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THE *Engineering Record* calls attention to the unscientific way in which chimney-flues for boilers are often planned, and points out the manner in which their area should be calculated, in a manner which will be interesting to architects, who have often to deal with this particular problem. Some years ago, Mr. Isherwood, the distinguished Chief Engineer of the United States Navy, made some experiments to determine the best proportion of tube-area, draught-area and grate surface, for the ordinary return-tubular boilers, such as are used for marine work. He found, in many boilers, which had been crowded with tubes, with the idea of increasing their efficiency, that the heated gases passed through a portion only of the tubes, leaving the others ineffective. As the *Engineering Record* says, any one can repeat this experiment for himself, by putting blocks of wood in the uptake end of the tubes in a boiler. Where the tubes are too numerous in proportion to the grate-surface, the charring of the blocks will show that nearly all the heated gas has passed through the middle tubes, leaving the lower ones, and those at the sides, comparatively undisturbed. It is found, by trial with boilers of marked efficiency, that the tube-area, for the best results, varies from one-seventh to one-ninth of the grate-surface, the average being about one-eighth; and that no practical advantage results from increasing this area. The area of the chimney, under ordinary conditions, should be somewhat less than that of the tubes, as the gases pass more freely through the chimney-flue than through the tubes, and too large a chimney is found to draw the gases of combustion too rapidly through the tubes. With water-tube boilers, as the *Engineering Record* observes, there is a tendency to make the chimney-flues altogether too large. Although the gases pass more directly and freely through the interstices of the water-tubes than through the return tubes of an ordinary boiler, it is common to see them set with a chimney-flue equal in area to one-fourth of the grate-surface; with the natural result that the hot gases are drawn up too fast, and the chimney temperature is much higher than it should be for economical use of coal.

THE art of fireproof building is advancing more rapidly than ever, and the difference in cost between constructions of wood, and those of iron and masonry, diminishes almost daily. Two or three patents have recently been issued for floors in which sheets of corrugated iron, laid on the beams, constitute the support for a stratum of concrete, which forms the floor; and several systems of flooring in which the iron beams support simply huge flat tiles of concrete, in which sheets of wire-cloth are embedded, have been introduced. To our mind, the value of a combination of wire-cloth and concrete, as a fire-resisting material, is not yet appreciated as it should be. The weaving of the wires serves to prevent them from pulling through the concrete, when under severe tensile strain, thus accomplishing, in the simplest manner, the result which earlier experimenters secured by twisting the flat rods which they buried in their concrete floor-slabs, or by punching them with holes, and inserting cross-wires; and, where the wire-cloth "armature" is likely to be especially strained, it is only necessary to leave the selvedges unbroken to make it impossible to draw out the wires. For wide spans, a French contractor has recently improved upon the plain wire-and-concrete tiles, by adding to their lower surface ribs made of strips of wire-cloth, turned at the bottom over a flat bar, which keeps them straight, and adds something to their resistance to tensile strain, and wired, mesh by mesh, to the main body of wire-cloth. A ribbed wire skeleton of this sort, when buried in good concrete, presents an enormous resistance, so that a room of moderate size can safely be floored with a single tile, resting only on the walls, without any support from beams; and the wire-cloth ribs, where they appear in the ceiling of a room below, can be arranged so as to form ornamented panels. For roofs, it is only necessary to bend the wire-cloth into the shape of a flat arch; and M. Cottancin, the inventor, has constructed roofs of this sort more than sixty feet in span, and a hundred and fifty feet long, with a thickness of one and one-quarter inches. Although these arched roofs have a rise of only about one-tenth the span, they have no appreciable thrust, and may be pierced with dormers to any extent; the stiffening effect of the dormer cheeks more than making up for the weakening of the wire vault by cutting holes in it.

IN some comments recently made on this system, in a communication to the Société des Ingénieurs Civils, by MM. Coignet and de Tedesco, the authors remarked that the objection often made to such constructions, that moisture, penetrating the cement, would rust the wire skeleton, was, according to their observation, untenable. Theoretically, iron buried in cement cannot rust, on account of the alkalinity of the cement; and, in practice, the authors found that if such a construction were made with wire-cloth which was already slightly discolored with rust, the cloth would lose its coating of oxide, and, on the removal of the cement, would appear clean, like new wire. We must confess that the chemistry of this phenomenon does not appear to us very clear; but there is no doubt that iron, well buried in masonry, is extremely durable.

TO our minds, no single act of recent date has done so much to encourage the belief in the revival of the proper appreciation of the value of American citizenship, and in its ultimate survival, as the appointment of Colonel Waring, as Street-cleaning Commissioner of New York, to which we referred last week. We have a distaste for speaking in eulogistic terms of living men, except in the case of certain foreigners and occasionally of our own public officials, and now that Colonel Waring has become one of the latter class, we feel it is permissible to express the belief that the manner in which he discharges his public duties will be found to have merely enhanced the enviable reputation he has already won in private life. In another column will be found a communication which throws some light on the patentability of his "separate" system of sewerage, the vexed question which has kept one of the most distinguished members of the profession outside the pale of professional association.

THE wisdom of the new Mayor of New York, shown in the selection of his Street Commissioner, has been further exemplified by the appointment of Dr. Doty to the responsible office of Health Officer of the Port of New York, Dr. Doty being a physician recognized as having a greater working knowledge of contagious diseases than is possessed by any except those rare and unnamed few who may possibly know as much of the subject as he knows. These two admirable appointments seem to have had a most happy effect on political appointments, as we have just learned that Mr. William Paul Gerhard, a sanitarian of the highest standing, has been appointed Honorary Consulting Sanitary Engineer to the Department of Health of the City of Brooklyn, N. Y., the appointment having been made by Dr. Z. T. Emery, the Health Commissioner of that city.

THE *Builder* describes a new surveying instrument, of what seems to be a very useful type. In brief, it may be described as a level, mounted over a horizontal circle, movable about its hollow vertical axis, but itself supported on an axis inclined from the vertical, the latter axis passing through that of the vertical circle. In this way, when the telescope is revolved, the inclination of its axis causes it to take an angle with the horizon varying with the amount of rotation. There is, of course, one position in which the telescope will be level; turning it out of this position in one direction points it upward, while turning it in the other direction points it downward. A suitable graduation on the horizontal circle then readily shows, with the aid of a vernier carried by the telescope, the vertical angle through which the telescope moves. It is evident that, by the device of reading the vertical angle from the horizontal circle, which magnifies the movement in a ratio inversely proportional to the angle between the two axes, vertical angles, if the instrument is well made, can be read with a precision impossible with a vertical circle, and it is thus easy, in running levels on uneven ground, to dispense with the tedious process of "stepping," all that is necessary being to level, so to speak, up hill or down hill, noting with each observation the angle of the telescope with the horizon, and reducing the observations to horizontal distances by a simple trigonometrical calculation at any convenient time. The most curious application of the instrument is, however, that by which it is used to measure horizontal distances, in a straight line away from the instrument, and without shifting this from its place. To understand this process, which is really a very simple one, it may be useful to recall the way in which the distances of the stars are measured by astronomers. For this purpose, two observations of the star are taken from two points as far apart as possible, these points being often, in practice, the opposite extremities of the earth's orbit, and the direction in which the star is seen from each point noted. The observations being simultaneous, or being so corrected as to make them virtually so, it is easily seen that, the direction of the star fram each point of observation being known, with the distance between these points, the distance of the star may be readily found, on the principle that, if two angles of a triangle are known, and the included side, which is here the distance between the points of observation, the other sides, which are here the distances from each point of observation to the star, can be calculated from them. With the new "Telemeter Level," the same principle is applied, but the apex of the triangle is at the telescope, instead of at the object whose distance is to be measured. Supposing the instrument to be used to ascertain the distance of a mark which cannot conveniently be reached with a steel tape, an assistant is sent to the station with a graduated staff. The telescope is pointed upward, downward or horizontally, as the case may be, until some mark on the staff, perhaps at the top, is accurately cut by the cross-hairs of the telescope. The angle with the horizon is then noted, and the telescope, or rather, the axis, shifted until another mark on the staff, nearer the bottom, is accurately viewed. Reading now the angle of the telescope with the horizon, the difference between this angle and that of the previous observation will give the angle at the apex of the triangle, of which the length of the portion of the staff between the two readings is the base; and these being known, with the relation between the observed lines and the horizon, the other sides of the angle, that is, the distance between the telescope and the two ends of the staff, are easily calculated. In practice, according to a report made by a Committee of the Royal Engineers, the average error, in measuring in this way a distance of more than a third of a mile, was only about two and one-half inches.

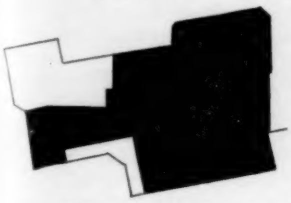
ARCHITECTS do not often have occasion to use the Stanley-Amsler planimeter, but most of them know something of this most ingenious and convenient instrument, and will be interested to learn that Dr. Amsler, the son of the original inventor, has added to the planimeter a device by which the instrument can be adjusted to any scale, so that it will read correctly from plans which have shrunk in mounting or copying. It will be remembered that the original planimeter has certain fixed scales. When adjusted to one of these scales, and applied to a map or plan drawn at the corresponding scale, the area of any tract shown on the plan can be directly measured, by fixing one point of the instrument in any convenient position, and tracing the outline of the area to be measured with the other point. As soon as the tracing of the outline is completed, the area is read off from a graduated wheel. In engineers' work, where, for example, it is desired to ascertain the area of a pond shown on a map, it is thus possible to obtain in a few minutes results which would require many hours of work to arrive at by trigonometrical measurement. Where, however, the plan to be measured has been blue-printed, or engraved, or mounted on cloth, or treated in some other way, through which the exact scale has been altered by shrinkage, the planimeter measurements are untrustworthy, just as would be those obtained by trigonometrical calculations from the scale dimensions. To provide for this, Dr. Amsler marks a short supplementary scale on the arm carrying the fixed point, with a vernier on the slide to which the wheel-work is attached. This scale is graduated to hundredths and smaller divisions of the length of the tracing-arm. To use the instrument in its new form, the plan is first measured, so as to compare its actual scale to that to which it was originally drawn. The correction so ascertained is expressed as a decimal of the original scale. This decimal is then doubled, and the instrument adjusted to this double correction, in terms of the length of the tracing-arm, by means of the supplementary scale and vernier. The instrument will then read correctly from the shrunk map or print. This ingenious improvement will add greatly to the usefulness of one of the most brilliant inventions, considered as a piece of scientific contrivance, ever made.

THE coolness with which the German Emperor has chosen to treat the architect of the new Parliament House seems likely to prove very advantageous to the latter's fame. On the completion of the building, decorations and honors were bestowed on various persons who had been connected with it, including the clerk-of-works and several of the contractors' foremen, but the architect was totally ignored; and when the Berlin Academy of Fine-Art selected him as the recipient of one of its great gold medals, after its recent exhibition, the Emperor himself struck his name off the list of nominations, and substituted that of a lady, whose contributions had been rejected by the Academy jury, and only admitted by the Emperor's order. Moreover, the Emperor, while visiting in Rome not long ago, informed his friends that Wallot's design was "the height of bad taste." This petty spitefulness, on the part of a potentate whose reputation for good taste is not very distinguished, and will not be enhanced by his treatment of a learned and painstaking artist, seems to have aroused the artistic professions throughout Germany. A few days ago, the Kroll Theatre, in Berlin, was the scene of a great "Wallot Banquet," given by the united architectural societies of Germany, together with some of the principal artistic bodies. Six hundred and fifty guests were present, all of whom were architects, painters or sculptors, and addresses of congratulation were presented to Professor Wallot by the presidents or other high officials of the societies represented. After this serious business was over, a series of tableaux were presented, illustrating the occurrences which led to the demonstration, in a style which seems to have been rather hilarious. Among other things, a model of the Parliament House was brought in, made entirely of bread and cheese, with sausages for columns, with a label on it, inscribed "The Height of Good Taste," while a distribution of gold medals "for ladies only" was made, and a large pasteboard representation of the "forgotten" Order of the Red Eagle was hung up for the owner to claim.

IT is not very strange that Professor Wallot has decided to leave Berlin, where he has been treated with such conspicuous and unmerited insolence by the person who, of all Germans, is most bound to show courtesy and consideration to others, and will take up his residence in Dresden. The *Builder* says, with truth, that his building, like much of the modern German work of the heavily aristocratic and official class, is rather unrefined in detail, and the radical alterations which he was compelled from time to time to make in the design rendered it, as all architects know, next to impossible to keep any sort of proportion or harmony of line in the composition; but the building shows, notwithstanding this, an artistic power and resource which will make it always interesting, and it is one of the best pieces of planning in Germany, where good planning is not very common in modern buildings.

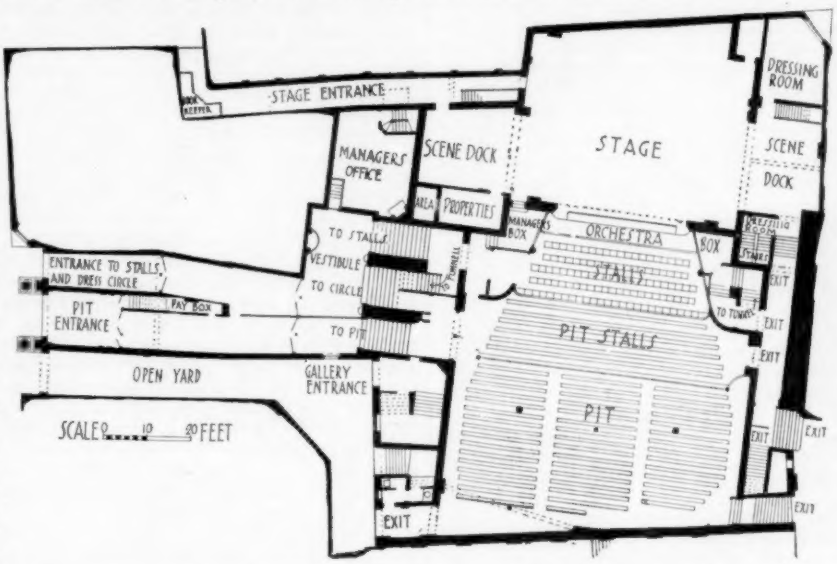
THEATRES.[1] — X.

THE GRAND THEATRE, ISLINGTON, LONDON.

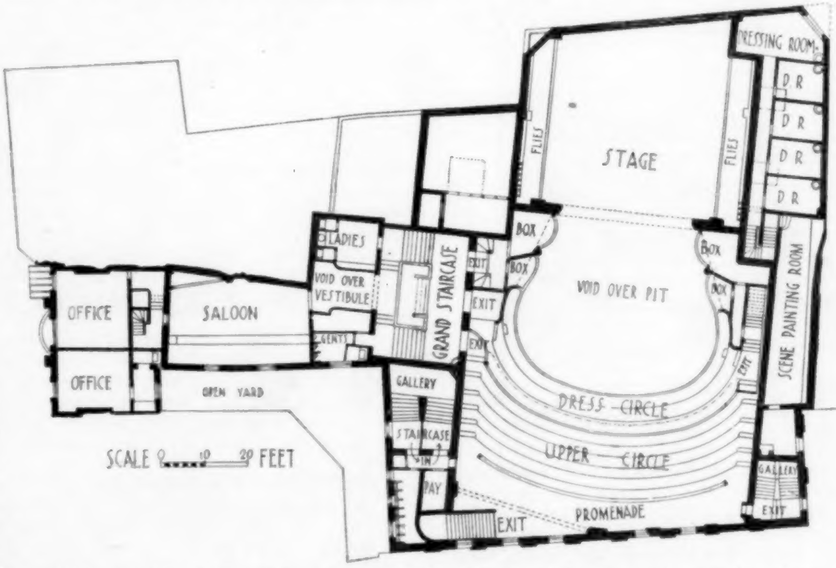


THE Grand Theatre, Islington, may be said to stand quite apart in its character from any other London theatre. Situated outside the fashionable centre of the West-End theatres, this play-house supplies the demand for entertainment to the dwellers in the thickly-populated northern suburbs of London, but a few yards from the Grand Theatre is the historical and once famous Sadlers Well Theatre, to be ever associated with the name of the great actor, Phelps.

At present, both of these theatres are under the management of one of the most enterprising and genial managers of this metropolis, Mr. Charles Wilmot. In Sadlers Well Theatre he caters for the poorer classes dwelling in Clerkenwell and Islington, and with cheap admission and two performances each night, he provides a bright and varied entertainment which brings crowded houses. These arrangements are made to enable those whose labors call them early in the morning from their beds, to visit the theatre early in the evening and be home by nine o'clock; while the second "show" gives those who work late in the day an opportunity of enjoying their amusements.



In the Grand Theatre, Islington, the subject of our illustrations in this number, Mr. Wilmot caters for a different class — for those who dwell in the outlying northern suburbs and who live too far from the West End to frequently travel there to see the plays of the day. As Mahomet will not go to the mountain, the mountain must go to Mahomet. So the Grand Theatre was built to form a home for short runs of all the successful plays produced in the chief London theatres. It is worked in this way: Every one conversant with the ways of theatrical matters in England knows that when a manager has scored a success in town, he adds considerably to his exchequer by taking his company, when the play flags in London, into the provinces. Now the Grand Theatre is very frequently made the first visiting-place and starting-point of the tour, so Mr. Wilmot gives his audiences the full fling of all the good things seen elsewhere. All the leading actors and actresses visit this house, and Mr. Henry Irving never fails to give a fortnight of his valuable time each year to the delight and instruction of the people of merry Islington.



My readers may wonder why, when writing for fellow-architects on a purely architectural subject, I should digress to describe the methods of management adopted in this theatre. Well, my reasons are these, which, indeed, I am ever repeating, that each individual theatre must be specially designed for the purpose for which it is intended. Here, then, was a difficult problem to overcome. Tragedy, comedy, opera, pantomime, burlesque drama, one after the other occupy the boards of the Grand Theatre. We have already together studied, even in this early stage of the present series, enough plans to see how an opera-house differs in planning from a house devoted to the legitimate drama, and a variety theatre from a bijou comedy theatre, and to appreciate the difficulties which Mr. Wilmot placed before his architect, Mr. Frank Matcham. As we study the plans we shall see with what success Mr. Matcham has overcome, what would at first appear, insurmountable difficulties.

It must also be noted that these were not the sole difficulties which the architect had to face. Let us glance for a moment at the origin of the Grand Theatre.

On a part of the site at present occupied by this theatre stood, at one time, the old Philharmonic Theatre, a small house once famous as the home of burlesque, which, however, had waning fortune and was eventually burned down — the fate, sooner or later, of all theatres. Such additional land as could be acquired was purchased to enlarge the site of the old house, and upon this irregularly-shaped piece of land Mr. Frank Matcham had to place his building.

The theatre was erected, and during the run of, I believe, the first pantomime season and the very first week of that run, a similar fate overcame the new Grand Theatre as that of its predecessor, the Philharmonic, the house being destroyed by fire.

Nothing daunted even by this heavy loss and misfortune, Charles Wilmot at once set to work to rebuild the present Grand Theatre upon exactly the same lines as the one burned down. This fact speaks volumes for the architect, for even after a trial of the building, when an opportunity arose to make alterations and improvements in the new plans, the manager decided that such a course was quite unnecessary, as the first building suitably met the curious and unique demands of his particular business. So the plans which I now publish, by the courtesy of Mr. Matcham, are actually the drawings from which two theatres have been built upon the same piece of land.

Now let us consider the particular features of this theatre. Looking at the ground-floor plan, it will be seen that the chief entrance is from Upper Street, Islington, and that the passages therefrom form the approaches to the area floor of the house, which is divided into stalls, pit-stalls and pit. Taking this pit-floor as a whole, it will be noticed that it has been planned as the largest seated part of the house, giving evidence that the manager caters for the "pittites," and depends upon them for the support of his treasury more than upon the stalls; as would be done in a West-End theatre. This pit is undoubtedly one of the finest in London. It will be seen there are two extra exits at the back of the pit to enable a rapid egress from this largely-seated part of the house. With regard to the stalls, I believe I am correct in stating that this was one of the first theatres where a tunnel or passage was formed under the floor of the stalls-seating, to enable those who wished to reach the far end of the rows to do so without pushing by and annoying those already seated.

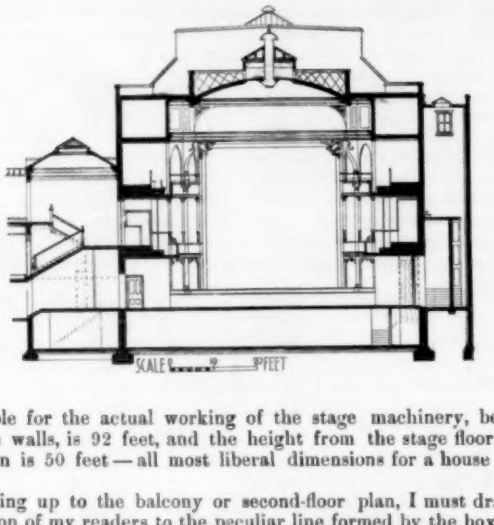
The extra exits for the stalls and pit-stalls will be seen on the plans. The width of the pit is 68 feet between the walls, and the average depth from the curtain line to the back wall of the pit is 72 feet.

The stage is of ample proportions to enable the manager to produce the most elaborately-mounted piece in a manner equal to any

[1] Continued from No. 991, page 126.

London theatre; in fact, when the various companies from the West End visit Islington, their scenery comes with them and the whole play and mounting is transferred bodily onto the stage of the Grand.

The proscenium-opening is 32 feet wide and 32 feet high. The width between the main walls of the stage is 52 feet, the average depth 42 feet from the curtain line to the back wall. The width



available for the actual working of the stage machinery, between outside walls, is 92 feet, and the height from the stage floor to the gridiron is 50 feet — all most liberal dimensions for a house of this class.

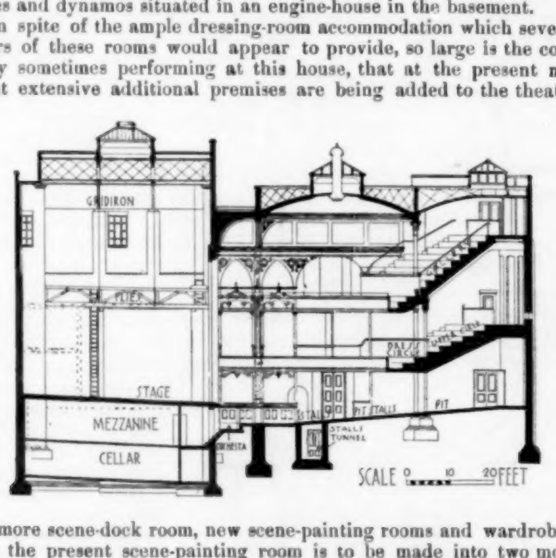
Passing up to the balcony or second-floor plan, I must draw the attention of my readers to the peculiar line formed by the box front, a line most appropriate for the purpose; this modification of the horse-shoe form has been made by Mr. Matcham, to enable all his spectators to *face* the stage and not to have to sit and look out of the corner of their eyes at the performance, or twist their necks. It is a form which has proved such a success that he has adopted it in many other of his buildings in the provinces, some of which I hope to produce in the *American Architect.* The side spaces are occupied by private boxes. The balcony, it will be seen, is divided into two-priced seats, that is, the grand-circle and the upper-circle are both on one tier, and is approached by a "grand" staircase, which also leads to the saloon. A separate exit is provided at the back of the circle.

The distance from the curtain line to the front line of the balcony is 41 feet, thus allowing the greater part of the pit and stall seats not to be overhung with the balcony, as would have been the case had the front been brought nearer the stage.

This theatre is only a two-tier house, the gallery being placed immediately over the circle seats, as is seen from the section given herewith. The gallery is a large one and, like the tier below, is divided into two-class seats, the front rows being called the amphitheatre, the back part the gallery. There are no seats in this gallery from which you cannot see the performance.

The theatre is lighted throughout by the electric-light from engines and dynamos situated in an engine-house in the basement.

In spite of the ample dressing-room accommodation which several floors of these rooms would appear to provide, so large is the company sometimes performing at this house, that at the present moment extensive additional premises are being added to the theatre



for more scene-dock room, new scene-painting rooms and wardrobes, and the present scene-painting room is to be made into two more floors of dressing-rooms. All these additions are in excess of the area shown upon the accompanying plans, which represent the building as designed and carried out by the architect, Mr. Frank Matcham.

E. A. E. Woodrow.

(To be continued.)

Restoring Heidelberg Castle. — The Government of Baden has voted 225,000 marks for renovating the ruins of the Heidelberg Castle. — *N. Y. Evening Post.*

THE STUDY OF MEDIÆVAL DOMESTIC ARCHITECTURE.[1]

The most neglected phase of mediæval archæology is that which relates to the dwelling. Architectural histories are scarcely better, down to the time of the Renaissance, than histories of religious architecture. With the Renaissance, the dwelling-house in its many forms assumed so important an aspect that it has been absolutely necessary for our historians to give some attention to it. But for the time previous to the Renaissance little has been done. Of English books there is almost less than nothing in the way of literature. Fergusson, who, notwithstanding his many obvious faults, has produced the most considerable history of architecture in English, refers to the quantity of ancient domestic architecture, especially that in France, but makes no use of it. Von Reber, in his admirable hand-books, scarcely does more than mention domestic architecture by name, while Mr. Moore, an American writer, does not refer to this phase of architecture at all in his work so broadly titled "*Character and Development of Gothic Architecture.*" Certain phases of ancient domestic architecture in England have been well studied and published, and there is, perhaps, little to be done in that country, save in the direction of publishing further detail.

But it is not altogether correct to say that nothing has been done; a good deal has been accomplished, and is being accomplished, which is important to remember; but, as yet, there has been no general survey of the whole field of domestic architecture from the earliest times down to the end of the last century. My object in the present note — for it is much too fragmentary to deserve the name of paper — is simply to direct attention to this somewhat neglected phase of architectural history and to suggest one or two plans for work in it.

Personally, I have no actual acquaintance with ancient domestic architecture outside of France, and I am, therefore, chiefly concerned with that country. Last summer I visited many out-of-the-way places in France, and was quite unprepared for the enormous number of houses of all sorts that I met with in my wanderings. Not all of these were of historical value; many of them were without special artistic or picturesque value, though their general effect, when seen up narrow streets or in small bits, was intensely picturesque; a good deal has been injured by restorations, by rebuildings and by repairs, until sometimes only a window-frame or a huge column remained to tell or to suggest what the original structure was like. By far the larger part of these ancient buildings are unstudied and unknown. Even the photographic series of the Commission of Historical Monuments contain but a few of them.

For example: the new catalogue of M. Robert, the official photographer to the Commission, which has just been published, contains but seven photographs of the old buildings of the town of Montferrand, and two of these are details of whole structures included in the other photographs. This town of Montferrand, which is not inaccessible at all, being reached in a few minutes by electric railway from Clermont, is full of old houses, scarcely any buildings of importance having been erected there since the sixteenth century. I do not wish to hint that all its structures are of great interest; many of them are not; but several are very important, with interesting courts, and which well deserve attentive study. Of Sarlat, which is one of the most picturesque and strange towns in France; in some respects the most striking place I have seen, M. Robert offers but four photographs, though I am sure he could have gathered forty easier than the trouble it must have been to have picked out the four. Of Mirepoix, M. Robert has but one photograph, and while that, fortunately enough, is the most striking and interesting house in the town, there are many others interesting, perhaps more singular than interesting, and the great square of the city is certainly one of the most remarkable in Europe. And I might take up fifty towns and make the same report on them: scarcely a village in France that does not contain some type of ancient house-architecture of more or less interest. And while speaking of the subject of photographs, it may be well to mention that almost nothing is done by local photographers. In some few localities where there are well-known curiosities that are visited by occasional tourists, small photographs can be had of scarce more value than the simplest souvenirs. Anything like adequate photographing by local photographers is quite unknown.

It is entirely natural that France, and, indeed, all the less visited and therefore less changed parts of the Continent, should abound in examples of ancient domestic architecture. For a single church there would be, and is, a hundred or more houses. So far as volume goes, there is no comparison between ecclesiastical and domestic architecture, though the quality is necessarily different. Houses, as works of art, do not approach churches in this respect, and in those attempted histories of architecture in which the study of form is made the dominant question, it is perhaps natural that the more ornamental structures should receive more attention than the more useful though the less ornate. Still, though the reason for this difference in treatment is apparent enough, there is no reason why, in this enlightened epoch, when everything that throws light on the development of human culture is eagerly studied and investigated, we should continue to close our eyes to the quantity of domestic architecture that has come down from previous times.

[1] A Paper read before the Archæological Institute of America in Philadelphia, December 29, 1894, by Mr. Barr Ferree.

Obviously, the circumstance that many of these dwellings have been repaired almost beyond recognition; that many of them are still inhabited; that many of them have lost their real artistic interest, has had much to do with the neglect with which they have been treated. The traveller who goes among them needs no imagination to reproduce the life of the Middle Ages, save the costume of the people. Climb the hill of Le Puy to its strange cathedral, and in its vertical streets one can almost smell the thirteenth century. Walk along the streets of Tulle and of Sarlat, and you can feel the intense cold dampness oozing out of the houses as it has oozed for hundreds of years. Go into Sisteron and see the narrow, ugly alleys, arched over, until, in broad daylight, one has almost to feel one's way, and you will realize what life in the Middle Ages must have been so far as the dwelling-house was concerned.

But I am not arguing for a revivication of the Middle Ages; all I wish to do is to point out this neglected phase of archæological study and to hint at its exceeding richness. I have already referred to the relatively slight attempts to perpetuate this work in the photographs of the Commission of Historical Monuments. What has been done otherwise?

In some respects, a good deal. That is to say, French archæological literature contains a good number of monographs on mediæval houses of one form or another. But these are mostly important houses. Now this is not what I suggest studying at all, but the unimportant ones, and I am sure the student who ventures into this field will have rich returns for his labors. But these monographs are scattered through the many publications of the French archæological societies, which we in America scarcely see at all, and which even in France are not well circulated. And, furthermore, these studies are undertaken without any special reference to system, to locality, to bearing upon other studies, or even to the history of domestic architecture as a whole. The great desideratum is systematic study on an extended scale.

My chief suggestion is, briefly, this: Nearly all the more important cities of the French Departments have an archæological society, whose special purpose is the study of the archæology of its immediate vicinity. Now, if these societies were to divide up France into a series of districts, for the study of its domestic architecture, if each would take its own neighborhood, and institute or encourage extended study of its domestic monuments, it would be possible, with systematic and organized work, to accomplish a vast deal in a few years, even though each society only took up a few buildings at a time. Most of these organizations publish bulletins or memoirs, and it would add no greater cost to their expenditures to publish reports on these buildings, and thus make common property to the whole world a rich field of study whose value they as yet scarcely know themselves, and which certainly has been no more than gently touched.

Such work should include, first of all, photographing of the building in every important aspect, or in any aspect which could, in any way, be considered important or useful. Even if these photographs were never published, the fact that somewhere they could be found, and that negatives were in existence, would be something of value. Important dwellings should be measured and be carefully drawn to scale; and all, important or not, should have their plans drawn. Wherever possible, life histories should be collected; that is to say, repairs, alterations and changes noted, and an actual record made of their present condition. Photographs, drawings and notes must be ample and complete, for work in this neglected field to be valuable or worth undertaking.

I suggested at the outset the making of these studies down to the close of the last century. Archæologists who are more familiar with events prior to the birth of Christ than with those that transpired after it, may think this too wide a limit for archæological study. But archæological study should not be incomplete, if there are later works to supplement it, and the archæologist who will devote his time to the study of the house may well be asked and expected to continue his research down to the latest times. The architecture of the seventeenth and eighteenth centuries, even in the ecclesiastical form, is scarcely studied; how much more important is it, therefore, that we try to make the most of its houses. Here, again, France is very rich; two cities, Toulouse and Bordeaux, and especially the former, being exceedingly rich in monuments of these dates. No one studies these; their forms, their relations to previous dwellings, their influence upon the form of our own dwellings, is scarcely known. The architectural type is not beautiful, and in many instances scarcely pleasing; I would rather call it interesting, as every sort of structure must be that illustrates any phase of human culture.

While speaking of Toulouse, I may be permitted to refer to a work recently published in that city that illustrates, in one aspect, the sort of work we need to see applied to every town in Europe. In "*L'Album des Monuments et de l'Art ancien du Midi*," of which the first Part was brought out by the Société Archéologique du Midi de la France, of Toulouse, in 1894, there was printed an archæological map of the city, in which the houses of different dates were carefully marked, so that the student can, at a glance, tell exactly what buildings of each century are in Toulouse and where they are situated. It is needless to point out the utility of a work such as this. A series of such maps for the chief cities of the Continent would be of the greatest value and interest.

I have no doubt but that those familiar with the architecture of Europe outside of France will agree with me that much the condition I have outlined for that country is true of the balance of the Continent. These conditions, to repeat what I have before stated, are: (1) an enormously rich field, which (2) has scarcely been worked; (3) many important individual monuments have been studied, especially those of the Renaissance period; (4) what work has been done has been diffuse and without system; (5) a necessity for extended systematic study.

How far work of the nature I have suggested can be carried out by American students, I am not prepared to say. It cannot be hastily done, and to be properly performed must entail more or less drudgery. American architectural students may almost be counted out of the race, though their assistance should be welcomed and valued. Earnest as many of these young men are, they want something striking to show for their work; it is the beautiful and the picturesque they are in search of. I doubt if much can be expected from them through the uninteresting nature of much of the material to be studied. It is, further, work that requires long-continued labor to bring adequate returns. A study of a single building is scarcely likely to have the value that the study of a group in the same vicinity would have. It is, therefore, hardly possible, as the archæological outlook now is, to hope for much in this department from any but the French themselves. Whether it is in good form to suggest to them that this work needs to be done; whether it is advisable to advocate the general study of European domestic buildings throughout the whole continent, I must leave to others to determine. My present purpose will have been accomplished when I repeat that in this one subject is an archæological field, close at hand and ready of access, of most amazing richness. And further, that each day detracts from its volume; each day sees new repairs, new restorations, new changes by people who have no thought of art or of archæological value. The longer this work is postponed, the less there will be for the future historian of this architecture to concern himself with. It would be easy for me to say I know no more important division in archæological work than this, because I am not familiar with any phase of archæology save that which relates to the Middle Ages. But I trust the importance of this work, yet to be done, will be recognized, and I earnestly hope the day is not far off when the beginnings will be made. Meanwhile, it would be well for some enterprising person to find out what has already been done. A bibliography on the subject would be enormously helpful, and would have the two-fold value of preventing the duplication of work already done, and of showing, by contrast, how little has been done.

One word on the general method of study. Architecture is not, to my mind, a bare recital of forms; architecture is the result of the efforts of the human mind to provide shelter for the human body, primarily; and, secondarily, to make these shelters as beautiful as possible. The study of domestic architecture is, therefore, a study of human life. Properly undertaken, it brings out the meaning and reality of architecture in a way impossible when it is a mass of descriptions only. Two advantages follow from this: the subject is given a real and live interest it could not otherwise have; and, secondly, it puts architecture before the general public in a living way, before people who now look upon it as the dullest and stupidest of subjects. I am not sure but that this last aspect of the question is the more important; at least, it suggests possibilities from the study of old, and in many cases, broken-down houses in Europe, that may not be apparent at first thought.

STRAINS IN COMPOUND FRAMED STRUCTURES.[1]—II.

FORMULAS FOR THE DETERMINATION OF STRAINS IN OCTAGONAL PRISMS.—REFERENCE.

Note.—The following formulas are strictly applicable to an octagon, but can be readily modified for any other polygon.

$F =$ Total transverse force, from wind, acting on a horizontal plane.
$r =$ Ratio of F acting on a side of the plane, parallel with force.
$s =$ Shearing force acting upon a ring strut.
$P =$ Force tending to deform a horizontal plane, normal to an apex of the plane.
$S =$ Strain in ring strut from P.
$T =$ Tension in ring ties from P.
$c =$ Strain in chords of secondary frames, developed.
$t =$ Tension in diagonals.
$p =$ Vertical force from dead load and superimposed load.
$b =$ Distance between centres of chords.
$f =$ Proportions of F acting on a side A, B and C respectively parallel to side.
$M =$ Bending-moment; $R =$ reaction at supports; $h =$ vertical height.

$$r_1 = r_3 = \frac{\cos^2 z^0}{1 + 2\cos^2 z^0} = \frac{0.5}{1 + 0.5 + 0.5} = 0.25 \text{ for sides } A \text{ and } C.$$

$$r_2 = \frac{1}{1 + 2\cos^2 z^0} = \frac{1}{1 + 0.5 + 0.5} = 0.50 \text{ for side } B.$$

$$f_a = f_c = \frac{F_n}{2\cos z^0}\, r_1, \text{ for side } A \text{ and } C.$$

$$f_b = \frac{F_n}{2}\, r_2 \text{ for side } B.$$

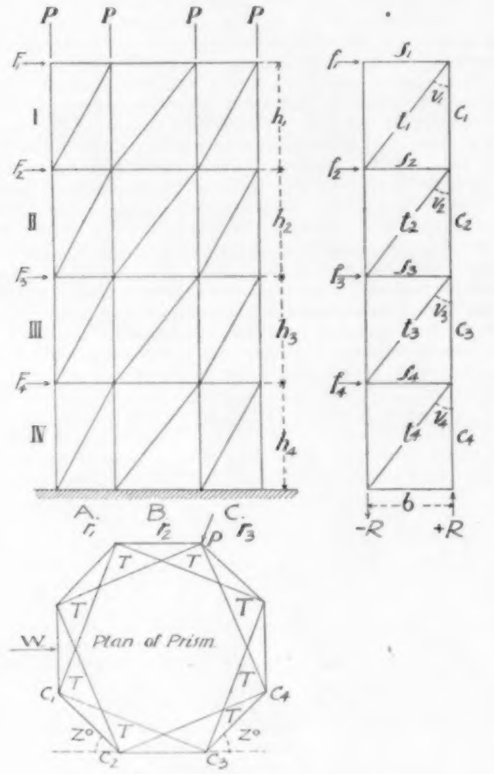
[1] By Francis Schumann, Engineer. Theory of strains in compound framed structures: Applicable to towers or piers, prismatic or pyramidal or both combined, polygonal in plan, subject to transverse and vertical forces. Continued from No. 988, page 88.

When the vertical forces are ignored in secondary frame, the windward chord is in tension, as also the diagonals, if inclined up from the windward chord. All other members are in compression.

STRAINS IN SECONDARY FRAMES.

$s_n = f_n + s_{n-1}$; $\qquad C_n = \frac{s_n h_n}{b} + C_{n-1}$;

$t_n = s_n \operatorname{cosec} v^0{}_n$; $\qquad R = R_1 = \frac{M}{b}$.



Sides A and C. $\quad r_1 = r_3 = \frac{\cos^2 z^0}{1 + 2\cos^2 z^0} = \frac{0.5}{1 + 0.5 + 0.5} = 0\ 25$

$f_a = f_c = \frac{F_n}{2 \cos z^0} r_1.$

Side B. $\quad r_2 = \frac{1}{1 + 2\cos^2 z^0} = \frac{1}{1 + 0.5 + 0.5} = 0.50$

$f_b = \frac{F_n}{2} r_2$

STRAINS IN PRIMARY FRAME.

$T_n = \frac{P_n}{2} \cot \frac{z^0}{2} = \frac{P_n}{2} 2.4142$

$S_n = \frac{P_n}{2} \operatorname{cosec} \frac{z^0}{2} = \frac{P_n}{2} 2.613.$

$C_2\ C_3$ = resultant of C when secondary frames are joined.

EXAMPLE.

$h = 10$ ft. $4h = 40$ ft. making 4 zones. $b = 10$ ft. $F = 10$ tons. $v = 45°$. $z = 45°$.

Vertical forces are not considered, being unnecessary to explain the operation of the formulæ.

STRAINS IN SECONDARY FRAMES, TONS.

Sides A and C. $r_1 = r_3$.

$f_1 = f_2 = f_3 = f_4 = \frac{F r_1}{2 \cos. 45°}$ .... = 1.768

$s_1 = f_1$ .... = 1.768

$s_2 = f_2 + s_1$ .... = 3.536

$s_3 = f_3 + s_2$ .... = 5.304

$s_4 = f_4 + s_3$ .... = 7.072

$c_1 = \frac{s_1 h_1}{b} = \frac{1.768 \times 10}{10}$ .... = 1.768

$c_2 = \frac{s_2 h_2}{b} + c_1 = \frac{3.536 \times 10}{10} + 1.768$ .... = 5.304

$c_3 = \frac{s_3 h_3}{b} + c_2 = \frac{5.304 \times 10}{10} + 5.304$ .... = 10.608

$c_4 = \frac{s_4 h_4}{b} + c_3 = \frac{7.072 \times 10}{10} + 10.608$ .... = 17.680

$t_1 = s_1 \csc v_1 = 1.768 \times 1.4142$ .... = 2.500

$t_2 = s_2 \csc v_2 = 3.536 \times 1.4142$ .... = 5.000

$t_3 = s_3 \csc v_3 = 5.304 \times 1.4142$ .... = 7.500

$t_4 = s_4 \csc v_4 = 7.072 \times 1.4142$ .... = 10.000

$m = f_1 \times 40 + f_2 \times 30 + f_3 \times 20 + f_4 \times 10$ .... = 176.800

$R = \frac{m}{b} = \frac{176.800}{10}$ .... = 17.680

Side B.

$f_1 = f_2 = f_3 = f_4 = \frac{F r_2}{2}$ .... = 2.50

$s_1 = f_1$ .... = 2.50

$s_2 = f_2 + s_1$ .... = 5.00

$s_3 = f_3 + s_2$ .... = 7.50

$s_4 = f_4 + s_3$ .... = 10.00

$c_1 = \frac{s_1 h_1}{b} = \frac{2.50 \times 10}{10}$ .... = 2.50

$c_2 = \frac{5.00 \times 10}{10} + 2.50$ .... = 7.50

$c_3 = \frac{7.50 \times 10}{10} + 7.50$ .... = 15.00

$c_4 = \frac{10.00 \times 10}{10} + 15.00$ .... = 25.00

$t_1 = 2.50 \times 1.4142$ .... = 3.5355

$t_2 = 5.00 \times 1.4142$ .... = 7.0710

$t_3 = 7.50 \times 1.4142$ .... = 10.6065

$t_4 = 10.00 \times 1.4142$ .... = 14.1420

$m = f_1 \times 40 + f_2 \times 30 + f_3 \times 20 + f_4 \times 10$ .... = 250.000

$R = \frac{m}{b} = \frac{250}{10}$ .... = 25.00

SUMMATION OF STRAINS IN CHORDS:

$+$ = compression. $-$ = tension.

Zone.	Side A, chord C_1.	Side C, chord C_4.
I.	= 0.0	= + 1.768
II.	= − 1.768	= + 5.304
III.	= − 5.304	= + 10.608
IV.	= − 10.608	= + 17.680
R.	= − 17.680	= + 17.680

Zone.	Side B, chord C_2.	Side B, chord C_3.
I.	+ 1.768 − 0 = + 1.768	+ 2.50 − 0. = + 2.500
II.	+ 5.304 − 2.50 = + 2.804	+ 7.50 − 1.768 = + 5.732
III.	+ 10.608 − 7.50 = + 3.108	+ 15.00 − 5.304 = + 9.696
IV.	+ 17.680 − 15.00 = + 2.680	+ 25.00 − 10.608 = + 14.392
R.	+ 17.680 − 25.00 = − 7.320	+ 25.00 − 17.680 = + 7.320

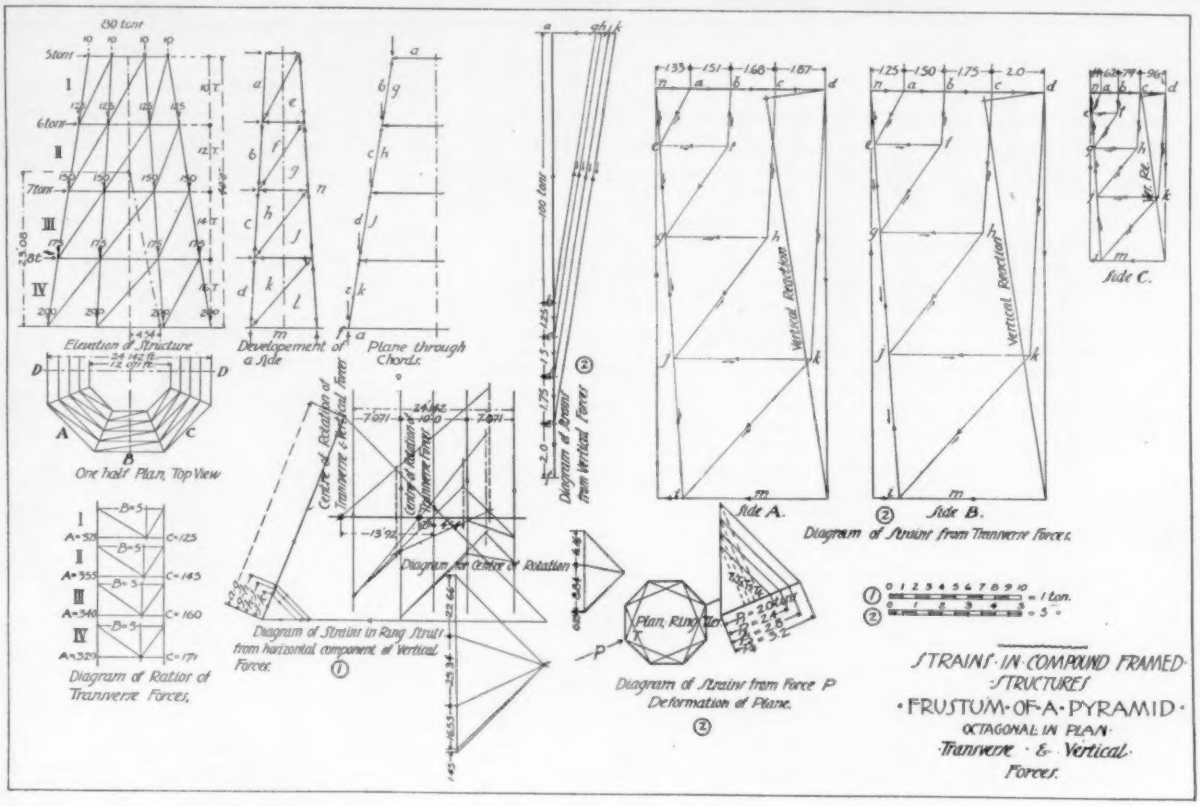
RING TIES AND STRUTS.

$T = \frac{3.54}{2} \times 2.4142 = 4.273$ tension.

$S = \frac{3.54}{2} \times 2.613 = 4.625$ compression.

DETERMINATION OF STRAINS IN PYRAMIDS, OCTAGONAL IN PLANS.—ANALYTICAL FORMULAS.—REFERENCE.

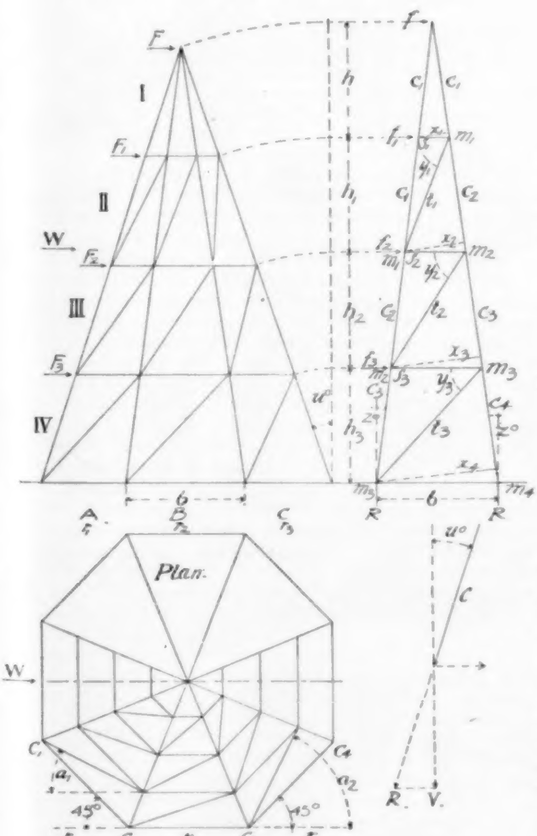
F = Total transverse force, from wind, acting on a horizontal plane.
f = Proportion of F acting on a side A, B and C respectively, parallel to side.
r = Ratio of F acting on a side parallel with force.
m = Bending-moment at joint in question, secondary frame.
c = Strain in chords, secondary frame.
C = Strain in chords, primary frame, resultants of c.
S = Shearing force at joint in question.
s = Strain in ring strut; to which add component from vertical load.
t = Strain in diagonal.
K = Horizontal component from c; windward chord.
k = Horizontal component from c; leeward chord.
R = Reaction in plane of development.
V = Vertical component of R when side or secondary frame is inclined to final position in structure.
h = Height from joint in question to f_n; measured from m_n.
x = Perpendicular from opposite apex to chord; lever arm.
a^0 = Angle of plane, embracing diagonal, with direction of force W.
u^0 = Inclination of a side with a vertical.
y^0 = Angle between a horizontal and diagonal, or strut when inclined.
Y^0 = Inclination of a chord with a vertical, on a radial plane.
z^0 = Inclination of a chord to a vertical; side developed.



STRAINS IN SECONDARY FRAMES, FROM TRANSVERSE FORCE, SIDES, A, B AND C.

$$c_n = \frac{m_n}{x_n}$$

$$m_n = f_{n-1}\, h_{n-1} + f_{n-2}\, h_{n-2} + \dots\dots\dots$$



$$S_n = f_n + f_{n-1} + f_{n-2} + \dots\dots\dots\dots$$

$$K = c_n \sin z^0_n$$

$k = c_n \sin z^0_n = K$ in symmetrical pyramid.

$$s_n = (S_n - K_n - k_n)$$

$$t_n = (S_n - K_n - k_{n+1}) \, Sec\, y_n;$$

$$M = \Sigma\, m;\ R = R_1 = \frac{M}{b};$$

C_2 and C_3 = resultant of c.

$$V = R \cos u^0.$$

The transverse force causes tension in the windward chord and compression in the leeward; ring struts are in compression and diagonals in tension.

Side A. $r_1 = \frac{\cos^2 a_1}{\cos^2 a_1 + \cos^2 a_2 + 1}$; Side B. $r_2 = \frac{1}{\cos^2 a_1 + \cos^2 a_2 + 1}$; Side C. $r_3 = \frac{\cos^2 a_2}{\cos^2 a_1 + \cos^2 a_2 + 1}$.

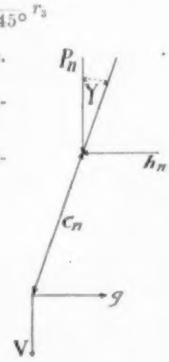
FOR THE APEX PORTION.

$$r_1 = \frac{\cos^2 45^\circ}{1 + 2\cos^2 45^\circ} = 0.25;\quad r_2 = \frac{1}{1 + 2\cos^2 45^\circ} = 0.50;\quad r_3 = \frac{\cos^2 45^\circ}{1 + 2\cos^2 45^\circ} = 0.25.$$

$$f = \frac{F}{2\cos 45^\circ}\, r_1 \qquad f = \frac{F}{2}\, r_2 \qquad f = \frac{F}{2\cos 45^\circ}\, r_3$$

NOTE: r_1 and r_3 varies for each zone; r_2 remains constant = 0.50.

STRAINS IN PRIMARY STRUCTURE, SECONDARY FRAMES COMBINED. — REFERENCE.



p = Superimposed load, dead and live load, at joint, acting vertically.
h = Horizontal component, acting towards centre of tower.
c = Component in direction of chord.
s = Component in direction of ring strut.
g = Strain in lower ring strut, tension.
$c_n = p_n \sec Y^0 + c_{n-1}$ = compression.
$h_n = p_n \tan g\, Y^0$.
$s_n = \frac{h_n}{2} \sec w^0$ = compression.
$g = \frac{c_n \sin Y^0}{2} \sec w^0$ = tension.
$V = c_n \cos Y^0$.

Finally, the members are to be proportioned for the maximum strains obtained, from the successive rotation of the transverse force, wind, around the structure.

The ring ties and their resultant component in ring struts are to be computed as for prisms.

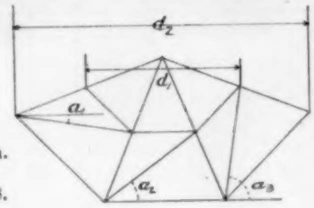
TO DETERMINE THE ANGLE BETWEEN DIRECTION OF FORCE, (PARALLEL TO A SIDE OF THE OCTAGON) AND PLANE EMBRACING THE DIAGONAL. — REFERENCE.

d_1 = diameter of inscribed circle of upper plane.

$d_2 =$ diameter of inscribed circle of lower plane.

Then cotan. $a_2 = \frac{d_2 + d_1}{d_2 - d_1} 0.4142$

$a_1 = a_2 - 45°$. $a_3 = a_2 + 45°$.



EXAMPLE FOR STRAINS IN OCTAGONAL PYRAMID.

Total height = 40 feet, consisting of 4 zones, each 10 feet high. Height of developed side 41.784 and 10.446 respectively.
$b = 10$ feet. $F = 2$ tons. $F_1 = 4$. $F_2 = 6$. $F_3 = 8$.

VALUES OF ANGLES.

$y_1 = 70°.15'$. $sec = 2\ 9595$ $u^0 = 16°.48'$ $cos = 0.9573$
$y_2 = 59°.06'$. $sec = 1.9472$ $w^0 = 67°.30'$ $sec = 2.6131$
$y_3 = 50°.03'$. $sec = 1.5574$ $Y = 18°.05'$ $tan = 0.3266$
$z^0 = 6°.49'$. $sin = 0.1187$

VALUES OF a^0.

Zone.	$a^0_1 =$	$cos\ a^0_1 =$	$cos^2 a^0_1 =$	$a^0_3 =$	$cos\ a^0_3 =$	$cos^2 a^0_3 =$
I.	——	——	——	——	——	——
II.	6°.10′	0.9942	0.9884	83°.50′	0.1074	0.0116
III.	19°.14′	0.9442	0.8916	70°.46′	0.3294	0.1084
IV.	25° 59′	0.8989	0.8080	64°.01′	0.4381	0.1920

RATIO r.

Zone.	$r_1 =$	$r_2 =$	$r_3 =$
I.	$\frac{.7071^2}{1 + 2 \times .7071^2} = \frac{0.5}{2} = 0.25$	$\frac{1}{2} = 0.5$	$\frac{.7071^2}{1 + 2 \times .7071^2} = \frac{0.5}{2} = 0.25$
II.	$\frac{.9884}{.9884 + .0116 + 1} = \frac{.9884}{2} = 0.4942$	$\frac{1}{2} = 0.5$	$\frac{.0116}{.9884 + .0116 + 1} = \frac{.0116}{2} = 0.0058$
III.	$\frac{.8916}{.8916 + .1084 + 1} = \frac{.8916}{2} = 0.4458$	$\frac{1}{2} = 0.5$	$\frac{.1084}{.8916 + .1084 + 1} = \frac{.1084}{2} = 0.0542$
IV.	$\frac{.8080}{.8080 + .1920 + 1} = \frac{.8080}{2} = 0.4040$	$\frac{1}{2} = 0.5$	$\frac{.1920}{.8080 + .1920 + 1} = \frac{.1920}{2} = 0.0960$

FORCE f.

Zone.	Side A.	Side B.	Side C.
I.	$\frac{2}{2 \times .7071} \times 0.25 = 0.3536$	$\frac{2}{2} \times 0.5 = 0.5$	$\frac{2}{2 \times .7071} \times 0.25 = 0.3536$
II.	$\frac{4}{2 \times .7071} \times 0.4942 = 1.3978$	$\frac{4}{2} \times 0.5 = 1.0$	$\frac{4}{2 \times .7071} \times 0.0058 = 0.0164$
III.	$\frac{6}{2 \times .7071} \times 0.4458 = 1.8914$	$\frac{6}{2} \times 0.5 = 1.5$	$\frac{6}{2 \times .7071} \times 0.0542 = 0.2299$
IV.	$\frac{8}{2 \times .7071} \times 0.4040 = 2.2853$	$\frac{8}{2} \times 0.5 = 2.0$	$\frac{8}{2 \times .7071} \times 0.0960 = 0.5431$

BENDING–MOMENTS.

Zone.	Side A.	
I.	$m_1 = 0.3536 \times 10.446$	= 3.6937
II.	$m_2 = 1.3978 \times 10.446 + 0.3536 \times 20.892$	= 21.9888
III.	$m_3 = 1.8914 \times 10.446 + 1.3978 \times 20.892 + 0.3536 \times 31.338$	= 60.0415
IV.	$m_4 = 2.2853 \times 10.446 + 1.8914 \times 20.892 + 1.3978 \times 31.338 + .3536 \times 41.784$	= 121.9662

$R = \frac{m_4}{10} = 12.1966$ $V = R \times .9573 = 11.6758$

Zone.	Side B.	
I.	$m_1 = 0.5 \times 10.446$	= 5.223
II.	$m_2 = 1.0 \times 10.446 + 0.5 \times 20.892$	= 20.892
III.	$m_3 = 1.5 \times 10.446 + 1.0 \times 20.892 + 0.5 \times 31.338$	= 52.230
IV.	$m_4 = 2.0 \times 10.446 + 1.5 \times 20.892 + 1.0 \times 31.338 + 0.5 \times 41.784$	= 104.460

$R = \frac{m_4}{10} = 10.446$ $V = R \times .9573 = 10.$

Zone.	Side C.	
I.	$m_1 = 0.3536 \times 10.446$	= 3.6937
II.	$m_2 = 0.0164 \times 10.446 + 0.3536 \times 20.892$	= 7.5587
III.	$m_3 = 0.2299 \times 10.446 + 0.0164 \times 20.892 + 0.3536 \times 31.338$	= 13.8252
IV.	$m_4 = 0.5431 \times 10.446 + 0.2299 \times 20.892 + 0.0164 \times 31.338 + 0.3536 \times 41.784$	= 25.7650

$R = 2.5765$ $V = 2.4665$

VALUES OF x AND c.

Zone.		Side A.	Side B.	Side C.
I.	$x_1 = 2.4823$	$c_1 = \frac{3.6937}{2.4823} = 1.4880$	$\frac{5.223}{2.4823} = 2.1041$	$\frac{3.6937}{2.4823} = 1.4880$
II.	$x_2 = 4.9645$	$c_2 = \frac{21.9888}{4.9645} = 4.4292$	$\frac{20.892}{4.9645} = 4.2083$	$\frac{7.5587}{4.9645} = 1.5226$
III.	$x_3 = 7.4468$	$c_3 = \frac{60.0415}{7.4468} = 8.0627$	$\frac{52.230}{7.4468} = 7.0137$	$\frac{13.8252}{7.4468} = 1.8565$
IV.	$x_4 = 9.9290$	$c_4 = \frac{121.9662}{9.9290} = 12.2838$	$\frac{104.46}{9.9290} = 10.5207$	$\frac{25.7650}{9.9290} = 2.5949$

VALUES OF K.

Side A.

$K_1 = 1.4880 \times 0.1187 = 0.1766$
$K_2 = 4.4292 \times 0.1187 = 0.5257$
$K_3 = 8.0627 \times 0.1187 = 0.9570$
$K_4 = 12.2838 \times 0.1187 = 1.4581$

Side B.

$K_1 = 2.1041 \times 0.1187 = 0.2498$
$K_2 = 4.2083 \times 0.1187 = 0.4995$
$K_3 = 7.0137 \times 0.1187 = 0.8325$
$K_4 = 10.5207 \times 0.1187 = 1.2488$

Side C.

$K_1 = 1.4880 \times 0.1187 = 0.1766$
$K_2 = 1.5226 \times 0.1187 = 0.1807$
$K_3 = 1.8565 \times 0.1187 = 0.2204$
$K_4 = 2.5949 \times 0.1187 = 0.3080$

VALUES OF S.

Side A.

$S_1 = 0.3536 + 1.3978 = 1.7514$
$S_2 = 1.7514 + 1.8914 = 3.6428$
$S_3 = 3.6428 + 2.2853 = 5.9281$

Side B.

$S_1 = 0.5 + 1.0 = 1.5$
$S_2 = 1.5 + 1.5 = 3.0$
$S_3 = 3.0 + 2.0 = 5.0$

Side C.

$S_1 = 0.3536 + 0.0164 = 0.3700$
$S_2 = 0.3700 + 0.2299 = 0.5999$
$S_3 = 0.5999 + 0.5431 = 1\ 1430$

VALUES OF s.

$s_n = (S_n - K_n - k_n)$.

Side A.

$s_1 = 1.7514 - (2 \times .1766) = 1.3982$
$s_2 = 3.6428 - (2 \times .5257) = 2.5914$
$s_3 = 5.9281 - (2 \times .9570) = 4.0141$

Side B.

$s_1 = 1.5 - (2 \times .2498) = 1.0004$
$s_2 = 3.0 - (2 \times .4995) = 2.0010$
$s_3 = 5.0 - (2 \times .8325) = 3.3350$

Side C.

$s_1 = .3700 - (2 \times .1766) = .0168$
$s_2 = .5999 - (2 \times .1807) = .2385$
$s_3 = 1.1430 - (2 \times .2204) = .7022$

VALUES OF t. $t_n = (S_n - K_n - k_{n+1}) \sec y_n$.

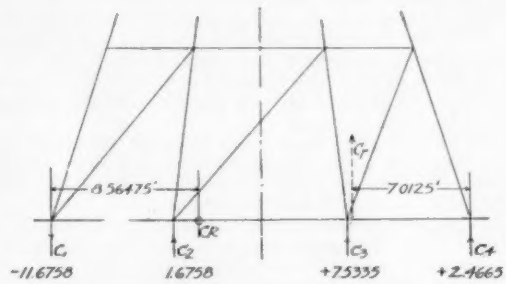
Side *A*.	Side *B*.	Side *C*.
$t_1 = (1.7514 - 0.1766 - 0.5257)\,2.9595 = 3.1048$	$(1.5 - 0.2498 - 0.4995)\,2.9595 = 2.2217$	$(0.3700 - 0.1706 - 0.1807)\,2.9595 = 0.0376$
$t_2 = (3.6428 - 0.5257 - 0.9570)\,1.9472 = 4.2041$	$(3.0 - 0.4995 - 0.8325)\,1.9472 = 3.2479$	$(0.5999 - 0.1807 - 0.2204)\,1.9472 = 0.3871$
$t_3 = (5.9281 - 0.9570 - 1.4581)\,1.5574 = 5.4711$	$(5.0 - 0.8325 - 1.2488)\,1.5574 = 4.5456$	$(1.1430 - 0.2204 - 0.3080)\,1.5574 = 0.9572$

SUMMATION OF STRAINS. (+ = COMPRESSION. — = TENSION.)

Zone.	Chord C_1.	Chord C_2.	Chord C_3.	Chord C_4.
I.	-1.4880	$+\ 1.4880 - 2.1041 = -0.6161$	$+\ 2.1041 - 1.4880 = +0.6161$	$+1.4880$
II.	-1.4880	$+\ 4.4292 - 2.1041 = +2.3251$	$+\ 4.2083 - 1.4880 = +2.7203$	$+1.5226$
III.	-4.4292	$+\ 8.0627 - 4.2083 = +3.8544$	$+\ 7.0137 - 1.5226 = +5.4911$	$+1.8565$
IV.	-8.0627	$+12.2838 - 7.0137 = +5.2701$	$+10.5207 - 1.8565 = +8.6642$	$+2.5949$

REACTIONS AND CENTRE OF ROTATION. — VERTICAL REACTION AT

$C_1 =$	$C_2 =$	$C_3 =$	$C_4 =$
-11.6758	$+11.6758 - 10.0 = +1.6758$	$+10.0 - 2.4665 = +7.5335$	$+2.4665$



Centre of action of compressive reactions $= Cr =$

$$\frac{1.6758 \times 17.071 + 7.5335 \times 7.071}{1.6758 + 7.5335 + 2.4665} = \frac{81.8770}{11.6758} = 7.0125 \text{ feet from } C_4.$$

Centre of rotation $= CR =$

$$\frac{24.142 - 7.0125}{2} = \frac{17.1295}{2} = 8.56475 \text{ feet from } C_1.$$

[To be continued.]

FORMALIN, A NEW DISINFECTANT.

THE technical journal issued by the Bavarian Polytechnic Society contains in its last number an interesting report relating to "formalin," a new composition for disinfecting and preserving purposes. According to this journal, which is reputed to be the best of its kind in the Kingdom of Bavaria, formalin is a forty-per-cent solution of the gas-like composition called "form-aldehyde" (CH O H), and is produced by oxidation of wood spirit (methyl alcohol). It has demonstrated itself to be a perfectly harmless means for disinfecting purposes; for preventing and destroying bacilli, and removing obnoxious odors, such as those arising from sulphuric-acid combinations, through chemical reaction, without in turn creating any odor whatever. On account of its poisonous properties it cannot be taken internally, either in concentrated or weak solutions. For most purposes one tablespoonful of formalin to one quart of water is sufficient. An extra advantage is the fluidity of this new chemical composition, in consequence of which its penetrable properties are greatly increased. Its fumes are hurtful only when inhaled in considerable quantities. Formalin saturates animal tissues very rapidly and prevents their decay. When sprayed, it is very serviceable for disinfecting and purifying the atmosphere.

Formalin is admirably adapted for disinfecting objects of every description, such, for instance, as hotels and school-rooms, stables, slaughter-houses, cars for transporting meat, cabins, and holds of ships, kitchens, cupboards, etc., for which purpose the formalin solution is placed in any suitable apparatus and sprayed under pressure. To remove the odor of this chemical, which is not at all disagreeable, a short exposure to the air is sufficient. In this manner, walls and curtains, sofas, beds, etc., can be disinfected without the slightest risk of injury to material or color.

It will thus be seen that formalin is particularly valuable for the use of health officers at ports and elsewhere. A solution of formalin is also exceedingly well adapted for use in soaking infected linen and clothing, and in rinsing vessels used in sick rooms.

Formalin powder and formalith sheets are employed for disinfecting furniture, reservoirs, etc. These forms of formalin are produced by saturating chalk paste with fifty per cent of the chemical.

Floors and other large surfaces are disinfected by strewing with impalpable formalin powder, or washing with a solution of it. Small articles are placed in chests with the above-mentioned formalith sheets. Rags, when strewn with formalin powder, can be kept closely packed together. This same powder, or the solution, serves admirably also for disinfecting and deodorizing the bilge-water of ships and steamboats.

The solution can be given any perfume preferred, and, when sprayed in sick rooms, removes at once the odor peculiar to the latter. In all cases, enough formalin should be used to render its characteristic odor plainly perceptible.

Meat, game, fowls, fish, etc., if dipped into a solution of formalin, remain fresh for a long period without getting a disagreeable taste or the odor of decay. Meat, which has already begun the process of disintegration, and is only in the first stages of decay, can be rendered odorless by simply dipping it into the solution for one or two minutes and washing with the same. The cause of the disagreeable odor is removed.

Regarding the use of formalin in the preparation of butter and cheese, sufficient data, the journal says, have not as yet been secured; but it has been shown to be very well adapted for cleaning the vessels and machinery employed in dairies.

Formalin is of special importance for slaughter-houses and meat-shops, for preserving fish (during transportation) and fruit, the latter being dipped or placed for a short time in a weak solution of the chemical.

While the discovery of formalin proper dates back a few years, its valuable properties as a composition for disinfecting and preserving purposes have only recently been made known.

LOUIS STERN, *Commercial Agent.*

BAMBERG, June 9, 1894.

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 CENTRAL COURT: METROPOLITAN LIFE INSURANCE BUILDING, NEW YORK, N. Y. MESSRS. N. LE BRUN & SONS, ARCHITECTS, NEW YORK, N. Y.

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

THE CENTRAL ARMORY, CLEVELAND, O.: TWO VIEWS. MESSRS. LEHMAN & SCHMITT, ARCHITECTS, CLEVELAND, O.

DESIGN FOR A COURT-HOUSE. MR. WALTER T. LITTLEFIELD, ARCHITECT, BOSTON, MASS.

DESIGN FOR AN APARTMENT-HOUSE, RICHMOND, VA. MR. M. J. DIMMOCK, ARCHITECT, RICHMOND, VA.

[Additional Illustrations in the International Edition.]

THE MAIN STAIRCASE: METROPOLITAN LIFE INSURANCE BUILDING, NEW YORK, N. Y. MESSRS. N. LE BRUN & SONS, ARCHITECTS, NEW YORK, N. Y.

[Gelatine Print.]

PROPOSED NEW OPERA-HOUSE, ST. PETERSBURG, RUSSIA. PROF. V. SCHRÖTER, ARCHITECT.

PLAN OF THE SAME.

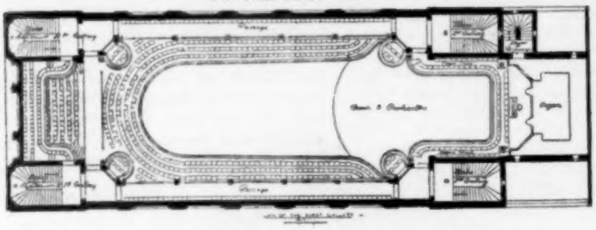
FLEMISH THEATRE, BRUSSELS, BELGIUM. M. JEAN BAES, ARCHITECT.

THE VICTORIA HALL, GENEVA, SWITZERLAND. CAMOLETTI BROS., ARCHITECTS.

THIS building, which has just been completed, is perhaps the most perfect example of a concert-room extant. It is due to the munificence of Mr. D. F. Barton, the British Consul in Geneva, who has spared neither money nor pains to make it what it is. The hall has had also the good fortune of being designed by the Brothers Camoletti, architects of exceptional talent, as may be seen by the grand building for the General Post-office, which was erected from their designs and under their superintendence on the main thoroughfare which leads from the Geneva railway-station to the harbor.

The hall is about 200 feet long, 62 feet wide and rather low-pitched. Both ends are narrowed to leave space for the four staircases, which give access to the auditorium and the galleries. The hall is also further narrowed by the galleries. To these proportions and general disposition of the space which gently rises from front to back are, perhaps, mainly due the exceptionally good acoustical properties of the hall; but there are refinements in the setting out of the galleries and seats which no doubt contribute to the satisfactory result. For instance, the plan reveals that the front lines of the side galleries are not parallel, but slope outwards as they near the stage. The figures marked on the working-drawings show that the distance from the gallery to the centre line of the hall

VICTORIA-HALL GENEVA



is 9 inches wider at the part near the orchestra than at the opposite end. Then the levels of the seats have been everywhere set out on isacoustic curves, so that each seat offers the same advantages for hearing and seeing.

The photographic view of the interior gives an idea of the splendor of the decoration adopted. The style is no pedantic reconstruction of any particular epoch, but yet may be said to have been inspired by such examples as the interiors of the palaces of Fontainebleau and Versailles. The ceiling is certainly according to the Louis XIV precedents. The painting which decorates the central field of the ceiling is from the brush of M. Bieler, a Swiss painter. It represents the opposition of the matter-of-fact world in which we live with the realm of the ideal, and also of terrestrial with celestial harmonies — a kind of abstruse symbolism which is much in fashion with Swiss artists at the present time. To these explanations we may add that the tone of the color decoration throughout is deep purple, crimson and gold.

The hall is lighted by 1,000 electric-lights of 16-candle power, of which 120 form a crown of iridescent carbuncles all round the ceiling. Besides these there are 400 similar electric-lights for the passages, vestibules and other parts of the building. Arrangements have been made for three degrees of lighting. All the lights will be on for exceptional occasions, such as the inauguration of the hall or the reception of some honored guest; a brilliant, but yet reduced lighting will be used for ordinary occasions, and a still more modest display for such practical purposes as rehearsals, and so on.

A point to be well kept in mind by all architects who may have the designing of theatres, concert-halls, or other places of public entertainment is the following: All the seats fold up automatically, arms as well as seat, when the occupiers rise, so that there are no impediments to the egress of the public. This is a feature which might advantageously be adopted even in churches and chapels.

As the building is surrounded on three sides by streets and yet has no windows, being lighted from above, it offers a good example of the architectural treatment of blank walls. The details of the architecture belong to the Classic Renaissance of the Louis XIII period, but the spirit of the whole is distinctly Egyptian. The main entrance is flanked like an Egyptian temple by two massive pylons, which frame between them a rich color decoration. This decoration is executed in a kind of paste which has all the hardness and durability of marble. It is the patent of the Cie. Industrielle Génevoise. The door itself, which reminds one of some of the architectural features of the Palace of Fontainebleau, is decorated with the arms of the Barton family, in which appear a boar's head, roses and fasces of arrows, bearing the motto "*Fide et fortitudine.*" Above the door stands in the simplicity of Eve a huge and yet graceful embodiment of the spirit of music; she seems just sprung from the waters, holding in her hands a harp covered with reeds. Three years ago this statue was exhibited in the Paris *Salon*, where it was much admired. It has the merit of being a novel treatment of a hackneyed subject and an acceptable relief from the ever-recurring Greek Classic muse so dear to Philistines, of which there are not a few even in Geneva.

The sides of the building exhibit but large panels, with no other decoration than the good taste and proportions of the cornices and stonework. And here we beg those who see only the photographic view of the exterior not to form a hasty judgment, for we may say it appears on paper much smaller than in reality. The same observation applies to all buildings designed in the colossal Classic style — that is, in the style where the building is considered as composed of one order of architecture, such as the Victoria Hall and the Central Post-office in Geneva, and the buildings erected by Michael Angelo on the Capitoline Hill at Rome. All the buildings look small in drawings and overpoweringly grand in reality, whereas the peculiar architecture of several of the most recent London buildings gains on being seen in drawings and photographic views where the smallness of the details cannot be gauged. But what a fall there is, what a deception, when we are face to face with the buildings themselves, with their gimcrack and petty details which we may carry off bit by bit in our pockets, if we feel so disposed.

We beg London architects when they pass through Geneva to closely examine the construction of the two buildings we have named, for they will find that they are composed of boulders, each measuring about 6 feet by 8 feet by 4 feet and more. These boulders go right through the wall, forming a true isodomos stonework, as in the Parthenon of Athens. They are honestly what they appear to be, and not simply a 6-inch or 9-inch veneer, such as covers the so-called stone fronts of many London buildings. Absolute truthfulness seems a very difficult virtue to be faithful to in architecture, as well as in morals, and the Geneva walls sin also in this instance, for they usually appear much less powerful than they really are. Here we constantly find the huge boulders which compose the walls worked on their face as if they were two or three courses of stone, a fact which a careful examination of the jointing will soon reveal.

It is curious to see how close is the connection between building and the character of the people who practise the art. In England, where we use sham stone fronts, keeping up appearances — that is, trying to seem wealthier than we really are — is the great social law. In Geneva, it is just the reverse; people do their utmost to seem poorer than they are, and thus both nations deceive one another.

It will be noticed in the plan that the stairs exhibit peculiar curves in some of the steps. Thanks to this device, which is well known in French work, the stairs gain a very easy ascent. To my old pupils of the classes of masonry, I may say that these steps are first set out on the principle of the dancing stairs, of which we have constructed a model last year at the Guilds Institute, and then the line of the nosing of each step is deflected so as to bring the inner end normal to the well-hole and the outer end normal to the wall-string.

Such are some of the lessons to be gathered from the new hall erected in Geneva by an Englishman to serve as another connecting link between Englishmen and Genevese, who can reckon already more than three centuries of fast friendship.

Before closing this communication, I wish to say something about the principal artist who conceived and executed this noble work, for, alas! he departed from the scene of his labors too soon to see the Victoria Hall completed. His name is John Camoletti, born in 1848, deceased six months ago.

To our young colleagues, who hanker after studies made easy by the establishment in London of a great school of architecture, such as the École des Beaux-Arts in Paris, we may point to John Camoletti, who became one of the greatest architects of the age without ever having attended any school whatever beyond the primary or Board school of the village in which he was born. So true it is that it is native genius and not training that makes the artist! He did what many an English lad has done, and is doing now. He entered an architect's office as office-boy, and from this humble beginning steadily worked his way up to the highest round of the ladder. This shows that our English way of letting everybody fish for himself as best he may, with little or no external help, is not such a bad one after all. If it does not raise inartistic incapables into decently mediocre architects, like the French school training, at least it does not cramp with its ready-made formulas heaven-born genius. This is the last and, perhaps, not the least lesson which the Geneva Victoria Hall is capable of teaching us.

GENEVA: November 28, 1894.

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.*]

COLONEL WARING AND THE PATENTING OF HIS SEWERAGE SYSTEM.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — In your comment on my black-balling by the A. S. C. E. — which is of itself unimportant — you refer to the matter of "professional ethics," and say that the point at issue is my "right to patent the system of drainage which has conferred such immeasurable benefits on Memphis and other places." Other statements to this effect have been made, with the addition that the same system had been used already in Europe. Were this true, it would have been highly improper for me to apply for a patent, and the Patent Office would surely have rejected my application. It is in no sense true. This system was never used or suggested in Europe until it was made known there through my work at Memphis. It was not known anywhere until it was described in my writings. It was first described before the American Society of Civil Engineers, by Odell, 1880. In the discussion that followed, Mr. J. J. R. Croes said: "I do not understand that the entire separation of sewage and storm-water which Mr. Waring advocates, and which has been carried out at Memphis and recommended for Newport, Stamford and other places, has been practised anywhere in England. In what is there called the "separate system," the rain-water from roofs and back-yards is allowed to enter the sewer, but the street-wash is excluded. The Memphis work is attracting as much attention there as it does in this country, and the results of a continued trial of it are looked for with great interest."

In a description of the Memphis work before the Sanitary Institute of Great Britain, 1880, Mr. Rogers Field said: "There are several very special features in this case which take it altogether out of the ordinary category." He then describes the conditions at Memphis and says: "These conditions are altogether unprecedented."

In the testimony taken in the trial on the patent (the Chelsea case), Mr. Charles H. Latrobe, C. E., of Baltimore, said that he first heard of any form of the system in 1880. He had before that time never known of a purely separate system, regulated by flush-tanks, and that he never before heard of the use of a flush-tank in connection with a system of sewerage.

Mr. Croes, who was also an expert in the suit, was asked: "Do you know whether or not such a combination existed before the date of the Waring invention?" He replied: "I have never heard of such a combination having been used or suggested for the purposes of town sewerage before Colonel Waring invented it." The defendant in the Chelsea case did not attempt to prove prior use.

M. Lavoinne, Ingénieur en Chef des Ponts et Chaussées, writing in 1880, speaks of my suggestions as "*rompant avec les systèmes de canalisation en usage.*"

In the literature of town sewerage, there is no record of any earlier work than mine from which rain-water was excluded. There is also no suggestion of the use of automatic flush-tanks at the heads of the branches of a sewerage system, and surely there is none of a combination of the two.

It was authoritatively decided, a few years ago, that the engineering profession is not yet so constituted that it can be regulated by "professional ethics." It is still in a very formative period.

GEORGE E. WARING, JR.

THE ARCHITECTURAL CATALOGUE OF THE BOSTON PUBLIC LIBRARY.

BOSTON, January 5, 1895.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Allow me to call attention to the subject catalogue of "*Books relating to Architecture, Construction and Decoration,*" which has just been issued by the Trustees of the Boston Public Library.

It is doubtless well known that the Public Library now possesses an architectural collection of some 5,000 titles, and that many of these books are exceedingly valuable and interesting. The catalogue just published seems to be particularly convenient for busy men, as the classification adopted will save a vast amount of time formerly spent in searching for books relating to special topics. The lists in the 150 pages of the book were arranged in twelve sections, extending from "Bibliography" to "Technical Details," many of these sections having numerous subdivisions. Thus the seventeen divisions of Section VIII, the "Illustrations of Architecture," are most convenient for the practising architect, since they place together the works treating of such special subjects as baths, churches, commercial buildings, prisons, railway-stations, etc. Section VII, the "Architecture of Countries," covering thirty-eight pages and arranged under thirty heads, with the sections, Periods and Styles, and History and Theory, are most useful to the historical student.

These sections contain many of the important books relating to Architectural History.

Section IX, "Architectural Details," does not seem to be as fully developed as other sections, since many subdivisions might be suggested which are here omitted, but as books treating of detail alone are few, the list is perhaps as complete as could be expected in a general catalogue. The Index of Authors, and the Index of Places and Subjects are both of great assistance.

All architects who have endeavored to arrange their own books and bundles of illustrations in a systematic manner, will appreciate the difficulties constantly arising in the classification of even a small architectural library.

The thanks of the profession, and of Boston architects in particular, are, therefore, due to Miss Mary H. Rollins, who has had charge of this catalogue, for the clear and systematic arrangement which makes this book of special value.

The architectural books are now being transferred to the new library, and probably will not be ready for use until the latter part of February, but it may be of assistance to those who cannot easily reach the library, to know that the catalogue will be mailed to any address for fifty-eight cents. Sincerely yours, E. B. HOMER.

BOOKS ON ACOUSTICS.

ST. PAUL, January 5, 1895.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Can you inform me of any definite set of rules or laws of acoustics, or any treatise on the subject. If you can supply such a work, I would be very glad to have you do so.

Yours very truly, CASS GILBERT.

[As we cannot supply any work on acoustics, the best we can do for our correspondent is to say that probably the most accessible work is T. Roger Smith's "*Acoustics of Public Buildings.*" Theo. Lachez's "*Acoustique et Optique des Salles de Reunions publiques*" also may be found in some public libraries. Further than this, we will say that a list of works dealing with this subject was published in our issue for Sept. 10, '81, while papers containing a considerable amount of practical information and advice may be found in our issues for Dec. 17 and 31, '87; Sept. 27, '90; Nov. 28, '91; Jan. 7, and Nov. 11, '93, and March 3, '94. — EDS. AMERICAN ARCHITECT.]

EXHIBITIONS

BOSTON, MASS. — *Winter Exhibition and Ancient Chinese Buddhist Paintings, also, Line Engravings, Mezzotints, and Etchings by Rembrandt:* at the Museum of Fine Arts.

Exhibition of Pictures of New England Life by New England Painters: at Jordan, Marsh & Co.'s, opened November 27.

Delorme's "Blacksmith" and Dielman's "Marriage of Dr. Le Baron": at Williams & Everett's, 190 Boylston St., until January 12.

Fifty-first Exhibition, Oil Paintings and Sculpture: at the Boston Art Club, January 18 to February 16.

Paintings by Theodore Wendel: at the St. Botolph Club, January 7 to 23.

Memorial Exhibition of Works by E. T. Billings: at the Unity Art Club, 711 Boylston St., closes January 16.

CHICAGO, ILL. — *Water-color Exhibition:* at F. Keppel & Co.'s, 1 Van Buren Street.

Loan Exhibition of Portraits: at the Art Institute, January 2 to 16.

NEW YORK, N. Y. — *Loan Exhibition:* at the Metropolitan Museum of Art, New North Wing, opened November 5.

Zschille Collection of Arms and Armor: at Tiffany & Co.'s, Union Square.

George Inness Memorial Exhibition: at the Galleries of the American Fine Arts Society, 215 West 57th Street, opened December 27.

Water-colors of Holland and Venice by F. Hopkinson Smith: at the Avery Galleries, 368 Fifth Ave., January 7 to 19.

Works by Claude Monet: at the Durand-Ruel Galleries, 389 Fifth Ave., January 12 to 27.

Etchings by D. Y. Cameron: at F. Keppel & Co.'s, 20 East 16th St.

PHILADELPHIA, PA. — *Sixty-fourth Annual Exhibition of the Pennsylvania Academy of Fine Arts:* opens December 17, closes February 23. The special exhibition of Architectural Drawings closes February 5.

NOTES AND CLIPPINGS

EMPEROR WILLIAM DERIDED BY THE ARTISTS. — The manner in which this attempt on the part of the Kaiser to impose his taste in matters pertaining to art upon the German people in general, and the art world in particular, is significant, and calculated to lead those who remember the Germany of Bismarckian times to believe that the end of all things is at hand. Not only has the press of every shade of political opinion been filled with protests against the attitude of the Emperor in the affair, but the National Society of Architects and the National Association of Artists, the two principal organizations of the kind in Germany, composed of all that is most eminent in the realms of architecture and art, jointly invited the Professor to a great banquet, at which over 600 guests were present and at which the Emperor was guyed in a most merciless manner. Thus the chief ornament of the principal table was a model of the Reichshaus in schwarzbrod, cheese and confectionery. The dome consisted of a cheese cover. The "Germania" on the top was represented by a smart chambermaid on horseback, the horse being led by a footman in livery. The whole was labelled "*Der Gipfel des Geschmackes*" (the acme of taste). Another item on the programme was a sort of a automatic machine which, when a "gold medal" was placed in the slot, would perform "*Der Gesang an Ihr*" ("The Song to Her," meaning, of course, Mme. Parlaghy). The joke, I need not say, lies in the parodying of the name of the Emperor's musical composition, the "*Sang an Aegir.*" The lustre hanging from the ceiling, which is known in Germany as a "crownlighter," was in the form of an old crinoline. Militarism was represented by a soldier who was administering a flogging to the other masses of the population. At the entrance to the banqueting-hall, there hung the representation of a gold medal, which a lady painter was trying, in vain, to grasp. At the end of the banquet, the chairman presented Herr Wallot with a laurel wreath, saying, "The new Reichstag Building, on which the golden inscription stands in invisible letters, 'To the German People,' is a triumph of German art." This observation of the chairman has reference to the fact that on the original plan of the building, as drawn-up by Herr Wallott, there was the inscription, "To the German People," but by command of the Emperor these words were struck out. — "*Ex-attache*" *in the N. Y. Tribune.*

ARCHÆOLOGICAL OPPORTUNITIES IN AMERICA. — The field of archæological research in America is limitless. To us it should be just as important as is that of Egypt, and in many respects more so. Extending, particularly in South America, over a much wider ground than Egypt, the difficulties are not to be overlooked. As Mr. Marshall H. Saville writes: "American students have not made as much progress in Central American archæology as those of Europe. Although forming a part of our own continent, we have made little effort to explore the old cities, and it is only recently that the Peabody Museum of Harvard University has undertaken to carry on extensive and exhaustive researches at the most prolific source of hieroglyphic inscriptions of which we have knowledge." Mr. Saville tells of the enormous fields to be worked over before the problems relating to the Maya race of Yucatan and Central America can be solved. There is no reason why Americans with means at their disposal should not contribute handsomely toward the founding of an "American Exploration Fund," to be devoted to exactly the purposes of the Egyptian one. There are many competent American archæologists who would intelligently carry out such a work. — *N. Y. Times.*

BURNING OF WREN'S WINCHESTER BARRACKS.—There are so few of Wren's works outside the Metropolis, the destruction of the Winchester Barracks on Wednesday morning is more of a loss in an architectural sense than could be any of the modern structures for military purposes. The Winchester buildings, it need hardly be said, were not planned as barracks. Charles II admired the old city, which had suffered grievously for the royal cause, and, as he imagined he could be a controlling power at Portsmouth, he resolved to erect a palace at Winchester. The works were commenced in May, 1683, from Wren's designs. The project was ambitious. There was to be a quadrangular group measuring 326 feet by 216 feet, with a cupola so lofty as to be seen from the sea. In addition, there was a broad street, with fine dwellings leading from the palace to the cathedral. A large area of ground was purchased for parks and gardens, of which a careful terrier in Wren's handwriting is still preserved in the library of All Souls', Oxford. The grounds were to be laid out by John Evelyn. A river was also to be excavated, which would enable small vessels to pass to and from the sea. The "carcase" of the palace was completed and roofed, when operations were suspended by the death of the King. James II would not meddle with the works, and William III was no less indifferent. Queen Anne was desirous to complete the building as a residence for her husband, but his death again stopped the works. The palace was useless until somebody proposed to turn it into an enclosure for prisoners of war, and during the Continental wars it contained many inmates. Subsequently it was converted into barracks. That buildings in which wood was so largely employed should be used for many years in housing a large number of soldiers is evidence of the incapacity of the technical advisers of the War Office. More than an hour elapsed on Wednesday before a supply of water was available, and the old timber was meanwhile vanishing. Nearly the whole of the parts used for barracks are destroyed, as well as the stores. The fire arose while the men were in bed, and if it were not for their perfect discipline, the consequences must have been terrible.—*The Architect, December* 21, 1894.

ALLEGATION OF NEGLIGENCE IN CASE OF ACCIDENT.—Actions arising from alleged negligence are often founded on peculiar facts. A single pamphlet number of recent opinions of the courts contains a case in which a mill-owner was held responsible for damage to an owner of adjoining land from the fall of a chimney after a severe gale. It was held that unless the fall of the chimney was the result of inevitable accident, or was caused by the wrongful acts of other persons, the mill-owner might be held responsible. In an Indiana case, in the same pamphlet, it was shown that a horse was injured by a wire fence adjoining the pastures. It was held that a complaint was sufficient, which charged that the fence-posts were set too far apart to support the wires so that they sagged in such a manner as to induce horses to attempt to cross the wires and thus lead them to certain injury. A woman who was riding in a buggy driven by her husband was killed while attempting to cross a railroad track. It was held that the negligence of the husband, if he were negligent, could not be imputed to the wife, who was riding with him. The railroad company was held to be negligent in encroaching upon the highway so as greatly to reduce its width, and in allowing obstructions in the roadway so as to prevent a person driving a horse from turning aside to avoid an approaching train. The driver was held not to be negligent when he stopped to look and listen within a short distance of the track and proceeded as carefully as he could, considering his ignorance of the highway on which he was driving.—*N. Y. Tribune.*

THE LION OF BELFORT.—One tiny corner of Alsace was saved to France by the almost superhuman efforts of M. Thiers—this was Belfort. Here resides a colony of at least ten thousand emigrants from German Alsace, and here the whole atmosphere, surroundings, and language are French; and I am sorry to say everything seems to breathe war. In the early spring of 1871, I witnessed the march out of the heroic French garrison of Belfort, with all the honors of war, after a siege and bombardment of months. It was only surrendered because Prince Bismarck refused to treat with the French Republic unless it was temporarily put in German hands. It was strong then, but it is infinitely stronger now. All the mountain tops around are converted into fortresses, and the whole place runs over with soldiers, and seems to breathe the spirit of the colossal "Lion of Belfort." This wonderful monument is partly cut out of the living rock at the foot of the castle, and seems always to gaze fiercely forth upon Alsace and upon Germany. A slight index of the tension of feeling that exists on the frontier is, that no sooner was I well out of Belfort than the French police came to my hotel to arrest me as a German spy! It is easy for patriotic Frenchmen living at Belfort to believe that Belfort is impregnable and France invincible; and as a true friend of France, I am very sorry to see that the new generation, who know nothing of war, is being fed upon the same sort of lies which proved so disastrous in 1870.—*The Contemporary Review.*

HARD TIMES DISAPPEARING.—To those political organs that care nothing what injury they do to business by recklessly misrepresenting the real condition of trade, in the hope of thereby gaining some partisan advantage, it does not matter what the actual situation is; they will still misrepresent it and try to make the better appear the worse side. The injury they do to business is incalculable, as their statements render capital timid and make labor discontented. The truth, which all should know, and which, with regard to the common welfare, should be proclaimed, is that while the trade of the country is not as active or prosperous as it has been in previous periods, it is gradually and certainly recovering from the effects of the depression that overtook it a year or more ago, and it is the practically-universal opinion of business-men of shrewdest judgment and long experience that the hard times, for both capital and labor, are disappearing, and that easy and good times are surely coming and are now well upon their way.—*Philadelphia Ledger* (*Ind. Rep.*)

WALL-FINISH USED BY SEMI-CIVILIZED PEOPLE.—The natives of the interior of Ceylon finish walls and roofs with a paste of slaked lime, gluten and alum which glazes and is so durable that specimens three centuries old are now to be seen. In Sumatra, the native women braid a coarse cloth of palm leaves for the edge and top of the roof. Many of the old Buddhist temples in India and Ceylon had roofs made out of cut stone blocks, hewed timber and split bamboo poles. Uneven planks—cut from old and dead palm trees, seldom from living young trees—are much used in the Celebes and Philippines. Sharks' skins form the roofs for fishermen in the Anadam Islands. The Malays of Malacca, Sumatra and Java have a roofing of attaps—pieces of palm-leaf wickerwork about three feet by two inches in size, and one inch thick, which are laid like shingles, and are practically waterproof. The Arabs of the East Indies make a durable roof paint of slaked lime, blood and cement. Europeans sometimes use old sails—made proof against water, mould and insects by paraffin and corrosive sublimate—for temporary roofs.—*Illustrated Carpenter and Builder.*

COLLAPSE OF BUILDINGS.—The records of failures in the Middle Ages rather indulge in religious than in practical explanations of the causes, and so we do not gain much practical knowledge from these examples, such as the fall of the towers of Winchester Cathedral in the twelfth century; of Gloucester Cathedral, in 1160; of Worcester Cathedral, in 1175; of Evesham, in 1215; of Dunstable Priory, in 1221; the smaller towers of Worcester Cathedral, in 1222; the tower of Lincoln, in 1244; of Ely Cathedral, in 1322; of Norwich Cathedral, in 1361; and the west front of Hereford Cathedral, in 1786; the central tower of Hereford would have fallen had not its impending ruin been observed and remedied. The old tower of Thurston Church, Suffolk, fell in 1860. Then we have the Chichester tower in 1861. The above small list of towers awakens the thought that special care is needed for all structures that are carried upon piers instead of upon continuous walls. But the description that has been given of the cause of failure in the Chichester tower would have been very applicable to many of the other cases. The lesson derived from the Chichester fall seems to be that rubble masonry should never be used in piers carrying towers or heavy work; it is a masonry suitable where bulk and weight are main objects, but it is inadmissible where unyielding vigor of pier is to be attained; it also suggests that in any such case a soft kind of stone is scarcely safe, even if it be of a sound nature; and the stone forming the facing at Chichester, though in some respects a good stone, was not suitable for a position where a crushing force was the chief force in action.—*Illustrated Carpenter and Builder.*

PINTURICCHIO'S FRESCOES BROUGHT TO LIGHT.—To Leo XIII is due the correction of an act of vandalism that, apart from everything else, should make his name respected in the mind of every lover of art throughout the world, says the Philadelphia *Times*, for it shows the refined tendency and the progressive ideas that animate him. The apartment in the Vatican that was occupied by Pope Alexander VI is now known as the Salon Borgia, and was famous 300 years ago for its frescoes from the brush of Pinturicchio, which were among the most beautiful then in existence, the most vivid in their colors, the most graceful in their composition, but the popes who succeeded Alexander VI were shocked by the worldliness and beauty of these incomparable mural adornments, and one of them, history does not particularize, but it is safe to assume it was the very first that had the opportunity, caused them all to be obliterated by a heavy wash of solid color that concealed even the outlines of that which had been the admiration in earlier years of the artistic world. In addition to this outrageous desecration, book-cases were put up against every wall, nails were driven and apparently deliberate carelessness was indulged in to the detriment of these frescoes. But when Leo XIII became the ruling spirit, his scholarly mind recalled the former splendor of the Borgia apartment, and he determined to restore its original appearance, if it were possible. The vandalism of 300 years ago would have appalled a less determined character, but the present pope went to work with a resolve that overcame every obstacle. He had the book-cases removed, the pavement taken up, and then he directed the talented Seitz, superintendent of the Vatican museums, to carefully remove the accumulations of centuries from the walls. This was done with the greatest delicacy possible, and soon a sufficient space was cleared to disclose the grandeur of that which had been lost to sight for so long. So soon as the prevailing character and coloring of the frescoes were learned, the pope caused a new floor to be laid, made of *faience*, and which in all respects would harmonize with the decorations. In the first salon, called the salon of the popes, because of the names of the many pontiffs that are inscribed upon the walls, M. Seitz has restored a series of landscapes in delicate little frames, all finished with an exquisite fineness, but, unhappily, some of them are badly chipped and marred from the nails and other mutilations of the walls. Between these frames are handsome caryatides that go up to the frieze. The decorations in this room are by Perin del Vaga and Jean d'Udine. The second salon is known as that of the Madonna, and is entirely the work of Pinturicchio. It is grand and superb. Covering the entire four walls from floor to frieze is an uninterrupted mass of painting that is unequalled, in its richness of color and the gorgeousness of its effect. The scenes are apparently painted upon a background of green stuff, over which runs a devious interlacing and golden arabesques. The frescoes of the third salon, known as that of the Saints, are simple and only remarkable because of the fidelity to real tapestry. The paintings of the fourth salon have suffered more than any others, and thus far they have only been able to restore the outlines of the frames, although sufficient of the pictures themselves are seen to understand that they were important and beautiful, but this particular salon had been transformed into a museum; heavy objects had been hung upon the walls, necessitating strong hooks or nails, and inscriptions had been mercilessly cut into the plaster and had, of course, destroyed whatever there was.

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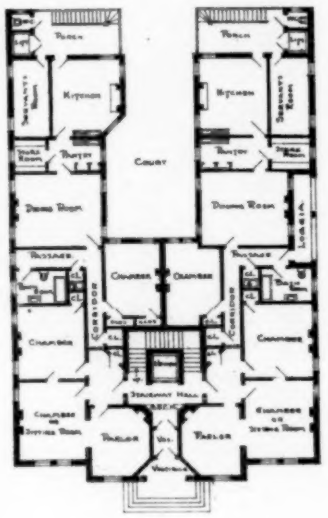
Design for an Apartment House,
Richmond, Virginia.

M. J. Dimmock, Architect,
Richmond, Virginia.



Plan.

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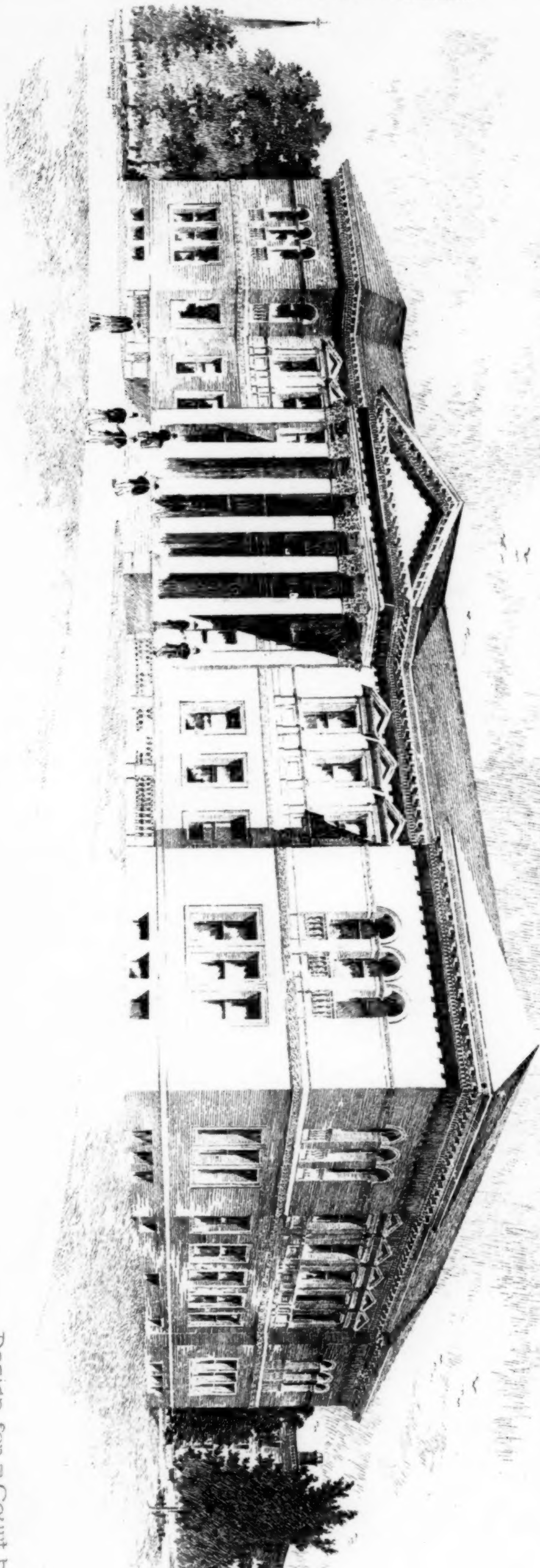

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Walter T. Littlefield, Archt.
Boston, Mass.

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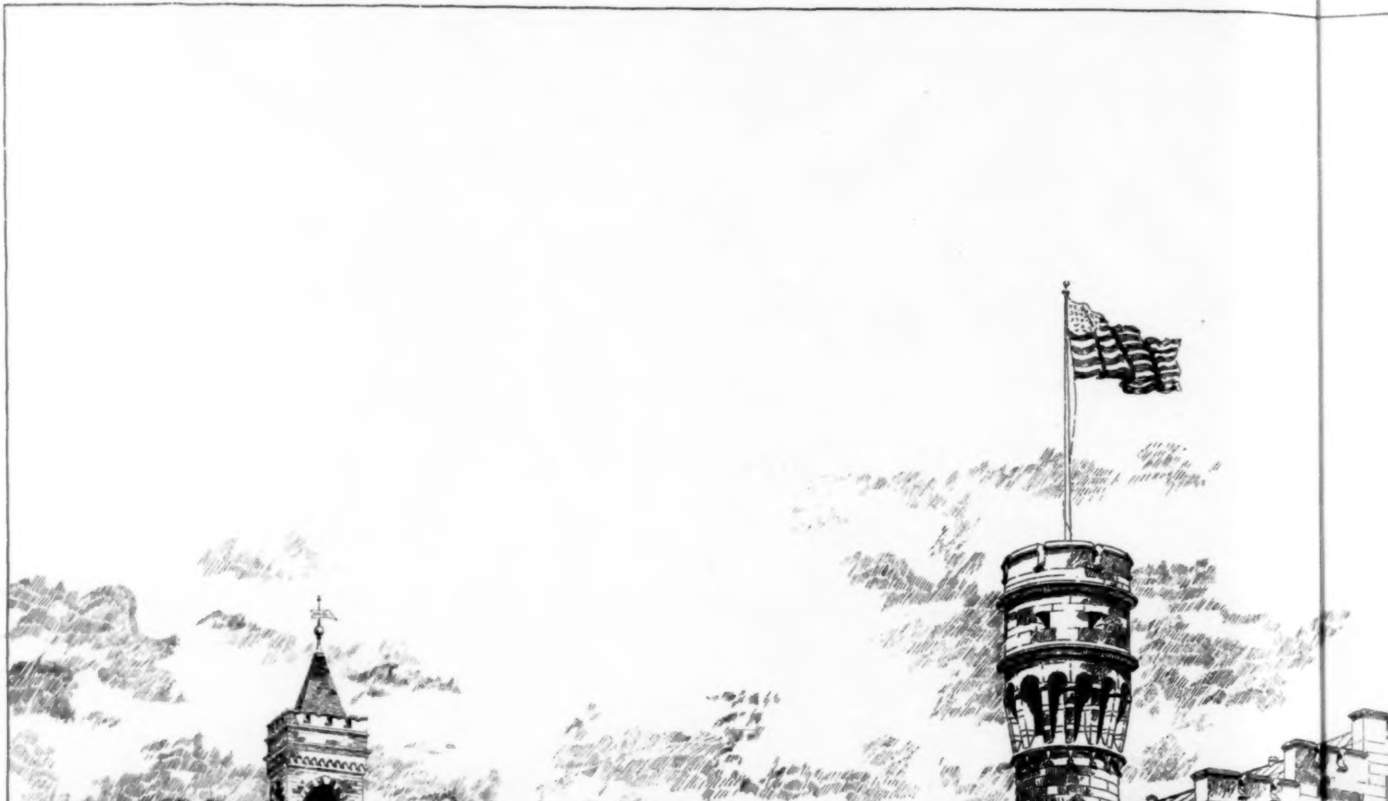

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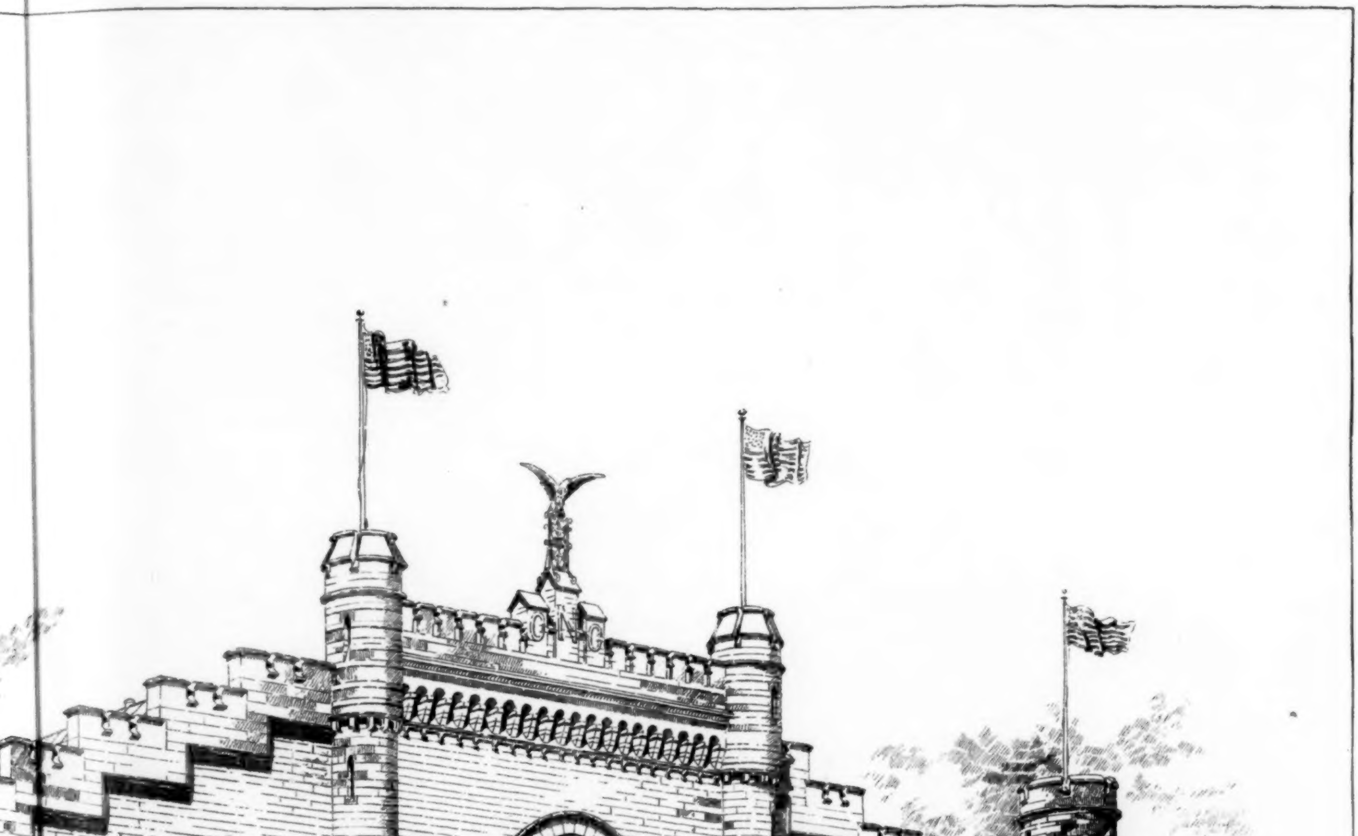

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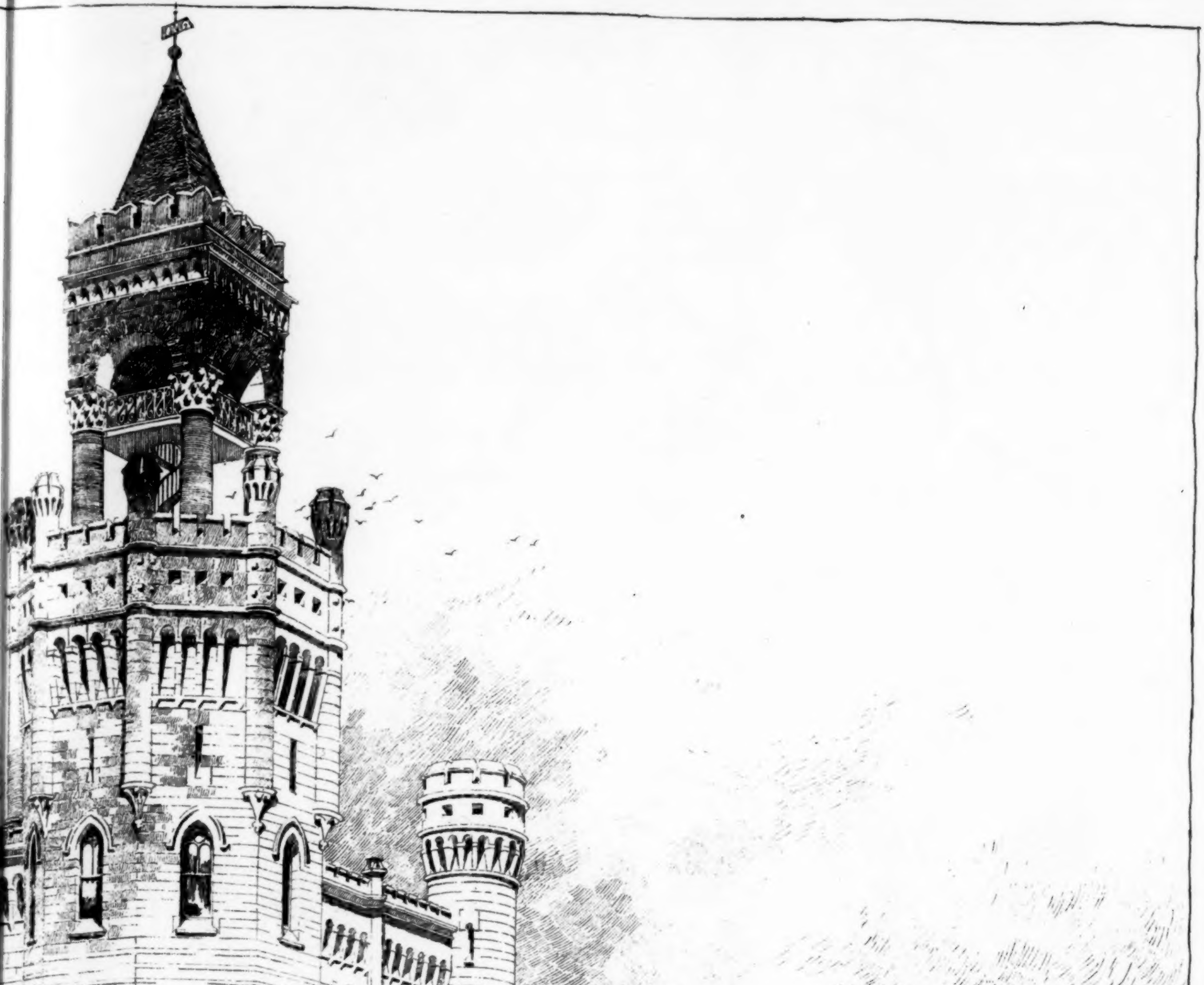

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