PRICE 15 CENTS.

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ILLUSTRATIONS.

Additional Illustrations in the International Edition.

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. L. Copyright, 1895, by the AMERICAN ARCHITECT AND BUILDING NEWS COMPANY, Boston, Mass. No. 1042.

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

DECEMBER 14, 1895.

CONTENTS.

THE old, old notions about the incapacity of architects for producing artistic and beautiful buildings, and the importance of returning to the alleged ancient practice of committing architecture to the tender mercies of masons and carpenters, have reappeared in England, this time under the patronage of no less a person than Mr. Lethaby, the author, in conjunction with the late Mr. Swainson, of the excellent little book on St. Sophia at Constantinople, which, as we hope, our readers are familiar with. Mr. Lethaby, who is undoubtedly earnest in his endeavors to promote a better conception of the part of architects in building, and whose book contains a great deal on this subject that architects will approve, in his later disquisitions, which have been delivered recently in London in the form of lectures, is so unfortunate as to quote Daudet, Professor Mahaffy, William Morris and Ruskin, in support of his theories; and thereby undoubtedly injures his own cause; for not only architects, but people of sense generally, pay about as much attention to the views of these gentlemen on matters of architecture as they would to those of a wolf on the proper deportment of lambs. Mr. Lethaby thinks that the art of architecture has reached a point where it needs to be refreshed by a return to the study of natural forms and principles; and all architects will, to a certain extent, agree with him; but they will agree with him only because they feel in themselves the æsthetic want that the infinite beauty of nature can supply, and not because of arguments based upon the fancies of people perfectly ignorant of the subject.

MR. LETHABY is also unfortunate in fortifying his theories by reference to the assumed custom of the ancients, and of the mediævals, of having their buildings designed by the workmen as they went along. The notion that the people of the Middle Ages, or of antiquity, did anything of the kind has been so thoroughly exploded that it is surprising that an intelligent architect like Mr. Lethaby should have brought it up again. In his own book he glorifies Anthemius as the architect of St. Sophia, agreeing in this with the contemporary historians of the period, who, while ascribing the merit of the design to the Emperor Justinian, whose desire for fame as an artist they well knew, praise the judicious selection by which he chose the noted architect of Tralles to carry out his conception. Mr. Lethaby would probably not undertake to persuade us that Justinian had to send to a little town in Asia for some one to teach the workmen of Byzantium how to set stone; and if it was to design the profile of the domes, and arrange the openings, to balance the thrusts against each other, and provide proper resistance in the buttresses, that he needed Anthemius, in what way did the latter's work differ from that of the modern architect? The refuge of the sentimentalists who try to disparage modern architecture, by describing an imaginary state of things which they assert to have existed in the great artistic epochs, when asked who it was, if not an architect, who solved the problems of plan, construction and design presented by the great buildings of all ages, is generally to escape the difficulty by saying that, at least, this person was not paid much, if any, more than a common workman. How a man is less an architect and an artist because he is poorly paid is a question which the sentimentalists can perhaps solve; but the historical fact is that the people who did architectural work in ancient times were highly paid; more highly, apparently, than architects in modern times. Our readers will remember the curious story of the two architects in Rome, who were so rich that they offered to build a temple at their own expense, hoping to be allowed to perpetuate their memory by inscribing their names on it; and an admirable notice in the *Builder* of Mr. Lethaby's lectures quotes a passage from a Greek author of the second century B. C. in which it is said that "As to building . . . an ordinary builder (τεκτων) may be secured for five or six minæ, (about ninety dollars), but an architect (αρχιτεκτων) cannot be had for less than ten thousand drachmæ," (about seventeen hundred and fifty dollars). It would be difficult to find, in all Greek literature, a sentence more closely resembling one that might pass between friends at the present day, discussing building matters, except that the financial position of the architect then, as compared with that of the builder, or, as the word might, perhaps, be better translated, the building mechanic, was many times more comfortable then than it is now. The Greek quotation goes on, "But there are few such architects among all the Greeks," a condition of things which, again, agrees closely with that now existing. Remarking, also, that Vitruvius was a Roman noble, who seems to have adopted the profession of architecture, in defiance of the traditional Roman contempt for all artistic pursuits, out of pure love of art, and was able to sustain his rank by the income that he derived from it, we find, in the Middle Ages, abundant evidence that architects were employed then just as they are now. The architects of several of the great French cathedrals are buried within their walls, just as Wren was buried in St. Paul's, and for the same reason — to do honor to the artistic creator of the structure; and the contract between a French architect and the ecclesiastical authorities of a city in Spain show that the services of men of distinction were sought by strangers, and well paid for, just as they are now; while the archives of the Cathedral of Tournai give ample details of the employment and duties of the successive architects to that fabric. In fact, so far as the documents show, architects now have to work harder, and incur greater anxiety and responsibility, than ever before in the history of the profession, and for less pay; and the idea that they are altogether superfluous, and that the designing of buildings ought to be left to bricklayers and stone-cutters, is entirely modern. No doubt, Mr. Lethaby thinks that architects could carry out their designs better if they could spend more time at their buildings; and so does every other architect; but it is of little use to study a design on the ground without the liberty of modifying it; and it is really in this point that the moderns are most at a disadvantage. While Anthemius, or Ictinus, or Pierre de Montereau, could have a detail changed if they thought its effect in execution would be improved, and their clients would pay the difference in cost, and be grateful to them for their zeal, the modern architect is tied to the contract with the builder as strictly as the builder himself. Any change which may suggest itself to him, as the work advances, as desirable, is met by a storm of extra charges and demands from the builder, and austere looks from his clients, who always wind up by informing him that, as he did not foresee at the beginning just what the effect of the executed work would be, he must pay out of his own pocket the cost of changing the design; and the consequence is that, not caring to devote his tiny fee to beautifying his employers' buildings, he, after he has had some experience in such affairs, keeps his artistic criticisms to himself.

A CORRESPONDENT sends us a copy of an "invitation to architects" to submit competitive designs for certain school-houses, on the familiar terms so dear to the hearts of the "keen business-men," and "close buyers," who direct

most of our public architecture. Two school-buildings are to be erected, and two sets of plans and specifications may perhaps be accepted, unless the Trustees should prefer to reject them all. Each set of plans is to contain four elevations and two "cross-sections," "all prepared as working drawings." Nothing is said about horizontal sections, but it is presumably expected that an assortment of these will be included in the collection. Certain details of construction must be rigidly adhered to, such, for example, as that the "footings of walls shall be below basement floors"; "roof-gutters, valleys and any and all decks shall be made of sheet copper," and no interior brick wall shall be less than nine inches thick. If the Trustees should accept two sets of plans and specifications, they are to become their absolute property, but the authors of the plans are without charge to furnish complete sets of specifications and working plans, with copies in triplicate of the same, all such copies, as well as the originals, to become the absolute property of the Trustees. "As soon as all the conditions are complied with," the Trustees will pay to the "successful" architect the sum of five hundred dollars in full of all fees and demands of every kind. It is distinctly understood that the preparation of the plans that may have been adopted "does not carry with it the right of supervising the erection of the buildings." On the contrary, "The Board further reserves the right to employ any person at discretion to superintend the erection of said buildings, but hereby agrees to let the contracts for supervision of the same upon fair and open competition."

TO put it briefly, the Board expects architects to scramble for the chance of preparing plans, details and specifications for a thirty-thousand-dollar building, with copies in triplicate of each piece, for a compensation which would not much more than cover the bill for blue-printing and typewriter work; yet, so alluring does it seem to consider the bait which it holds out to the profession that it is expressly stipulated that no architect shall be allowed to submit plans at all unless he first gives bonds, in the sum of two thousand dollars, that the cost of the building executed from his design will not exceed his estimate. Considering that the execution of the plans would, in all probability, be put under the supervision of a disappointed rival, who would bid low for the job for the sake of the opportunity which it would afford him for "getting even" with his successful opponent, there is something grotesque in the idea of putting the authors of the plans under bonds as to the cost of execution. It is hard to believe that the Trustees will receive any plans under these stipulations. Most invitations of the sort are responded to by thieves, who, by collusion with the contractors, put secretly at least ten dollars in their own pockets for every dollar of difference between the compensation offered them and that which an honest architect would charge; but in this case, where the supervision is likely to be entrusted to a rival, the quiet filling of the "architect's" and contractor's pockets from the public treasury is not so easy. The ordinary method of defrauding the public in building operations is for the alleged architect to draw specifications and contracts requiring work of most elaborate excellence; and, when the time for execution arrives, to certify, as satisfactory, work of a very different character. As the specifications and contracts are not usually matters of public record, no outsider has the means of detecting the fraud, even if he had the necessary leisure and technical knowledge requisite for doing so; and, after the community has paid for the work described in the specifications, and the contractor has paid for that actually put in and accepted, there remains a very handsome balance, amounting, in some actual cases, to about half the contract price of the building, for division among the ingenious gentlemen by whose collaboration it has been saved; and it is evident that, the greater the number of people who have to share the fund, the harder they must work to make it large enough to supply them all with a satisfactory dividend. It is understood that we do not mean to suggest the possibility of any such transactions in connection with these particular school-houses. On the contrary, we are convinced that all the citizens of the community which is to pay for them and enjoy them love to work for nothing, and carry out with perfect fidelity every kind of trust, at their own expense; but it will do no harm for the people of the less immaculate outer world to remember that it is notorious in the building professions that the comparative cost of public buildings varies about in inverse ratio with the compensation paid the architect; that is, that an architect who accepts one-half the usual fees for his services generally produces a building which costs much more than the same building would cost in the hands of his more scrupulous, and consequently more expensive brother.

WILLIAM H. RINEHART, a noted Baltimore sculptor of the last generation, left a considerable fund for the encouragement of young sculptors. The money was originally left to the late William T. Walters, as trustee, but, after his death, was turned over to the Peabody Institute. The income is now more than five thousand dollars a year, and the Trustees of the Institute have for the first time put it to its intended use, by awarding two travelling-scholarships, one for study in Rome, and the other for study in Paris. The former was awarded to Mr. Herman Atkins McNeil, of Chicago, and the latter to Mr. A. F. Proctor, of New York. Mr. McNeil has already studied in Paris, under Falguière and Chapu, and has a considerable reputation as a sculptor, although he is only twenty-eight years old. Mr. Proctor is a younger man, who has devoted himself particularly to the study of Indians. The scholarships are annual, but the holder of either may compete again until he has held one for four years; and each holder of a scholarship must send annually to the Trustees of the fund a bas-relief, a statuette and a bust, of his own work.

THE lovers of Alpine travel will be more or less delighted to hear that a project has really been formed for a railway up the Mont Blanc. M. Issartier, a mining engineer, after long study of the problem, has produced a plan for the construction of the road which is really startling in its simplicity. It is hardly necessary to say that the topography of the Mont Blanc, to say nothing of the eternal snow with which it is covered, does not lend itself easily to the construction of a surface road; and M. Issartier accordingly builds his railroad entirely beneath the surface, where he can shape its profiles to suit himself. Moreover, having once determined to keep underground, it is evident that the distance below the surface is not of much importance; so the engineer, instead of endeavoring, like his predecessors, to keep his tunnels somewhere near the outside of the mountain, in order to provide for occasional glimpses of the exterior world, solves the problem of the selection of a route by running his railroad, at an easy grade, in a straight line, from a station near Chamonix to a point vertically under the peak of the mountain, ascending thence vertically, by a shaft nearly two miles high, to the terminus at the summit. The idea of designing railways straight upward is not quite new, for the Jungfrau road is to have a short vertical shaft; but the credit for the extension of the system, so as to climb mountains by a right-angled tunnel, two miles underground, is certainly due to M. Issartier.

THE practical engineer will probably remark that the sinking of a shaft two miles downward from the top of a mountain on which snow lies constantly to a depth of hundreds of feet is not a very easy matter; but here also the talent of this ingenious Frenchman displays itself. Instead of sinking his shaft from the top of the mountain, he proposes to cut it upward, from the station in the bowels of the earth, at its foot. For this purpose, he has devised a sort of caisson, furnished with springs, which, when the horizontal tunnel is ready, is carried in, and put together, and serves as the staging from which to cut the shaft. The springs are intended to receive the shock of the explosions incident to the rock-cutting, which is carried on from a temporary platform supported on the caisson, so that the latter may not be blown down the shaft, and a stone crusher is mounted on the caisson, for the purpose of receiving the débris from the blasting, and reducing it to the condition of fine sand. Once brought into this condition, it is turned into the water-courses arranged in the horizontal part of the tunnel, and washed out at the mouth, the tunnel being graded so as to give a suitable flow. After the shaft is built, it is to be furnished with four toothed rails, up which the cars, or trains, will climb by electric-power. Notwithstanding the novelty of the scheme, it cannot be said that there is anything absolutely impracticable about it, and M. Issartier thinks that the cost of carrying it out would not exceed eight million francs.

ART IN THE MODERN CHURCH.[1] — IX.

THE CHURCH INTERIOR.

The Paulibrunnen, Erlangen.

HERETOFORE we have been concerned exclusively with the exterior of the church. And a more illogical method, architecturally speaking, it would be hard to find, since the architect, when he sits down to design a church, does not begin with the elevation, but with the plan, of which the elevation is only the expression. The exterior, of course, is but part of the design, and many will tell us it is less important than the plan. We need not stop to argue this point, but it may be well to remark that by far the larger number of people never go into churches at all, and those that do are familiar with but one or two. New York City, for example, has some hundreds of churches; but how many of its population are familiar with the interiors of more than two or three? How many know six or ten? How many know fifty? So the exterior of a church has an importance hard to be overestimated. Were it rightly designed, did it speak of God and His message to mankind, a dumb church exterior might convey the gospel message to many a hungry soul. It would not be a difficult task to justify the space already devoted to the exterior of our churches.

It need hardly be said that the Christian laws governing the exterior of the church are as imperative within as without. The Christian building is not a structure that shows the faith by its outer side alone, but it gives its testimony in every part. Such examples as we have studied have been viewed solely in their external aspects; it now remains to briefly consider the interior. Few architectural subjects are so difficult to illustrate as church interiors. If it be a Gothic building, the long aisles, lined with lofty columns and covered with a high vault, become, even in a photograph, dimensionless spaces enclosed with unmeaning lines. If it be a domed temple of the Renaissance, its crowning glory can seldom be seen from one point-of-view, and so the picture in both these great cases, under which most church interiors can be classified, wholly fails in illustrating what it purports to represent.

We may, therefore, dispense with illustrations of the special branch of our topic we are considering. But it should be remembered that the interior calls for the same developed treatment in a Christian style as the exterior. The faithful, when they congregate in the churches; the curious, when they are drawn thither by some noted "attraction"; even the scoffer and the unbeliever who come that they may find weapons for their unholy war; all must find in the church interiors the expression of Christian hope and faith that is the essential feature of the Christian life. The form of worship, the individual doctrines of a particular religious body, even the personal beliefs of a noted preacher have nothing to do with this fundamental fact, at once elemental and essential. In a certain sense the task of the Christian architect is easier within than without. He cannot build towers within, nor can he introduce the many varied features which he applies to his exteriors in the delusion that he is creating a peculiarly Christian and inspired structure by their use. Opportunities for personal eccentricities are rarer than without, and in the sobered conditions of the internal problem he can obtain a more satisfactory result with comparatively simple materials.

But the architect should not rest satisfied with a result that is "satisfactory" and no more. That in itself is something, but it is not the goal he has started for when he set out to design a church. Rather, it is not the goal he should aim at, for usually he thinks there is no higher end than this. A church interior may be satisfactory, and yet not be Christian, since many good and wholesome things in this life are satisfactory without being in the least religious, having, in truth, no religious signification. But the church architect can never get away from the sacred associations of his structure. His aim must be to create an interior that shall be at once sacred and holy, inspired, reverential, devout.

This I have already had occasion to remark time and time again in these studies. But it is not useless to repeat it here, because the idea with which our church interiors are designed so frequently ignores this elemental condition. How often do we judge of the success of our church interiors by the distinctness and ease with which the preacher may be heard in every part! Or, how pleased are we apt to be if the preacher and the choir are readily visible from the most retired corners! Or how delighted with comfortable seats, with broad aisles, with deep-toned glass! Just so the savage is fascinated with a string of glass beads, the child with a row of mud-pies. All these phenomena are akin, or the former series but a survival of the latter in a more advanced state. A comfortable seat in a church is not to be despised; in a measure, it conduces to godliness, since an uncomfortable one might create mental and physical conditions incompatible with a pious frame of mind. And if we wish to hear the preacher it is an advantage to be able to hear him easily and readily, though the value of the ability to see him utter the words of his discourse is less certain. As for the stained-glass and other internal decorations, we may leave them until we take up the subject of church ornament a little later. But neither the most comfortable seats in the world, nor the most perfect acoustics will create a religious architecture, a sacred art that shall speak of God and of the story of the gospels. These are mere incidentals, the trimmings, as it were, of the structure whose art, given it by the architect, must speak clearly and in no uncertain way, of the most precious possession of humanity. We can enjoy comfortable chairs without going to church to sit in them; we can hear agreeable speakers in halls delightful to speak and to hear in, without partaking of a church service. Neither of these things, therefore, contribute essentially towards the success of a Christian interior.

Modern religious development has divided Christian churches into two great classes, the liturgic and the non-liturgic. In the latter the preaching service is the most important, and the church building becomes, practically, if not actually, a preaching hall. In the former group the ceremony of the altar is the essential service, which is conducted with more or less ceremony of physical worship. So far as the uses to which the churches of these two great bodies is put is concerned, the distinction between them is broad and definite; yet over and above the difference in forms is the common ground of Christian belief and faith in God. Whatever the worship, how elaborate soever the ceremony, how important the sermon, this one great fact remains at the foundation of the superstructure. It is as essential, therefore, that the lecture-hall set apart exclusively for Christian worship, should illustrate the same Christian trust and faith as appears to be naturally expected of those religious bodies which retain the altar ceremonial. It need not follow the traditional form of the church building, it need not seek to be other than what it is, but it must express its purpose as clearly and as distinctly as the liturgic church. This is the standpoint from which the architect must start, though he has seldom, if ever, done so in the lecture-hall church.

The preaching service has called into existence the amphitheatre type of church which, in a certain sense, is wholly modern. That it is *a* modern form may be admitted without debate; that it is not *the* modern form is evident from the continued growth of the liturgic churches, and even the approximate reproduction of their architectural characteristics by non-liturgic bodies. The popularity of this plan in certain denominations has become very great, and that it corresponds to certain needs cannot be denied. For the Christian architect, its chief interest is its individual treatment and its influence upon the form and the style of his building. It wholly ignores the traditionary church building, but it is seldom this is frankly admitted in the exterior.

A church which has already been adverted to (Fig. 31) is one of the freest expressions of the ampitheatre in external design we have, though, while the architect has utterly cast aside the traditional materials, he could not wholly rid himself of the idea of a façade flanked with two towers. It is seldom that a modern architect goes as far as in this building. Usually the ampitheatre is encased in a building that approximates the traditionary form; a rectangle or a square usually entirely conceals the inward form. Various expedients are resorted to in order to obtain the circle within the rectangle, the most successful being a diagonal plan, with the pulpit in one corner and the rows of pews radiating from it. This is ingenious as well as economical of space, but it would be difficult to imagine a greater falsehood. The mightiest amphitheatre the world has seen, the Colosseum at Rome, derives its imposing dignity quite as much from the frankness of the expression of the plan as from its gigantic proportions. We do not build churches on so splendid a scale, and probably never will, but this pagan edifice shows us how to design an amphitheatre, and incidentally it shows us what a pagan sort of a structure that kind of a building is!

But it is not necessary to argue the pagan significance of the amphitheatre. It has been accepted by many Christian bodies as the form most convenient to their worship, and it has thus become a type of Christian edifice whose development has taken place solely within our own time. Yet this development and adaptation is not without significance to the Christian builder. Its importance in modern

[1] Although the author of this paper has drawn the greater part of his illustrations from designs that have appeared in this journal, he and we are under obligations for the remainder to the *Inland Architect*, the *Northwestern Architect* and to *Architecture and Building*. Continued from No. 1041, page 110.

church architecture would scarcely have arisen had it not been supposed that a building convenient to see and to hear in was the perfect form of Christian building. That it is admirably suited to these purposes cannot be denied; but the importance attached to these unchurchly, irreligious conditions has attained its legitimate end in these unessential things becoming the chief consideration in the church building. The amphitheatrical church is, therefore, the result of an ignoring of the Christian element in architecture.

Having originated in error and been perpetrated in misunderstanding, it is not, on this ground, to be considered without the pale of Christian buildings. God is worshipped in such a building as truly (from the standpoint of the worshipper) as in the edifice wherein is practised the most elaborate ritual. Both, from their particular standpoints, are Christian, and each is as Christian as the other. Architecturally, therefore, the architect though working on different plans, and trying to meet different conditions, cannot distinguish between the Christianity of his architecture. It is as needful that one be Christian as the other. The spirit that dominates the one must be the spirit that dominates the other. God is present in both, and each is built to His glory and to the spread of His word. We come back, therefore, to our original proposition: "What is Christian is sacred, and where God is worshipped there must we have an art that breathes a religious and consecrated spirit, an art that rises above forms of worship and individual beliefs, and speaks only of eternal hope and faith and joy. That these qualities may be more readily expressed in one group of churches than in another does not diminish the architect's responsibility towards each. We cannot change the basic use of a church building unless we deny the existence of God, and prostitute it to pagan and unholy uses.

The problem of the church interior naturally divides itself into two parts, that of plan and that of detail, or of decoration. So far as the plan is concerned, the greatest importance rests upon the two-fold division that has just been discussed; the subject of decoration will presently be taken up under a separate heading. As to general form and style, it is essential that the architect remember there is nothing sacred in any one architectural element. All, even in the time of the utmost development of Christian architecture, have been employed upon secular as well as upon sacred buildings. It is feeling that makes a structure Christian — feeling, reverence, love, faith, hope. The ability to express these sensations in building materials is not given to every man calling himself an architect. But Christian architecture demands just these qualities, and unless they are contained in our church architecture, within as well as without, the building fails as a church and as a Christian building, be its seats as comfortable as they may, or its opportunities for seeing and hearing as perfect as modern ingenuity and science can make them.

DECORATION.

The decoration of a building, including in that term every description of ornament, detail, carving, painting, may naturally be considered under two great heads: structural decoration, or that which is an integral part of the structure, and which in the epochs of pure architecture aided as well as illustrated the architecture; and applied decoration, which has no structural signification, and which may be varied or removed at will without affecting the integrity of the architecture. When, for example, we enclose a doorway of a church with a carved frame, or throw a richly sculptured arch over it we have an instance of structural decoration, since the carving upon the *voissoirs* is an integral part of the structure, and has the further advantage of expressing the construction by enriching it at an important point. On the other hand, if we apply a painted frieze to the walls of our church, or set up a statue in a niche, we have an instance of applied decoration, since either may be removed at pleasure, and in neither case is the structure of the building affected, though its aspect may be considerably modified.

Structural decoration is, of course, an integral part of the architecture. It has, therefore, as important a part to play in the appearance of the church as the materials of the walls, the form of the floor-plan, the shape of the openings. It cannot, in fact, be separated from the architecture; for ornament and detail are sure tests of style, and in the hands of the archæologist become the surest test whereby the date of a building is determined, and therefore the style, or the phase of a particular style to which it belongs. The importance of architectural detail in the giving of Christian character to a church is not to be overestimated. Plan, form, style can not produce the desired effect unless the detail be characterized by the same reverential spirit that should be insisted upon for every part of the work. This requirement is so plain that it might seem needless to refer to it were it not that the term "Christian decoration" suggests possibilities that might easily be misunderstood.

If we must employ Christian decoration in the detail of our churches, must we, it may be asked, employ only the Christian symbols — the cross, the crown, the anchor, the star, to name but a few of the many forms that have a Christian meaning; must our painted figures be of angels only, and our models be based exclusively on the forms consecrated by long Christian usage?

Christian iconography is indeed a delightful and mysterious science, or art, if you choose so to call it. It is concerned with a multitude of emblems, symbols, legends, suggestions, ideas that have grown up around the Christian faith as it descended through the ages. Its material is almost inexhaustible, and it covers every possible field; yet the vast array of facts it has accumulated for our benefit has been gathered through a great space of time, and in a territory bounded by the influence of the Christian religion itself. Its very distribution and immensity are themselves evidences of no mean order that Christian decoration is not synonymous with the emblems consecrated to Christian usage or endowed with Christian meanings.

Let us take, for example, any great Gothic church; it matters not whether it be Amiens or Chartres, or Paris, or Rheims. The structural ornament, in any case, will be of immense variety, running from symbolic representations of the Godhead to the rich treasury of nature's forms. The typical decoration of a great Gothic interior is the capital and the string-course, the boss at the apex of the vault, and perhaps a leaf at the angle of the column base. There is scarcely a church or a cathedral in all Europe where, in these parts, one may see Christian emblems cut in imperishable stone as part of the structural ornament. Nature has been the model, the leaves and flowers, the buds and grapes; these form the base of the larger part of the decoration of the great Christian edifices of the finest periods of Christian art.

This patient going to nature for inspiration by the mediæval sculptor, this translation of the delicate forms of vegetation into stone, and the setting of them upon God's house, as in their original, fair state they adorned God's hills and meadows, teaches many a lesson besides that which may be drawn from it in connection with Christian ornament. But this is the only lesson we are concerned with, and important enough it is. Christian emblems have their proper place in the decoration of the Christian church, but they are not the materials to be employed in their structural decoration and that certainly is the great lesson taught by the decoration of the churches of Europe, and that is the chief lesson we have now to remember. The world knows no purer, fairer thing than the flower of the field or the leaf of the tree; what more proper than to employ God's most delicate creation in the adornment of His churches? It is enough that this was done in the time when the great buildings we now look upon as models of Christian architecture were built.

Christian decoration, therefore, does not imply the reproduction of set series of forms that are to be repeated without end under every possible circumstance. On the contrary, history and analogy teach the freest use of every material God has given us. But this use is not to be promiscuous, careless, thoughtless or irresponsible. The precedent to use everything we have does not give us the privilege of using all sorts of things in all sorts of ways. Time and again in these papers has the importance of Christian feeling been insisted upon as the fundamental element of Christian architecture. It is so also with ornament. To find a place in the house of God, the ornament must be refined and chaste, beautiful and appropriate, and conceived and carried out in a reverential spirit as befits an undertaking for the glory of God. The ornament must, therefore, whatever its materials, be endowed with the same Christian feeling and quality that should be an integral part of every Christian church.

The license to use every form of nature in Christian ornament rests upon this fact. Ornament, even a strip of foliage, can have a character we instinctively recognize as religious, as Christian, as sacred, though no emblem of Christianity or deliberate reference to its use be contained in it. In other words, it is not the material, the substance, the objects represented in Christian ornament that make it proper for the church, but its quality. Christian architecture, as we have seen, is not concerned with forms, but with the quality of forms; and it is the same with detail and with ornament, wherever found and employed. Were it otherwise, we should find Christian builders employing a limited number of forms which would have acquired a certain sanctity by their repeated reproduction. The limitless opportunities which Christian designers opened up for themselves in going straight to nature would otherwise never have been availed of. Christian ornament would then have become cold and hard, the freedom of the artist would have been restricted at every point. He would, in truth, have become as unskilful in his task as the Mohammedan artist in the reproduction of the human and animal form, while his detail, in the end, would have grown no more ornamental and pleasing than the letters of the alphabet. Fortunately the early builders of Christian churches felt sufficient reverence for their task, realized sufficiently well the consecrated work before them, to give to their undertakings that admirable quality of faith and love that impressed its character upon every part, that rose above forms and ideas, and though subtile and indistinct in itself, still dominated the whole edifice. BARR FERREE.

[To be continued.]

An Elizabethan Tomb. — A superbly rich Elizabethan tomb is left to us in Boreham Church, Essex. This was erected to the memory of Thomas Radcliffe, Earl of Sussex, Lord Chamberlain, and known as the stern opponent of Leicester. Three knights in martial costumes lie on the tomb slab, one of whom is his son and the other his grandson. Walpole incidentally states that the Earl bequeathed £1,500 to be expended on this tomb, and that his executors agreed with a Dutch sculptor, Richard Stevens, to execute his part of the work for £292 12s. 8d. The Earl and his son were first buried in the Church of St. Laurence Pountney, in the metropolis, and then removed to Boreham at the instance of the grandson. — *Cornhill Magazine.*

A STUDY OF THE HEATING AND VENTILATING PLANTS IN THE SUFFOLK COUNTY COURT-HOUSE AND THE MASSACHUSETTS STATE-HOUSE, BOSTON.[1]

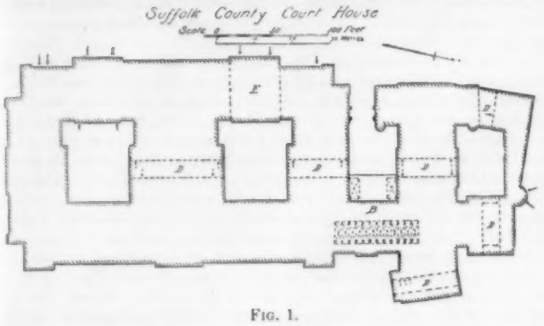


FIG. 1.

THESE two buildings are so nearly alike as regards size, exposure and conditions of use, that a study of their heating and ventilating equipments and some of the results obtained will, I hope, prove not uninteresting.

But while the buildings are so nearly similar, the heating-plants differ from each other very radically and at very many points, both in general design and in detail; in fact, there is hardly a single feature which is common to both.

In each case the selected engineer was in consultation with the architect while the building plans were being prepared, and his suggestions were followed wherever practicable, though in the case of the Court-house some progress had been made on the foundations before such consultation, so that the engineers were at a disadvantage. In both buildings the uses to which the different rooms were originally assigned were in some instances changed, during or after construction.

I will first call your attention to the ground-plans of the two buildings which are shown in outline, Figures 1 and 2, on the same scale, and from which you will readily see that the area covered by each of the buildings is somewhat alike. The State-house, however, is actually the larger of the two, careful computation giving the figures in Table I.

TABLE I.

	Court-house.	State-house without Bulfinch portion.
Cubic capacity	5,500,000 cubic feet.	6,200,000 cubic feet.
Area covered	65,300 square feet.	67,000 square feet.
Heating surface — direct	35,800 "	15,000 "
Heating surface — indirect	67,000 "	9,560 "
Total heating surface	102,800 "	24,560 "
Cost of building	$2,700,000	$3,000,000
Cost of apparatus	$122,000	$112,000[2]

For the purpose of this paper we will leave out the Bulfinch portion of the State-house, shown at the extreme left of the plan. This is the original building, erected in 1798, the proposed destruction of which has recently brought out such strong protests from many good citizens of Boston. A steam-heating plant was installed in this building in 1867, and has since been modified — the original fan for the ventilation of the House and Senate Chamber being replaced by one of more modern type about fifteen years ago.

The Bryant addition, on the north side of the Bulfinch Building, was built in 1855, and has now been pulled down and is being rebuilt in conformity with the design of the "Extension." Mount Vernon

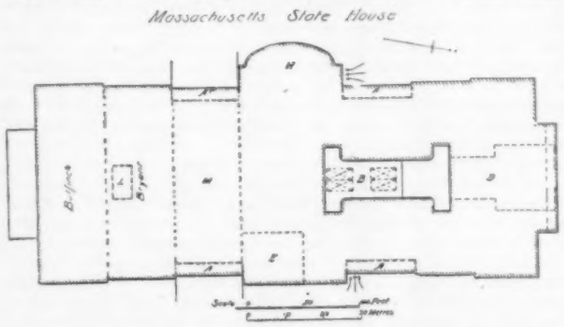


FIG. 2.

Street runs under the portion marked *M*, which, in consequence, has no basement or first floor.

The wing at the right, on the Court-house plan, is the Municipal Building, and contains the City Prison and the Criminal Court-rooms. The remainder is the County Building, devoted to court-rooms, rooms for judges, lawyers and juries, and the Law Library, which occupies nearly the whole of the front of the building on the third floor.

The heating and ventilation of the Court-house is accomplished by a hot-water apparatus, operating without pressure except that due to the head of water in the system. The boilers are placed below the lowest radiating surface, special excavation (which on account of the foundations being already in place, was very costly) having been made for this purpose. *B* on the plan indicates the boiler-room. The water being heated in the boilers to a temperature varying according to the weather, from 80 to 180 degrees, flows through the supply mains and their many branches, rising till it reaches the various radiators, in which it is cooled, and then flows back through the return-pipes into the boilers again — without the invention of any traps, tanks or pumps — arriving at a temperature averaging 15 degrees cooler than when it began its journey. The usual expansion-tank is provided at the top of the building, and the water-level in this tank is maintained automatically. The air-vents of all the indirect radiators are connected to two 1½-inch mains, which are run to the top of the building and have a free discharge. The direct radiators are provided with ordinary air-cocks.

The rooms are warmed partly by passing the air supplied to them through large return bend-coils of 3-inch cast-iron pipe placed in brick chambers at the base of the several flues, and partly by horizontal wrought-iron tube radiators located in the window recesses.

Ventilation is effected without the use of any moving machinery. The tunnels or corridors in the sub-basement, which contain the large hot-water pipes, serve also as main fresh-air ducts to those rooms which can be reached from them. The court-rooms have, as a rule, independent fresh-air inlets.

The air-inlets to the rooms are, in most cases, on the warm or inner side, and are placed at the floor. All the court-rooms, however, have two opposite exposed sides, and in these cases there is an air-inlet at each corner on one exposed side, and a corresponding outlet flue on each corner on the opposite side (as shown in Fig. 6). The outlet flues have registers both at the ceiling and at the floor. With this arrangement of air-inlet and with no means for diffusing the air as it enters, it is not surprising that when weather conditions are favorable, and the volume of entering air large and its velocity consequently high, draughts are complained of by persons sitting near the supply-registers. To avoid these, screens or baffling plates have, in some cases, been provided, and in some cases the inlets have been raised a few feet above the floor. The efficiency of the air circulation in a room so arranged is evidently open to grave suspicion, for it is obvious that as regards the two exposed sides it cannot possibly be symmetrical. The entering air, being warmer than the air of the room, a large proportion of it — especially where the screens are used — will rise immediately to the ceiling and then gradually find its way down the cooling surface of the windows towards the floor. That portion of it which flows down on the side where the inlets are placed will have to cross the room to the outlets at a low level and will do useful work, but that which comes down on the other side can reach the outlets almost without working its passage, and except for the foul air at the ceiling — which, doubtless, it does help to dilute and displace — it would be almost as pure when it left the room as when it entered it.

The temperature in the rooms is regulated very approximately by the temperature of the water in the main supply-pipe — a thermometer being placed in this pipe for the guidance of the engineer, who varies the condition of his fires and the number of boilers used, according to the outside weather. A further regulation in any particular room is effected by operating the valves of the direct radiators under the windows, or by changing the position of the mixing dampers which are provided for all the court-rooms.

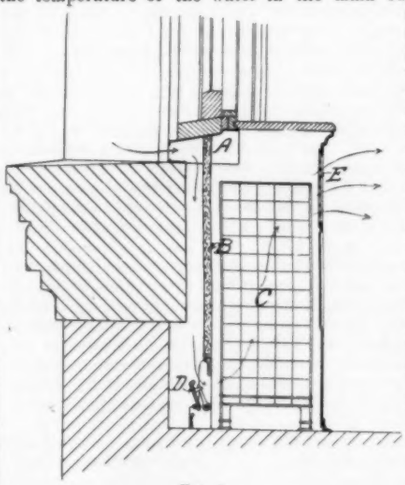


FIG. 3.

It was prophesied before the apparatus was completed, that a large corps of supernumerary engineers would be needed to regulate, with every change in the weather, the many valves and dampers which form a part of the apparatus. This, however, does not prove to be the case; in the court-rooms the mixing dampers are rarely touched except when something of unusual interest is going on, and the room is consequently crowded. Then the adjustment is usually made by one of the two engineers. In the smaller private rooms the radiator valves and cold-air dampers are

[1] Read before the Association of Engineering Societies, September 18, 1895, by Percy N. Kenway, Member of the Boston Society of Civil Engineers, and printed in the *Journal* of the Society.

[2] This includes $6,000 for temporary apparatus for drying the building, and $4,800 for air-filters.

controlled by the occupants, while in the jury and other rooms — which have no air-supply flues, and are not occupied constantly by the same persons — the valve wheels have, in most cases, been removed as a safeguard, and the temperature of such rooms is dependent on that in the apparatus and on the amount of air admitted behind the radiators.

The ability to approximately regulate the temperature in such a large building from a central source is undoubtedly one of the strongest arguments in favor of a hot-water apparatus as against steam. A range of temperature extending over more than 100 degrees Fahrenheit is at the disposal of the engineer, without in any way straining the apparatus or increasing the pressure, whereas a pressure of about 70 pounds per square inch would be needed in the case of steam to get an additional 100 degrees over the temperature at the boiling-point. and such a pressure in a large apparatus, with many thousands of joints and fittings and some miles of piping, would be impracticable and even dangerous.

There are in the Court-house about 220 occupied rooms, including the large Law Library and some twenty other very large rooms used as court-rooms or rooms for hearings, but not counting toilet-rooms. The Law Library has a cubic capacity of about 132,000 feet, and the other large rooms average nearly 40,000 feet each. About twenty of these two hundred rooms are used for unimportant purposes and have direct radiation only, without air-supply. Ninety of them have direct radiators in the window recesses, enclosed in cast-iron casings and arranged to warm air taken from the outside through cast-iron sub-sills, as shown in Figure 3. *A* is the sub-sill; *B*, an apron of 1-inch hair-felt, cased in galvanized-iron, extending across the window recess; *C* is the radiator; *D*, a damper for admitting air behind the radiator, and *E*, the grating through which the air escapes into the room. The dampers are under the control of the occupants of the rooms, and, as a matter of fact, in cold weather most of them are closed, the occupants preferring to have them so. These rooms all have vent-flue connections, but no air-supply other than that admitted through the dampers *D*, so that, with these dampers closed, the ventilation cannot be very excellent. However, in most of these rooms the number of occupants is small and a large supply of air is not needed.

The remaining one hundred and ten rooms have both air-supply and vent-flue connections, in addition to the direct radiators in the window-recesses. These radiators, however, have no sub-sill air-supply, but are simply enclosed in cast-iron screen-work, with gratings at the top and bottom for the circulation of the air.

The corridors and hallways are warmed by indirect radiation, without air-supply from the outside. An air connection is made from the floor of the hall, or corridor, to the underside of indirect stack, and another connection from the top of the stack to the floor again, or to a register in the wall above the floor. In this way these spaces are warmed by circulating the air contained in them through the indirect radiators.

The amount of air supplied with this, as with any gravity ventilating apparatus, is dependent, first, on the difference between the inside and outside temperatures; second, on the direction and force of the wind; third, on the barometric pressure; fourth, on the amount of heat used in the aspirating coils in the vent shafts, and fifth, on the area, height and form of the supply and vent flues and their freedom from obstructions and changes of direction. From this it will be seen that the air-supply in this building is not likely to be constant, but must, of necessity, vary from day to day with the outside weather conditions. The severest test for such an apparatus is a spring or autumn day when the barometer is low, the air still and the temperature a few degrees too cool for open windows. If the amount of air supplied on such a day is up to the standard, then, of course, it would be theoretically possible to keep the supply constant, and to have neither more nor less air than is needed at any time; but as this would entail, in the case of the Court-house, the very frequent, perhaps hourly, manipulation of seventy-four cold-air dampers, it would hardly be practicable, and as a matter of fact it is not attempted, although the dampers are used to check the flow of air to the rooms when it becomes too generous under favorable weather conditions.

Turning now to the State-house, we find there a steam-apparatus throughout. A pressure of 100 pounds per square inch is carried on the boilers for the purpose of running the engines in connection with the electric-lighting plant, but only from two to ten pounds is used in the heating-apparatus. The boiler-room is located in the court-yard of the extension — as shown at *B* on the plan — and its floor is about two feet below the level of the sub-basement. It is a one-story structure, the roof being largely of glass, making it an exceptionally light room.

The different pressures carried and the high pressure needed for the engines made a gravity apparatus impracticable in this case, and consequently the water-of-condensation from all the direct radiators and from the main coils — with the exception of the exhaust steam-sections — is returned to the boilers through a series of traps, tanks and pumps. The rooms here, as in the Court-house, are warmed partly by the air-supply and partly by direct radiation; but in this case the indirect radiation, instead of being divided up and placed at the bases of the several flues, is massed in large stacks near the main air-inlets. The two sets of stacks, through which passes all the air supplied to the Extension (the whole building, except the Bulfinch and Bryant portions) are built of 1-inch wrought-iron pipe, and are made up of a series of mitre coils set up on end and connected together in sections. The arrangement will be better understood by referring to Figure 4, which shows one of the coils and its relation to the floor and ceiling. The largest stack contains ninety of these coils, connected together in groups of ten, each group having separate controlling-valves.

Ventilation is effected by fans driven by electric-motors, and for this purpose the Extension is divided into two sections, the Bulfinch and Bryant portions, together, making a third, so that there are three supply-fans and three sets of main coils. The general method of ventilation can be understood from a description of the apparatus on the west side, which is the more interesting as it supplies air to the House of Representatives. The air-inlet is on the west side, and is indicated by arrows on the plan. On its way to the fan the air first passes through a series of primary coils, which are designed to heat it to about 40 degrees in zero weather. Between these coils and the fan there is a large chamber in which it was designed to place an air-filter; but this has not as yet been constructed. The fan is 12 feet diameter and 14 inches wide at the tip of the blades. It is a cone fan of the Briggs-Meigs type, modified by Professor Woodbridge, and has proved very efficient and economical of power. The one on the east side is of the same type, but two feet less in diameter, as it has less work to do.

After passing through the fan the air is forced through a secondary coil, and is further heated to about 75 degrees, at which temperature it is distributed through the vertical ducts to the different floors. The total area of the main air-supply ducts on this side is 145 square feet, 45 square feet being for the House of Representatives. Horizontal branches are taken out of the vertical ducts at each floor for the purpose of distributing the air to the rooms. These horizontal ducts are formed by furring down the ceilings of the corridors, so that they are not visible, and by the casual observer would be unsuspected. The air-inlets to the rooms are in most cases taken directly out of these corridor ducts, so that they are on the inner side of the rooms and usually something less than three feet below the ceiling. The vent outlets are, in nearly all cases, at the floor, and, wherever practicable, on the warm side, and are furnished with gossamer check-valves to prevent down-draughts. No ceiling outlets are provided and the floor outlets have no register valves. Some of the rooms which could not be reached from the corridors have separate air-flues leading up from the sub-basement, and connected to the warm-air chamber by galvanized-iron piping. In these rooms the air-inlets are about eight feet above the floor.

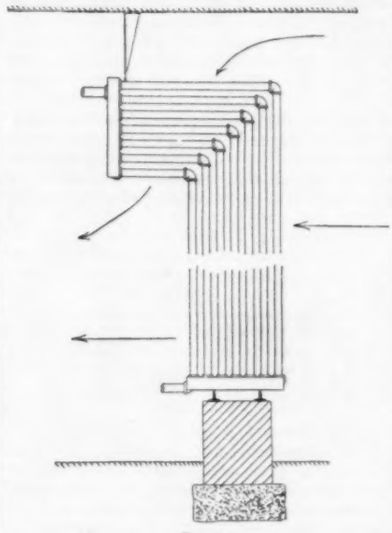


Fig. 4.

The House of Representatives, the location of which is indicated by the letter *H* on the plan, is elliptical in form, 86 feet long by 70 feet wide and 44 feet high, has a cubic capacity of about 264,000 feet and seats 240 persons on the floor and about 200 in the galleries. On special occasions, when the standing-room is occupied, as many as 1,800 persons may be inside the doors at one time. This chamber is treated in a special manner, the conditions being different from those existing in the other rooms. A special vertical air-duct is provided, which has two openings at the base, both connecting with the air-pressure chamber, but one connecting on the inside and the other on the outside of the secondary coil, so that air at 40 or at 75 degrees, or at any intermediate temperature, as required, may be supplied. Mixing-dampers, automatically controlled by thermostats, are provided in front of the openings and keep the temperature of this important legislative chamber practically constant, in spite of variations in the weather and in the number of occupants. The air-inlets to this room are differently arranged from those in the other rooms. The desks on the floor and the seats in the galleries are fixtures, and the floors are raised and inclined in such a manner as to give a considerable air-space between them and the ceilings below. Into these spaces the air from the vertical duct before mentioned is discharged, so that they become air-pressure chambers. The desks are of special construction and have hollow bases which connect with the air-chamber below, and the air finds its way into the room through gratings (backed by coarse haircloth) in these bases and in the risers of the floor, which is stepped. The gallery inlets are somewhat differently arranged, though the same principle of a large and evenly distributed inlet area near the floor and a low velocity of air-flow is carried out. The total area of inlet is about 240 square

feet for the floor and 200 square feet for the galleries, or one square foot for each regular occupant.

The main vent outlet is at the ceiling, where a free area of about 20 square feet is provided, but there are also 16 square feet of outlet area in the rear walls for the galleries. The ordinary air-supply to the House is 900,000 cubic feet per hour, but it has been found quite possible on special occasions to raise it to 1,300,000, and that without causing disagreeable draughts. Samples of air taken at the ceiling ventilator towards the close of the exercises on the occasion of the Governor's inauguration last January, when fully 1,800 persons were inside the doors — more than four times the seating-capacity — gave by the Pettenkoffer method 12.1 parts of carbon-dioxide in 10,000 — a large proportion under ordinary circumstances, but a very satisfactory showing considering the adverse conditions and the fact that the samples were taken at the point of maximum impurity. It may be mentioned incidentally that a Wolpert air-tester, carefully used at the same time and place, gave but 8½ parts CO_2 in 10,000, indicating an error in the latter instrument of more than 30 per cent. As the Wolpert device is used by the District Police in testing the air in the school-houses of this State, this fact has some significance.

The warming of the House is done entirely by the air-supply, no direct radiators being used. The temperature of the incoming air, when the room is occupied, rarely exceeds 70 degrees in the coldest weather.

The temperature of the air-supply and of the rooms and corridors throughout the building is automatically controlled and kept constant within one or two degrees by the Johnson Electric System, so long as the weather is cold enough for artificial heat to be required. Thermostats are placed in the main air-ducts and control sections of the main coils, and in each of the rooms and in the corridors there are other thermostats controlling the valves on the direct radiators. The mixing-dampers above mentioned, which regulate the temperature of the air to the House, are also controlled by the Johnson System. *No valves or dampers are accessible to the ordinary occupants of the building, or need to be operated or thought of by them.*

In the completed building there will be about 200 occupied rooms, including the House of Representatives, the State Library and the Senate Chamber. Of these, 170 will have connection to air-supply and vent flues as well as direct radiation. The remaining thirty include such rooms as the restaurant and kitchen, and the Board of Health laboratories on the fifth floor, which have liberal vent connections, but take their air-supply from the hallways and corridors; and the stack-rooms, on the third floor, through which the air from the State Library passes on its way to the vent outlets. The advantages and economy of such an arrangement are obvious. The large volume of nearly pure air at the top of the building is utilized, and a continuous inward current is insured towards those rooms which might otherwise be centres for the distribution of foul odors throughout the building. Similarly, all the toilet-rooms, instead of having their own air-supply flues, as is the case in eight of the large toilet-rooms in the Court-house, take their supply from the corridors through gratings in the lower panels of the doors, and the vent-flues from these rooms are all connected to an exhaust-fan which is kept running continuously. Exhaust-fans are also provided for the kitchen and restaurant, and for the laboratories, and these are run intermittently as needed. Ventilation in the stack-rooms is required principally for the preservation of the books, so that the air from the library, which is usually a very thinly populated room, is entirely pure enough for the purpose, and it would, in fact, be wasteful to use fresh air.

There is a fourth exhaust-fan in the State Police department in the sub-basement, where confiscated liquors are disposed of. This was not anticipated in the original design, but was found necessary on account of the strong fumes liberated.

All the fans are run by electric-motors. Vent-flues, other than those mentioned above as being connected with fans, are merely carried up above the roof and suitably capped. No aspirating coils are provided or needed.

The total amount of air which the apparatus is capable of supplying to that portion of the building known as the "Extension" is 10,000,000 cubic feet per hour, or, say, 50 cubic feet per minute to each of 3,300 occupants. Add to this 2,500,000 cubic feet per hour for the Bulfinch and Bryant portions, and we get 12,500,000 cubic feet as the total for the completed building. This amount, it should be noted, is practically independent of outside weather conditions, and is well under the control of the engineer, who can reduce it as may be required. It is, of course, dependent on the fans and motors; if these should become disabled, then the air-supply would be very greatly reduced, and with unfavorable weather conditions this building would be worse off than the Court-house. But such a contingency is not likely to occur except at long intervals, and even then the stoppage would be of short duration and would not interfere with the use of the building.

We now come to the consideration of some of the details in the two buildings.

In the Court-house there are twelve horizontal tubular hot-water boilers of 80 nominal horse-power each, and two steam-boilers of the same type of 50 horse-power each, making a total of 1,060 nominal horse-power. The steam-boilers are for the elevator-pumps and have no connection with the heating-apparatus, except that the exhaust steam, after passing through a feed-water heater, escapes to aspirating coils in two of the vent-shafts. There is no electric-lighting plant in the building. Of the twelve hot-water boilers, eight have been found sufficient in the coldest weather experienced since the apparatus was installed. The firing is done by hand, Cumberland coal being used.

In the State-house there are four Babcock & Wilcox boilers of 208 nominal horse-power each, or 832 horse-power in all. These boilers are designed to supply steam to the entire heating-apparatus, to the elevator-pumps, and to a 5,000-lamp electric-lighting plant. Last winter, beginning with January, the entire building — except that portion marked *M*, which was not built — was warmed by steam from these boilers, as was also a large building across the street on the east side, known as the Commonwealth Building. The electric-current was at the same time supplied to 3,500 16-candle-power lamps, or their equivalent, and in the coldest weather only three out of the four boilers were used, showing that there is an abundant reserve force to take care of the whole building when completed. Roney mechanical stokers are used for firing. The coal is brought from the bin in a steel car running on a 2-foot track, is weighed and shovelled into hoppers secured to the boiler-fronts above the grates.

Special arrangement has been made for the disposal of ashes. Between and below the two pairs of boilers there is a fireproof chamber with connection to each of the four ash-pits; the ashes are dumped into this chamber and do not appear on the floor of the boiler-room at all. A mechanical conveyor raises the ashes out of the chamber and deposits them through a chute outside the boiler-room wall, ready to be carted away.

In a hot-water apparatus we should naturally expect to find the supply and return pipes of a larger size than those in a corresponding steam-apparatus, so here, in the Court-house, the main supply-pipe or drum is 30-inch internal diameter, with 14-inch connections

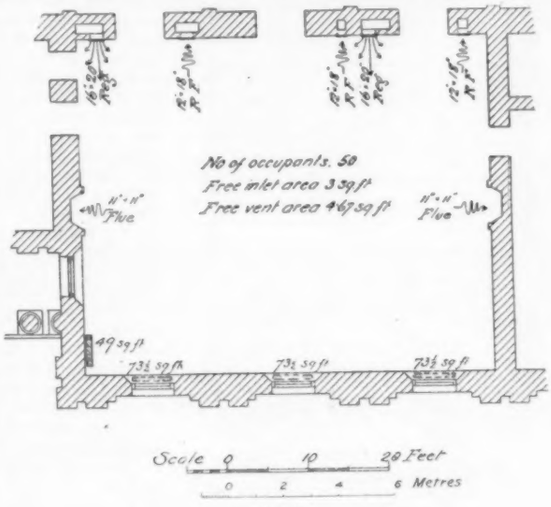


FIG. 5.

to twelve boilers. In the State-house the largest supply main is 10 inches, with 8-inch connections to four boilers. The return mains in the Court-house are the same size as the corresponding supply-pipes, the return drum being 30 inches in diameter, whereas the largest return main in the State-house is only 3½ inches in diameter.

All pipes in the Court-house larger than 5 inches in diameter are of cast-iron, flanged. No cast-iron pipes are used in the State-house.

In the Court-house the supply and return mains are in the sub-basement; the larger pipes run in the fresh-air supply ducts and are covered with hair-felt and canvas, an excellent non-conductor for hot-water work, but objectionable from the fact that it has become infested with vermin. Each line of radiators has its separate supply and return riser, so that there are in the building 80 pairs of risers, not counting those which do not reach up to the second floor — 160 rising lines in all.

In the State-house the supply to the direct radiators is first taken to the top of the building by two 7-inch risers, and is thence distributed to the downward feed-pipes by mains running in the roof space and covered with asbestos-cement felting. Exclusive of those in the Bulfinch portion, there are 67 of these "droppers" or downward feeders which perform the function of carrying away the water of condensation as well as supplying steam to the radiators, so that no return risers are needed. The average size of these vertical pipes is very nearly the same in both buildings, about two inches in diameter. The "droppers" are concealed in slots in the brick walls, which are covered with cast-iron plates. These plates have perforations near the floor and near the ceiling, so that a circulation of air is maintained and the heat utilized. The ordinary pressure carried on the direct-radiator system is under 5 pounds per square inch.

The direct radiators used in the Court-house are constructed of 1-inch pipe screwed into cast-iron headers at one end and into return

bends at the other, the bends being tapped left hand. They are practically ordinary pipe radiators set with the pipes horizontal instead of vertical. This form was adopted partly because of the case with which such radiators can be made of varying heights, widths and lengths to suit the different window recesses and the amount of surface specified.

The State-house radiators are of the H. B. Smith Union pattern for hot water, vertical cast-iron loops connected together at top and bottom. Each radiator has a supply connection at the top and return connection at the bottom, both connecting with the same vertical pipe.

The amount of radiating-surface in the Court-house is vastly larger than in the State-house, notwithstanding that the latter is the larger building and has ample surface to more than meet all the requirements. I am not able to state exactly the area of the exposed window and wall surface in the two buildings, but it is probable that the proportion of such surface to cubic capacity is greater in the Court-house than in the State-house, and the actual figures might possibly show a surplus for the Court-house. Bearing this in mind, and also making liberal allowance for the fact that we are dealing with hot water in one case and with steam in the other, it is still very evident that an extravagant factor-of-safety was used in designing the Court-house apparatus.

For purposes of comparison I have selected a large room in each building, which will, I think, help to bring out this point more clearly. The room in the County building which I have chosen is one of the court-rooms on the second floor on the west side (Fig. 6), and the one in the State Building is on the third floor on the east side, and was originally assigned to the Secretary of State (Fig. 5). Their respective locations are indicated by the letters *E*, *E* on the floor plans. They were chosen with reference to their size and exposure, and by referring to Table II it will be seen that while the rooms vary very little in those particulars, yet the Court-room has 89 per cent more direct surface and 1,347 per cent more indirect surface than has the room in the State-house. It should be noted, however, that this difference is in part due to the use of hot water without a fan in one case, and steam with a fan in the other, and also to the fact that on account of the larger number of occupants in the court-room, a larger maximum air-supply has been provided for. But even when all this has been taken into consideration, the excess in the court-room is still very remarkable, and I do not think that "extravagant" is too strong a term to apply to the "factor-of-safety" there used.

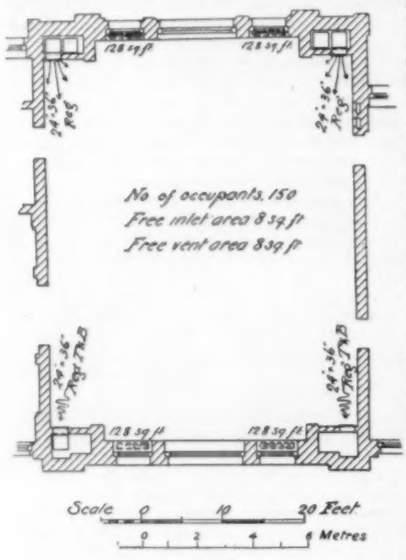


Fig. 6

The figure 85, which is given in Table II as the amount of indirect surface for the room in the State-house, is in the same proportion to the total indirect heating-surface on the east side (4,240 square feet), as the amount of air supplied per hour to the room (150,000 cubic feet) is to the total air-supply per hour (4,500,000).

TABLE II.

	Court-house, room 22, second floor.	State-house, room 113, third floor.
Floor area, square feet	1,813	2,090
Cubic capacity	38,300	39,700
Glass area	340	260
Exposed wall area	920	994
Glass plus wall	1,260	1,254
H. S. direct	512	270
H. S. indirect	1,230	85

By referring to Table I, it will be seen that much the same proportions are maintained when the two entire buildings are compared. The Court-house, with 11 per cent less cubic capacity, has 318 per cent more heating-surface, and this is without taking into account the large amount of surface in the enormous supply and return mains.

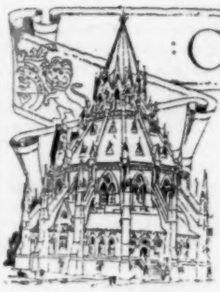
With regard to the coal consumption in the two buildings, I have not found it possible to get data for a fair comparison. The amount used in the Court-house from January 1 to June 1, 1895, was 995 tons, and in the State-house for the same period, 1,465 tons. But it must be remembered that in the latter building there is a 5,000-lamp electric-light plant, some portion of which was in operation day and night, and that the Commonwealth Building, the Bulfinch and Bryant portions, and the Extension (except that part over Mt. Vernon Street), were all warmed during this period by steam from the new boilers. Also it should be noted that the north side of the Bryant portion and the south end of the Extension were then outside exposures.

The electric-lighting bill for the Court-house, covering the period above mentioned, was $3,030, which must be placed against the State-house expenses. This is enough to pay for the extra coal used in that building and leave a balance of $300 a month towards the heavier running expenses, but even then we do not get an accurate comparison, as many more lamps are used per hour in the State-house, and there are six elevators there against three in the Court-house.

The number of employés in the engineer's department is greater in the State-house than in the Court-house, partly because of the lighting plant, and partly because of the State law which limits the working-hours of State employés to eight in twenty-four, a law which does not affect the Court-house. There are in the State-house three engineers, six firemen, three oilers and two electricians, against two engineers, five firemen and one electrician in the Court-house.

The Court-house apparatus was designed by Bartlett, Hayward & Co., of Baltimore, and installed by the Samuel I. Pope Co., of Chicago. That in the State-house was designed by Prof. S. H. Woodbridge, of the Massachusetts Institution of Technology, and installed by A. B. Franklin, of Boston.

CANADA



UNDERCUTTING PREJUDICING THE EXISTENCE OF THE ONTARIO ASSOCIATION OF ARCHITECTS. — LACK OF INTEREST IN THE EXAMINATIONS. — ARTICLED PUPILS. — THE AREA OF UNEXPLORED CANADA.

THE official report of the last annual meeting of the Province of Quebec Association of Architects, which took place early in October, makes one feel as if one had been struck below the belt. The vigor and enthusiasm with which this and its sister Association of Ontario were started a few years ago, still exist among the real workers and earnest members of both societies, but (and these members do not deny it or attempt to conceal the fact) the principal objects which it was their intention, if possible, to attain, or bring about immediately, are a long way still from consummation. The first object of all is being attained, undoubtedly, and therein these societies are doing good work, although the results are not by any means so gratifying as it was hoped they would be and the work of the members is carried on against depressing odds. This "first object" is, of course, "education of intending architects," but owing to the limited recognition these societies have as yet received and the opposition displayed by architects who desire to work untrammelled by regulation of any sort, students are doubtful of the advisability of spending time and money (though the fees are small enough) in taking the examinations provided for their benefit.

The Secretary of the Quebec Association, in his report for the year, stated that the question of the schedule of charges had not been materially advanced and to all outward appearances we might say it is almost in the same position as it was when the plan was proposed. Indeed, in Toronto — the residence of the majority of the Ontario Association members — the movement is not only at a standstill, but one might think it was abandoned. Very little, if any, allusion was made to the subject at the last meeting of that Association and so much opposition has been presented that there is little encouragement left to console the promoters.

There have been traitors in the camp, who, while professing horror at the bare idea of "undercutting," have been doing their "level best" to secure work at any cost and finding that the plan paid them well, through limiting their field of competitors (the exclusion of the best men being secured, through their adhesion to the promise not to undercut, left only the small fry to compete with), have finally overthrown all scruples about "low rates" and fallen out of the ranks of the fighters altogether. Traitors are bad enough, but a worse blow than a blow in the dark is one from a friend. One of the very most active agitators for a definite and binding scale of charges now states that he has thrown up the sponge, that the traitors have worked so well and so successfully, have obtained so much work at just whatever they could get it for, that they have done better than anybody who nobly stuck to his agreement, verbal only though it was, that now, not wishing to do anything in the dark, he gives it out that he will in future do as others do, and accept whatever is offered rather than lose a "job." A cause of failure to obtain recognition for a scale of charges has, undoubtedly, been indecision as to what that scale of charges should be. The

Ontario Association, it is true, adopted, or professed to adopt, a scale, and a table of charges was printed for every member, headed "Scale of Charges in Use in the Office of ——," or something to that effect, and it was intended when a person represented himself as desiring to build, the architect, whom he addressed, should give him one of these printed forms. This should have been a well-directed shot, but it could not be fired, for the traitorous undercutters then had in their hands a definite statement of the charges that would be made by many men, and all they had to do was to say "*We* don't." So the subject has come to be looked on as a bugbear and it is apparently thought better to "let sleeping dogs lie."

The Quebec Association has not come to so baleful a decision, but in their fear that, if too determined, they would be snubbed altogether, alternative proposals made by the Government for the purpose of meeting them *halfway* were considered, instead of being met by the determined stand, that alone could command success, that "this we must have and nothing else." The alternative proposals were, first, an arbitration to decide upon items of charges and an opportunity to make them obligatory by law, the Association paying all expenses, or that the Association should issue a schedule and force it into use and that it should become law by long and united usage. The first would be a heavy tax upon the members of the Association and be doubtful of beneficial results in the face of the opposition that would be presented; the second, which, however, the members appear to prefer, was what was tried in Ontario and failed simply because "united usage" was an impossibility, and without that no length of time would be long enough for the object stated. And where are we now? The Quebec Secretary's report on this matter winds up with: "What arises from this is that the profession would gain enormously by a greater unanimity of action for the common interests of all." We are, therefore, just exactly where we were when the idea of forming associations of architects was first mooted in Canada; those words were what the provisional president or chairman of the yet unborn association made use of as the reason for the formation of an association.

A second important matter which was to be regulated by associating for the reform of abuses, is that of competitions. These were to be carried out on definite lines and according to settled rules, or all members of the associations were to abstain from competing. Here again the traitors got in their work, and though these have given signs of improvement, nothing really has been attained. The work of education goes on, it is true, but one is almost ashamed to report facts. At the Quebec examinations were there thirty candidates with, say, seventy-five per cent successful? Alas! there were only four candidates, but these four all passed, three in preliminary and one in final. Let us say, then, that the earnest working members of this association are worthy of great commendation in sticking to their posts, despite the wretched and disheartening response to their efforts on behalf of the students. In minor matters, however, the Association makes the fact of its existence felt and in so doing probably saves its life. If the public can be reminded from time to time that there is such a society, in time it may be found to be of value to the said public and be missed if it did not exist. The Art Standing Committees are good things, even if not so successful in getting their recommendations carried out, but the fact that their work, of suggesting improvements in thoroughfares from an artistic standpoint, necessarily brings them before the public, will show that the Association is not merely a social gathering or a "union."

It behooves all who are not traitors or turncoats to stand together closely, braced up to withstand the underhand opposition, determined to stick to their principles through thick and thin, and in time the desired results will be achieved.

It is very strange how little enthusiasm can be aroused in young students themselves for the future of the profession. The whole system of paying students salaries, however small, is a mistake, and yet it is difficult to break through what has become a custom. Boys, when they first go into an architect's office, think more about their pay than about study, and "articles" with an accompanying premium are almost unknown. The architect who pays his "pupils" without articles of indenture knows that if that pupil can get a little better salary in another office he will take it, and, therefore, he is not going to teach that boy more than he is obliged for the work of the office, for as surely as he does, just when he is beginning to get interested, and consequently more useful, the boy gets a "better offer" and decamps. Until the profession recognizes the necessity of binding students, and it becomes the practice among the foremost men, the education provided for by the examinations of the Associations of Ontario and Quebec will not be satisfactory in their results.

Dr. Dawson, Director of the Dominion Geological Survey, has published a paper, in which he gives the results of careful calculation as to the extent of unexplored areas in Canada. The total area, he says, aggregates 1,250,000 square miles. Beginning at the extreme northwest of the Dominion, the first of these areas is between the eastern boundary of Alaska — the Porcupine River — and the Arctic coast, consisting of 9,500 square miles, a little smaller than Belgium and lying entirely within the Arctic circle. The next area is west of the Lewes and Yukon Rivers and extends to the boundary of Alaska. Until last year there were 32,000 square miles unexplored, but last summer a part of this was surveyed. A third area of 27,000 square miles lies between the Lewes, Pelly and Stike Rivers, and is nearly as large as Scotland. Between the Pelly and Mackenzie Rivers is another large area of no less than 100,000 square miles, or about twice as large as England. It includes 600 lineal miles of the Rocky Mountains. An area of 50,000 square miles is found between Great Bear Lake and the Arctic coast, being nearly all to the north of the Arctic circle. Nearly as large as Portugal is the area between Great Bear Lake, the Mackenzie River and the western part of Great Slave Lake, in all 35,000 square miles. Lying between Stike and Laird Rivers to the north, and the Skeena and Peace Rivers to the south is an area of 81,000 square miles, which, except having been recently penetrated by a field-party, is quite unexplored. Another area of 25,000 square miles southeast of Athabasca Lake is an area of which little is known except that it has been crossed by a field-party *en route* to Fort Churchill. East of the Coppermine River and west of the Bathurst inlet is some 7,500 square miles, which may be compared to half the size of Switzerland. Eastward from this is an area about the size of Ireland, 31,000 square miles and lying between the Arctic coast and Backs River, and stretching to the Hudson Bay is another, larger than Great Britain and Ireland together, of 173,000 square miles. The most easterly area is the largest of all. It comprises almost the entire interior of the Labrador peninsula or Northwest Territory, in all 289,000 square miles, more than equal to twice the area of Great Britain and Ireland, with an added area of the size of Newfoundland. The Arctic islands will add an area of several hundred thousand square miles of unexplored Canada.

The largest steel arch bridge of single span that the world has yet seen is to be constructed immediately at Niagara Falls, in fact part of the foundation work, I understand, is already begun. It is intended to supersede the present suspension bridge, which has a long swing in the gales to the alarm of all passengers. The span will be nearly 900 feet, and the arch will spring from masonry carried down to the water's edge. Mr. E. C. Buck is the engineer.

An association for the encouragement of the art of sculpture has been formed in Toronto, under the style and title of the "Guild of Sculpture," supported by several prominent persons who have been roused up by the present increasing demand for public statues to arrange for the possibility of their being made in Toronto instead of being imported from the studios of artists in the Old World. The Association is well and substantially founded, and has for its president Mr. L. R. O'Brien, Canada's first artist and late President of the Royal Canadian Academy, the Honorary President being the Lieutenant-Governor of the Province.

SOCIETIES

THE ENGINEERS' CLUB OF PHILADELPHIA.

AT the regular meeting, held November 16, 1895, seventy-three members and visitors were present.

The paper of the evening, on "Paint as a Protection for Iron," was the joint production of Messrs. E. A. Custer and F. P. Smith (non-members), and was read by the former.

It would appear from past experiments that bright iron does not rust when exposed to a dry atmosphere of pure oxygen and carbonic-acid gas, separate or mixed. After the rust has once commenced, only the slightest trace of moisture is necessary to continue this chemical action, which is probably due, not only to the corroding influence of the rust already present, but also to its power of absorbing oxygen and condensing moisture. Any covering that is absolutely impervious to moisture will, when applied to clean iron, prevent rust under atmospheric conditions in which corrosive elements are wanting. The protective covering that is to meet these conditions must be cheap and easily applied, and a paint or combination of paints seems to be the logical outcome of the problem involved.

The requisites of a good paint for the preservation of iron and steel are stated by Mr. Woodruff Jones, A. M., to be:

1st. It should firmly adhere to the surface and not chip or peel off.

2d. It must not corrode the iron, else the remedy may only aggravate the disease.

3d. It must form a surface hard enough to resist frictional influences, yet elastic enough to conform to the expansion and contraction of the metal by heat and cold.

4th. It must be impervious to, and unaffected by, moisture, atmospheric and other influences to which it may be exposed.

In undertaking to produce a paint, with the above requirements, that would absolutely protect iron, it was early determined that the covering should consist of two distinct elements, the first of which should possess the adhesive and elastic properties, and afford a safe and elastic base for the application of a second coating that would be hard, elastic, acid-proof and absolutely impervious to moisture. There is no paint known that will meet the first requirement so fully as good red-lead and linseed oil. The dry film of red-lead and linseed oil, however, is porous, and this defect must be remedied by a second coating of paint, which will dry with an absolutely impervious and water-proof surface.

It has been justly claimed for red-lead that the property it possesses of saponifying the oil — not oxidizing it, in its true sense — renders it one of the most valuable pigments for a first coating on

structural iron. After numerous experiments, a vehicle was finally selected as affording the nearest approach for an ideal outer covering for ironwork.

The pigment was next considered and it was decided that this must itself be inert so far as iron is concerned; for while it was intended to be used over a foundation coat of red-lead, it should be possible to employ it in some cases as a sole protective covering. A material was incorporated in the pigment, which enables it to resist frictional action in the highest degree, makes it practically impossible to destroy, and to all intents and purposes absolutely insoluble in any of the known solvents.

One important point that must be carefully considered when the protection of iron is desired, is the presence of mill scale or iron-rust. No paint, however good, is worth a cent a ton for the protection of iron when used over mill scale. The absolute removal of mill scale from the iron before it is painted should, therefore, be specified and insisted upon. In ordinary practice it has been found sufficient to brush the surface of the iron carefully and thoroughly with a good wire brush and then apply the paint.

Attention was then called to the quality of the paint to firmly adhere to the surface of iron when subjected to very high or low temperatures, and some specimens of pipe were exhibited that were first coated when cold with the protective paint referred to, and were then subjected to live steam at a temperature of 340°, then painted while hot with the same preparation, and afterwards dipped in a mixture of ice and salt until thoroughly chilled.

DISCUSSION.

Mr. G. B. Price: Am I right in supposing that the first coat of red-lead fills in the pores of the iron, while the second gives a hardened surface?

Mr. Smith: The first coat does not necessarily fill up the pores, but it makes the surface of iron glossy and smooth, and the second coat gives it an enamel surface. The most severe test that we have given our paint is in a place where it has been exposed to the fumes of sulphuric and muriatic acid for nearly four years. It shows no signs of deterioration yet, although the first gloss has disappeared, but a careful examination of the iron, after scraping away the paint, shows that it has been perfectly protected. Ordinary paint, under the same conditions, would not have lasted more than two years. This paint has also been used largely for the protection of smoke-stacks and for boiler-fronts, where it has lasted for nearly a year. It does not crack under a high temperature. In structural work, the first coat is usually applied at the shop, and the finishing coat is put on after erection, as it would very likely be marred in putting the iron together.

Mr. John C. Trautwine, Jr.: While not bearing directly upon the subject under discussion, it may be of interest for me to state that in applying asphalt paint on a concrete surface, it has been found desirable to dissolve the asphalt in a considerable proportion of benzine or gasolene; in the latter solution the best proportion being 75 per cent of gasolene. The liquid seems to carry the particles of asphalt into the pores of the concrete, and, when it is thoroughly dry, a thicker coat of melted asphalt is applied. In this way we obtain a very perfect adhesion of the latter material.

Mr. C. D. Rinald: What Mr. Trautwine has said is true of almost all paints. Paint, for protection, should not be too heavy, as it is then much more liable to be affected by mechanical action, such as anything striking against it.

Mr. Smith: So far as the use of benzine on iron is concerned, we have found it objectionable, as it is difficult to obtain it perfectly volatile, so that when it evaporates it leaves a greasy surface, which, though not objectionable on cement or concrete, is disadvantageous upon iron.

Mr. Rinald: The use of red-lead as a priming coat to make the protective coat adhere better, recalls to my mind an amusing letter we received some time ago from a gentleman down South. He wrote that it was the custom in that part of the country to allow metal roofs to rust slightly, because the paint would then adhere better. Many builders, indeed, believe in allowing the iron to rust slightly, thinking that the protective paint, applied afterwards, will be incorporated into the iron. I do not think that this can be proved, but I do not see why a paint cannot be made — in fact, there is a paint — that will adhere to the iron without anything under it, even when the iron is very smooth. However, a priming of red-lead would certainly be better than a coat of rust.

Mr. E. A. Custer: We had that experience in connection with a couple of buildings last summer. The roofs were made of tin, the front being inclined a half-inch in 10 feet to satisfy our city building-laws. We requested the builder to paint it over with red-lead, but he replied, "We always wait until it rusts, for then the paint sticks better."

Mr. F. Schumann: Some ten years ago we allowed a man to exhibit at our works a material that he prepared for coating iron with a glossy covering of different colors, which stood the test of being immersed in water and different acids. We bought the secret from him for the composition of the material, which was simply sandrax gum dissolved in alcohol and colored by pigments. We afterwards painted a steam-engine with this mixture, which, without pigment was very transparent, so that the engine always remained clean, and prevented the iron from rusting until it was taken off, about two years after its application, at a cost of nearly $100. Why are there not some good qualities in these vegetable gums for their use in the protection of iron? It stood exposure to steam, gas and moisture.

Mr. Rinald: A similar preparation, largely used for many purposes, is gum shellac dissolved in alcohol. It makes a strong coating, but I do not think a gum will stand exposure to the weather for any length of time. It will crack and peel off.

Mr. Smith: It is, unfortunately, true of almost all vegetable gums which are completely soluble in alcohol, that while they make a good-looking appearance, they are practically worthless when exposed to the weather, and even in the better grades of varnish for wood these gums are never used for that reason.

Mr. Max Livingston: I would like to bring up the point of the comparative difficulty of protecting steel and iron. It has been my experience that paint on iron will last considerably longer than on steel, especially on the outside of steel tanks filled with water. If filled with oil, there seems to be less difficulty; but when they contain water the steel rusts very quickly. The best of paints will chip if over a steel surface, under the same atmospheric conditions where they would last on iron. I should like to know if this can be explained.

Mr. Smith: This, doubtless, is a fact; but the explanation which I must fall back upon is the somewhat lame one that some materials rust quicker than others, in the same way that some materials are more soluble in certain acids than others. Regarding bisulphate of carbon as a vehicle for paint, its fumes have a very bad effect upon workmen using it, and are probably more inflammable than the vapor of any other liquid; and I have known of cases where serious explosions occurred from paints in which it was used.

Mr. Custer: I think that if the surface of either iron or steel is perfectly clean before the paint is applied, iron will not be found to last any longer than steel, so far as rust is concerned.

Mr. Schumann: The absolute removal of scale must be insisted on. We find, instead of using acid baths for this purpose, sand-blasts are very efficient and very quick, and make the surface of the iron bright and clean. In the plan that I am familiar with, a 3×3 angle bar 20 feet long can be thoroughly cleaned with a sand-blast in about 5 minutes. It also has the advantage of being applicable to work already riveted together. I think it would be well if those preparing specifications should incorporate a clause requiring the cleaning of the iron and its subsequent inspection before any paint is applied.

Mr. C. E. Wolle: Rosin dissolved in benzine will protect iron from the effects of salt water, as we found by experiment in shipping deck-loads of this material. Regarding the rusting of tin roofs before the paint is applied, I think the tin is often exposed to the action of the atmosphere in order to allow the film of oil which covers it when manufactured to be destroyed, and the paint will then certainly adhere better.

Mr. Trautwine: In examining a piece of 6-inch water-pipe laid in about 1822, we found it incrusted inside with a layer of material that proved to be chiefly oxide of iron and graphite, so that the internal area of the pipe had been reduced about 20 per cent. Another piece of 6-inch pipe laid 26 years ago, after having been first coated with a protective paint, was examined, and practically no incrustation was found upon it.

Mr. H. J. Hartley: For the last 25 years we have never allowed iron plates to be applied on ships without first pickling them in muriatic acid, washing the acid off thoroughly, and then painting them with red-lead; so that I see nothing new in that. When the ship is ready to launch, a second coat of good red-lead and linseed oil is applied.

Mr. John L. Gill, Jr.: Chimney-stacks made of No. 14 iron are very common on the boats sailing the Ohio and Mississippi rivers, and are often painted with ordinary coal-tar containing a little lime, to neutralize any acid that might be present. Stacks coated in this way have to be renewed about every three years. The first experience I had of red-lead being used in this way was on the steamboat "*J. B. Williams*," built during the war. Two years ago I saw this boat at Pittsburgh, and it still had its original stacks, which had been protected by a coat of red-lead and linseed oil applied regularly once a year. This method of protection for smoke-stacks is one of the best that I know of. For boiler-fronts and similar purposes I know of nothing equal to Bessemer paint.

Mr. Hartley: I think a coating of linseed oil is as good as any paint for the latter purpose.

Mr. Custer: My experience has been that on the smoke-stacks of locomotives, for instance, linseed oil gums and causes considerable trouble.

Mr. Schumann: In the discussion on this subject at our meeting of four weeks ago there seemed to be a difference of opinion as to the efficiency of a cement covering to prevent corrosion of iron. I therefore took the trouble, within the last two weeks, to inquire about this among builders who had torn town old structures built with mortar cement, and some of more recent date built with cement. Their opinions differed, but the majority seemed to be in favor of cement forming a protection for iron.

Mr. H. C. Lüders: It would seem to me that the additional expense of cleaning iron in buildings would amount to almost as much as the original price of material, and if so, would it be well in the specifications to insist upon the iron being so prepared?

MR. SCHUMANN: I think the iron could be cleaned with sand-blast at a comparatively small expense after it is placed in the structure. It would probably cost as much as handling the iron and applying the first coat of paint.

MR. CUSTER: It should not matter to the designer what the expense will be, if it is made necessary in order to have a building that is absolutely safe. Any structure that is liable to break down in a few years is not worth the material in it.

L. F. RONDINELLA, *Sec'y.*

ARCHITECTURAL LEAGUE OF NEW YORK.

AT the regular meeting of the Architectural League of New York, held December 3, 1895, there was quite a warm discussion, by the members of the Society, upon the following subject: "The Amendments to the Building-laws; the Relation of the Department to the Building-laws, and the Relation of Architects to the Building laws and the Building Department."

There was no motion passed or definite action taken, but it seemed to be the general opinion that the amendments to the laws should be made by the architects, assisted by the engineers; and that the law, as it stands to-day, applies and was made for buildings on a lot 25′ x 100′, not more than five stories high.

That the Department should be a department of surveillance, superintendence and the prosecution of violators of the law — and not translators of the law. The present system of translating the law before the buildings are built is but causing the public to feel that the services of an architect can be dispensed with, and that the employment of any one who can merely draw out a building for application to the Department, is all that is required.

The members of the League thought the law should be more elastic; it should specify the limit to which one could go in building, but not specify the detail of construction. In that way, leave intelligent architects and builders free to do the best possible to advance the mode of construction, the free use of new materials, and the responsibility of the owner should be put upon their shoulders. That the Department should be composed of good and capable men, able to properly inspect and intelligently substantiate the truth of any disapproval before an intelligent jury.

The Committee on the Eleventh Annual Exhibition of the League, (which will be open to the public from February 15 to March 7, 1896) reported a very interesting programme. It has been finally decided, after many years of opposition, to throw the Exhibition open to the public free, except on Tuesdays and Thursdays of each week. Many interesting features were discussed, which were referred back to the Committee, to report on at a later date.

The Committee on Competitions and Awards reported the programme for the gold and silver medal of the year, a competition for a prize offered by the President and one for a prize offered by Mr. Samuel P. Avery. Announcements for the Exhibition and the three prizes above named are expected to be distributed to the members in a few days.

SOCIETY OF BEAUX-ARTS ARCHITECTS.

THE Annual Meeting of this Society was held at the Hotel St. Denis, on Monday evening, November 15. Over thirty members were present.

The following officers and committees were elected: *President*, John M. Carrère; *Vice-President*, John Galen Howard; *Secretary*, Edgar A. Josselyn; *Treasurer*, Joseph H. McGuire; *Corresponding Secretary*, John L. Howe. Members of *Executive Committee* (besides officers *ex-officio*) Walter Cook, Ernest Flagg and S. B. P. Trowbridge. *Committee on Education*, Whitney Warren, E. L. Masqueray and Albert L. Brockway.

Four new members were elected at this meeting and a ceremony of initiation was inaugurated, which gave great entertainment and formed the chief feature of the evening's fun.

EDGAR A. JOSSELYN, *Secretary.*

VANBRUGH AND MARLBOROUGH.

THE first proprietor of Blenheim had a distressing time in completing his house; so did the architect, Vanbrugh; so did the British Parliament. Each time the architect added a pantry shelf or a peg to the Duke's clothes-closet he had to knock off work and wait till the governmental ghost walked. In other words, he could not pay up his workmen Saturday night. He was kept in a state of mind continually.

When George I ascended the throne, the workmen were glad to accept a third of their wages and call it square. At last, in 1715, the workmen all went out on a strike, and a notice was tacked to the fence that non-union men need not apply. Things had thus come to a standstill several times before. Since Blenheim was intended as a memorial monument from a grateful Government, the Duke determined not to frustrate the Government's design by making any contributions, or in any way making himself responsible for debts incurred for its building.

Once before this time, the Queen had given the architect enough change to board up the windows and doors against the ravages of the weather, and had left things long at a standstill.

The Duke had plenty of money, but he determined to board or live in a flat for the rest of his life rather than deprive the Government of one jot of happiness it might experience by building his house for him.

All kinds of things happened in connection with the building of the Duke's house. For one thing, the architect lost through it his vocation. He and the Duchess were constantly quarrelling. Every time a speaking-tube was put in, she had a criticism to make on the style of the mouth-piece, or some similar trivial thing of a sort to make an architect wish he was dead.

This kept the poor architect constantly on the verge of nervous prostration. That his life was made miserable may be judged from his correspondence. He writes:

"I have the misfortune of losing, for I now see little hope of ever getting it, near £2,000, due to me for many years' service, plague and trouble at Blenheim, which that wicked woman of Marlborough is so far from paying me that the Duke, being sued by some of the workmen for work done there, she has tried to turn the debt due to them upon me, for which I think she ought to be hanged."

How different it is to-day in the history of the Marlboroughs! The present Duchess, like the one who has just gone before her, has but to say: "Let there be electric-light," and there is electric-light.

And yet it was not for lack of funds that the primitive Duchess of Marlborough acted so; because we read that:

"The Duke of Marlborough's treasure exceeds the most extravagant guess. The grand settlement, which it was suspected her Grace had broken to pieces, stands good and hands an immense wealth to Lord Godolphin and his successors. A round million has been moving about in loans on the land tax, etc. This the treasury knew before he died, and this was exclusive of his land, his £5,000 a year upon the Post office, his mortgages upon a distressed estate, his South Sea stock, his annuities and, besides, what is in foreign banks. And yet this man could neither pay his workmen their bills nor his architect his salary.

"He has given his widow (may a Scottish ensign get her!) £10,000 a year to spoil Blenheim her own way; £12, 000 a year to keep herself clean and go to law; £2,000 a year to Lord Rialton for present maintenance, and Lord Godolphin only £5,000 a year jointure, if he outlives my lady. This last is a wretched article. The rest of the heap — for these are but snippings — goes to Lord Godolphin, and so on. She will hand £40,000 a year in present."

Thus we see that there is an advantage in having for an architect one who is a writer of brilliant comedies as well. His letters afford joyous interest to posterity.

Vanbrugh tells some interesting things about that first lady of Blenheim. He tells how he took a party, including his wife, over to look at the place, while they were waiting for the walls to settle, so that they could begin plastering. He says:

"We staid two nights in Woodstock; but there was an order to the servant, under her Grace's own hand, not to let me enter Blenheim! And lest that should not mortify me enough, she, having somehow learned that my wife was of the company, sent an express the night before we came there, with orders that if she came with the Castle Howard ladies, the servants should not suffer her to see either house, gardens, or even to enter the park; so she was forced to sit all day long and keep me company at the inn."

Imagine the bell-boys of that English inn bringing up ice-water all the afternoon under these conditions to Vanbrugh and his wife.

The Duchess whittled her enmity to a fine point in 1735, and Vanbrugh tells of its prick thus:

"I have been forced into chancery by that B. B. B. the Duchess of Marlborough, where she has got an injunction upon me by her friend, the late good Chancellor [Earl of Macclesfield], who declared that I was never employed by the Duke, and therefore had no demand upon his estate for my services at Blenheim.

"Since my hands were thus tied up from trying by law to recover my arrear, I have prevailed with Sir Robert Walpole to help me in a scheme which I proposed to him, by which I got my money in spite of the hussy's teeth. My carrying this point enrages her much, and the more because it is of considerable weight in my small fortune, which she has heartily endeavored so to destroy as to throw me into an English bastile, there to finish my days, as I began them in a French one."

Unhappy Vanbrugh! — *N. Y. Times.*

THE ILLUSTRATIONS

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

THE VIRGINIA LIBRARY: MCCORMICK THEOLOGICAL SEMINARY, CHICAGO, ILL. MESSRS. SHEPLEY, RUTAN & COOLIDGE, ARCHITECTS, BOSTON, MASS.

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

A DESIGN FOR THE MINNESOTA STATE CAPITOL, SUBMITTED IN THE SECOND COMPETITION. MR. ERNEST FLAGG, ARCHITECT, NEW YORK, N. Y.

ELEVATIONS AND SECTIONS OF THE SAME.

PLANS OF THE SAME.

[Additional Illustrations in the International Edition.]

VILLA OF M. LE COMTE DE B——, RADE DES BORDES, AUDE, FRANCE. M. HENRI VALETTE, ARCHITECT.

[Copper-plate Photogravure.]

ANOTHER VIEW AND PLAN OF THE SAME.

[Copper-plate Photogravure.]

CITY ASSEMBLY ROOMS FOR MESSRS. DRAYSEY BROS., BIRMINGHAM, ENG. MESSRS. ESSEX, NICOL & GOODMAN, ARCHITECTS.

NO. 18 GREAT MARLBOROUGH ST., LONDON, ENG. MR. PERCY STONE, ARCHITECT.

COMMUNICATIONS

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

A QUESTION OF COMMISSION.

St. Louis, Mo., December 7, 1895.

To the Editors of the American Architect:—

Dear Sirs,— Will you kindly answer the following question which has arisen between myself and a client, whose house I am just finishing.

In my specification for his work, the sum of $200 was allowed for a filter, and among the items which I mentioned in the specifications as not being included in the contract, but which would be necessary to the full completion of the house, were the art glass windows.

My client took the matter of the filter out of the general contractor's hands, and let the contract himself for a more expensive apparatus, and aside from seeing that the necessary water connections were made to it, I have not been asked to attend to it in any way.

The art glasswork, which I have heretofore always had in my charge, in this case was given to the decorators by the owner, and aside from furnishing blue-prints and correct measurements for these windows, I have had nothing to do with them.

I claim that my 5 per cent commission on the total cost of the house should include the filter and art glass, as "fixtures considered necessary by the owner to render his house fit for occupancy." He thinks, as I had nothing whatever to do with them, I should not demand a commission on their cost.

Not wishing to appear unreasonable, I will ask you to please answer this question through the pages of your paper — whether I am justly entitled to the commission or not?

Very truly yours, W. Albert Swasey.

[There is no reason whatever why your client should not pay commission on the intended cost of the filter. Unless the contract expressly provides otherwise, the builder is legally entitled to retain his profit, of twenty or twenty-five per cent, on the price of anything omitted from the contract, to compensate him for the trouble of estimating it in the contract price; and it would be strange if the architect could not collect his five per cent for taking a great deal more trouble in regard to it. As to the art glass, as the architect must study, in making his designs, the effect of the glass in modifying the light and color of the rooms in which it is placed, and must arrange his plans so as to give it a position where it can be well seen, and suitably illuminated, all of which requires very considerable time and skill, it is always customary, so far as we know, to allow him his five per cent commission on its cost, in any case, and a good deal more if he designs or selects it. — Eds. American Architect.]

EXHIBITIONS

Atlanta, Ga.— *Cotton States and International Exposition:* September 18 to December 31.

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

Paintings from the Paris Salons of 1895: at the Jordan Art Gallery, 450 Washington St.

Paintings by Wilton Lockwood: at the St. Botolph Club, December 2 to 14.

Ninth Exhibition of Water Color Club: at J. Eastman Chase's Gallery, 346 Boylston St., December 6 to 18.

Pictures by William Adam: at the Boston Art Club, December 16 to 23.

Water-color Exhibition: at the Unity Art Club, 711 Boylston St., December 10 to 24.

Water-colors by Walter L. Chaloner: at the Bostoniana Club, 83 Newbury St., December 12 to 17.

Chicago, Ill.— *Paintings by Glasgow and Danish Artists:* at the Art Institute, November 19 to December 22.

Paintings by the Chicago Palette Club and Chicago Art Students League: at the Art Institute, December 12 to 29.

New York, N. Y.— *Twenty-ninth Semi-annual Exhibition, including Loan Exhibition of Early American Paintings, Old English Paintings, and the Cullum Collection of Classic Sculptures:* at the Metropolitan Museum of Art.

Flowers in Water-color, by Paul de Longpré, also, Butterflies of all Nations: at the American Art Galleries, Madison Square South, opened November 28.

Drawings by George du Maurier: at Wunderlich & Co.'s Gallery, 868 Broadway, November 23 to December 21.

Pictures by Walter L. Palmer: at the Avery Galleries, 368 Fifth Ave., December 2 to 14.

Pictures by Victor Pierre Huguet: at the Durand-Ruel Galleries, 389 Fifth Ave., December 10 to 18.

Philadelphia, Pa.— *Autumn Exhibition of the Philadelphia Art Club:* opened November 18.

Sixty-fifth Annual Exhibition of the Pennsylvania Academy of Fine Arts: opens December 23, closes February 22. The Architectural Section of the Exhibition closes February 1.

Thomas Hovenden's "Breaking Home Ties": at 904 Chestnut St.

Springfield, Mass.— *First Annual Exhibition of Society of Springfield Artists:* at Rude's Gallery, December 4 to 25.

NOTES AND CLIPPINGS

Storage Batteries. — Storage batteries have at last reached the place in the electrical arts to which their peculiar advantages have long entitled them; but the road of progress has been strewn with disastrous failures, blighted hopes and wrecked fortunes to an unimaginable degree. They have now certainly "arrived," and the production is already large. One factory alone in Germany turns out fifty tons a day, while there is every indication that the figure will be largely exceeded in this country. The amount of ingenuity bestowed on this vexatious appliance in the period when it may be said to have been sowing its wild oats was large, but improvement was still going on. A recent innovation of importance has been to admix granulated pumice-stone with the lead from which the storage-plates are to be moulded. Heat expands the air in the pores of the pumice-stone, and thus an infinite number of cells are formed throughout the mass of lead. The porosity thus obtained is so great that a plate 9″ x 7½″ will absorb 5½ ounces of water. The pumice-stone can be removed at will, but as it is electrically inert, and there is only ten per cent of solid matter, its presence is of little account. Obviously a great range is available in both the elements of weight and porosity. It is expected that the use of this spongy substance may permit a return to the earlier and simpler Planté type of cell, which has of late disappeared before the Faure type, in which the "active material" has to be mechanically applied to the plate. The new cell has evidently a very large natural surface of "active material," whether its plates be thick or thin, while it is held with absolute security in the innumerable pores and pockets of the body of the plate. — *N. Y. Evening Post.*

An Abandoned Tunnel as a Wine-cellar. — The most expensive and extensive wine-cellar in the world is owned by the Roumanian Government, which, very much against its will, has become the proprietor of this realty. A railroad tunnel situated between Galatz and Barbosh could not be used for railroad purposes because of its inferior construction. Piercing a mountain in which clay, loam and conglomerates are the principal geological constituents, many cave-ins, slides and other accidents have occurred within the tunnel. It is almost 2,600 feet long, and its cost was near 4,000,000 francs. Since it could not be used for the railroad, the tunnel was leased to a wine dealer, who has turned it into an immense and excellent wine-cellar, for which he now pays an annual rental of 6,000 francs. He has placed 4,000 large barrels of wine within the tunnel, and claims that the storing of wine in this cellar considerably adds to its excellence. There is no other wine-cellar in the world which has cost as much. — *Boston Transcript.*

Fort Raleigh, Va. — The work of restoring Fort Raleigh, which was built on Roanoke Island by Sir Walter Raleigh's colonists, will begin immediately. It is one of the most historic spots in the United States. In the restoration, permanent materials will be used, and the fort will present, as nearly as possible, the appearance it did over three centuries ago. The work of restoration will be done by an association whose members are mainly in North Carolina and Maryland. — *Boston Transcript.*

S. J. Parkhill & Co., Printers, Boston, U. S. A.

DESIGN FOR THE MINNESOTA STATE-HOUSE, SUB
ERNEST FLAGG, AR

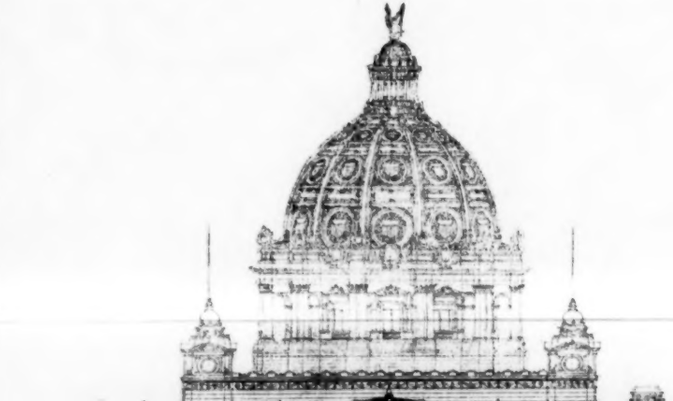
BY THE AMERICAN ARCHITECT & BUILDING NEWS CO.

HELIOTYPE PRINTING CO. BOSTON

OUSE, SUBMITTED IN THE SECOND COMPETITION.

T FLAGG, ARCHITECT.

NORTH · ELEVATION



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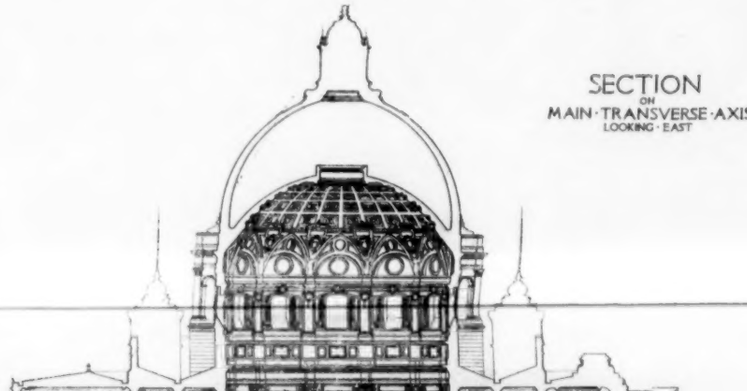

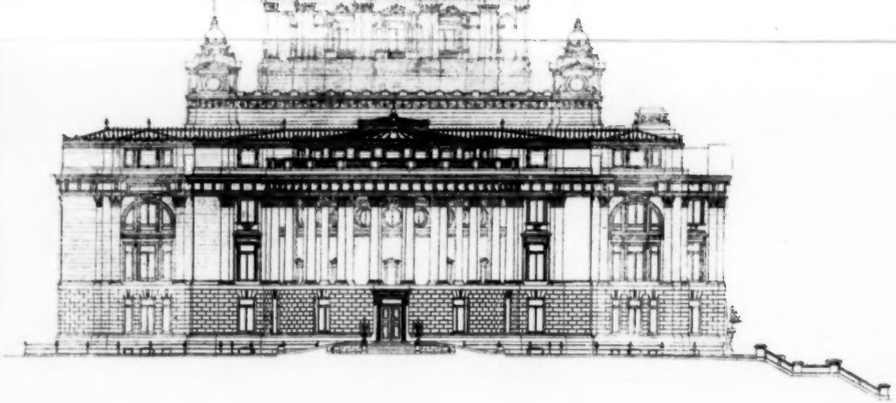

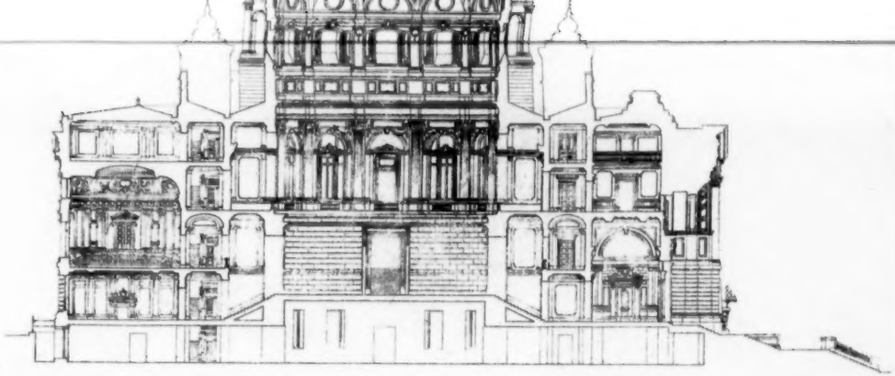

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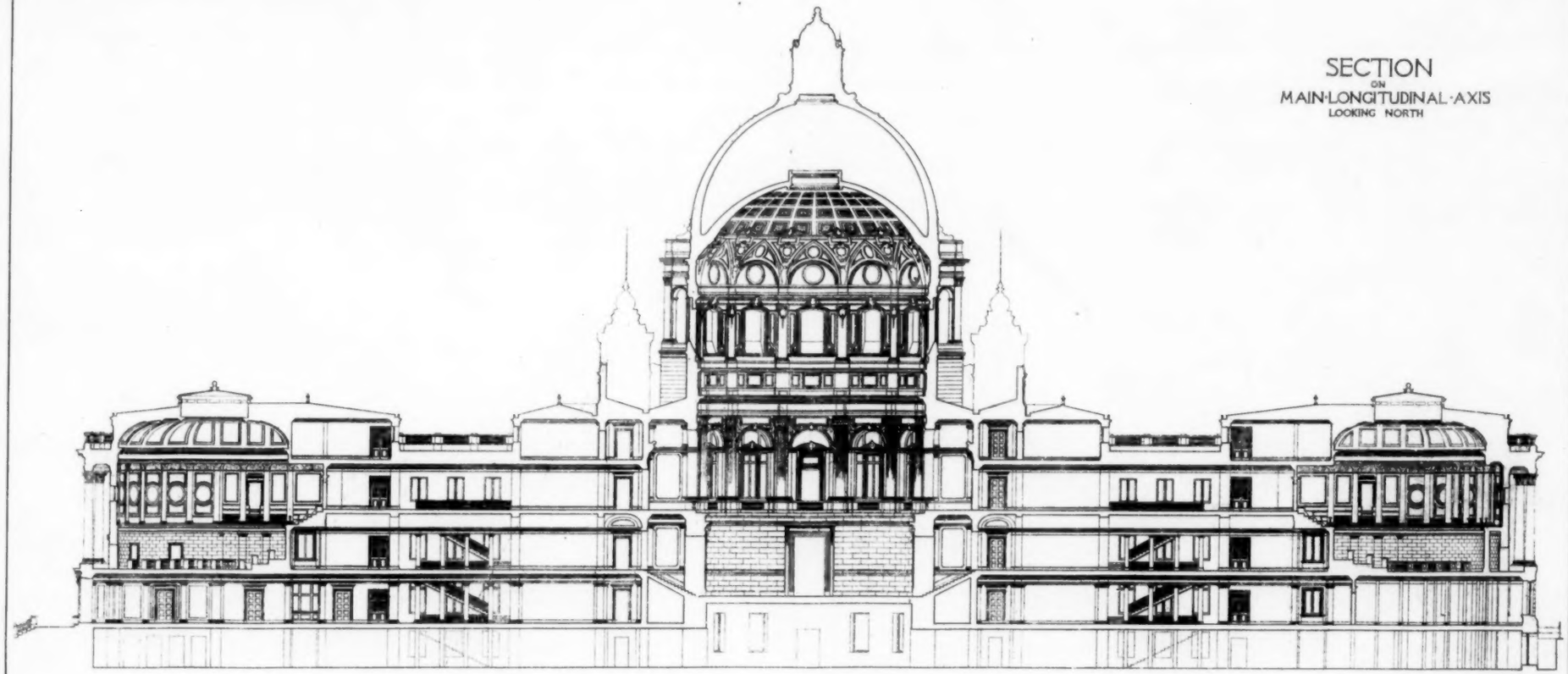

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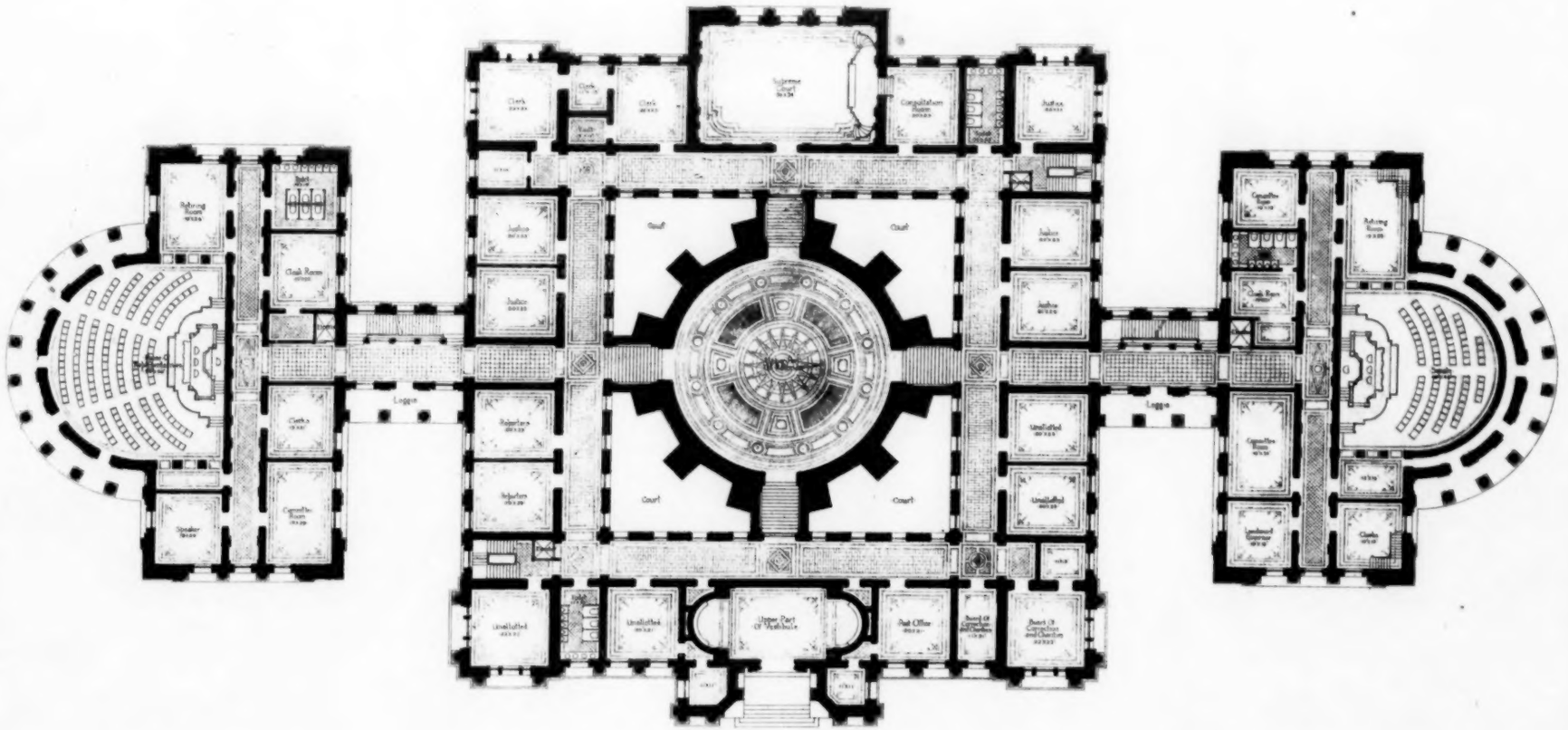
ERNEST FLAGG, ARCHITECT.



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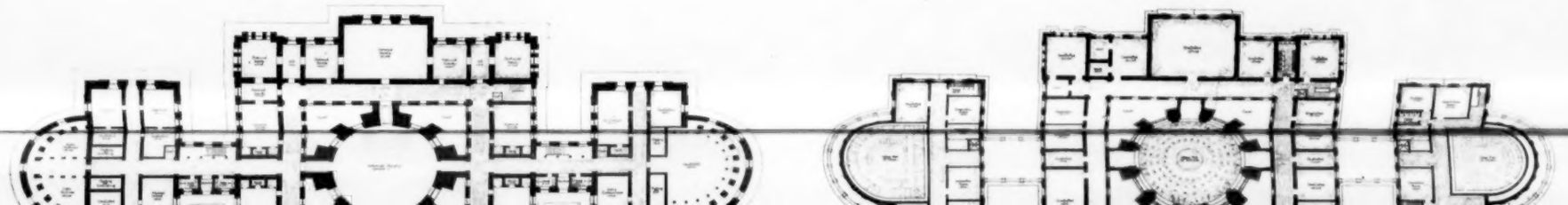

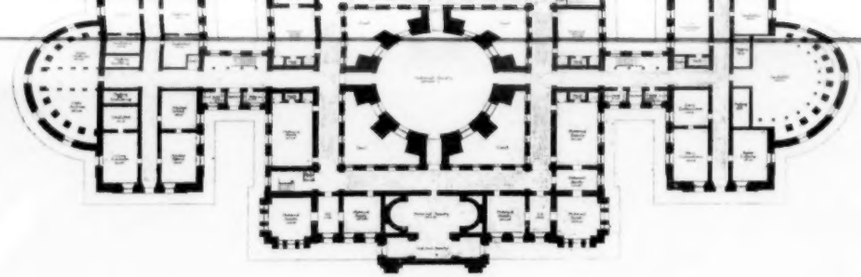

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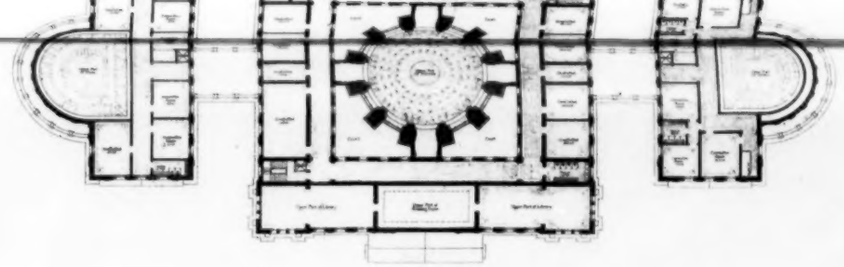

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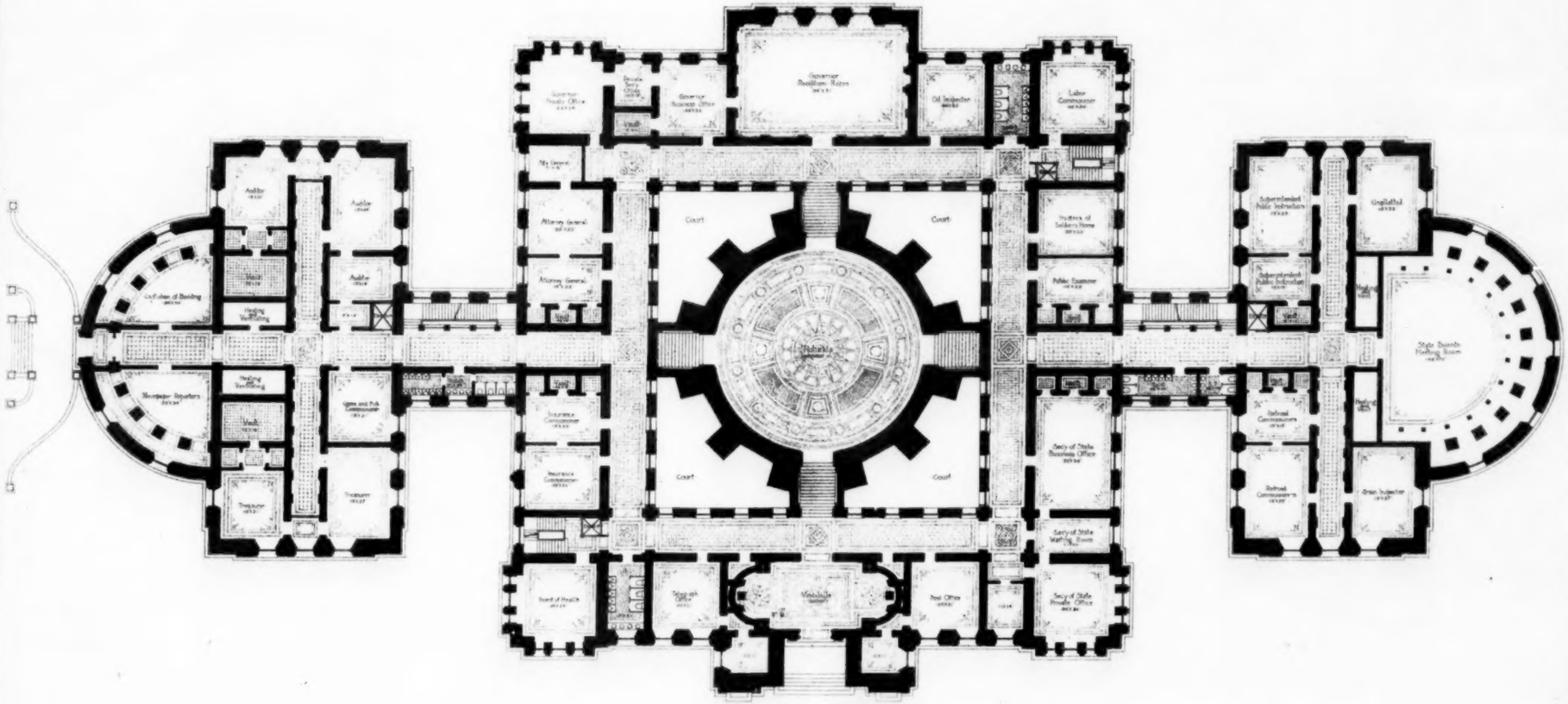

GROUND FLOOR.

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