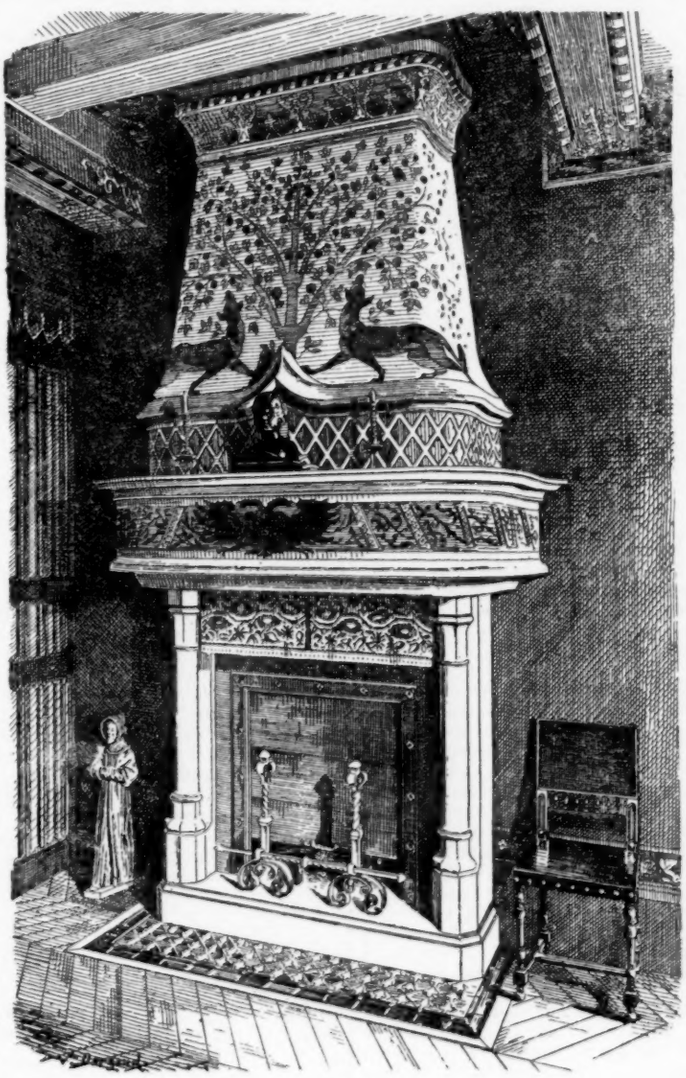


Fig. 27. From a Private Residence, Rue Ampère, Paris.

Now if architecture were like law or divinity, here we have a very excellent machinery for professional education. One is the examining body and the other the leading body and in the combination of the two powerful bodies, there would be strength and wisdom: the analogy, however, is not complete and there have always existed outside the ranks of the Institute certain architects of eminence who have refused to join it and who have maintained a more or less consistent opposition to the examination policy. Among these are Mr. Norman Shaw, Mr. Bodley and others of like calibre.

Up till a year or so ago these men confined themselves to individual protests, but with the development of the examination policy, and with the growth of a new generation their numbers have extended and ultimately a memorial was addressed to the Institute praying them to abandon their policy of examination. The memorial fell rather flat and it was felt that the "memorialists" as they were dubbed, were not strong enough to materially influence the course of architectural politics.

So far I have not referred to our National School of Architecture, the Royal Academy. The Academy is a body which has notoriously neglected its duty. It is conservative to the backbone, and does not recognize that times change. The number of the architect members is small and their influence is not so great as it might be. Consequently the painters, who do not as a rule understand our art, and can think of no other art worth mentioning than their own, carry all before them, and legislate for the architectural school with a very unfortunate result. The consequence is that the Academy which might do so much, does very little, its influence is small and the work done in its schools is poor and unsatisfactory.

A few months ago, an event took place which seems likely to lead to the struggle I have referred to. Mr. T. G. Jackson, M. A., was elected an Associate of the Royal Academy. Mr. Jackson is a man essentially of an artistic temperament and one of the leaders of the best form of architecture in England. Up to his election as an A. R. A. he held studiously aloof from his brethren, his work was very much admired, but it was more the work of a name than a man. Lately, however, he has come more to the front in architecture, particularly in opposing the movement against registration, and his election seems to have been chosen as an opportunity to place himself at the head of the somewhat disorganized "memorialists," and lead the movement against the Institute and its examination policy. One of the first steps was the meeting at the Association, which I referred to some time ago. Here he defined his position clearly in a paper which was one of the most able expositions of what architectural education should be that has been delivered in England, but it went on to tell the Association that unless they abjured the Institute and so reconstituted their scheme of education that no colorable pretence of preparation for examination should remain, the "memorialists" would have nothing to do with them. The next step was suggested by Mr. Norman Shaw, who thought it would be a good plan to write a volume of essays—after the style of "*Lux Mundi*," explaining the "memorialist" views which it was argued were misrepresented. "This volume," writes Mr. Jackson, "is now almost ready for the press, and the publication has been undertaken by Mr. Murray. It will be edited by Mr. Norman Shaw, R. A., and myself, and will contain essays by Mr. Bodley, A. R. A., Mr. Champneys, Mr. W. B. Richmond, A. R. A., Mr. Micklethwaite, Mr. Reginald Blomfield, Mr. Newton, Mr. Macartney, Mr. Prior, Mr. Clayton, Mr. Lethaby, Mr. G. C. Horsley and by the editors."

The next step was a private conference between certain members of the Association and certain "memorialists" to ascertain whether mutual concessions would not help to establish a *modus vivendi*. The result of the conference was generally understood to be satisfactory.

Subsequently a meeting of the architects who are members of the Art-Workers Guild, a "memorialist" society, was held under the chairmanship of Mr. Jackson, and he was commissioned to lay the whole position before the Association by letter.

Of the further development in this direction, nothing yet is publicly known, but current rumor has it that the governing body of the Association has thrown out the essential parts of the proposals, but as I say, this is only rumor. I shall know more next month.

Concurrently with this movement with regard to the Association, there is another proceeding having for its object the reformation of

the Academy. Petitions are being drawn up in many directions with this object in view, the idea being that the Academy ought to start day-classes coupled with instruction in the handicrafts. It is reported that Mr. Norman Shaw and Mr. Jackson are again at the head of this movement.

What will be the result of these movements it is, at this early stage, impossible to say, but I expect that next month or the month after I shall have some interesting news to tell you.

[May 1.] Various circumstances having combined to prevent me sending you my letter last month, I am now able to add some later news and bring my report of the interesting struggle I have indicated above up to date. The rumor I mentioned that the Association committee had thrown out the proposals adopted at the private conference or "informal meeting" between certain members of the association and the memorialists turns out to be true. And not only so, but the committee went farther, and summarily dismissed one of the editors and superseded the manager (a past president) because they permitted Mr. Jackson's appeal to the Association to be printed in the Architectural Association *Notes*. This energetic action at once threw an immense amount of fat into the fire. The whole staff of the Architectural Association *Notes* resigned and several members of the Architectural Association committee resigned, and withdrew their nominations for the new committee. The latest news is that a considerable party is gathering round the secessionists, and that there is a prospect of the action of the committee being challenged at the forthcoming elections. The struggle is an interesting one and is being watched closely by the Institute and the memorialists, and indeed by all architects, as the result will indicate pretty clearly the direction in which architectural thought is tending.

A proposal has been made by the dean and chapter of Lincoln Minster under the advice of Mr. J. L. Pearson, R. A., to remove Sir Christopher Wren's Library, which stands upon the site of the north walk of the Minster Cloister, to re-erect it in another position, and to restore the Gothic cloisters on their old site. This proposal has been met with a considerable amount of popular opposition. Wren's Library is probably familiar to many of your readers as a very excellent and characteristic piece of his work, and they will, I am sure, agree with me that it would be a totally unjustifiable proceeding to pull it down. This sort of thing would have been all very well thirty years ago when it was *aut Gothic aut nihil*, but now our sympathies have broadened, and we have come to see that there is beauty to be found in all styles, and that to remove an interesting and picturesque bit of history in order that it may be replaced by what is, after all, nothing else but an archæological lie, is a piece of sheer folly. The proposal has subjected the dean and chapter to a good deal of criticism in artistic circles, but public attention has for a time been diverted by the fall of a large portion of the stonework of one of the western towers and a subsequent discovery that the tower is in a dangerous condition. The dean and chapter now have something more serious to think about than the destruction of Wren's building, and it is to be hoped that this providential interference will stay the hand of the vandals for a time.

This leads me on to a short consideration of a little American work entitled "*Christian Thought in Architecture*," which has been sent me for review by one of our English art journals. The book is a reprint of a paper read before the American Society of Church History at its fourth annual meeting, Washington, December 30, 1891, by Mr. Barr Ferree. I do not, of course, know to what extent Mr. Barr Ferree represents current American ecclesiastical opinion, but it seems to me that a protest should be raised against some of the leading ideas of the book. "In discussing the architectural illustration of Christian ideas it is well to note that they come to an end with the Renaissance." "The complete disappearance of Christian faith and doctrine from the religious architecture of the early Renaissance is one of the most striking and interesting of architectural psychological questions." These ideas in a work which displays great study and knowledge of the works of the mediæval Goths jar on one's English notions. Surely religion did not come to an end in the fifteenth century concurrently with the decline and death of Gothic architecture, or to use Mr. Ferree's expression — at the interruption of its growth. No one is more ready than I to admit the surpassing beauties of Gothic architecture, but would Mr. Ferree pass as irreligious and unworthy of his notice — to take one example — Wren's London cathedral and churches? Surely Bow Church steeple is in its way every whit as beautiful as the spires of the Nene Valley, and may we not indulge the hope, now that the era of slavish imitation of past styles is gone, that we may evolve a style of church-building that may in years to come justly be regarded as on an artistic parity with either?

Sir Frederick Leighton, P. R. A., has initiated a proposal to remove Alfred Stevens's Wellington memorial from the side chapel in which it at present rests, out into the open cathedral in order to give it more opportunity of being properly seen. Sir Frederick in a letter to the *Times* points out very rightly that the monument is cooped up in a narrow space and that "the only aspect of it which directly receives the light is brought so close to the spectator, that his eye cannot embrace it as a whole; while the opposite view, shrouded already in darkness, is further effectually concealed by Sir Christopher's beautiful screen, a work which none would, it is hoped, venture to touch." The proposal of Sir Frederick has been supported by a leading article in the *Times* which took the opportunity of using some strong language upon the treatment Alfred Stevens received in the matter "Never was a great artist worse treated." It says "Never was there a more shocking instance of stupid officialism hirdering and thwarting genius, or of genius acting so as to distress, perplex and infuriate the official mind. Compelled at the outset to accept a sum far below what the execution of his design was certain to cost, Stevens was put wrong with the Government from the beginning. His work was starved; he got into debt with quarrymen, bronze founders and everybody else; he had to accept outside commissions in order to pay them; and in a word he and Mr. Ayrton (the First Commissioner of Works) were at cross-purposes throughout. No one can blame the then First Commissioner for demanding guaranties that the work should be done; but those who recollect what manner of man was that business-like official and quite essential Philistine, do not require to be told that he nearly worried poor, sensitive, irritable Alfred Stevens into his grave. Then came the moment when the work was finished, except for the equestrian statue (which was to have completed it); and the Dean and Chapter thrust it into the side chapel where the diligent explorer of the nooks and corners of our great cathedral is enabled after a careful search to find it." I am glad to say that Sir Frederick Leighton has not simply contented himself with a proposition in the air but he has definitely started a subscription list and obtained the sanction and approval to his scheme of the Dean and Chapter of St. Paul's, of the First Commissioner of Works, of the distinguished architect, Mr. Penrose, who has charge of the cathedral and of the present Duke of Wellington. His proposal has I hear, been well supported and there is now fortunately every chance of Alfred Stevens's masterpiece being completed and placed in a suitable position.

The latest victim of the rapacity of those who wish to destroy our city churches is Wren's beautiful spire of St. Dunstan in the East. This is one of the most graceful of the group of spires seen on the left-hand side as London Bridge is crossed, and is based upon the same principle as the well-known church of St. Nicholas at Newcastle-on-Tyne. The old process is adopted. First it is said that there is no necessity to touch the spire which is not part of the church and can easily be maintained when the church is gone. Then attacks are made upon the architectural beauty of the structure, efforts made to prove the church is not required, and that its services are not well attended. Then the advantage of union with a neighboring rich church are speciously pointed out and in time these efforts frequently succeed. It is, however, to be earnestly hoped that the proposed piece of vandalism which is more outrageous than usual, will arouse such a storm of opposition that the Philistines will abandon their attempt.

It is not often that the leader of the House of Commons ventures to talk about art, but Mr. Arthur Balfour at the Royal Academy dinner went into the question of the right of individual owners of property to put up buildings offending against the public taste. He particularly instanced Charing Cross Railway Station as an erection that should not have been permitted to have been erected on the centre of the beautiful promenade known as the Thames Embankment, and suggested playfully that the County Council might wisely expend some of their surplus energy in looking after this question of the artistic beauty of our streets.

It is an odd commentary that while their leader thus emphasizes the importance of preserving the beauty of the embankment, the Commons should assent to a measure for carrying a tramway across Westminster Bridge and along the embankment to a point near the proposed new Horse Guards Avenue. Up to the present every effort to carry tram-lines across the Thames and into the city and west end of London has been strenuously resisted and has failed, but this looks like the first step towards the permanent disfigurement of our finest thoroughfares by a series of tram-lines. A select committee of the House has also given a preliminary consent to the new railway line from London to the north and known as the Manchester, Sheffield & Lincolnshire Railway.

A Sculptor's Indignation. — A few months ago some young ruffians broke the nose of the beautiful statue of Paul Veronese which adorns one of the principal squares of Verona. After a long consultation, the city fathers decided to call upon the sculptor, Romeo Cristani, to repair the damage. But the signor declined to obey their instructions, on the ground that it would be beneath the dignity of a great sculptor to attempt to patch up the statue in such a manner. It would be necessary, he contended, to chisel a new head for the work of art at the cost of 1,000 lire. The Council did not feel inclined to pay this sum of money, and made a contract with another sculptor to repair the nose alone. Signor Cristani, enraged at the action of the aldermen, hastened to declare that he would not allow another man to touch the work which has made him famous. Up to the present time no one has cared to run the risk of getting his own nose placed in the condition of that of the statue. It is possible that he will carry the day. Many inhabitants of the old city uphold him, and declare that they will assist him in preventing the desecration of the statue. At any rate, the nose of Paul Veronese promises to play an important part in the local history of Verona for some time to come. — *New York Tribune.*

CONSTRUCTION.[1] — VIII.

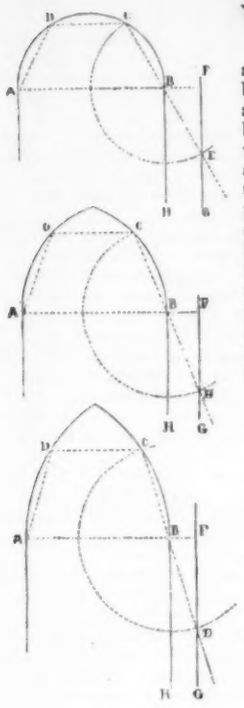


Fig. 32*b*.

WE are about to pursue the examination of great religious constructions, first, because they are the most important, and, next, because they are developing rapidly at the end of the twelfth century, and because the principles in accordance with which these edifices are erected are applicable to every other construction. We know now the successive phases through which the construction of these vaulted edifices had to pass, in order to change from the Roman to the Gothic system; in other terms, from the system of passive resistances to the system of active resistances. From 1150 to 1200 they were building in the Royal domain, in the Beauvoisis and Champagne, the great churches of

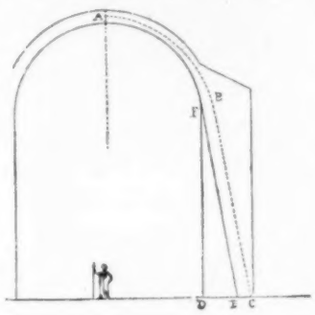


Fig. 33.

Nôtre Dame at Paris, at Mantes, at Senlis, at Noyon, (the choir of Saint Remy) at Rheims, at Sens, and of Nôtre Dame at Chalons-sur-Marne, all after the new principles adopted by the lay school of that period, all having preserved a perfect stability in their principal works.

VAULTS.

In every thing experience or practice precedes theory, fact precedes law; but when the law is known it serves to explain the fact. We observe that all bodies are heavy, and that some force draws them toward the centre of the globe. As yet we know nothing of the pressure of the atmosphere, of the force of attraction, of the shape of the earth; we know only, that every heavy body, if left to itself, is drawn vertically toward the ground. From the observation of the fact, we deduce laws, and whether these laws be true or false, it does not at all alter the nature of the fact or its recognized effects. The builders of the twelfth century had not defined the laws to which the voussoirs of an arch are subjected, namely their weight and the reaction of the two adjoining voussoirs. We know to-day, from theory, that if one seeks on each bed of these voussoirs the point through which the resultant of the pressures acting upon them passes and if one draws a line through these points, one thus determines a curve called the *curve of pressures*.

We discover, again, by the aid of algebraic calculation, that if one wishes the equilibrium of the voussoirs of an arch to be perfect, this curve of pressures, whose first direction at the key-stone is horizontal in a semicircular arch, must not come out upon any point in the lines of the intrados and extrados of the arch. This curve of pressures, prolonged down through the arch, when it rests upon piers, determines what is called the *thrust:* then, the nearer the arch comes, in its development, to a horizontal line, the farther that thrust is from the vertical; and the farther the arch from being a horizontal line, the nearer is the thrust to the vertical. The Gothic builders had only the instinct of this theory. Perhaps they possessed some of those mechanical formulas that we still find mentioned by the authors of the Renaissance, who have treated of these matters, and give them not as discoveries of their time, but, on the contrary, as traditions good to follow. With regard to the thrusts of arches, for example, they made use still, in the sixteenth century, of a very simple geometrical formula for estimating the strength to be given to abutments.

In Figure 32*b* we have this formula. Given an arch having *A B* as its diameter, to find in relation to the nature of that arch, what should be the thickness of the piers capable of resisting its thrust. We divide the semicircle or the pointed arch into three equal parts, *A D*, *D C*, *C B;* from the point *B*, as a centre, we describe an arc having *B C* for a radius. Then we pass a prolonged line through the points *C* and *B*. Its point of meeting *E* with the arc of which *B* is the centre, will give the outer facing of the pier whose thickness will be equal to *G H*. If we proceed in the same manner upon the pointed arches, dividing them always into three equal parts, we shall obtain abutments as much less thick as these arches are the more acute, as our figure shows. Of course this process is only applicable to arches mounted on piers of equal height for these different arches, and if not more than one and one-half times the diameter of the base of these arches. It is probable that the early Gothic architects made very simple rules for themselves in ordinary cases; but it is certain that they referred only to their own judgment whenever they had some new difficulty to solve. As if they had determined the laws for the pressure of arches, they arranged to concentrate the resisting materials upon the path of these lines, and thus conducting the pressures from the top of the vaults to the ground they arrived, by successive steps, at considering everything outside as useless, and suppressing it.

We wish to be understood by everybody and will not deal in definitions. Let us take an example.

Let Figure 33 be a Roman semicircular cradle-vault; let *A B* be the curve of pressure of the voussoirs, and *B C* the thrust. If the wall that supports this vault has the height *F D*, its thickness must be *C D*. If all the oblique pressure of the vault bears upon the point *C*, of what service is the triangle of construction *E D F*? Suppose now that we have a Gothic vault (Fig. 34) in pointed arches; the resultant of the three oblique pressures *B A*, *C A*, *D A*, in the plan will be a line *A E*, and in the cross-section a line *G H*. The instinct of the builder indicating to him this principle, he will arrange his whole construction to relieve this point; in other words, he will move back the vertical support *I O*, and place a capital *M* whose projection shall unite with the direction of the thrust *G H*. In *O* he will have a corbel and in *I* a relieving-capital so as to bring *P*, the axis of the lower column, as near as possible to *H*, the point of arrival of the thrust *G H*. But being forced in the edifices with three naves, to leave this point *H* outside of the axis *P* of the column, he no longer considers the latter except as a support that must be kept vertical by equilibrium. He then neutralizes all the lateral action by building the flying-buttress *K*. But, some one will object, why keep the relieving-wall (or facing) after the thrust of the great vault is neutralized by the pressure of the flying-buttress? It is here that the subtlety of the builder appears. That thrust *G H* is neutralized, but it exists; it is a force overpowered but not suppressed. The flying-buttress checks the effects of that thrust; that is its only function, for it cannot take away this oblique action. Let us not forget that there is a lower vault, *L*, whose thrust can act only upon the column *P*, and that this thrust can be suppressed only by the vertical weight exercised by building from *R* to *S;* that this vertical weight will have as much more power as it is increased by the thrust of the great vault, and that since the meeting of these two forces, vertical and oblique, takes place in a single point *S*, upon the capital, it will exactly buttress the pressure exerted by *L S*. To determine this action by calculations would be a sheer waste of labor, for these calculations must vary infinitely by reason of the height or breadth of the spaces, the thickness of the walls, the quality of the material, their resistance, the height of the courses, etc. But the human instinct, when it is acute, is always more subtle than

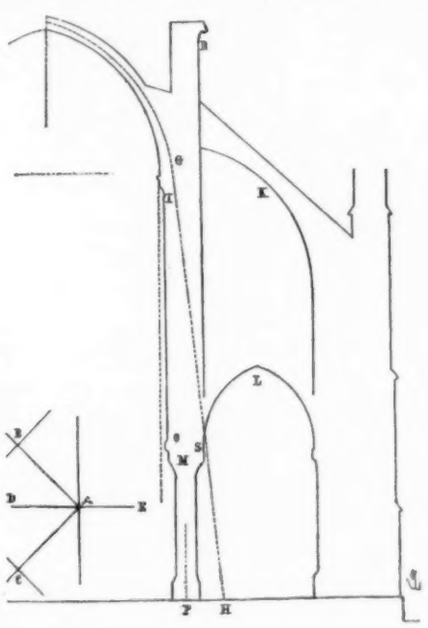


Fig. 34.

calculation; just as there is no machine, however perfect it may be, which attains the delicacy of the hand and the sureness of the eye. In this case, the instinct of the first Gothic builders served them well, for all the naves built with monocylindrical columns arranged as indicated in our cross-section (Fig. 34), are rarely put out of

[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. 856, page 119.

shape to a perceptible extent; while the majority of those where the piers, composed of clusters of pillars, rise from the ground, are bent more or less at the height of the thrust of the lower vaults. But we shall have occasion to return later to this subject.

This first point having been cleared up, let us come now to the details of the execution; for this is necessary. Gothic construction proceeds (if we are permitted to avail ourselves of this comparison) from an organic system much more complicated than that of the Roman construction. "So much the worse," say some, "it is a mark of inferiority." "So much the better," say others, "it is a proof of progress." Progress or decadence, it is a fact that we must recognize and study. Already, Figure 34 has shown that the combination by means of which the thrusts of vaults are maintained in Gothic buildings is by no means simple. Now, every construction starting from a complicated principle brings a series of consequences that cannot be simple.

Nothing is so imperiously logical as a building erected by men reasoning out what they do; we shall see this at once. The choir of St. Remy of Rheims was rebuilt about 1160, at the time when they were constructing that of the Cathedral of Paris. This construction, very skilfully conceived in its whole, showed in its details only a series of attempts; which indicates a school already far advanced in theory, but of very little experience in execution. The principle of weight and equilibrium which we have previously outlined, are there rigidly applied. But evidently workmen and overseers in the building-yard were lacking to these first Gothic builders; and they neither had the time nor the means of training skilful laborers, for no one understood them. Furthermore, the choir of St. Remy of Rheims must with reason have excited the admiration of the builders at the end of the twelfth century, for the methods there adopted are followed in Champagne at that period, and notably in the rebuilding of the choir of the church of Nôtre Dame at Chalons-sur-Marne.

But first let us describe in a few words the history of this charming edifice. The church of Chalons-sur-Marne was built during the early years of the twelfth century. It then consisted of a nave with aisles; the nave was roofed over, probably by timbers resting on transverse arches, like many of the churches of that period in Champagne; and the aisles were vaulted by means of transverse arches separating Roman groined vaults. The choir was composed of an apse without aisles, but with two square chapels opening into the transepts, under two steeples, like the cathedral of the same city. Toward the end of the twelfth century (although this structure had been raised under excellent conditions, and nothing leads us to the supposition that it had deteriorated), these arrangements were no longer in harmony with the ideas of the time: they were now wishing for vaulted naves, with aisles and chapels radiating out around the chancel. So the church had to undergo a complete rebuilding: the circular wall of the apse was replaced by detached columns; they built an aisle opening into three circular apsidal chapels; they kept the two steeples which flanked the apse but pierced the wall at the floor of the square chapels arranged under these towers, and these served to communicate with the aisle of the apse.

The nave was made higher and completely vaulted; and in place of the Roman vaults over the aisles they built pointed arches. Some capitals taken down from the original structure were replaced, notably in the side aisle of the apse.

This historic summary shows how much they were disposed to profit by all the resources presented by the new system of architecture then hardly sketched out. The construction of the apse of the Church of Nôtre Dame at Chalons-sur-Marne is a very little later than that of the choir of Saint Remy of Rheims, but already it is more scientific; one still perceives many blind attempts, and yet the progress is perceptible.

We ought here to resume the matters previously under discussion. We have described the simple groined vault raised between parallel walls, and we have indicated the first efforts of the architects to build and maintain this on its piers. We must return to this subject and examine the varieties of these vaults.

From the eleventh century, already, they had surrounded the chancels of churches by aisles with or without radiating chapels. (See "*Architecture Religieuse.*") That method, foreign to the plan of the early basilica, had caused builders more than one perplexity. Roman antiquity left nothing similar to it. Certainly the Romans had built porticos upon a circular plan, but these porticos, if vaulted, were composed of thick piers supporting a cradle-vault in which two semi-cylinders met, forming groined vaults, or a succession of radiating cradle-vaults fixed on arches, or even on horizontal imposts faced in stone, as still seen in the amphitheatre of Nismes.

[To be continued.]

A Submergible Pavilion.—The King of Siam has just had a pavilion of glass built for himself by a Chinese architect, the material for which was furnished by a French company. Walls, floors and ceiling are formed of slabs of different sorts and thicknesses of glass joined by impermeable cement. By one door only can the King enter, and this closes hermetically when he comes in, and ventilator valves in tall pipes in the roof open, as does also a sluice beside a large reservoir in which the glass house stands. The transparent edifice then becomes submerged, and the King thus finds himself in a cool and perfectly dry habitation, where he passes the time singing, smoking, eating and drinking.—*Invention.*

THE USES AND APPLICATIONS OF ALUMINIUM.[1]

Carved Walnut Chair, XVI Century. From Havard's "*Dictionnaire de l'Ameublement.*"

THE utility of a metal in the arts is governed by its physical properties, and the price at which it can be produced in an available form. I propose, therefore, as a commencement, to deal with both of these aspects of the question this evening, in order that a fairly correct basis may be arrived at on which to estimate the uses to which aluminium is applicable; and, in what I say, it must be understood that I refer generally to aluminium itself, or to aluminium alloyed with a few per cent of other metals, unless it is mentioned to the contrary, and not to aluminium bronzes, or bronzes consisting chiefly of copper alloyed with a few per cent of aluminium.

Let us commence with the cost of the metal, as that so largely determines its sphere of usefulness. Just three years ago, in this room, Mr. William Anderson described the Deville-Castner process, which had then just been put in operation by the Aluminium Company of Oldbury, near Birmingham. It was then stated that it was proposed to manufacture aluminium at 20*s.* per pound, or at about one-third of what its price had been previously, and still leave a satisfactory commercial profit. These anticipations would have been duly realized but for the contemporaneous perfection of the electrolytic methods of reducing aluminium, which, being brought into use on a large scale, have resulted in an enormous reduction in the cost of production, and this has constantly reduced the market-price of aluminium in a manner which is probably without parallel in the industrial history of metals. Starting three years ago, as has been mentioned, at 20*s.* per pound, the price of aluminium quickly fell to 15*s.*, then to 12*s.*, next to 8*s.* and even to 6*s.* It was thought, about a year ago, that the climax, for the time being at any rate, had been reached, when the Pittsburgh Reduction Company of Pittsburgh, Pa., announced that they were prepared to supply aluminium at a dollar, or 4*s.* 2*d.* per pound. But the competition chiefly of the Aluminium Industry Company of Neuhausen, Switzerland, whose works are operated by water-power and are on a large scale, has led to still further reductions, and at present, in considerable quantities, aluminium of ninety-nine per cent guaranteed purity is obtainable at 2*s.* or even less per pound.

On anything like the present output this price is hardly a remunerative one for the companies engaged in production; and it seems to me that it is improbable that there will be much greater reduction at present. On the other hand, I do not think the price is likely to rise very much again, because a larger consumption of the metal would make this rate a paying one, which would lead to increased output. This, then, is the cost basis on which we have to estimate the openings for aluminium during the next year or two, a cost, bulk for bulk, not greatly exceeding that of copper, for at present the cost of copper is about 5*d.* per pound, and, since it is three and a half times as heavy as aluminium, the latter, at 2*s.* per pound, would equal copper at $\frac{24 \times 2}{7}$ = say 7*d.* per pound, or a relative cost for equal quantities of as five for copper is to seven for aluminium.

It may be interesting to outline the processes by which these astonishing results have been obtained, particularly as finality has by no means yet been reached; and should the uses of aluminium warrant a largely increased output in the future, considerably better economical results could be attained.

As usual, success has been achieved by the labors of many minds, but there are two patented processes under which most of the aluminium at present made is being manufactured. The first is that of Mr. Hall, of Pittsburgh, Pa., whose patents are owned in America by the Metal Reduction Company of Pittsburgh, and in England by the Metal Reduction Syndicate of Patricroft, near Manchester. The second is that of M. Heroult, a young French engineer. This latter process is controlled by the Société Electro-Metallurgique of

[1] A paper read before the Society of Arts by G. L. Addenbrooke and printed in the *Journal* of the Society.

Troyes (Isere), in France, and by the Aluminium Industry Company of Neuhausen, Switzerland, at which latter works the largest plant in the world for the reduction of aluminium and its subsequent working is situated.

Although, however, two in name, there is, in fact very little difference between these two processes, so far as the details have been made known, and therefore, for my purpose this evening, one description will answer for both.

In both cases the oxide of aluminium, of alumina, $Al_2 O_3$, is the material from which the metal is reduced. This is dissolved in a fused flux, consisting of fluorides of aluminium and sodium, which simply serves as a vehicle to carry the alumina. The furnace for effecting the operation is made in the form of an iron-cased box, which is thickly lined with carbon, having a cavity in the centre into which the materials for reduction are introduced. Two or more of these furnaces are placed in series, and one pole of the dynamo is connected to the carbon lining of the first, forming the kathode. A large block of carbon carried on an adjustable support, and arranged so that it can be dipped into the central cavity of the furnace, forms the anode, from it connection is made to the lining of the second furnace, and from the carbon anode of the second furnace, if there are two, the main passes back to the other terminal of the dynamo.

In starting the plant, the carbons are brought well down in the furnaces, and the current turned on. At first considerable resistance is offered, but as the materials in the furnaces get warm this decreases, and the carbon anode can be raised somewhat. Decomposition takes place at about a full red heat, the alumina is resolved into its elements, the oxygen partly unites with the carbon, and is given off as carbonic oxide, and partly escapes free, while the aluminium sinks to the bottom, and gradually accumulates. When a sufficient quantity has collected, it is tapped off and run into moulds without interrupting the process of reduction, which is thus continuous. As the aluminium in the furnace is decomposed, the resistance rises, as the workman can see by watching the ammeter, and this is an indication to him to add more alumina.

It will thus be seen that the process is a pretty simple one. First, we have the dynamos, which must be driven by steam or water power, and which, as they are operated continuously, can be worked to the best advantage. The load is fairly even, and therefore the wear and tear on this part of the plant should be small. Then we have the furnaces, which are not expensive and will only require the carbon lining and anodes renewed occasionally. Lastly, the flux, acting simply as a carrying vehicle, needs only small additions from time to time. The four great items in the cost of production of aluminium are, therefore, the cost of the electric energy, of the alumina required, wages and superintendence, and depreciation and interest on capital employed.

Now, in the Hall process, it is found that twenty-two electric horse-power flowing through the bath, at a potential of eight to ten volts, for one hour, is what is required to reduce one pound of aluminium, and this can easily be produced by the combustion of half a hundred weight of coal, which, at 10*s.* per ton, means a cost of 3*d.*

As to the alumina, I am informed by the Metal Reduction Syndicate that the anhydrous alumina which they use, and find most suitable, on account of its freedom from impurities, costs £30 per ton, and yields about fifty per cent of its weight in aluminium. The cost, therefore, of the raw material is at present about 6*d.* per pound for the aluminium contained.

The cost of the pound of aluminium then totals up to 2*s.* 9*d.* per pound for the aluminium extracted, unless indeed water-power is employed, as at Neuhausen, where the first item is, of course, considerably reduced.

Coming now to the capital required, a horse-power of plant, working for twenty-four hours, produces, in practice, about one pound of aluminium. Supposing the plant works 300 days a year, we have 300 pounds of aluminium as the product of an indicated horse-power of plant working for a year. Now, such a plant as this could easily be erected complete, including buildings and all accessories, for £30 per indicated horse-power available; and supposing we take upkeep at ten per cent, and interest and profit at ten per cent, this represents £6 per annum to be spread over 300 pounds of aluminium, or 5*d.* per pound, which is a very liberal estimate, and may well include the cost of carbons and fluxes. For these three items then we have a total of 1*s.* 2*d.* per pound. Finally, come labor, superintendence, and administration expenses. These so much depend on the output, which at present is small, that I shall not attempt to estimate them. It will be sufficient for my purpose if I have shown that the present price of aluminium ingots, say 2*s.* per pound, cannot leave much margin of profit on the present rates of output, which are about as follows: The Aluminium Industry Company, 1,000 pounds per diem; the Pittsburgh Reduction Company, 600 pounds per diem; the Metal Reduction Syndicate, of Manchester, 300 pounds per diem; Cowles Company, 600–700 pounds in alloys. At the same time it is sufficiently near the remunerative level to prevent any great advance, except by a reduction of output, or some agreement amongst manufacturers.

To get further cheapness, a larger demand and production are needed, which must come within a moderate time, when we may safely calculate on aluminium comparing, at any rate, on equal terms with copper as to price for equal bulks; but, from what I have shown, I think it is pretty clear that we cannot look for much reduction on the price I have named in the immediate future. Improvements will certainly take place in the processes of manufacture, and I feel very hopeful of them, but they will probably be in details rather than in any fundamental alteration of the present electrolytic process of reduction, and will chiefly take the form of improvements in the methods of obtaining pure alumina of some other salt of aluminium, and in the method of operating the furnaces, in which, at present, only about twenty-five per cent of the energy is utilized for production directly, the rest being absorbed in heating the materials. Electric heating has so far been, I believe, preferable to direct heating, but I cannot help thinking that, at any rate, where steam-engines are employed, further experience will lead to improved forms of apparatus being devised, which will admit of the heat required being applied directly and more economically than through the intermediation of a steam-engine, which, as a heat-producer, is so very inefficient.

To pursue these lines of thought further would be speculative, whereas my object this evening is of a more practical nature; therefore, having settled on an approximate price at which aluminium will be obtainable for present use, it remains to be seen what field this price, coupled with its peculiar physical and mechanical properties, will enable it to occupy.

Within the last ten years, the quality of metal manufactured has been very much improved, and the larger quantities in which it has been dealt with have given better opportunities of estimating accurately its nature than was possible before. Most of the metal made is now of over ninety-nine per cent purity, and the reduction in the amounts of iron and silicon contained in it, which are the chief impurities, has altered and improved its working qualities considerably when it has to be rolled, spun and drawn.

To show exactly what its properties are, I have here a cast bar of pure metal, about one-half an inch wide, three-eighths of an inch thick and one foot long. Taking the ends of that in my hands, you will see that I can bend it double, bringing it into the form of a rather elongated O without breaking; that is about the limit of what it will stand. As regards hardness, it is rather softer than copper, and in the lathe or under the file behaves in much the same way, having a strong tendency to pull and tear and clog the tools. Like copper, too, it is softened by being plunged hot into cold water, and hardened by being cooled slowly.

Clearly, in this state, it is not very suitable for castings, and, just as zinc and tin are added to copper to improve its qualities, so some similar additions must be made to aluminium if it is to be as useful in this form as its other qualities lead us to anticipate.

In the endeavor to improve the qualities of aluminium without detracting appreciably from its characteristic properties of lightness and incorrodibility, I have gone over some old ground, and, perhaps, entered a little new, and a few notes on the results of additions of other metals to aluminium may be interesting, as the literature on this subject is rather fragmentary and incomplete, and early experiments were mostly performed with impure metal.

To begin with, the pure metal does not cast quite so well, nor is it as hard or strong as when it contains two to three per cent of silicon, though its malleability is decreased, and it has a scratchy, sandy feel.

The addition of iron seems to be simply detrimental, leading to porous castings, while the metal is of a rotten nature.

Copper gives much better results; it hardens the metal considerably, when added up to five or six per cent; after this brittleness is produced.

My experience with copper, however, is that the alloy does not stand re-melting well, but soon becomes porous; on the other hand, until it has been several times melted and allowed to stand, scum is apt to form and mingle with the metal, producing bad marks in the casting. The metal also still pulls in the lathe. Silver alloys with aluminium very well, but its cost puts it out of court for most purposes.

Zinc hardens aluminium, and also toughens it when added to the extent of three or four per cent, but the resulting metal is difficult to turn, and the alloy is not a very clean one. It does not stand re-melting well.

The addition of tin appears primarily to have two actions: up to three or four per cent it makes the aluminium short, but improves its turning qualities; if ten per cent is added, the bar is at first as pliable as the pure metal, and of about the same strength, but, if this metal is once or twice re-melted, it soon becomes crystalline.

Nickel has much the same effect. When added to copper, it, however, produces a closer grain, though still leaving a bad surface under the tool.

Though the qualities of aluminium, therefore, are improved in some respects by the addition of alloys, none of them seem to produce alone quite what is wanted.

In combination, however, better results are obtainable, and I have here some specimens made by the Phœnix Engineering Company. The exact compositions of these I am not at liberty to disclose at present, but it will be seen that the metal is both whiter and much harder than aluminium, while it can be turned with practically the same facility as brass, leaving as good a surface. A good example of the alloy will have a rigidity slightly superior to ordinary cast brass, though it cannot be bent to the same extent; however, it is

still fairly malleable, and bears considerable extension under the hammer. As with so many other alloys, the best results are obtained after the metal has gone through a certain amount of mixing and re-melting; afterwards, frequent re-melting renders it more brittle, and is apt to produce porosity. This, in fact, constitutes the chief difficulty in casting aluminium, and it is aggravated by the fact that most of the objects hitherto made in aluminium are small, while, owing to the lightness of the metal, higher heads are needed than for brass or iron. There is, therefore, necessarily a good deal of re-melting if metal is not to be put aside. This difficulty is, however, one which practice and the use of aluminium for an increasing number of objects will diminish.

To illustrate what can be done with this alloy, I have here a dumpy level made from it, including all the screws and working parts. Further, I have camera screws and nuts, tripod heads and a portable galvanometer, while Mr. Dallmeyer has been kind enough to send down examples of his lenses, particularly his new ones, all the parts of which, except the tubes, have been made of this alloy. It will be noticed that satisfactory screws can be cut in the metal. I have here, also, a specimen of a small resistance-box, of which the top is made of it, and which appears to answer very well.

The alloy will also be useful, I think, for the frames of light motors and for some of the working parts, for parts of portable microscopes and telescopes, range-finders, heleographs, projectors, arc-lamps, field-telegraph apparatus, stands for portable lamps and for a considerable number of other purposes where a fair degree of strength and rigidity is needed, combined with lightness and incorrodibility.

Before passing on from the consideration of alloys, I must mention the beautiful one of aluminium and gold, containing, I believe, about twenty-three per cent of the former metal, which has been discovered by Professor Roberts-Austen, and which he has been kind enough to bring to-night. In structure it is crystalline, but the interesting point about it is its beautiful rose-pink color, which is quite different from anything that has been observed in metal before.

Of alloys with aluminium in general, it may be said that they decrease its malleability, and that, for metal which has to be rolled or drawn, it is usually expedient to employ the pure metal; in fact, the purer the better. I think, however, that as the handling of the metal is better known, some of these alloys may prove useful, and provide us with harder sheets, and wires of higher breaking-strain than can be obtained from aluminium itself.

Passing now from cast aluminium to rolled and drawn. There are on the table some five-pound ingots cast in iron moulds, such as are used for rolling from. These can be rolled right down into sheets of any thickness, cold and without annealing, of which there are several specimens before you, ranging from the ordinary grades down to one which I have, and which is only 1-1000 of an inch thick; while, to proceed farther, foil can be beaten out into leaves, the thickness of which is about 1-40000 of an inch. This leaf has almost entirely superseded silver for gilding, on account of its permanence, as a good instance of which I can show you a book of leaf which was made in 1868, and has been in London since. You will perceive that it is as bright as the day it was made.

Sheets of aluminium cold rolled become very hard and quite springy, in fact their rigidity is greater than that of ordinary brass sheets. They will still stand a fair amount of bending, and can quickly be made quite soft by annealing at a temperature of about 400°. It is evident that such sheets are applicable to a number of purposes in the flat. For instance, they have been used for making canoes and the hulls of steam launches, or for parts of photographic cameras. Sheaths for holding photograph films, and a number of the parts of portable instruments, are also readily made from aluminium sheet, and it will also, I think, have a future for ornamental work for electroliers and gas-brackets, especially in conjunction with ironwork, with which it forms an excellent contrast; but its greatest value lies in forming the substratum, so to speak, for stamping and spinning.

Of the various useful articles which will be made of aluminium in the immediate future, it is safe to say that a large proportion will be stamped or spun, for aluminium lends itself particularly well to this work, and anything that can be so made in other metals can be carried out in aluminium. It has, like other metals, a few peculiarities of its own which required to be mastered, but when this is done, we have a metal which is as tractable in the hands of the workman as silver. As instances, there are on the table some fine stampings of a couchant lion and examples of buttons, also forks, the backs of brushes, etc., which show how much can be accomplished, and what a nice effect the work has.

Of spinnings, Messrs. Still & Co. have been kind enough to send some fine examples; there is, for instance, a stethoscope entirely spun up, including the tube and both ends, from a circular plate, such as I have here; a more perfect specimen of what can be done with a metal, and what it will stand, it would, I think, be difficult to conceive — though so light, it is yet very rigid. There are also examples of surgical specula; an ewer and basin; and, lastly, some helmets for firemen or military purposes; these, Messrs. Still & Co. assure me, they consider as strong and stiff as ordinary brass, of which there is also an example, that its weight may be compared with those in aluminium.

Then I have here an example of the aluminium flask, of which so much has been said lately in connection with the German army; it will be observed how light and strong it is. For comparison, there is another somewhat similar one of English manufacture. The uses of aluminium for cooking utensils and probably for cartridge-cases, should also be noted here.

Lastly, there are some very interesting plaques and picture frames, the work of the Scovil Company of New York, which are an interesting example of scratch brush work.

Turning now to a slightly different field, here are examples of tubes. Some provided by the Mannesmann Company, as examples of their power, are twelve or fourteen feet long, and of excellent quality. For the remainder I am indebted to the Phœnix Engineering Company. All these tubes, I need hardly say, are solid drawn; and it will be noted what excellent examples of workmanship they are. For telescopes, and wherever lightness is essential, they must supersede brass or German silver. Whether they will answer for bicycles still remains a moot point. I have tested two sets of tubes of the same dimensions — one of steel and the other of aluminium — in the following way. The tubes were supported in **V** groves a foot apart, and a lever was brought down on the centre of the tubes between the supports, a pad and narrow ring being used to secure a fairly even pressure. The lever was then adjusted, and it was found that the aluminium tubes stood about half the strain of the steel tubes, though their collapse was a little more complete on passing the critical point. As an instance, an aluminium tube one inch in diameter and forty mils. thick stood a strain of 200 pounds applied in this way. This, I think, must be considered very satisfactory.

Of the applicability of aluminium to opera and field-glasses it is needless to speak, but there is an example on the table of a glass made in 1864, which has been in constant use since. In 1870 the wheel of a carriage passed over it, but it was afterwards straightened out and made usable. It has made two voyages across the Atlantic, two across the Pacific and has had other shorter experiences of the sea air, besides lying on one occasion for some time in salt water; this disposes of the idea that aluminium is readily spoiled by contact with sea air. For my part, I have kept strips of aluminium for two or three weeks in salt water, and have noted very little effect.

I might continue this somewhat discursive paper farther, and it is obvious that I have only enumerated a few of the uses to which aluminium can be put, but I have rather relied on showing from the examples before you that aluminium is an easily workable metal, and can be worked into almost any form which metals, such as copper, brass and silver, are capable of assuming, having once grasped which, each in his own sphere, can find uses to which it adapts itself. At its present price, it can be classed as eminently a useful metal, and the lower the price becomes, the wider will be its sphere of utility.

There is, further, one goal towards which aluminium workers will look forward, and the attainment of which it is not unreasonable to expect in the future. At present the price of aluminium is about four times that of pure copper for equal weights, and its output is little more than a ton a day for the whole world. In the improvements in the process of reduction, and an output of some thousands of tons per annum, is it looking too far ahead to anticipate that the price will be reduced to that of copper, when aluminium, with its conductivity of 200 per cent that of copper — weight for weight — would, in a large measure, replace the latter metal for mains for electric lighting.

In what I have said nothing has been mentioned about solder. I have here an example of some joints I have had made, which are fairly satisfactory. Strength of joint is secured, but the process of making it requires a good deal of care, on account of the high melting point of the solder and the difficulty of getting it to flow readily. Still it can be done. Messrs. Balfour & Co. have, however, informed me that they have a solder which they propose to bring out shortly which is a great improvement on previous ones. They have brought some examples of work done with it to-night, from which it will be seen that the joints are quite invisible. I have not yet seen any actual joints in the process of being made, but aluminium workers will await further results with interest.

Thirty-seven Years' Fire Statistics for New York. — During the thirty-seven years which ended on May 1, 1891, 41,722 alarms of fire were struck — an average of 1,127 a year — and the fires did $102,000,000 damage, or an average of $2,445 each fire. The yearly average of fires in the last ten years of the volunteer service was 694, while that of the last ten years of the paid service was 1,844, and yet the percentage of loss on the insurances in 1890–91 was but 17.56, while in 1854–5 it was 32.87, in 1864–5, 36.34, and in 1865–6 — the time of change from the volunteer to the paid system — 47.09. In 1871–2 the percentage was as low as 14.58. The lowest percentage was in 1889–90, when it was 11.37, or about $3,200,000 loss to $28,000,000 of insurance. The most disastrous year was 1887–8, when on buildings and contents insured for about $35,000,000 there was a loss of 17.61 per cent, or about $6,250,000. In this year there were 23 fires each involving a loss of more than $50,000, or an aggregate of more than $3,950,000. The heaviest of them was that of January 30, 1888, which cost the insurance people about $1,090,000 and extended from 539 to 559 Broadway and damaged 552 and 554 Broadway, and involved 112 to 130 and 113 to 125 Mercer Street. — *New York Times.*

BOOKS AND PAPERS

EVIDENTLY, in preparing this extremely useful set of plates,[1] Professor Chandler did not stand in dread of the criticism of Mr. Atkinson and the other consistent and persistent opponents of the ordinary methods of cellular building, as employed by the American architect and builder, and why should he? The common practice is one which will be used hereafter — even if it should be prohibited within city fire-limits — in country places everywhere, simply because its methods are generally understood, because the merchant sizes of materials are adapted to it, and because circumstances make it a cheaper method to use than one that is absolutely better and safer. Accepting this as the probable condition of future building operations, an instructor does his duty in showing how the best mechanics work in that method. Yet it does seem a little odd that since so much attention is now given to slow-burning construction, that nothing of the kind appears in any of the plates. Unquestionably, however, the methods of solid-wood construction must be properly explained in the class-room as desirable variants from the common practice. These twenty-five plates merely undertake to deal with the details of ordinary construction, or rather, with some of them, for in the limited space all cannot, of course, be dealt with, but must be deferred to a second series, which, we hope, will some time follow this first portfolio.

When a student or a new draughtsman is set to making detail-drawings, he has either to hunt through the office drawers for some similar detail he can follow, or pester those about him with questions as to what is the usual thickness of a sash, whether the rebate in a door-frame is $\frac{3}{4}''$ or $\frac{1}{2}''$, whether the outer casing of a window-frame butts against or laps over the outer boarding, and so on; but, with these admirable plates to turn to, he can work out his own drawing with satisfaction to himself and to those about him. It is extraordinary, the number and kind of every-day practical matters a student fresh from school finds he does not know when he begins to do office-work. It is not a little humiliating for a youth who has been designing "casinos," "picture-galleries" and "little museums" to find that he doesn't know whether the putty should be indicated on the inside or the out of a sash, and finds the head of the office pointing out that his detail won't fit, because he has not allowed for the thickness of the stripping for the ceiling laths, since he had always supposed the laths were nailed to the joists direct.

In wooden buildings, the chief effort in the way of construction — strength apart — is made in excluding those two enemies of comfort, wind and water, and unfortunate and uncomfortable is the man whose architect or builder has not used all known means to prevent the entrance of these unwelcome visitors. The path of the air-current cannot be absolutely closed, but it can be made devious, its insinuating presence may be detected, but it need not be a riotous visitor. On the other hand, water can be absolutely excluded, and, as it generally enters from above, let us see how Professor Chandler proposes to keep it out. We find that the plates give little attention to the different methods of covering a roof. The details of slating, shingling, tiling, tinning and the use of composition roofings will probably be treated in a subsequent part, together with finials and crestings, and so on, but we do find here that the important matter of flashing about the chimney and the building of a tin-covered cricket behind the chimney is clearly shown. If the skylight is properly looked to and dormer walls flashed high enough, there is nothing more to look after than the valleys, and speaking of valleys reminds us that we had recently to cure a leaking valley formed between a roof of steep pitch with a flatter one by making an open valley and turning the flashing over a high roll.

If a roof leaks, the seat of the trouble can usually be found, but when a faulty gutter is the cause of the trouble, it is not easy to decide where the difficulty lies, and oftentimes what could be cured cheaply if the cause could be determined is cured by adopting a different style of gutter for the whole building at a great expense.

Of gutters, all for wooden houses, eight varieties are shown, of which, as Professor Chandler says, the safest is one of the modifications of the simple V-trough gutter hung clear below the eaves and free to overflow front or back without injury to the wall behind. In cottage work this kind of free-hung gutter can be used very effectively, as can also the V-trough gutter built upon the upper side of the roof-boarding, if one take care not to place it too high up on the roof, but give the eaves a good overhang, keep the gutter as near the edge as possible, and then flashes up beyond the line of the wall. In cases where a more formal cornice finish is used a deep inner facia against which the gutter is nailed is, as here shown, a most useful piece of justifiable precaution; but even without this if care is taken to lap joints and to incline the planceer upward to the wall and make sharp drips where possible, some of the simpler forms shown will do as well. Perhaps these two plates are as interesting as any in the series and largely because several methods are shown in parallel, and we will add that a greater use of the parallel system of illustration would have added to the value of the whole, as would a sample of each detail showing how the work ought not to be done — a few "horrid examples" often have an impressive value.

The next place that water is likely to enter is between window-rail and sill. The useful device of running a semicircular groove on the under side of the rail is not shown, but in its place a slight rebate is worked in the sill itself upon which the sash rests in such a position that half the thickness of the rail projects and forms a drip; and the useful rebate is again used for protecting the straight joint formed between stone and wooden sills, for the under side of the wooden sill is worked out so as to lap down over a lug worked on the upper rear edge of the stone sill. The protection this arrangement gives is worth all its cost. If the roll-way door is provided with a gutter to catch the drip from the house-wall and prevent its entrance through the long horizontal joint at top, there is a fair chance that the house will be water-tight, unless casement windows are to be used. Here it is not only the horizontal joint at bottom that gives trouble but the long vertical joint as well, and more or less trouble they will give, no matter how much care and ingenuity are expended on them. The vertical joint shown is an excellent one, and the groove which is sometimes used on the underside of the lower rail of a hung sash — where its function is to give the air-current a chance to pass over the water it is driving before it and being deflected down in front of it actually to tend to drive it out the way it came in — is here used to intercept the water and lead it down to an outlet at the sill. But the bottom joint cannot be properly protected by any simple joiner's device, and a mechanical weather-strip must be used, and very likely the one shown is as good as any.

It would be interesting enough to go over all the plates and point out the particular merits of the arrangements exhibited, arrangements which are not necessarily better than others which are used for similar purposes in this market or elsewhere. Their best value lies in the fact that they show one good method of doing the work, and, if they are good enough, there is an excuse for not showing other methods equally good.

The liberal employment of isometric drawings makes needless an excessive amount of explanatory notes, but these have not been spared when there was occasion for them, and, together, they make the plates readily understandable by any one, and give them an extremely clever and workmanlike air. To be sure, they deal largely with the commonplaces of every-day practice, but draughtsmen are fallible and peripatetic as well, and who knows what evil practices may be imported unannounced into his drawings by some one who has been working last for a careless or ignorant employer? A collection such as this, to which a new-comer can be referred, would form a desirable safeguard for every office library to contain.

A PORTFOLIO[2] of plates of a very different kind has just been issued, also by a Mr. Chandler — not the professor whose work we have mentioned above, but a young architect of Boston, who has taken recently what could hardly have been a comfortable trip to Maryland and Virginia in search of "Old Colonial Work." Instead of finding the bare ground and sunny aspects he may have expected, these plates show that the belated snow-storm persistently dogged his steps. As a rule, the photographer of architectural subjects will do well to avoid working with snow on the ground. The contrasts are usually unpleasantly glaring, the reflections are puzzling and contradictory, and the snow is apt to lodge on features and details where it will do the utmost possible harm to the resulting print. How it happens that, in spite of these drawbacks, Mr. Chandler succeeded in securing such very artistic results we do not understand. The presence of snow has been as often an advantage to his result as it has been an injury: for example, the violence of the contrast between the white columns, pediment and cornice of the street front of the University of Virginia at Charlottesville, Va. (Plate 46), has been mitigated by the presence of snow on the ground and snow haze in the air, as could not have happened if the sky had been clear and grass had covered the broad foreground. On the other hand, the ill that snow may do is partly suggested in the view of Westover (Plate 40), for here there is less white work about the house, and the solid dark of the brickwork and the whiteness of the patches of snow clash unpleasantly.

In one respect Mr. Chandler has shown a perspicacity which has not always served other purveyors of architectural photographs: he has paid much and successful attention to the selection of his point of sight and the grouping of his subject. The result is that he has produced a series of artistic pictures which will interest non-professional book-buyers quite as much as it will architects, perhaps even more, for the procuring of an artistic effect and a good architectural presentation of the subject do not necessarily go hand-in-hand, and oftentimes it is necessary to sacrifice scale to effect when much heed is given to grouping.

In the matter of selection of subject an equal judiciousness has been shown and so the collection embraces some public buildings, though the greatest heed has been paid to dwelling-houses, for in these the characteristics of the style are most marked while in public buildings more attention was paid to the rules of formal classicism, and the architect and builder did not allow themselves to take those liberties of which they felt the need when it came to marrying the

[1] "*Construction Details*," prepared for the use of the students of the Massachusetts Institute of Technology by F. W. Chandler, Professor of Architecture. Published by the Heliotype Printing Co., Boston. Price, $10.

[2] "*The Colonial Architecture of Maryland, Pennsylvania and Virginia*." Fifty plates photographed and arranged under the direction of Joseph Everett Chandler, Architect. Boston: Bates, Kimball & Guild, 1892.

stately forms used on the temples of the ancient with the comfort and hospitable friendliness which should mark the homes of a generation of men as open-handed and generous as any that ever lived. Yet the University of Virginia at Charlottesville — it is annoying by the way that no plan of this interesting group of buildings is given — said to have been projected by Thomas Jefferson, and the Court-House at Williamsburgh are all of this class that the collection contains, and no church has been found in the course of the trip which, seemingly, was deserving of a record. All the other subjects are drawn from the interesting dwelling-houses of the period and as one studies these plates, he cannot but regret that his lot was not cast in that period when there seems to have been more time to enjoy life and its possibilities than in the present crowded and nerve-stretching days.

In a general way the early manor house was built four-square, like Shirley and Westover, but even in the early days there were some whose whims or means led them to construct their dwellings on a less simple plan. Coeval with Westover in Virginia (1737), was White Hall in Anne Arundel County, Md. (1740), and here the simple square house was replaced by a structure consisting of an oblong two-story main building, flanked at either end with square one-story pavilions with which it is connected by one-story enclosed corridors. The arrangement gives a delightful impression of roominess which to the guest promises that desirable seclusion that is so hard to find where all the occupants of a house having to use the same hall and staircase are by that fact compelled to give notice of their movements to whomsoever chooses to watch. The same arrangement was adopted at a somewhat later date at Homewood in Baltimore County, Md. (Plate 7), and here the architecture is more in character with the style and the general air of the building is more refined and stately. The heavy Corinthian portico of White Hall with its narrow flight of three steps is replaced at Homewood by a lighter portico of Composite type, to which ascend a broad flight of marble steps: this is made necessary because there is at Homewood a "practicable" basement, well lighted, while in the older house there is apparently no cellar, the servants being housed in one of the pavilions or relegated to quarters at the rear. Either of these plans would give a most delightful country-house for almost any part of the country.

It is curious that Mr. Chandler does not seem to have found a wooden house in the style that was worth copying. Perhaps there are none, but in New England where there are homelike and stately dwellings as well of the same date, it is the brick house that forms the exception to the general practice of building of wood. In the more southern English settlements, brick seems to have been used mainly and the difference must betoken something, but what? Probably a mere difference in wealth; but yet one can't help feeling that climatic differences, the shortness of the building season in one section and its greater length in the other, had their influence. Or did the settlers in the South come from a part of England where brick was the normal and only building material, while the Puritans came from a section where houses were still built mainly of wood?

Most of the houses shown give little indication of modern alteration and addition and the sentiment and circumstance that have kept the exteriors practically unchanged seem to have operated to keep the furnishings of the present owners fairly in harmony with the standing finish of the rooms in which they are placed. Of the many interior views there is not one that has that overpowering essence of modernity about it, so redolent of the five o'clock tea, where the modern dude and dudine can hardly move about without tipping over some table littered up with bric-à-brac of most miscellaneous character and doubtful authenticity and value. These views show in general, plain walls with now and then a portrait or some standard engraving, whose day of fashion is long passed, and the many interesting and delicately designed chimneypieces bear mantel ornaments, few in number and quite in character with their resting place; when a bit of modern bric-à-brac appears it seems to be quite out of place and ashamed of itself. One of the plates (32) showing a mantel in Dr. Crim's house in Baltimore, is quite perfect in make-up and were it not for the reflection in the mirror over the mantel, of a vulgar gas chandelier, the presence of a hot-air register in the chimney-breast and — shall we say it? — a distinctly modern spittoon on the hearth, we might accept it as showing the furnishing of the room a hundred years and more ago. The sword-hilt poker, the warming-pan, the twin-silver candlesticks and the brass pillar candlestick between, may have kept their places for years, while the Sheraton chair, the high cabinet, the sofa with its twisted carved arms and legs may have had intimate acquaintance with the gallant Catholic gentlemen and ladies of Lord Baltimore's time. As for the chimneypiece itself, it is not so interesting, not so refined as some others here shown, but to which there is not time to refer any more than to the very interesting series of exterior doorways which of themselves would make this portfolio interesting.

Mr. Chandler is to be warmly congratulated on the result of his effort. He has covered a fair range of territory and secured a wide range of subject, and has in this way made sure of interesting those who may chance to open the portfolio. He is fortunate, too, in one respect — the inferior quality of some of his negatives and the imperfect way in which some of the plates have been printed; defects which would depreciate seriously the value of a work which was intended wholly for the use of architects, have by their very imperfections and mistiness added in a wholly unintended manner to the artistic effect of the plates looked at simply as impressionist pictures. Because they have this redeeming quality the architect can forgive them, perhaps, when on looking closer at a print to discover what the detail of some feature is he finds that the print is too imperfect to tell its secret.

The Illustrations

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

HOUSE OF J. ADAMS, ESQ., CORNER CARROLL PLACE AND 8TH AVENUE, BROOKLYN, N. Y. MR. C. P. H. GILBERT, ARCHITECT, NEW YORK, N. Y.

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

HOUSE AT SOUTHPORT, L. I. MR. WILSON EYRE, JR., ARCHITECT, PHILADELPHIA, PA.

HOUSE AND STABLE FOR WILLIAM WILSON, ESQ. MR. MANLY N. CUTTER, ARCHITECT, NEW YORK, N. Y.

THE AGASSIZ SCHOOL, JAMAICA PLAIN, MASS. MR. E. M. WHEELWRIGHT, CITY ARCHITECT, BOSTON, MASS.

The main walling of this building is of terra-cotta-colored brick laid in yellow mortar. The frieze is made by using light-red brick laid in a mixed bond with white mortar. The decorative finish is of terra-cotta.

[Additional Illustrations in the International Edition.]

CHATEAU DU DUC D'ANJOU, ANGERS, FRANCE.

[Photogravure.]

When we compare this habitation with the rich and noble seigniorial dwellings of the same epoch, we are surprised with the modesty of what is called in the good city of Angers the Château of the Duke of Anjou, situated at the centre of the ramparts and fortifications of the Fortress of Angers. This pavilion seems to have served the purpose of the classic donjon, which, doubtless, it supplanted for the sake of assuring to the dukes of Anjou a possible residence on those days, more and more rare, when they had to confine themselves to this spot. The character of its architecture, and especially its mode of construction, strip it of the stern aspect common to military structures, and it does not seem that its architect ever desired that it should fill an heroic rôle. It sufficiently resembles the dwelling of the modern bourgeois grown rich, who is haunted with the nightmare of a beturreted dwelling; but a bourgeois might have asked for machicolations, which in this case are quite wanting.

ENTRANCE TO THE LIBRARY, BRUGES, BELGIUM.

[Gelatine Print.]

VESTIBULE OF THE PALAIS DE JUSTICE, BRUSSELS, BELGIUM, FROM THE SECOND LANDING OF THE GRAND STAIRCASE. M. JOSEPH POELAERT, ARCHITECT.

[Gelatine Print.]

THE BRIDGE OF SIGHS, VENICE.

A title that appeals to the sentiment has obtained interest for the Ponte de' Sospiri, or Bridge of Sighs, which it would not receive for its appearance. It is one of the first structures in Venice which strangers desire to see, and there are few who do not feel that the bridge has gained universal renown under false pretences. Gautier was not far wrong when he described it as a cenotaph over a canal, and without the real and imaginary associations it is as prosy a piece of work as many of the galleries which connect two warehouses in the back streets of London. The only difference is that it is constructed of stone. Byron, who helped to create the interest in the bridge, has very little to say about it beyond the two famous lines in "Childe Harold":

> I stood in Venice on the Bridge of Sighs,
> A palace and a prison on each hand.

In the "Historical Notes" which he appended to the canto containing the lines, his lordship gave more attention to the prison than to the bridge, as will be seen from the reprint, which describes the state of the cells about 1817:

"The communication between the ducal palace and the prisons of Venice is by a gloomy bridge, or covered gallery, high above the water, and divided by a stone wall into a passage and a cell. The State dungeons, called 'pozzi,' or wells, were sunk in the thick

walls of the palace, and the prisoner, when taken out to die, was conducted across the gallery to the other side, and, being then led back into the other compartment or cell upon the bridge, was there strangled. The low portal through which the criminal was taken into this cell is now walled up; but the passage is still open, and is still known by the name of the Bridge of Sighs. The 'pozzi' are under the flooring of the chamber at the foot of the bridge. They were formerly twelve, but, on the first arrival of the French, the Venetians hastily blocked or broke up the deeper of these dungeons. You may still, however, descend by a trap-door, and crawl down through holes, half-choked by rubbish, to the depth of two stories below the first range. If you are in want of consolation for the extinction of patrician power, perhaps you may find it there; scarcely a ray of light glimmers into the narrow gallery which leads to the cells, and the places of confinement themselves are totally dark. A small hole in the wall admitted the damp air of the passage, and served for the introduction of the prisoner's food. A wooden pallet, raised a foot from the ground, was the only furniture. The conductors tell you that a light was not allowed. The cells are about five paces in length, two and a half in width, and seven feet in height. They are directly beneath one another, and respiration is somewhat difficult in the lower holes. Only one prisoner was found when the Republicans descended into these hideous recesses, and he is said to have been confined sixteen years. But the inmates of the dungeons beneath had left traces of their repentance, or of their despair, which are still visible, and may perhaps owe something to secret ingenuity."

The architect of the bridge was, it is commonly supposed, Da Ponte, who also built the prison, but some ascribe it to Andrea Boldu. Prout was compelled to make a drawing of the bridge with the palace and the prison, and he has suggested the gloom of the Prigioni, or, rather, of the side on the canal, for the front which faces the Riva is far less sombre. It may also be said that the upper cells, the "Sotto i Piombi," are not so fearful as those in the lower part of the building.

GEORGE HERIOT'S HOSPITAL, EDINBURGH, SCOTLAND. PERSPECTIVE VIEW. DRAWN BY R. S. BALFOUR.

WEST ELEVATION OF THE SAME.

GROUND PLAN, SOUTH ELEVATION OF THE SAME.

PLATE-GLASS MANUFACTURE IN GERMANY.

THE United States Consul-General at Frankfort, in his last report, says, in reply to instructions received from his Government to supply certain information concerning the grinding and polishing of plate-glass for mirrors as practised in Germany, that there is no manufacture or export of plate-glass in southern or western Germany, except in the consular districts of Aix-la-Chapelle and Fürth. At the latter place the United States Commercial Agent succeeded, in the face of many obstacles, in obtaining information upon the subject, the substance of which is given below. Consul Mason remarks that information upon the subject of plate-glass manufacture is all but impossible to obtain in Germany. The whole plate-glass manufacture in the Frankfort division is concentrated at the two places above mentioned, and all the manufacturers are leagued in a syndicate or pool, and access to their works is rigidly denied to every one, especially to Americans. The reason of this is, according to Consul Mason, that most of the German manufacturers live in fear that in some way Americans will discover the secrets of their trade and transfer their industries to the United States, with the result of ultimately destroying their best foreign market. The works, where nearly all the white German looking-glass used in the United States is blown, are situated near the borders of Bavaria and Bohemia, near the city of Egar in Bohemia. There are numerous large and extensive works besides innumerable smaller ones, the greater number of which belong to a pool, which regulates production, prices, etc. The greater part of the glass, when blown, ultimately finds its way to the city of Fürth, in Bavaria, where it is stored in a pool warehouse, whence it is delivered to members of the pool, no one outside that organization being able to purchase a single square foot, the capacity of each manufacturer being well known, and no increase of manufacture above a certain percentage being permitted. After leaving the glass-blower's hands the plates are quite rough, and it becomes necessary to grind them. There does not appear for some time to have been any material improvement in the method of grinding, though perhaps there has been in the machinery. The glass is fastened to a marble or cast bed of sufficient dimensions to receive the largest plates. If necessary, smaller plates are used to fill the table. The plates are held in place by a thin bed of plaster-of-Paris, the moisture of which holds them securely. The upper plate is turned upside down while the glass is being placed in position, and, when ready, is turned over carefully. Both the upper and lower beds revolve in different directions. The grinding material is coarse sand at first, a finer quality being used consecutively until the plate is finished. The time required varies, from sixteen to twenty-four hours being generally necessary for this process. The next process is that of polishing the plate, to make it transparent, preparatory to the silvering. The same kinds of beds are used as in grinding, with this difference, that they are stationary; and the plates are held in position in the same manner. The polishing is done by running square discs, covered with felt, backwards and forwards across the surface. The tables usually stand in dozens, six on each side, so that, as the rubbers move backwards and forwards, no motion or power is lost. In most of the works, the disc revolves by the motion of sliding across the surface, but in one important factory a new polisher is in use, to which a rotary motion is given by chain gearing, which performs the work in about half the usual time — fifteen minutes instead of thirty. The polish used is a native Bavarian product, and is called *potte* or *bolus*, it being an earth strongly impregnated with iron, and is kept moistened during the process, one man being required to attend six machines. As many pieces of glass may be laid upon the polishing table as it has capacity for, it being generally thirty inches by ninety. If bevelling is required — and the greater number seem by the demand to require bevelling — the plates are removed to an iron or stone cylinder twelve to fifteen inches in diameter, revolving slowly, where the edge to be bevelled is held by the operator on the face of the grinder, moistened sand being applied at the same time to the stone. A frame at the end serves to hold the glass from slipping, and steps upon this, regulate the angle of the bevel. Expertness on the part of the workman is essential in this operation. From the grinding of the bevel, the glass is taken to a round polisher, where the bevelled surface is held upon a felt cylinder supplied with *potte* until it is polished. About fifteen minutes are required for this process.—*Journal of the Society of Arts.*

NOTES AND CLIPPINGS

COMPRESSED AIR IN CHICAGO. — An ordinance has been passed and signed by the mayor of Chicago giving permission to a company known as the Chicago Power, Supply and Smoke Abating Company to lay pipes in the streets of that city for the transmission of compressed air as a motive power for machinery. — *Scientific American.*

THE STRASBURG CLOCK. — The famous clock in Strasburg Cathedral is the only timepiece which marks the old time in Alsace-Lorraine, now that the whole province has adopted the Greenwich meridian. Experts declare that any attempt to alter the routine of the clock would effectually disarrange the elaborate mechanism. — *New York Evening Post.*

THE PRESENT OUTPUT OF ALUMINIUM. — A recent issue of the *Bulletin de Musée Commerciale* gives the following statistics regarding the present production of aluminum:

	Lb. per diem.
The Neuhausen Works	1,000
The Pittsburgh Reduction Company	600
The Metal Reduction Syndicate, limited	300
The Cowles Company	600-700 in alloys.

PROFITS ON EIFFEL TOWER STOCK. — It is announced that the Eiffel Tower Company will complete a dividend of 11 francs per ordinary or founder's share for 1891. The capital was all paid off from the receipts in the Exhibition year, and the shares are now *actions de jouissance*, their rights lapsing in 1910. The receipts from ascensions last year were 576,123 francs. Shares are dealt in at 220 francs. — *New York Evening Post.*

BELFRY. — The word had originally no connection with "bell," an idea which is now intimately associated with the term. The first meaning given is "watch tower," from the Middle English "berfry," a watch tower. The first part of this word is connected with "borough," the second with "free." As the practice grew of hanging "bells" in such towers, people reminded themselves of the fact by changing the word "berfry" into the modern "belfry." In modern times with our wide diffusion of education, the spread of books, and the steady influences of printing, the tendency illustrated above to sacrifice accuracy in terminology to simplicity in form and sound, cannot much longer hope to find illustration. — *Chambers's Journal.*

THE LIFTS IN THE AMPHITHEATRE OF ROME. — In the square lifts grooves can be traced to guide the cages in their ascent, and pierced stone-bearers (at the top) to hold the pulleys over which ran the ropes and counterpoising weights that hoisted up the cages. A similar arrangement of machinery and lifts in some earlier place of amusement is described by Seneca (*Epis.* 88), who mentions the *machinatores* (scene-shifters) working the *pegmata* (lifts?) and scenery (*tabulata*), rising up to a great height. A large number of massive bronze sockets, with dove-tailed flanges set in great blocks of travertine, exist in rows in various parts of the substructures, both under the *arena*, and also in the long-vaulted rooms on each side of the subterranean passage which runs toward the Lateran on the major axis. These bear marks of circular wear from revolving pivots, and must have been for windlasses to hoist up the heavy scenery from the lower spaces. Probably these windlasses were originally used to hoist cages up the inclined planes, before the lifts were introduced. — *The Remains of Ancient Rome, T. H. Middleton.*

Local Transportation in Paris. — The systems of public transportation in Paris and the department of the Seine are: Ordinary omnibuses drawn by horses; street cars drawn by horses; street cars run by steam engines without fire-grate (Francq system) and with fire-grate and without smoke (Rowan system); automotor street cars (Mekarski compressed-air system); automotor street cars driven by electricity (this system is now on trial on the line from Levallois-Perret to the Madeleine); a street-car line from the Place de la République to Belleville (funicular cable system); a belt-line railroad following the inside of the city fortifications; the Vincennes Railroad, running through the eastern suburb of Paris; the Sceaux Railroad running through the southern suburb; and the Western, Northern, Eastern, Lyons and Orleans railroads, each traversing a number of localities in the environs of Paris. To the above may be added the Grand Belt Railroad, although it is in part outside the department of the Seine. The franchise for public transportation in Paris was granted by the municipal authorities to the General Omnibus Company (Compagnie Générale des Omnibus) in the year 1860; subsequently this company obtained the franchise of several lines of street cars. The lines connecting the interior of the capital with the suburbs have been granted under franchise to two companies — the Northern Street-Car Company and the Southern Street-Car Company. Finally, the railroads of Nogent and l'Etoile-St. Germain have been granted to special companies. Inside of Paris the rates of fare are uniformly 30 centimes for first-class and 15 centimes for second-class, irrespective of the distance travelled on the same line; the first-class rate once paid also gives the right to a first-class ticket, called "correspondance," enabling the passenger to continue the trip on a corresponding or connecting line. Outside of Paris the price of fare is variable and is calculated on the maximum at the rate of 10 centimes per kilometer for first-class and 7 1-2 centimes per kilometre for second class. The companies generally control the collection of fares by means of a ringing dial, which the conductor rings each time that a passenger enters the omnibus car. Each company furnishes monthly a statement showing the number of trips made and passengers carried. The city of Paris collects from the General Omnibus Company a tax called "droit de stationnement," amounting to 2,000 francs annually for each vehicle in circulation. For this purpose each vehicle bears a number controlled by the city administration. In addition to the above tax, the city has the right to one-half of the profits when the dividend attributed to the stock shares of the company exceeds 8 per cent of the value of the share, each share being of the capital value of 875 francs. For the new lines of street cars, under the franchise granted by decree of June 13, 1891, a tax of 30 centimes is collected for each round trip. The tariff of fares is fixed by the clauses and conditions of the franchise. The local authorities also fix the number of trips and the time-table, and compel the companies to follow certain disadvantageous routes, which would be given up if the obligation to work these unremunerative routes were not imposed on the companies by the prefectoral or municipal authorities. The railroads and street cars are placed under the control of the State, which fixes the number of trains and the time-tables. The facilities afforded by the omnibus and street-car companies are, as a general thing, satisfactory to the public. It happens, however, that at certain hours of the day, notably on Sundays and holidays, the number of vehicles is insufficient on some lines. The street-car companies are, as a rule, financially profitable and able to remunerate the capital employed in the construction of the tracks and the rolling-stock. The same may be said of the General Omnibus Company. — *Adam E. King, Consul-General.*

Draining the Zuyder Zee. — The Government of Holland has for a long time past had under consideration a project for draining the vast lagoon known as the Zuyder Zee. This sheet of water is almost useless for purposes of navigation, and large vessels can only find their way to Amsterdam by means of the North Sea Canal. As agricultural land, however, it would be exceedingly valuable, since it is estimated that more than two-thirds of it is very fertile. The Zuyder Zee was formerly a lake, but in the twelfth and thirteenth centuries it was united to the North Sea by inundation. A commission was appointed some time ago to examine into the question of draining this territory, which has a superficial area of 760 square miles. A report on this subject has now been issued; it proposes to close the Zuyder Zee by means of a dam that shall be constructed from the mainland, on either side of the island of Wieringen. The water thus cut off from the sea would be divided into four parts, in each of which the work of draining would be carried out successively. The cost of constructing the dam is estimated at £3,675,000, and the draining would involve an expenditure of £13,000,000. Such a large sum would naturally be spread over a number of years and the time which the works would occupy is put down at thirty-two years. In view of the preference which is shown in Holland for English machinery, makers in this country may fairly look forward to receiving a large proportion of the orders for pumping and other appliances that will have to be given out. At the same time, the activity that is being shown by German engineers to obtain a footing in Holland, should stimulate English makers to increased enterprise in the increasingly valuable market. — *Invention.*

The Funicular Railway at Zurich. — The inclined railway connecting the Limmat quay with the Polytechnic School is now in its third year of operation, and though scarcely a quarter of a mile in length, it proves a great public convenience, somewhat in the nature of a passenger-elevator. It is ultimately intended to continue it farther up the mountain, nearly to the summit of the Zurichberg, but its present length is considered to satisfy all present public demands. The road is the property of a stock company, known as the Zurichbergbahn-Gesellschaft, operating under a charter from the Cantonal authorities. It pays taxes as any other corporation does, and is obligated by law to certain rates of fare and a certain minimum of service, as in the case of the horse railway company. The fare is 10 centimes (2 cents) for each trip, there being no stops between the termini. The authorities have no other return from the company than that coming from regular taxation. The undertaking paid in 1890 a yield of 6.45 per cent on the capital invested. The road is operated simply by water. There are but two cars, which pass each other by a turn-out midway, the one ascending, the other descending. The reservoir of the descending car is full of water, that of the ascending car being empty. The thus increased gravity of the descending car furnishes the power which drags the car with the empty reservoir up. By thus alternately filling the reservoir of each car on its arrival at the upper terminus and emptying it again when it reaches the lower terminus, a constant and regular motive power is obtained at a comparatively cheap cost. The road's water consumption last year cost only 4,814.60 francs ($900) which is certainly cheaper than coal, when coupled with the fact that no less than 47,443 double trips were made over the line. — *G. L. Catlin, U. S. Consul.*

The Decoration now in Progress at St. Paul's. — The decoration of the interior of St. Paul's, London, with mosaics instead of the paintings (which proved impracticable owing to the bad atmosphere) is proceeding slowly. Mr. W. B. Richmond has to fill with mosaics twelve spandrels about the arch tops in the choir, twelve window spaces about the windows in the clerestory of the choir above the spandrels, three sections of the vault over the apse, and twelve "pendentives" or spaces on the vaulted ceiling about the base of three domes which light the choir. In the three domes the acts of creation are to be shown, namely the creation of birds, fishes and beasts. The fall of man and the redemption provide subjects for spandrels and window walls. In the vault of the apse a leading design shows Christ seated in judgment with recording angels by his side. The kite-shaped pendentives narrowing down from the bases of the domes will contain each an angel with many wings, the arms raised upward and outward so as to fill the space; there are twelve, or four to each dome. Mr. Richmond has already placed the mosaics in two spandrels and drawn the designs for the other ten and for the east end figures. At this rate of progress the dull interior of St. Paul's will in a few years glow and glitter with gold and bright glass mosaics, as it was meant to when the cathedral was first erected. — *New York Times.*

TRADE SURVEYS

Among the interesting features deserving of special attention at this time in the commercial and manufacturing world are these: the continued abundance of money at low rates of interest; the increasing confidence not only in American, but foreign countries; the continuance of conservative methods in business; the refusal of manufacturers to produce beyond the actual requirements of the market; the spread of banking facilities throughout the country, heretofore imperfectly accommodated; the appreciation of agricultural facilities within convenient reach of railroads; the surveys of a great many lines of new road; the increased employment of labor in a large number of factories in the New England States; the preparations being made by manufacturers of raw material for future requirements. To these might be added a number of other considerations, all showing healthy and increased activity. The commercial world is in a healthy condition, but there is not the same anxiety for speculative operations as in years past. It is not because there are fewer opportunities for speculation, but because speculation of late years has not yielded good returns. Losses have been too frequent, and disasters have occurred often enough to frighten small operators away. It is growing more and more difficult for speculative movements to succeed. Legitimate enterprises are now covering the entire business world, and whenever opportunities for profit are presented they are taken hold of in a legitimate way, instead of, as in years past, by speculative minds. Advices from nearly all business centres show a gradual growth in confidence, though not in the volume of business done. The condition of things now existing is exactly the reverse of what was looked for three or four months ago, when it was said that by early summer a great expansion of business would take place and prices would advance. It is better that conservative methods should continue with low prices and moderate demand. The country is not yet ripe for the anticipated expansion. This expansion must of necessity be preceded by an era of railroad building, by a further spread of population, by the opening up of, perhaps, two or three thousand new consuming centres in the shape of towns and villages, and by an increase in the agricultural area. Our manufacturing interests have grown not out of proportion to agriculture, but have certainly kept pace with it. Our export trade is very satisfactory, as is shown by the figures for the export of domestic merchandise for the past three-quarters of the fiscal year, $809,411,629, an increase over last year of nearly $120,000,000. The greatest increase was in bread-stuffs, and the increase amounted to over $152,000,000. Another favorable indication is the prospective establishment of two or three ship-yards; it is probable that three, or, perhaps, four ship-yards will be established on the Lakes during the next twelve months. It is stated on apparently very good authority that during the next three months most of the large Western railway corporations will place orders for engines and cars which will tax the capacity of engine and car builders for the next six months. The manufacturers of machinery are, as a rule, very busy, and the reports from several centres for the past week or two show that large contracts will be placed this month for some of the heaviest machinery ever turned out. The lumber manufacturers are disappointed thus far over the volume of business done, as well as over prices, but builders and buyers of lumber are correspondingly benefited. The production of coal is considerably in excess of last year. The textile manufacturers report activity in nearly all lines. German importers of hosiery are doing considerable damage by their heavy importations of cheap foreign hosiery. Paper-makers East and West report a rather sluggish demand for most of their products. Iron and steel makers bitterly complain of low prices and sluggish demand. Financiers in New York are calling the attention of the promoters of railway building to the probability of increasing absorption by Europeans of American railway securities in the next year or two. A multitude of small industries are being established in the Southern States from Virginia to Texas. Building and loan associations are increased in number throughout the West, and are rendering excellent service to the supporting wage-workers in the supporting wage-working membership. Electricians report a more urgent demand for appliances than ever before known, and all of the well-established works are crowded with contracts.

S. J. Parkhill & Co., Printers, Boston, Mass.

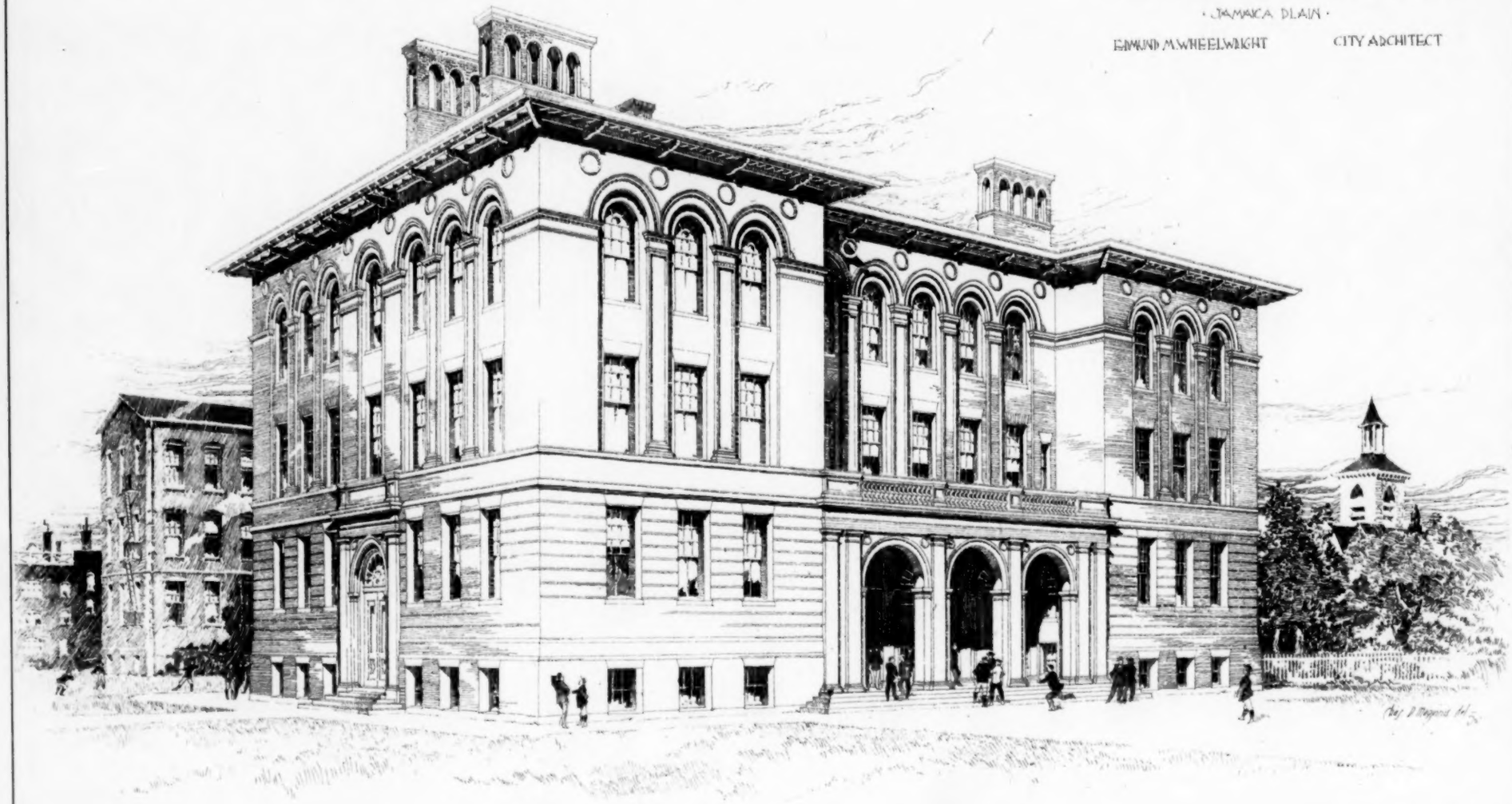
CITY OF BOSTON

PERSPECTIVE VIEW OF

"AGASSIZ GRAMMAR SCHOOL"

JAMAICA PLAIN

EDMUND M. WHEELWRIGHT CITY ARCHITECT



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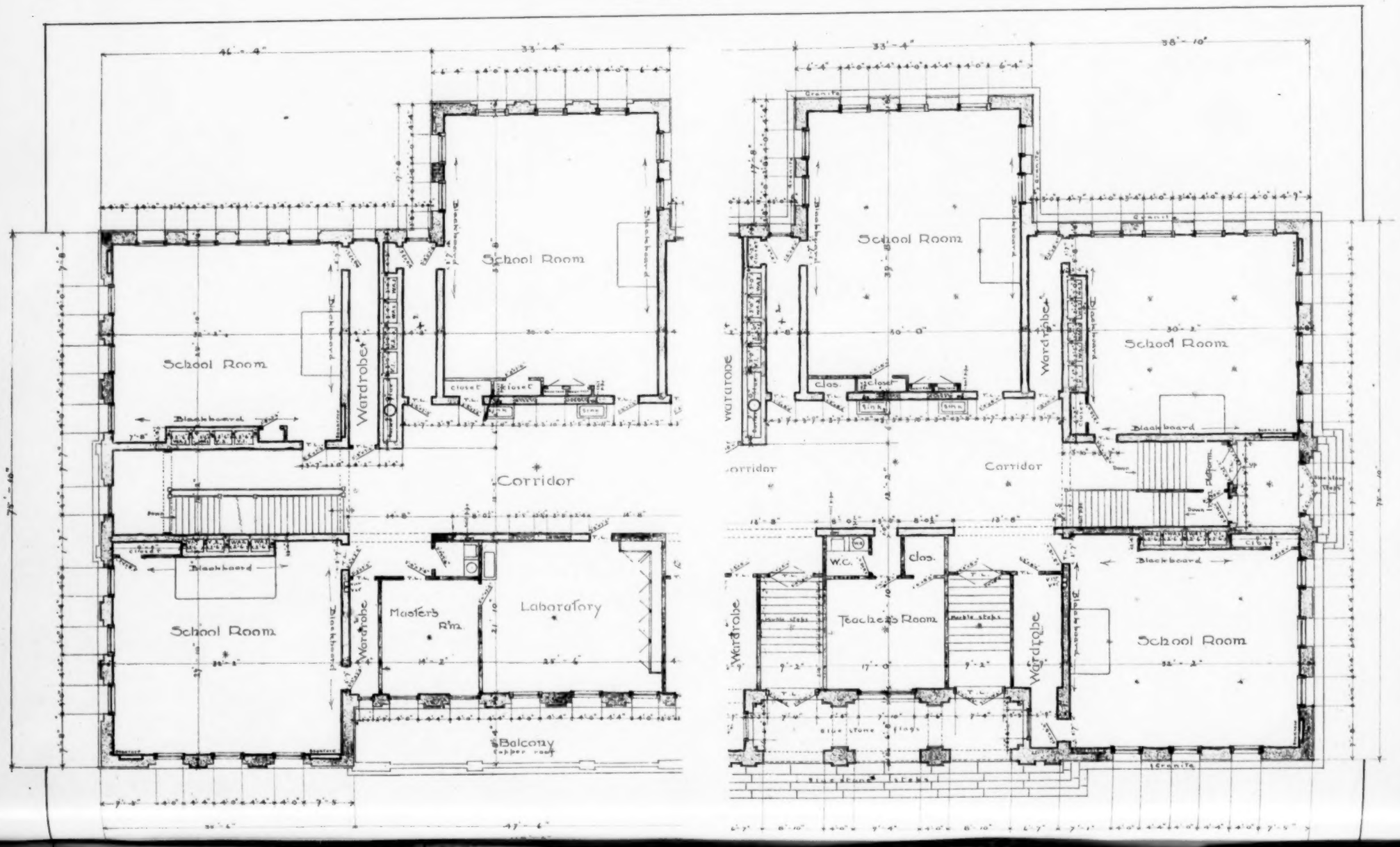

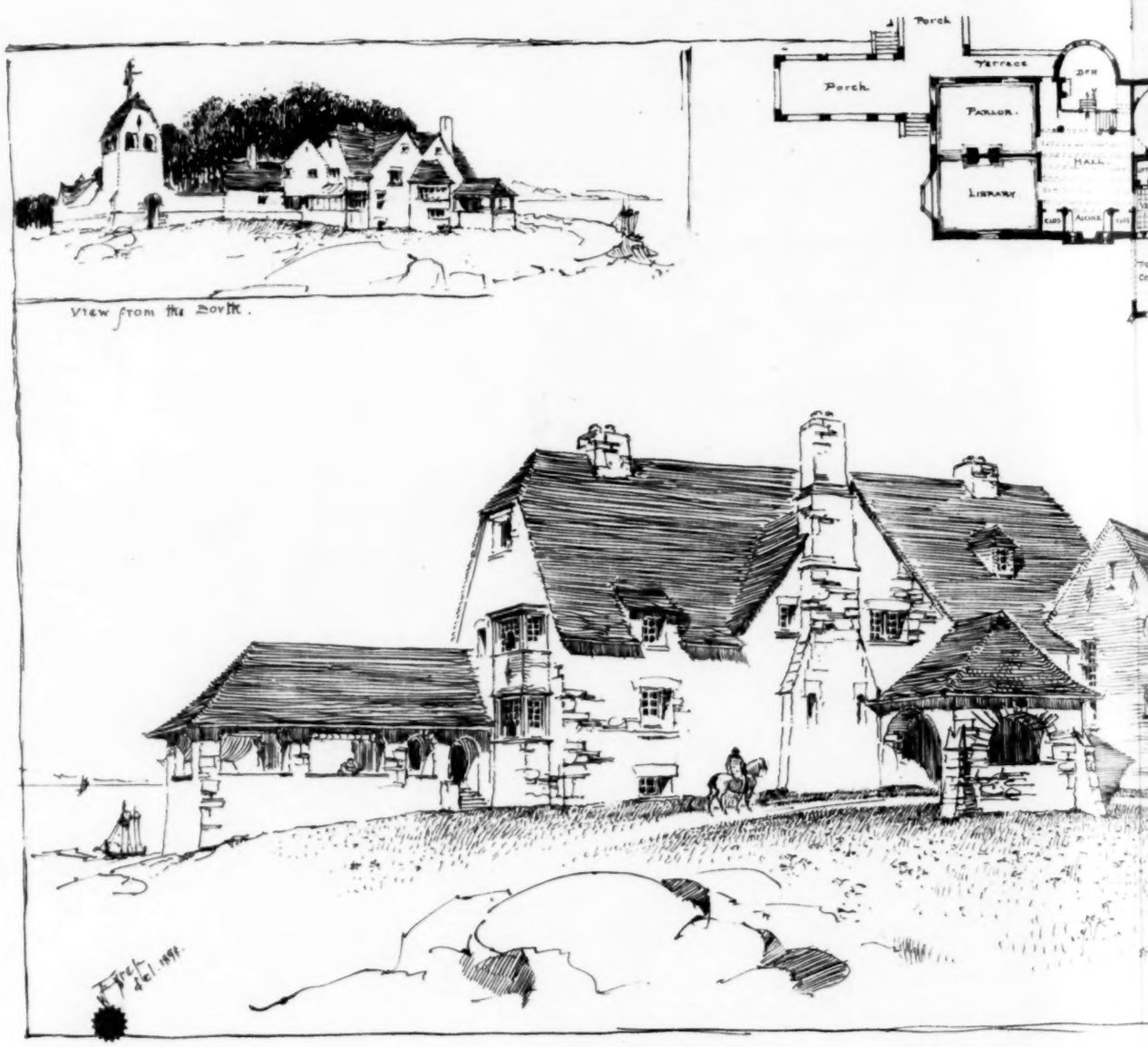

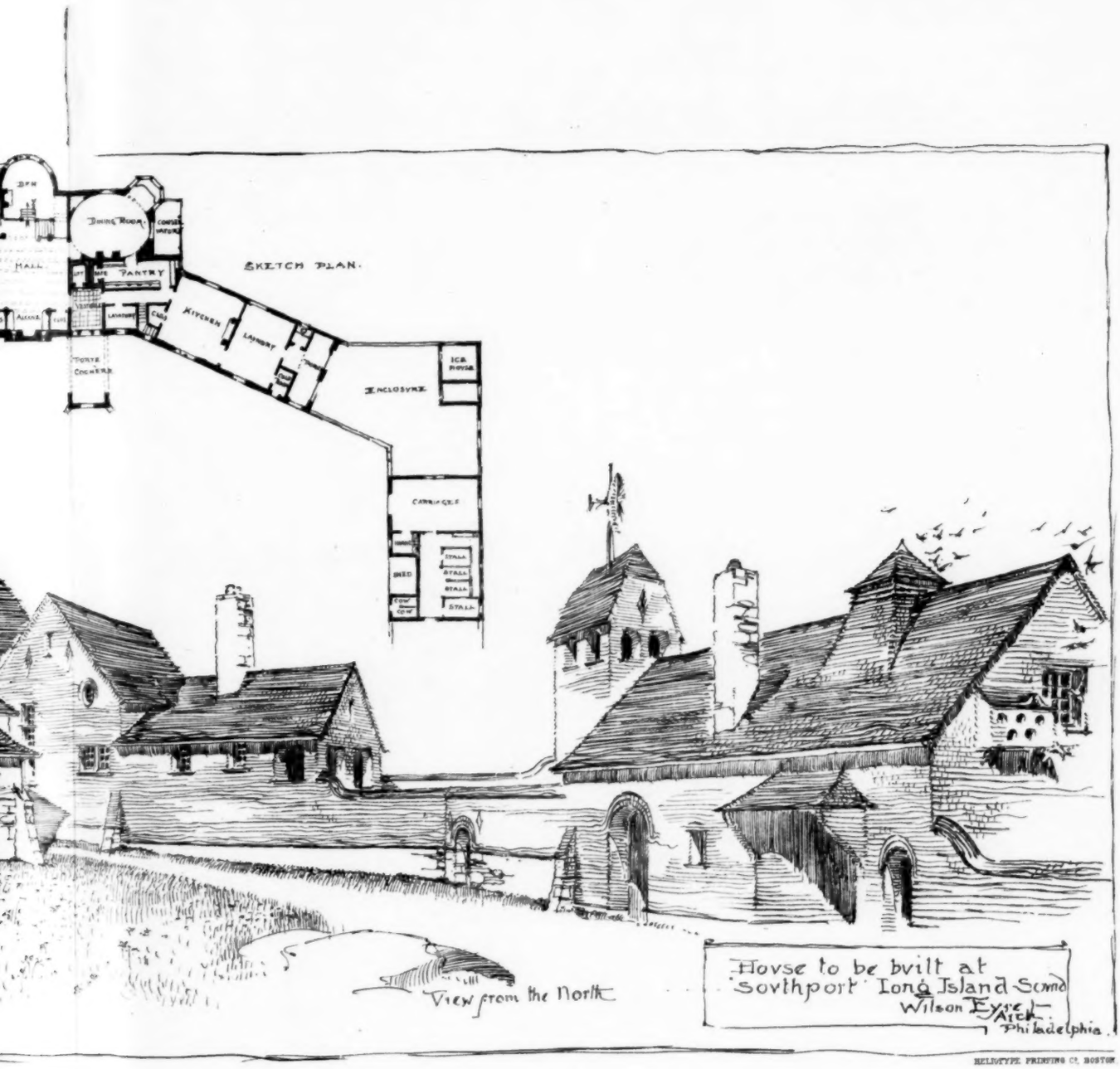

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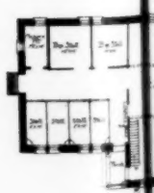
Second Floor Plan

Residence for Wm Wilson Esq.

View from the North West

Mack & Cutter. Archts.
18 Bway N.Y. City



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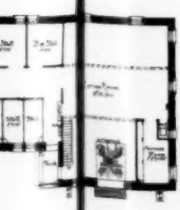

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