THE AMERICAN ARCHITECT

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Architectural Rambles in Brittany—IV

By A. KINGSLEY PORTER

The Cathedral of Quimper—II

THE history of the cathedral of Quimper as compiled by Le Men reveals interesting details in regard to the master-builders. Thus we find in the fifteenth century several examples of a priest master-builder. It will be recalled that there exists an old archæological legend to the effect that the builders were monks during the Romanesque period, but laymen in the Gothic period. I have elsewhere called attention to the fact that there were lay builders during the Romanesque period and priest-builders during the Gothic period. Building methods continued the same before as after the magical year 1140. The new data from the cathedral of Quimper further confirm what has, I think, already been proved abundantly.

QUIMPER, CATHEDRAL, INTERIOR FROM WEST ENTRANCE

The accounts of the cathedral are full of details which throw light upon the building trades. The spirit of joyousness which pervaded architectural art at this period breathes from every page. A characteristic custom was the fête of the masons, celebrated on the Feast of the Ascension. On that day the *procureur de la fabrique* was held to give to each of the *chantiers* of the church a sheep as a prize for a race or a wrestling match in which the workmen contended between themselves. In addition he gave a sum of money sufficient to pay for the dinner with which the festival ended.

Funds for the construction of the church were raised by a variety of expedients, some of which were picturesque. There was a rule that the body of no dead person, unless it was a prince, a prelate, a lord, or a canon, should be carried into the choir except upon the payment of a considerable sum of money. Every person buried in the other churches of the city had to pay a tax for the benefit of the construction of the cathedral. Indulgences were granted by the popes to those who should contribute to the completion of the building. At times a regular system of taxation was levied upon the parishes of the diocese, and failure to pay was punished by excommunication.

The canons belonging to the class of the nobility were probably predisposed to hostility against the burgesses of the city of Quimper. This natural dislike flared up into a sort of riot on Easter eve, 1514. The canons claimed that certain trade corporations were obliged to celebrate masses founded in favor of these associations in the cathedral. To prevent the corporations from with-

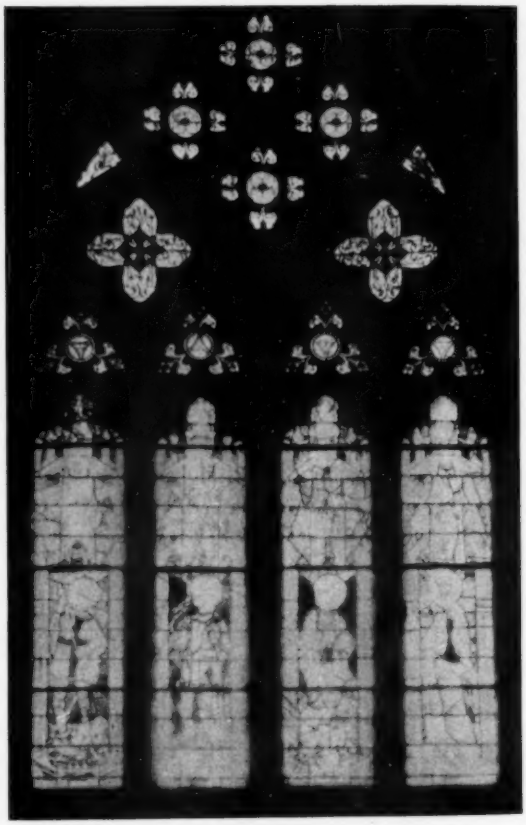
GROESKAËR WINDOW, CATHEDRAL OF QUIMPER

This window, the westernmost on the north clearstory of the nave, is the finest in the nave of the cathedral. The subjects represented are: 1, a kneeling canon before a prie-dieu on which is a restored escutcheon. This canon is Laurent du Groeskaër, who was canon of Quimper in 1496. He is presented by his patron, St. Lawrence. 2, St. Corentin, bishop of Quimper. 3, St. John the Evangelist. 4, St. Michael and the Dragon. It will be evident on comparison with the windows in the choir that the glass of the end of the fifteenth century has become more pictorial and more clear, but is losing its architectural character.

drawing to celebrate the functions elsewhere, the canons seized the ornaments and sacred utensils belonging to the guilds. The guilds thereupon refused to adorn the chapels of the cathedral with tapestries, as had been the custom. Moreover, they attempted to steal certain relics from the church.

Affairs took a serious turn on the occasion of the funeral of one of the master-builders of the cathedral, named G. Le Goaraguer. The canons of the cathedral accompanied by all the clergy went to the house of the deceased to bring his body to the cathedral where it was to be buried. The corporations also attended the funeral. A fight broke out between the canons and the corporations. The *bourgeois* of the city, armed with sticks, aided the workmen in attacking the clergy. In the *mêlée* the coffin was overturned, and the corpse was rolled in the street. It appears to have been the intention of the townspeople to throw the clergy into the river, but the canons succeeded in escaping, and took refuge in the cathedral.

The archives also throw interesting light on the construction of the vaults. It is evident that in the fifteenth century wood was exceedingly scarce in the neighborhood of Quimper, since it was imported for the roof from Brasparts and Pleyban. The cement employed in the vaults was encaustic, and there is preserved the recipe for its composition. Twenty-five pounds of resin were mixed with one pound of tallow. Le Men thinks lime was probably also added. Not only was the cement heated, but it was necessary also to heat the masonry to which it was applied. The heating of the stone made it necessary to cover the soffits of the vaults with a plaster wash. On a cream background were painted imitation stone joints. This decoration was destroyed in the nineteenth century, but traces are



WINDOW ERECTED BETWEEN 1417 AND 1419, CATHEDRAL OF QUIMPER

This is the second window from the transept in the north clearstory of the choir. The subjects represented are: 1, St. George and the Dragon; 2, St. Julien; 3, St. Margaret and the Dragon; 4, St. Catherine. Le Men describes the last panel as representing St. Catherine supported on a wheel, but as the window exists there is no wheel. The saint is crowned and haloed and holds a naked sword and a shield with a device.

THE CATHEDRAL OF QUIMPER FROM THE EAST

This is one of the most striking views of the cathedral, showing the towers and chevet to the best advantage. The eastern chapel has a square east end which possibly shows English influence. Originally, however, there may have been a rectangular apse. The traces of an older opening can be seen on either side of the eastern window. The tracery of this window, like that of the clearstory, is in the style of the third quarter of the thirteenth century.

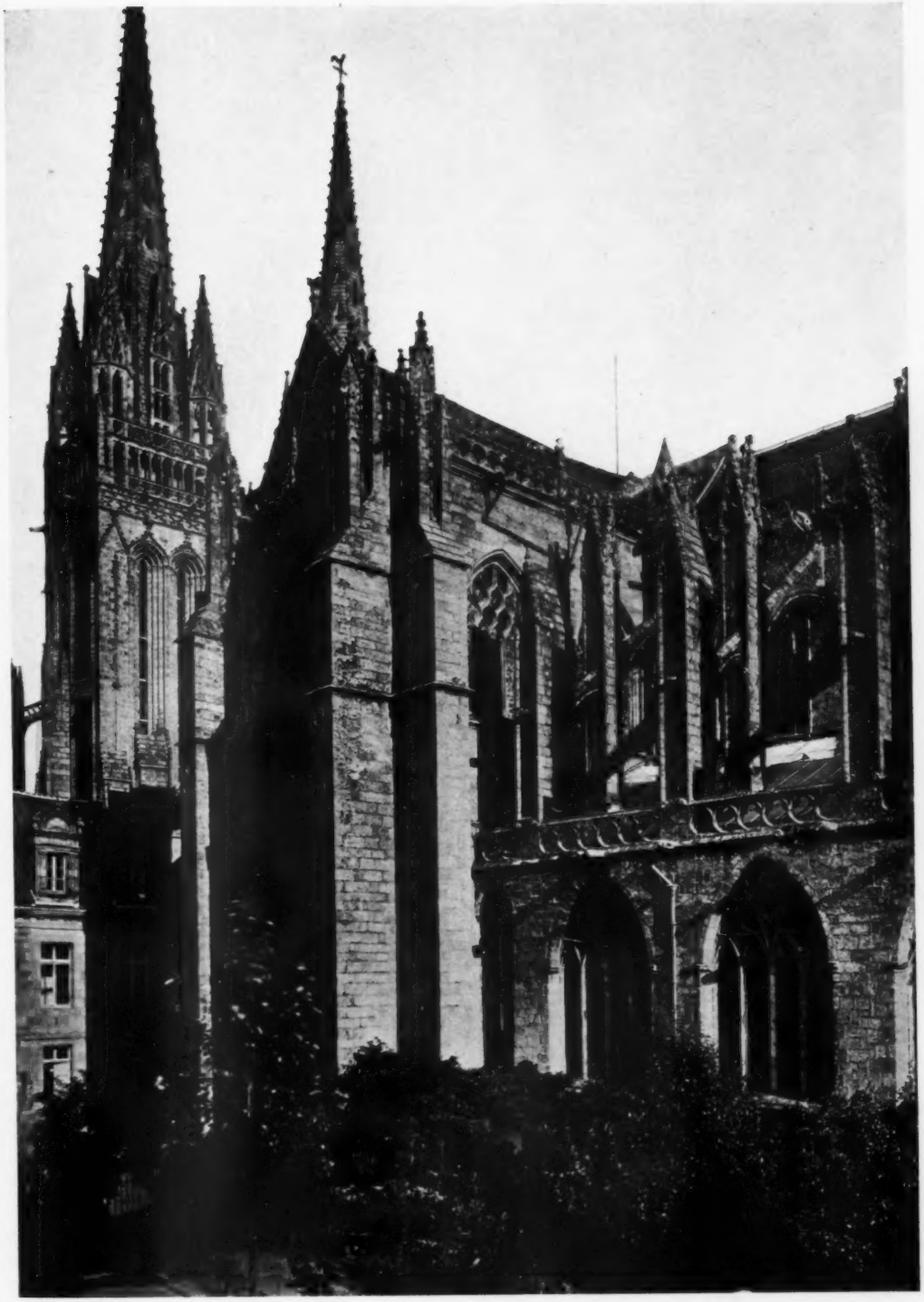
still in many places clearly visible. The stones of the vaults are of various sizes and shapes, averaging about 12 x 3 inches, and are disposed in courses more or less regularly horizontal. The vaults at the crown are about 8¼ inches in thickness. Above them still stands the ancient timbered roof in its original form, except that it appears to have been in part renewed in 1777.

From the standpoint of archæology the cathedral of Quimper is important, because it offers early and surely dated examples of several flamboyant features. Thus the arch of the east end of the ambulatory leading into the sacrament chapel offers a very remarkable instance of a continuous moulding dating not later than 1295. Although it appears to be due to accident, it may nevertheless have inspired the development of this motive destined to become so characteristic of the fifteenth century. The profiles of the two eastern piers of the chevet show veritable flamboyant wave mouldings. These also apparently date from the last quarter of the thirteenth century. In the south portal, which bears the arms of Jean V (1399-1442) and Bertrand de Rosmadec (1417-1444), there occurs a flattened arch.

SOUTHERN PORTAL OF THE CATHEDRAL OF QUIMPER

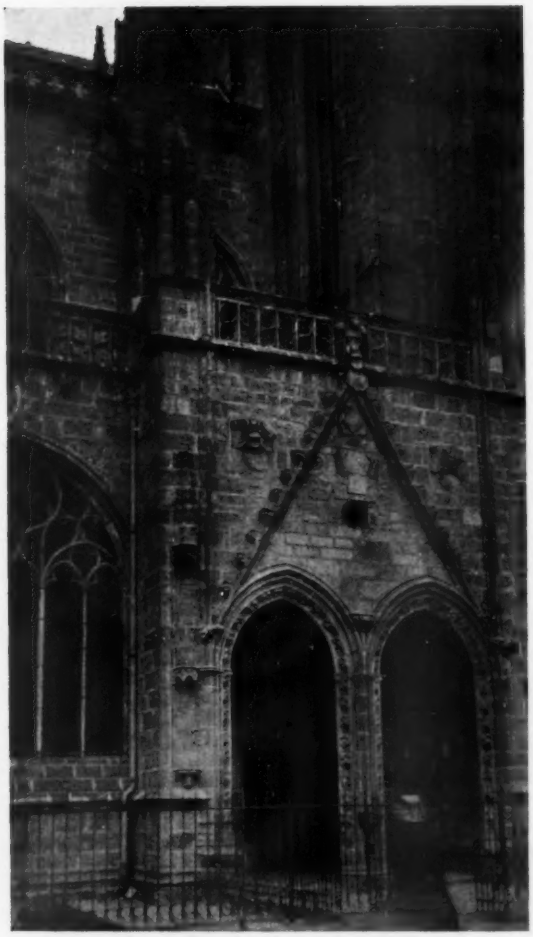
The Cathedral of Quimper is unusual in that the façade has only one, instead of three, portals. The side portals are placed on the sides instead of in the front of the building. The decoration of the Portail Sainte-Catherine marks the passing of the religious in favor of heraldic iconography. The escutcheons of nobles above the portal have come to assume equal importance with the religious figures in the tympanum and voussoirs. This portal also offers an early example of a flattened arch.

Few cathedrals of France possess as interesting stained glass as Quimper. If there is none of the golden age of the thirteenth century, there is in compensation an extraordinary series of windows of the fourteenth and especially of the fifteenth centuries, enabling us to trace the history of the art across these epochs of which the monuments are so rare. The windows, it is true, were almost all damaged at the time of the Revolution, when the coats of arms they bore were destroyed, and they have been very indifferently restored. Nevertheless, much that is of the greatest importance remains. It is fortunate that there are several indications of the date of individual windows. Thus the third window from the west on the north side of the nave clearstory contains the portrait of a canon who died in 1465. The fourth represents a man who was canon from 1486 to 1497. A window of the south transept is dated 1496. A canon of 1489-1497 is represented in the second window from the east on the south of the nave. This window seems to be later in style than the others on this side of the nave, and contemporary with those of the transept. The western window on the southern side represents Alain le Maout (1484-1493). Its style appears later than that of the earliest windows of the north side. The contrast in style between these excellent examples of the second half of the fifteenth century and the windows of the first half of the century in the choir is very marked. In the latter the figures are small and placed in large elaborate niches composed almost entirely of white or gray glass. White predominates even in the figures themselves. Such colors as are introduced are for the most part light and delicate, pale blues, thin greens, ochres and the like. The fields of color are comparatively small.



CATHEDRAL OF QUIMPER FROM THE SOUTH-EAST

The views of the cathedral from the bishop's garden are particularly satisfying. The fine spires mass effectively with the buttresses and the transept. In the southern ambulatory can be seen tracery of the fourteenth century of archæological interest because of the rarity of examples of this epoch.



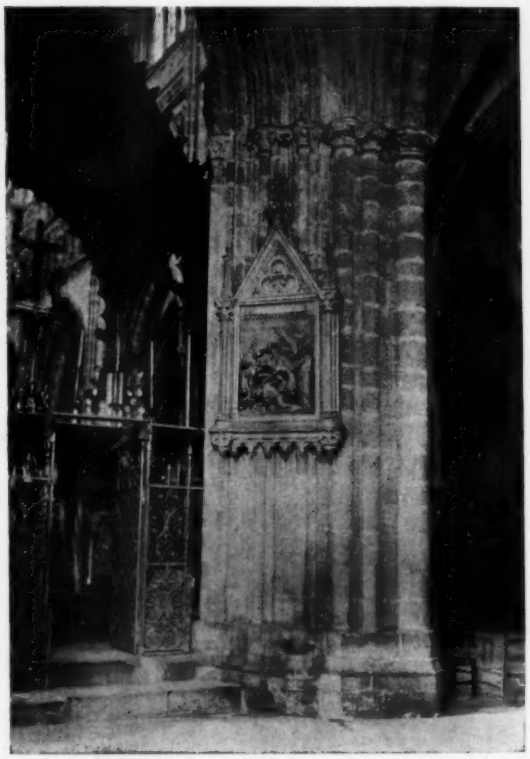
NORTHERN PORTAL OF THE CATHEDRAL OF QUIMPER

This porch was erected after 1442 and is therefore later than the southern porch. The religious iconography has entirely disappeared, and (at least, now) the only symbolic decoration consists of heraldic devices. The balustrade surmounting the porch is designed with peculiar charm.

Occasionally a large piece of scarlet or green is introduced, a jarring note presaging the art of the sixteenth century. In general the figures are indistinctly drawn, the outlines difficult to determine. It is a delicate, architectural art, not so rich nor so overpowering as the glass of an earlier epoch, but dainty and refined.

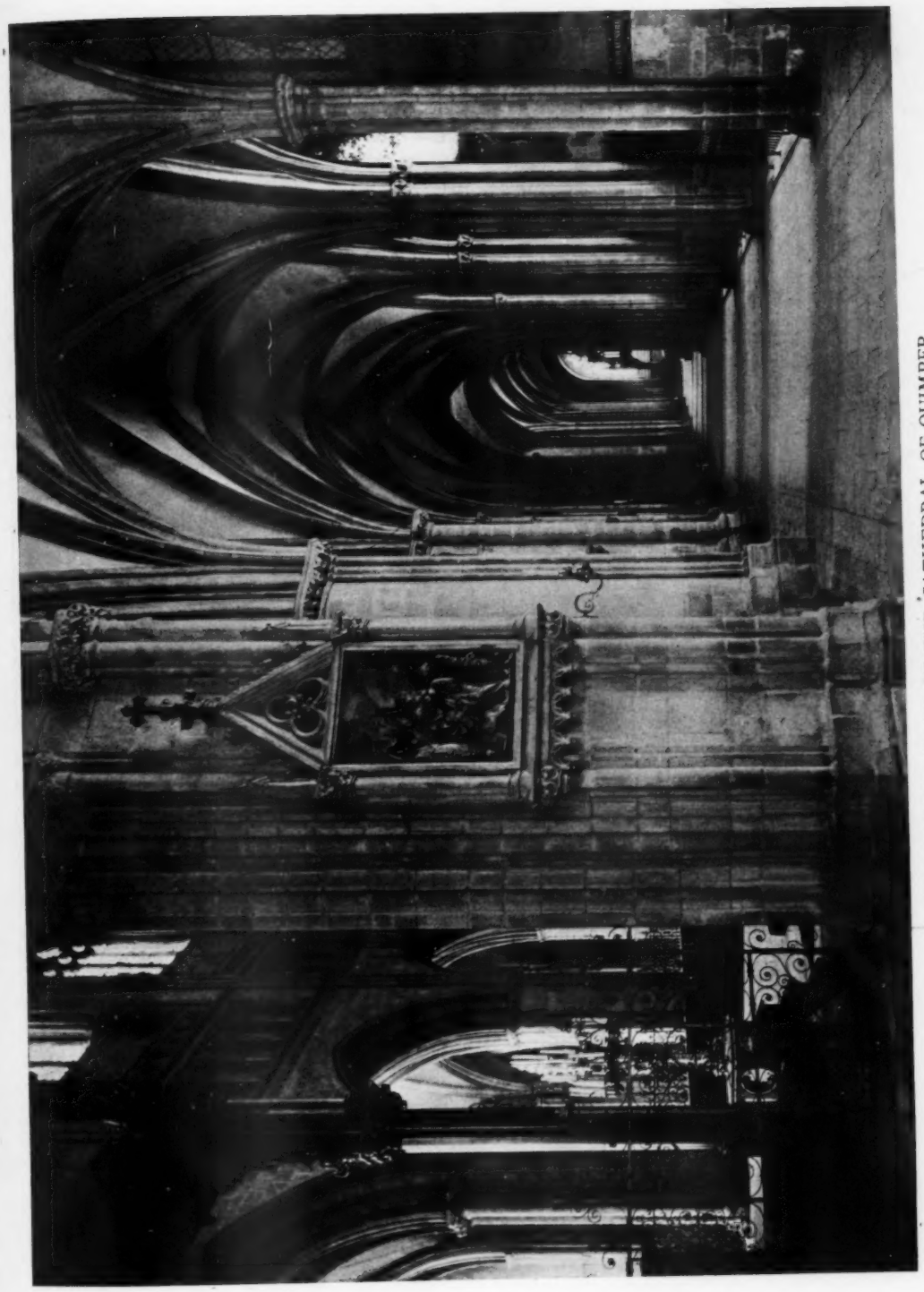
The glass of the nave, on the other hand, is very uneven in quality. At its best it is far more virile than that of the choir. White is employed, but in much less quantity. The colors are striking and decided, at times even dashing. The picture leaps out from the surface of the window. It is impossible to miss even the smallest detail. The fields of color are much larger, the tones far more robust. The drawing is no longer done in a sketchy impressionistic manner, but in a realistic style that leaves nothing to the imagination. The niches and architectural accessories are highly colored, and stand out like a perspective picture. As yet little use is made of shade or *chiaroscuro*. The backgrounds are given texture by brocade patterns worked upon them. The details of the finger nails, the ornamentation of the dresses and sword hilts are executed with the painstaking accuracy of a miniaturist.

The asymmetries of the cathedral of Quimper are particularly striking. The cathedral offers perhaps the finest example of a deflected choir that I have ever seen. This deflection is not as might appear from a casual inspection in the form of a straight line, but is a delicate S-shaped curve extending not only in the choir, but also in the nave. The character of this curve presents notable analogies with the deflection at St.-Ouen of Rouen, already described by Mr. Goodyear. The church also contains a fine example of the widening refinement. In the choir the piers are straight. Between the capitals



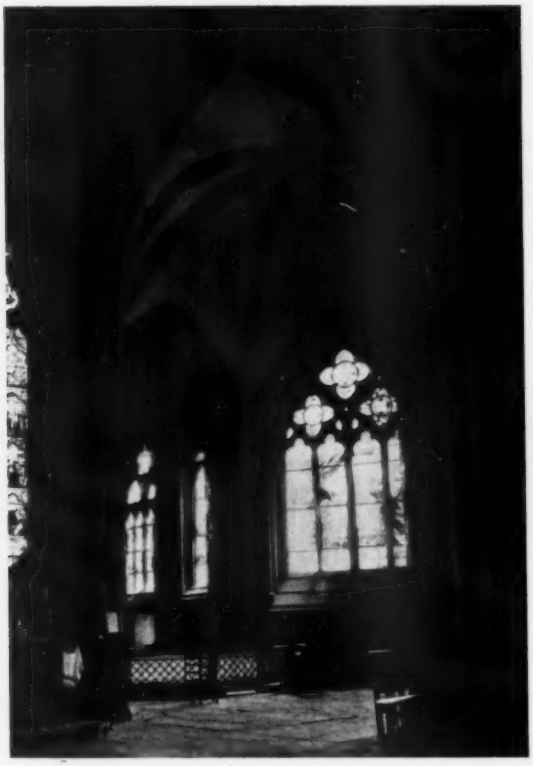
EASTERN PIER OF THE CHEVET CATHEDRAL OF QUIMPER

This pier, as indicated by documentary evidence and the character of the capitals, dates from not later than 1280. The wavy profile of the colonnettes engaged upon the pier is, I think, the earliest known example of an important flamboyant motive.



NORTHERN SIDE AISLE OF THE CATHEDRAL OF QUIMPER

The deflection of axis is even more strikingly visible in the side aisles than in the nave. The apparent length of the cathedral, as well as its æsthetic charm, are greatly increased by this device. In this photograph the character of the thirteenth century capitals and bases executed in the stubborn stone of Brittany may be studied.



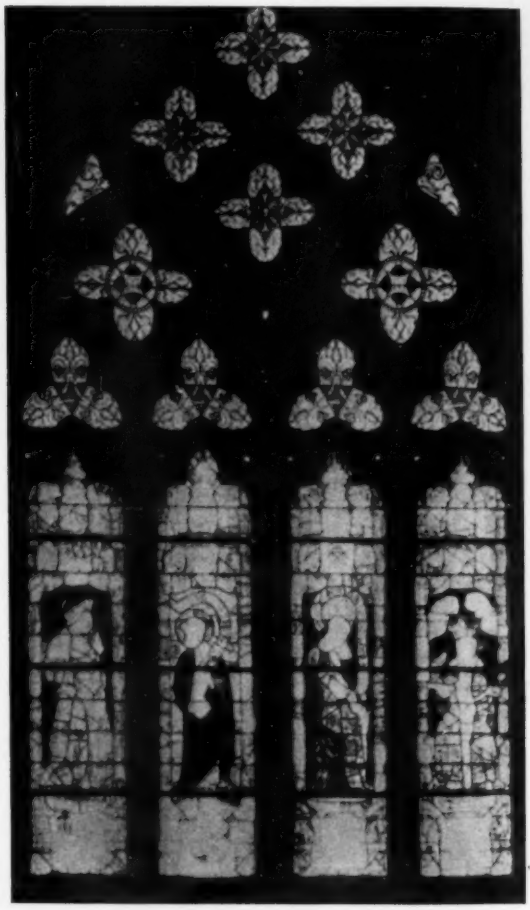
VIEW IN THE AMBULATORY, CATHEDRAL OF QUIMPER

To the left is seen the entrance to the Chapel of the Sacrament. Over this arch are continuous mouldings which must have been executed not later than 1295. This is an early instance of an important flamboyant motive. The eastern vault of the ambulatory is sexpartite.

and the triforium the wall leans outward, as does also that between the triforium and the vaults. Externally, the upper part of the wall actually leans inward; that is to say, it has a battened or pyramidal form. It is thinner at the top, wider at the bottom, and the slope seems to be about equally divided between the interior and exterior facings.

As regards general style, the cathedral of Quimper is notable as one of the earliest Gothic monuments in Brittany. In this connection, it is interesting to note that the bishop, Rainaud, who began the construction in 1239, was a Frenchman. Certain it is that the style of the church on the whole is French. The hard stone of Brittany has caused the carving to lose the delicacy usual in the Ile-de-France, but the details as well as the broad structural features of the church are fundamentally French.

With this French foundation there is combined influence from England and from Normandy. The former appears in the complicated mouldings of the archivolts, the multiple rib vaults, the mouldings of the choir arcade, the north porch (which, by the way, is later than the south porch, since it bears the arms not of Jean V, but of François II), the triforium of the nave, the square east end of the sacrament chapel, the absence of a system in the nave, the horizontal balustrade between the spires and the towers, and the tracery of the upper windows of the west façade. It is obvious that the English influence was stronger in the fifteenth century than in the thirteenth, which is interesting in view of the fact that the flamboyant style originated in England. Norman influence is evident in the balustrade of the clearstory, in the spires (which, although modern, are correct restorations), and in

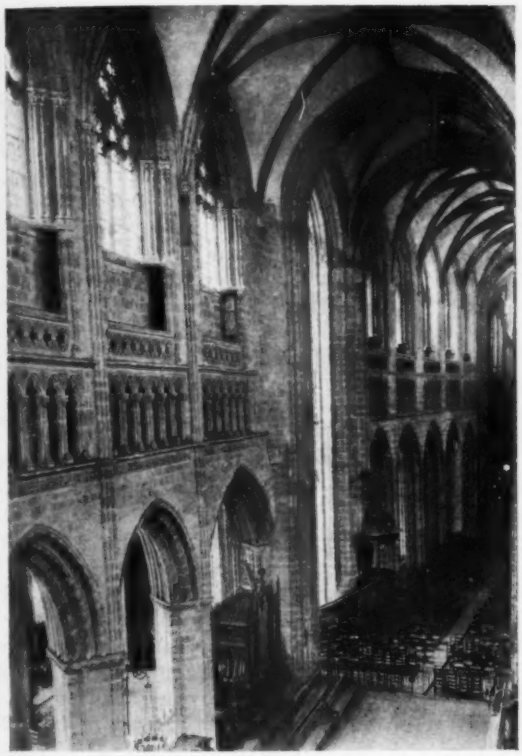


WINDOW ERECTED BETWEEN 1417 AND 1419, CATHEDRAL OF QUIMPER

This is the third window from the transept on the north side of the choir. Although much restored, especially in the upper part of the tracery, it offers an excellent example of the glass of the first quarter of the fifteenth century. The colors are delicate, the drawing indistinct. The four panels represent: 1, a kneeling canon presented by a saint whom I am unable to identify; 2, St. Peter holding in one hand a book (in the other hand, in the time of Le Men, he held a key, but this has disappeared); 3, St. Paul holding a sword; 4, the Holy Trinity.

a gargoyle on the southern side of the nave, which offers the closest analogy with a capital in the organ loft of Aversa! The somewhat debased style of the cathedral is indicated by the fact that many of the gargoyles are purely decorative, and could never have been intended to throw the water from the walls, since there are no grooves on the backs.

Near the cathedral formerly stood two interesting accessory structures. One was the baptistery, which existed until the fifteenth century. The other was the charnel-house, destroyed during the restoration of the nineteenth century.



INTERIOR OF THE CATHEDRAL OF QUIMPER

Another photograph showing the S-shaped deflection of axis and the widening of the piers and wall. Although built nearly two centuries later, the design of the nave does not differ radically from that of the choir. The most notable difference, aside from the character of the details, is the fact that in the nave the system is omitted. The ridge rib introduced in the vaults doubtless shows English influence.

Although deprived of these and many other details of great interest it once possessed, the cathedral of Quimper still remains a monument of very exceptional importance. I confess that it possesses for me an extraordinary fascination for which I am not altogether able to account on either archæological or artistic grounds. The picturesque legends connected with the building and the quaint charm of the city of Quimper itself have doubtless increased its glamor. An even more cogent charm, however, is, I think, to be found in the fact that the cathedral is to a singular degree unspoiled by contact with the nineteenth century. It is free alike from the defiling touch of tourists and—to a large extent—from the restorations which have destroyed the beauty of so many mediæval monuments.

WINDOW DATED 1496, CATHEDRAL OF QUIMPER

This is the southern window in the east wall of the southern transept. Although much restored, it is of particular interest because its date is determined by the following inscription:
(Lan) mil CCC(C). III(I). xx XVI fut maistre Gefre de Tre(anna archidiacre) du Mans chanoine de ceste église recteur de Craozon.
The subjects represented are: 1, a canon presented by the bishop St. Eloi, who holds a hammer in his right hand; 2, Ste. Geneviève of Paris; 3, Christ holding the Cross; 4, St. Martin of Tour dividing his cloak with a beggar; 5, a kneeling canon presented by St. Anthony. The two canons are Geffroy and Rioc de Tréanna, elected to the chapter in 1486. The window has been radically restored, and has undergone great changes since Le Men described it in 1877.

Recent Books

OVER THE DRAWING BOARD. A Draftsman's Handbook. By Ben J. Lubschez. Full cloth, 120 pages, size 5 x 7½, published by The Journal of the A. I. A., Washington, D. C. Price, $2.

While there's "no royal road to learning," there is no doubt that in our pursuit of knowledge we may hasten our journey by association with those who have traveled over the course and who unselfishly retrace their steps to help the student on his way. Mr. Lubschez has performed a service of this nature in the preparation of this interesting and instructive volume.

While a book of this sort needs no apology for its making, the author states in a preface the reasons that prompted him to publish it. He refers to conditions in drafting rooms with which we are all familiar, to the groups gathered during the luncheon hour to discuss the work in hand, and to the interruption, when some more than usually interesting problem is being worked out, that everyone might have opportunity to learn of it.

It is information picked up at such times that constitutes a very large part of the draftsman's education. In fact, it is, in a sense, a post-graduate course. All of these things the author has set down clearly and concisely. The book is decidedly worth while.

FURNITURE OF THE OLDEN TIME, by Frances Clary Morse. Full cloth, 470 pp., size 5½ x 8 inches, with more than 400 illustrations. Price $6.00. New York, The Macmillan Co.

The tendency developing from early in the seventeenth century to apply elements of good craftsmanship to every article of domestic utility naturally found in furniture its widest opportunity. The progression from the "settle" through various forms to the elaborate and highly developed styles and types of furniture of the present day reflects the advance in domestic refinement of the entire world.

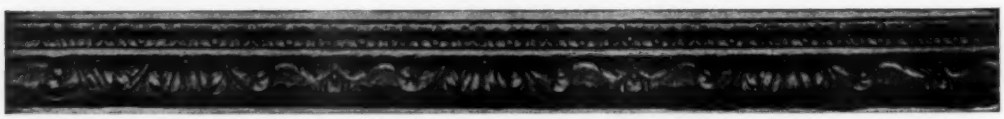
To dwellers in this country no type will have greater appeal than the often mis-called Colonial. What is more generally meant by the much-abused word Colonial is Georgian, or those types that had their origin in England during the reigns of the Georges, and which, when the colonists came to this country, were brought here as part of the *lares* of the emigrants.

There is some authentic record of furniture makers of repute who plied their craft during the early Colonial period in this country. It is certain, however, that most of the authenticated examples extant were made by local cabinet makers. That they are mute witnesses to a high degree of craftsmanship and attest the skill of their makers is indisputable.

The ubiquity of collectors has served to bring to light all of this old and prized furniture, and books written to describe it have been very much a repetition, in text and illustrations, one of the other.

The book under discussion, however, is unusual in its presentation of very many interesting examples that will not be familiar to the casual reader, and may perhaps be equally unknown to many collectors.

In the four hundred odd illustrations every type of furniture is illustrated, and they are all thoroughly described in the thirteen chapters which comprise the book. For this reason this book will form an interesting addition to the library of the collector, and because of its wide, suggestive character will be valuable to the architect who may be engaged in furniture design. The author wisely refrains from any attempt at classification of period styles. While there might, in certain well-known examples thoroughly authenticated as to date and authorship, be assigned a definite "period," the influence of well-known makers in England and France has been so thoroughly shown in furniture built in this country as to make a true designation of period impossible. Because of this the date of make is set forth by the author, and a simple statement as to the probable influence in design.



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Government Restriction of Building

ELSEWHERE in this issue is published the report of a committee, representing the Indiana limestone industry and other commercial interests in the same section of the country, which visited Washington in March to present resolutions urging a more liberal policy on the part of the Government toward the great building interests.

The report sets forth in clear and forceful language the extremely bad condition brought about by unwise restriction of building activities, largely due to lack of knowledge on the part of those issuing the instructions.

This journal has already called attention to these matters, as have also some of the ablest financial authorities of this country, both in the public press and in pamphlet form.

The investigator approaching this question with an open mind will find that the condition existing in a single industry as presented in this report is equally deplorable in others, and will be convinced that relief is necessary.

Associations, organizations or representatives of every other branch of the construction field should follow the example of this committee—formulate strong statements and send a committee to Washington to impress the importance of the subject on the authorities there.

Postal Rates and Postal Service

FROM the standpoint of service, the postal establishment of the United States has deteriorated greatly in the last ten years. A decade ago the mails were handled with extraordinary dispatch. First class or letter mail and second class matter, composed of publications admitted to transmission at second class rates, were given preference over other classes. A letter or a publication mailed in Chicago before noon was reasonably certain of delivery in the business district of New York during the forenoon of the second day thereafter. Transcontinental service was hardly as rapid as it might be to-day, because then the railroad schedules across the continent were somewhat slower, but it was safe to assume that any piece of first or second class mail, barring accidents, would be delivered as quickly as the railway mail service and a highly efficient distributing force could get it to its destination.

To-day the Post Office is making a profit in place of the loss it was sustaining ten years ago. Perhaps the reasons may be traced through a few recent and typical examples:

A letter mailed in the Loop district of Chicago, correctly addressed to a publication office in the business district of St. Louis, with postage fully prepaid, was seven days in transit. The railroad time between the cities is eight hours.

A copy of THE AMERICAN ARCHITECT, mailed in New York on Wednesday, was delivered at a residence address in Flushing, Long Island, which is within the limits of New York City, on the afternoon of Monday of the following week.

Actual tests by the New York branch of a large western industrial concern have demonstrated that an ordinary three-cent letter passing between the home office of this concern in Chicago and its New York branch—in either direction—will be delivered more promptly than a special delivery letter on which 10 cents additional has been paid.

Hundreds of publications are displaying prominently in their columns notices advising subscribers that on account of the condition of the postal service delays in delivery are unavoidable and must be expected.

Thousands of business houses have doubled their use of the telegraph because the mails are undependable.

But the Post Office Department is making a profit.

Meanwhile, Congress has enacted a law which, if not repealed, will increase the postage on publications to a tremendous extent and will compel the mailing of all publications under a zone system similar to that applying to parcel post mail; a sys-

tem that is going to cost publishers enormous sums of money for sorting and zoning their mail, that is going to force publishers to increase the subscription charges against their subscribers located at long distances, the heaviest burden in most instances falling on that portion of the public located in the South and the far West, and is going to necessitate the employing of great numbers of additional clerks in the postal service at a time when efficient clerical service is almost unobtainable in connection with really important enterprises.

Thus, despite the fact that the Post Office Department is either unwilling or unable to handle the mail service of the country with reasonable speed, a law that tremendously complicates the work of the service goes on the books to cripple the publishing business of the country, regardless of the fact that the publishers have rendered loyal and patriotic service to the Government in every possible way in connection with the present great emergency.

All of this would seem a sufficiently unfortunate combination of circumstances; but it is not all. The country is suffering from an actual shortage of print paper, a tremendous volume of which is used in the printing and circulating of that class of "direct mail" advertising literature with which every professional man's waste basket is so intimately acquainted. But Congress, though it raised the rates on letter mail, on postal and mailing cards and on publications, allowed the old rate of .1 cent for two ounces to continue in effect on third-class mail, which includes all miscellaneous printed matter except books. Thus the already overloaded mail service continues to be choked with millions of pieces of mail matter that accomplish no good except to yield a profit to the printer, but that have to be hauled, sorted and delivered to addressees who in most instances have so little respect for a 1-cent stamp that the matter it accompanies is discarded without even casual inspection.

The increase in second-class mail rates will be paid by the consumer, of course. If he is willing to pay it, if by his silence at this time he fails to force its repeal, the ultimate outcome will be a little more revenue for the Government and a lot more jobs for the faithful. But the zone system, with its tendency to divide the country, to put a premium on the widespread dissemination of periodical literature, is sure to work unfortunate results and eventually must fail because it is un-American to apply the same principle to the fixing of postal rates on educational literature and on fresh eggs or farm implements. Periodicals and merchandise hardly belong in the same class.

The people of the United States were long trained to expect efficient handling of the mails. The principle underlying the postal service has not changed. "Neither snow nor rain nor heat nor gloom of night stays these couriers from the swift completion of their appointed rounds." These words were not descriptive of a service operated for profit, which seems to be the present obsession. But the question remains: If the American people are going to submit to these increases in postal rates, are they going to continue to tolerate the present inadequate and inefficient service?

A Green Operating Room

The educational bureau, scientific section, Paint Manufacturers' Association of the United States, presents in circular No. 54, an interesting experiment in the decorating of operating rooms in hospitals. The subject is presented by a reprint of an article appearing in a recent issue of *The California State Journal of Medicine*. The article was contributed by Dr. Harry M. Sherman, under whose direction the experiment in decoration was conducted.

Dr. Sherman writes, in part, as follows:

The discomfort I have had in the present-day white operating rooms led me to suggest that we have dark floors and wainscots in these rooms, so that the operator who looks up from a wound shall not encounter a glare of light and find his eyes useless for a moment, as he looks back into the less well illuminated wound. The color scheme, it seemed to me, should start from the red of the blood and of the tissues, therefore I advised that green, the complementary color to red, should be chosen for the color of the floor and wainscot. The particular shade of green to be selected was the green of the spinach leaf.

A room painted in this way, the floor and the walls for six feet from the floor, a bright spinach green, and all above a glazed white, was matched for use against a room painted a glazed white—floor, walls, and ceilings—in the little operating pavilion built at St. Luke's Hospital. No one who could get into the green room to do an operation ever went into the white room, and after some months of this experience the point was accepted as settled sufficiently to warrant the innovation of a room similarly colored in the operating suite in the new hospital. Here, however, we could not get in tiles as close an approximation to spinach green as we could in paint; the tile for the floor had to be duller and darker and that for the wall darker, but the two shades harmonize and answer the purpose perfectly of preventing the bright daylight from being reflected upward from walls and floors into the eyes.

Above the level of the six-foot, green wainscot is white encaustic tiling to the ceiling, and the ceiling itself is a bright buff. This arrangement imitates fairly well the optical environment out in the fields or among low bushes, where the ground of the surroundings, to above the level of the eyes, is green, and the sky overhead is full of white daylight. This, again, is the optical condition for which the eye was originally adapted by natural selection, and it seems only right to reproduce this condition for the eye when it is to be relied upon for quick and accurate work; while the condition of the greatest eye strain—the dead white and glare of snow on ground and bushes—is the optical condition reproduced by the white rooms and the white furnishings.

The green room is lighted by a window which gives us a northern light, and it reaches from about three feet above the floor up to the high ceiling. At first this window was glazed with ground glass, but it was at once seen that the room would bear much more light than the ground glass permitted, for the excess of light, the useless light which fell upon the floor and the lower part of the walls and could not be reflected thence on to the operating field, but could be reflected from a white floor and white wainscot in the eyes of the operator, was all absorbed by the green floor and wainscot. Therefore, the ground glass was taken out and transparent glass put in, giving a distinctly brighter illumination of the operating field. In working with this it was soon noticed that the light reflected into the operator's eyes by the white sheets and towelings was as dazzling and as interfering as was that reflected from the floor, and so the same color scheme was followed out, and green toweling and green sheets of galatea were provided. The color in these however, did not stand the superheated steam in the sterilization. They became a dingy gray. I then decided to surround the whole operation field with black, as giving a surface from which no light whatever could be reflected, using it around all wounds. I not only had sheets and towelings of black, but I had black gowns made, and the coverings for the instrument tables were all of black; and I found that they were exceedingly satisfactory. The only objection I have heard urged against them was the superstitious fear that people coming up for operation would see this somber accoutrement and consider it a color of bad omen. This has proved to be a groundless fear, for patients who have had work done upon them under local anesthesia have expressed no objection to the black dress of the operator, nurses, and room.

In the new hospital, as in the old operating pavilion, there is a very decided preference among operators for this green room, as against the other operating rooms, which are finished in the conventional encaustic tiling; and those operators who have taken advantage of the whole equipment, and have used the black table coverings, towelings and sheets, and the black gowns, have appreciated the improved optical conditions which they gave, for the eye was not compelled all the while to receive light rays from every direction when the only rays it wished to receive or needed were those that came from the wound itself.

War Conditions in Building Trades

Report of a committee on the call at Washington, D. C., March, 1918, regarding war conditions in the building trades in general and the Indiana limestone district in particular.

THE committee consisted of W. E. McCormick, president of the Bedford Chamber of Commerce, and R. M. Richter, secretary of the Bedford Stone Club.

It carried with it the original signed resolutions adopted at the meeting of all commercial interests of Bloomington and Bedford, February 26, 1918.

On the afternoon of March 7 the Indiana congressional delegation met at the office of Senator New to discuss the situation with the committee. There were present Senators New and Watson and the following members of the House: Messrs. G. K. Denton, O. E. Bland, W. E. Cox, Lincoln Dixon, R. N. Elliott, Merrill Moores, A. H. Vestal, W. R. Wood, L. W. Fairfield, H. A. Barnhart.

The only absentees were gentlemen who were out of the city at the time. The non-partisan nature of the gathering is evident.

The committee presented the resolutions formally and then went into a detailed account of the situation in Lawrence and Monroe counties, Indiana.

Aside from the direct question of producing war supplies and having Indiana limestone used to a greater extent in permanent Government buildings arising on all sides, considerable time at the conference was devoted to the general economic and public welfare issues at stake. Figures were quoted showing that Monroe and Lawrence counties had exceeded by a generous margin in each instance their allotments of Liberty loans, Y. M. C. A., Red Cross and other war fund contributions, not to mention man power furnished.

It was emphasized that the Indiana limestone industry is the mainstay of both these communities, involving as it does an investment aggregating well in excess of $10,000,000, employing normally something like 5000 men, with shipments nation-wide and ranging from 20,000 to 30,000 carloads annually.

Those present were told that the industry is already depressed below 25 per cent of normal and that not to exceed 1,000 men are now at work, where the full complement of 5,000 would ordinarily be on the payrolls at this time of the year. The condition was outlined under which the district has always in the past emerged from the winter's interruption into spring operations. That is, the companies invest large sums in stocks in raw material, depending on early spring business for the conversion of these into cash. The men depend largely on credit extended them by merchants to carry them through the usually brief period of idleness. As matters stand, the raw material remains stock on hand and store credit for the men has been canceled. Many competent employees who never knew unemployment have not earned one cent so far this year. Numerous families already are dependent on charity. Individual instances of destitution and want were cited.

It was freely admitted that quite a number of men had left the district and found employment elsewhere, but nevertheless a large contingent remains in its home cities for various reasons. Some spent precious money to find work elsewhere but were unsuccessful and returned; some found only temporary employment elsewhere, and returned; a good many had not the wherewithal to travel, so perforce stayed home, hoping against hope for an opportunity to make a living.

It was argued that labor is mobile to a degree only and that an artisan skilled in one line mastered in twenty or thirty years' effort cannot quickly, if at all, become proficient in an entirely new craft.

Some discussion was had on the present general policy of discouraging all commercial building operations. The committee made it clear that it did not expect normal activity, but did believe industry should be permitted to live so long as it does not interfere with war matters and that in fact some industrial life is necessary with its production of new wealth enabling important communities to contribute properly to war financing.

It was submitted for the consideration of those present that the war cannot be successfully financed out of the wealth created in the past, but that continued production must furnish constantly increasing wealth, lest our tremendous expenditures outrun the available supply of old capital.

Not one of those present expressed disagreement with the arguments offered, but rather there was manifested a unanimous disposition to help influence the situation so as to maintain public welfare at a stable level and thus instill in the people confidence and give them the power to help win the war.

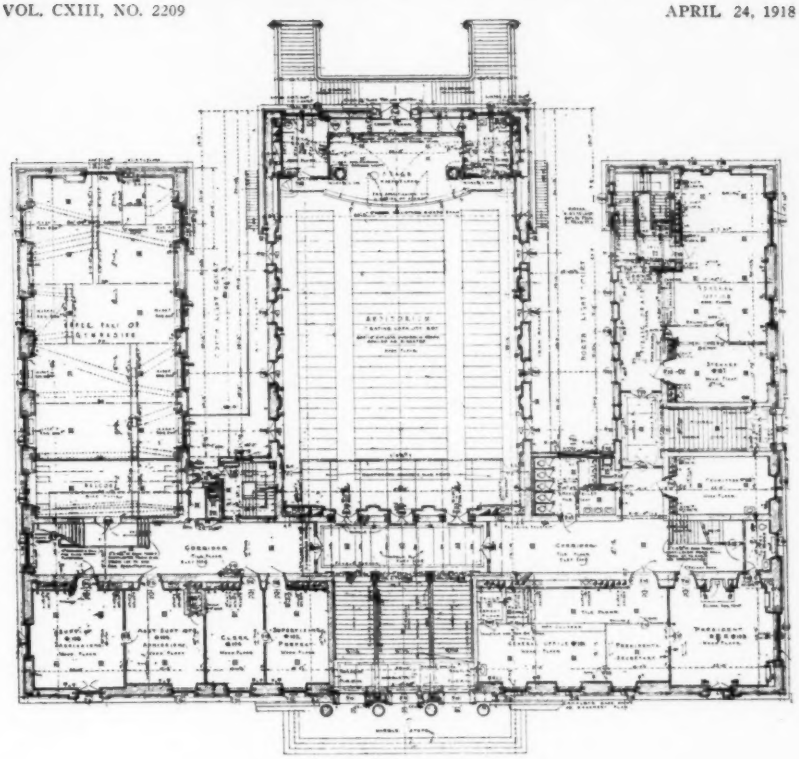
It was mentioned that it is the purpose shortly to call a meeting of associations interested in building materials of national importance, for the purpose of crystallizing the practically universal sentiment that, to the extent that it does not interfere with war purposes, the industrial life of the nation must go

PLATE 142

HIGH SCHOOL BUILDING, GIRARD COLLEGE, PHILADELPHIA, PA.

JOHN T. WINDRIM, *ARCHITECT*

VOL. CXIII, NO. 2209 APRIL 24, 1918



FIRST, OR MAIN, FLOOR PLAN

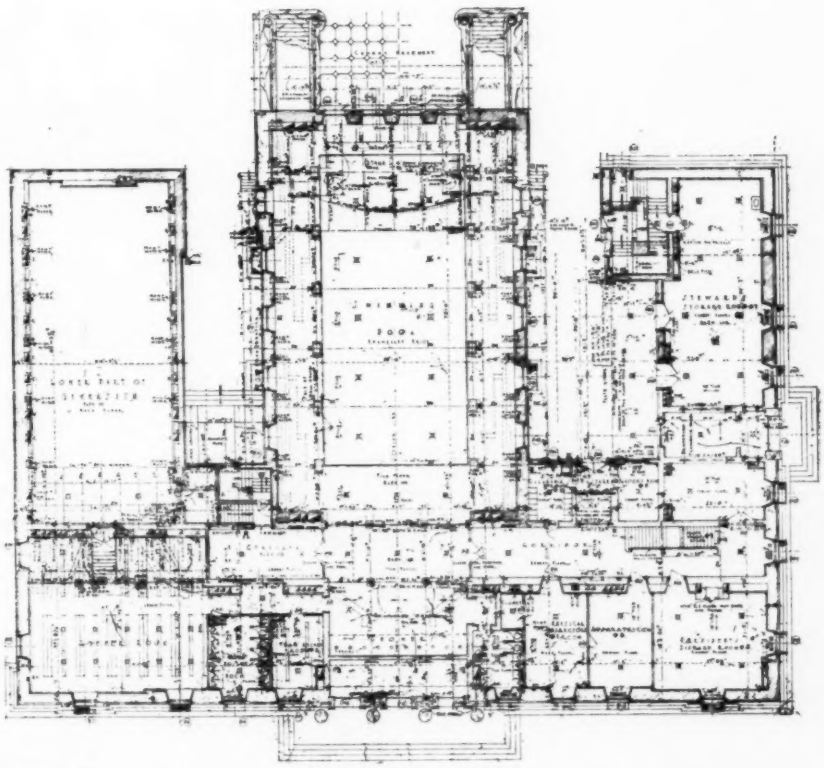
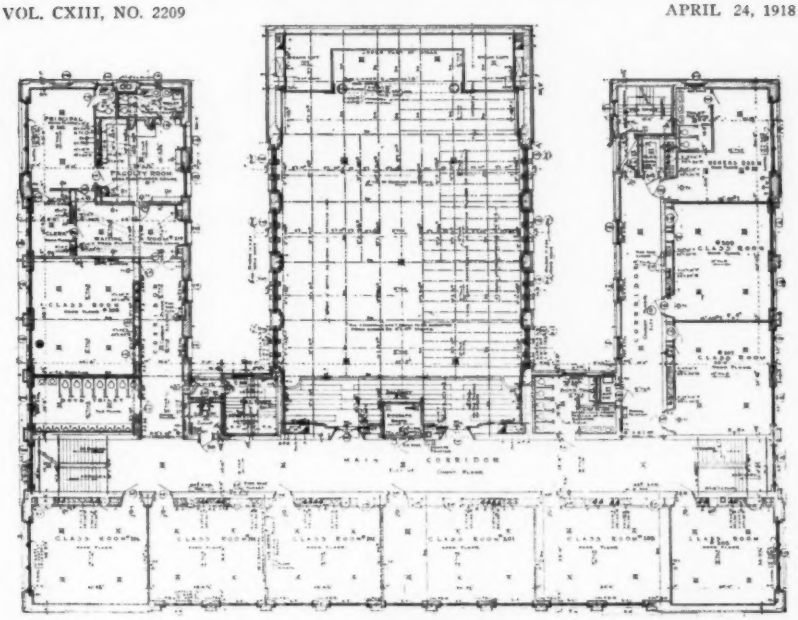


PLATE 143 BASEMENT FLOOR PLAN

HIGH SCHOOL BUILDING, GIRARD COLLEGE, PHILADELPHIA, PA.

JOHN T. WINDRIM, *ARCHITECT*



THIRD FLOOR PLAN

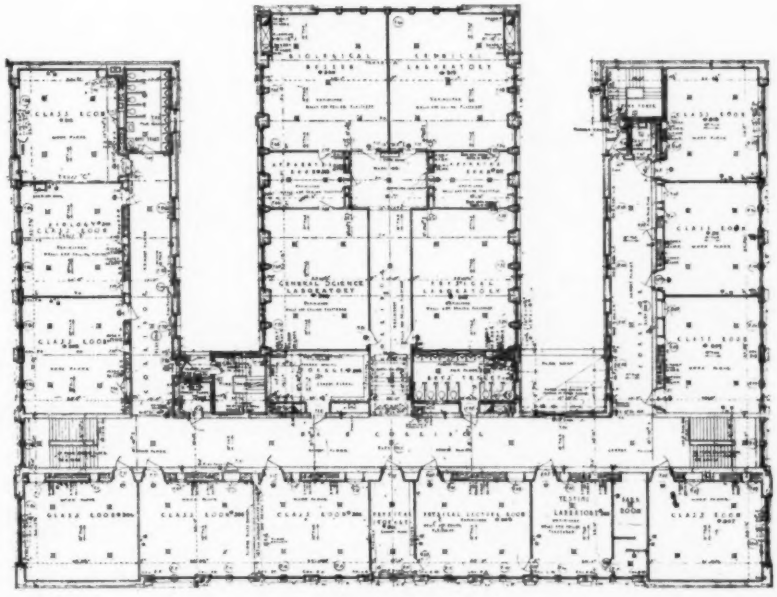


PLATE 144 SECOND FLOOR PLAN

HIGH SCHOOL BUILDING, GIRARD COLLEGE, PHILADELPHIA, PA.

JOHN T. WINDRIM, *ARCHITECT*

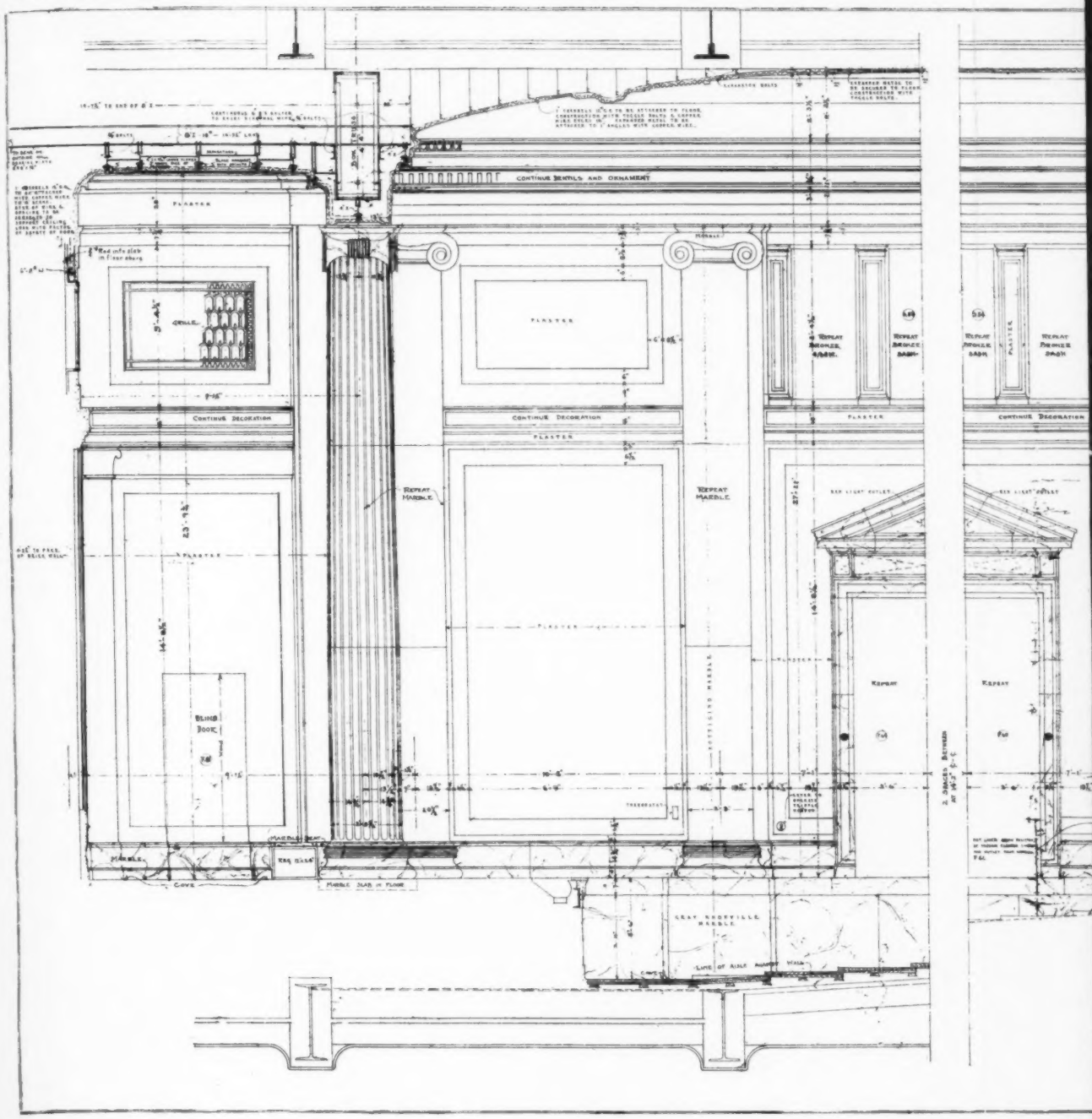
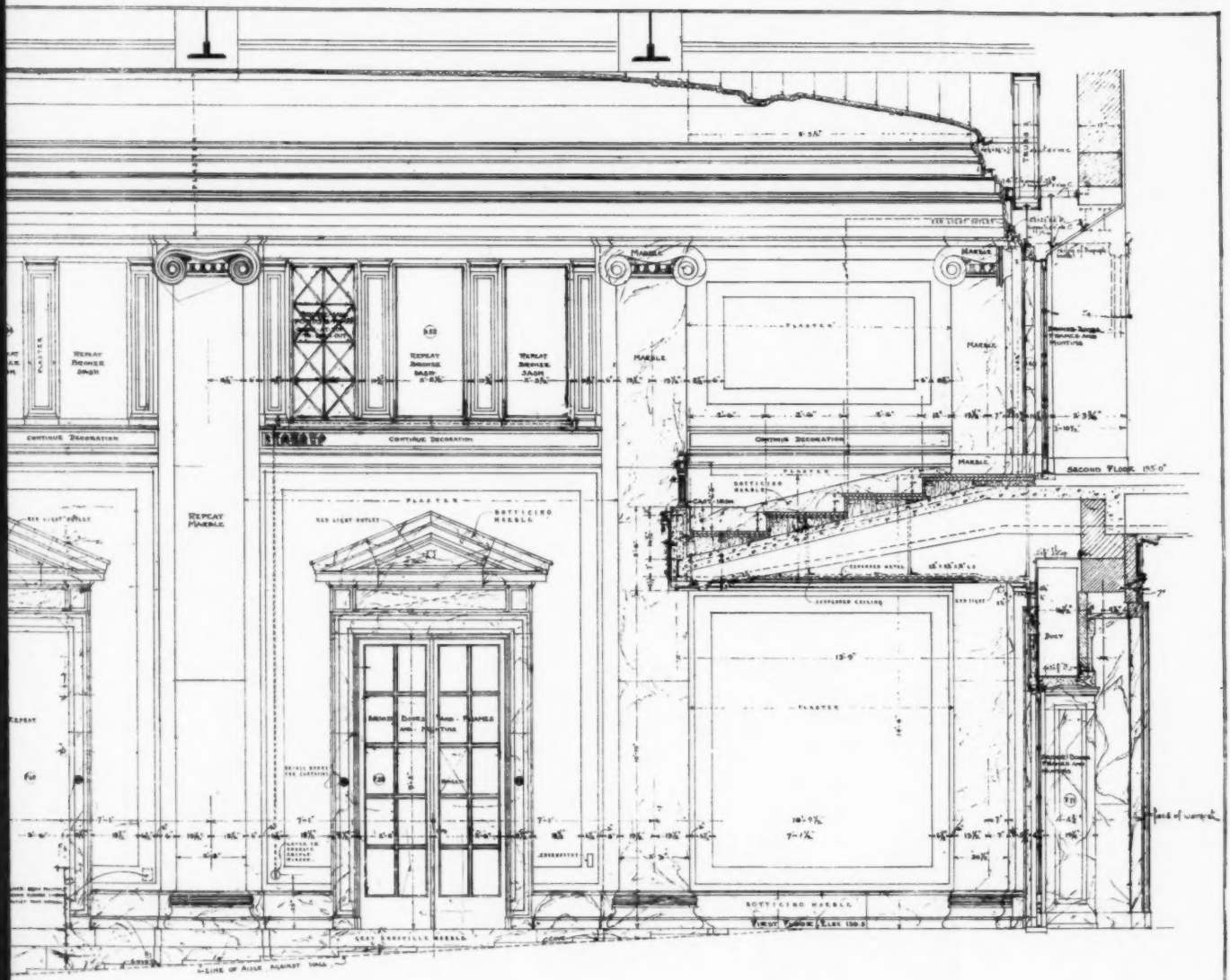


PLATE 145

DETAILED ELEVATION

HIGH SCHOOL BUILDING, GIRARD

JOHN T. WINDRIM,



NORTH ELEVATION

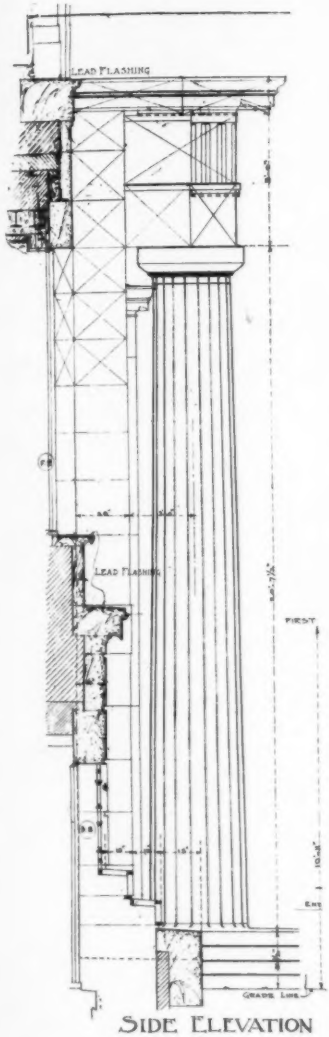
SOUTH ELEVATION REVERSED

NOTE- PARTS SHOWN IN OUTLINE TO BE LIKE PARTS SHOWN IN DETAIL.

ELEVATION OF AUDITORIUM

, GIRARD COLLEGE, PHILADELPHIA, PA.

T. WINDRIM, *ARCHITECT*



SIDE ELEVATION

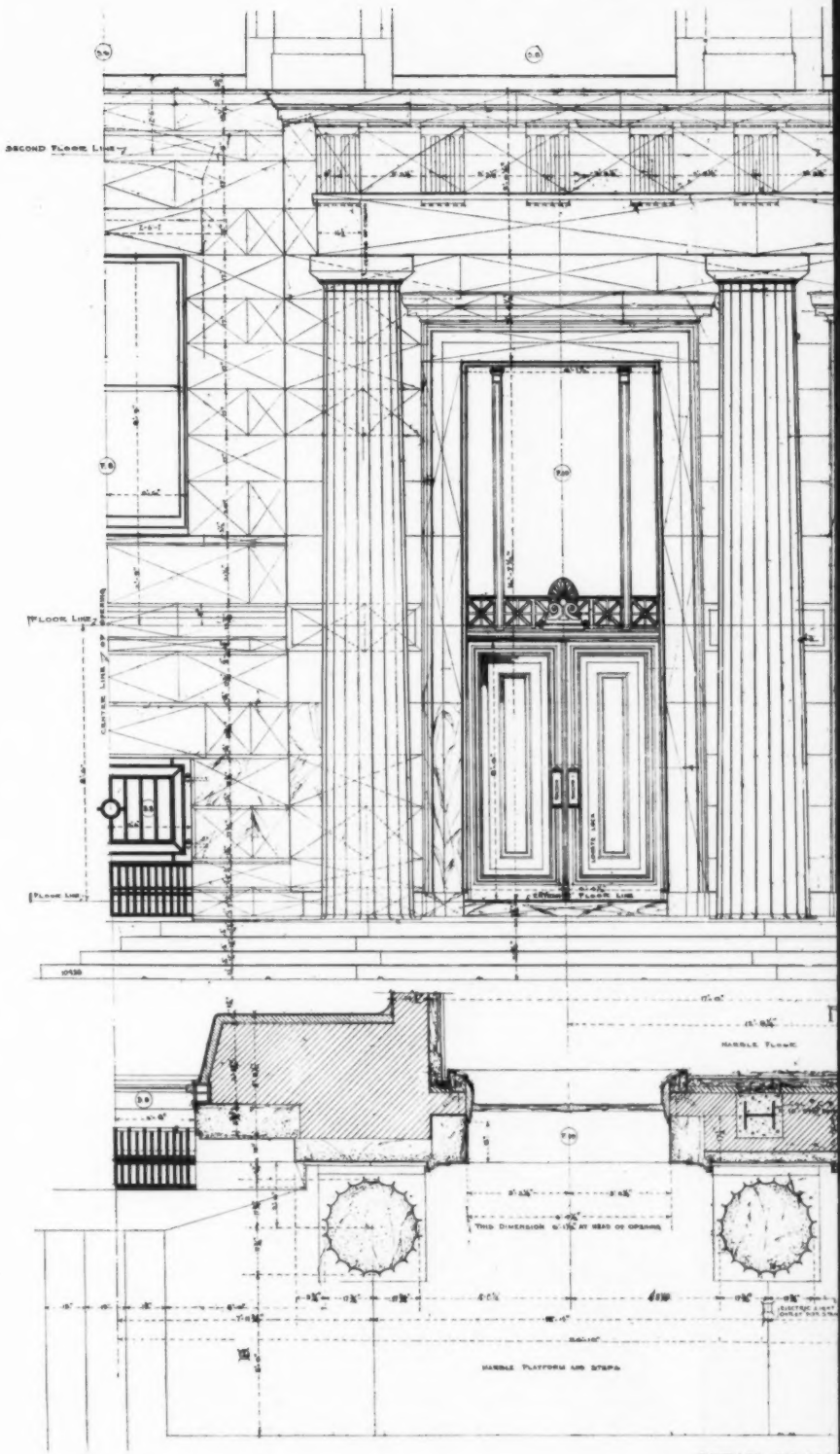
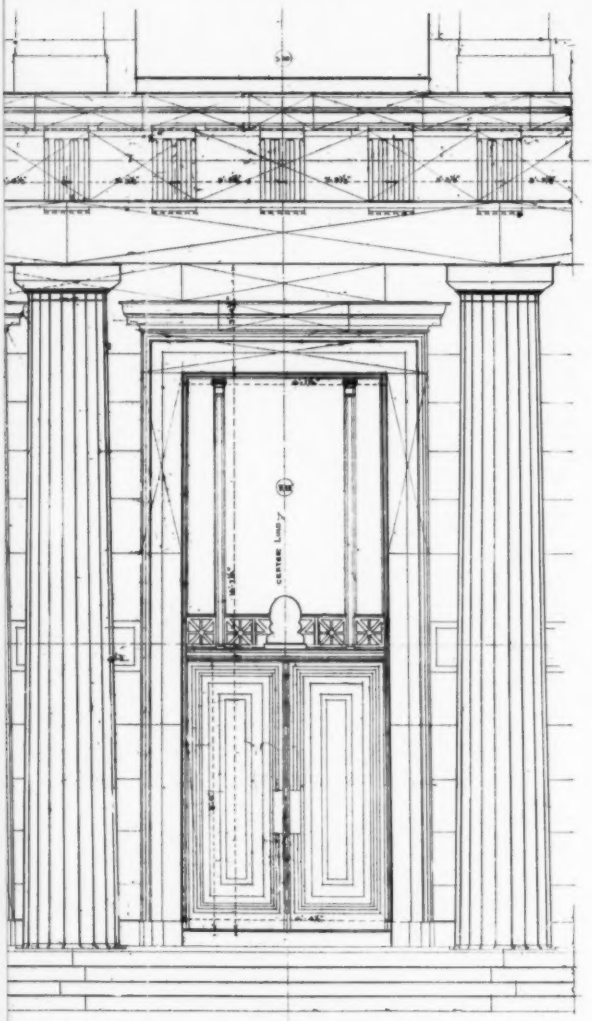


PLATE 146

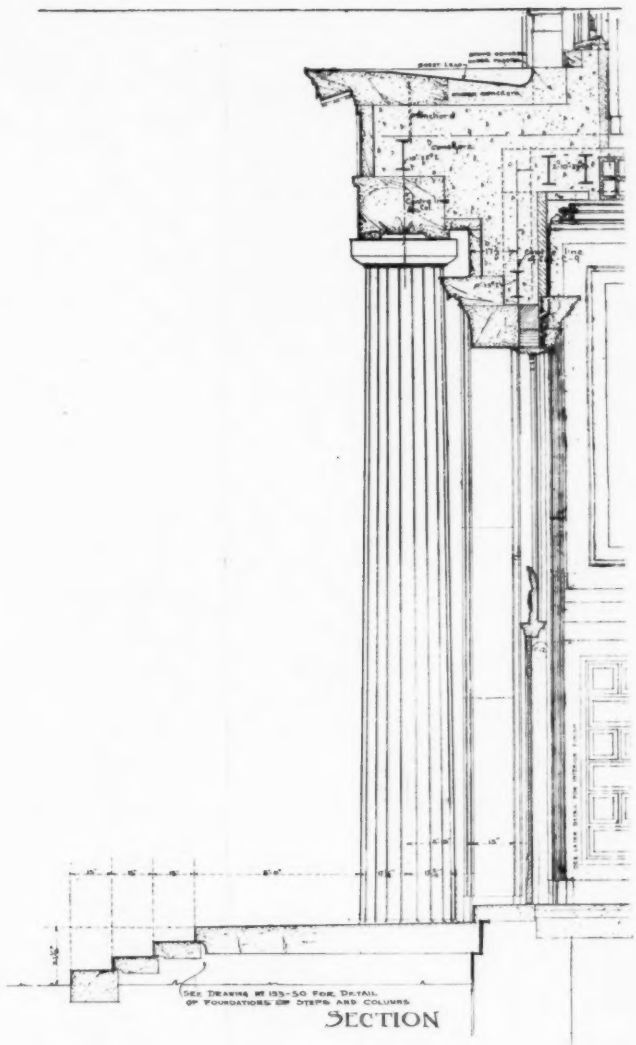
DETAIL OF MA

HIGH SCHOOL BUILDING, GIRARI

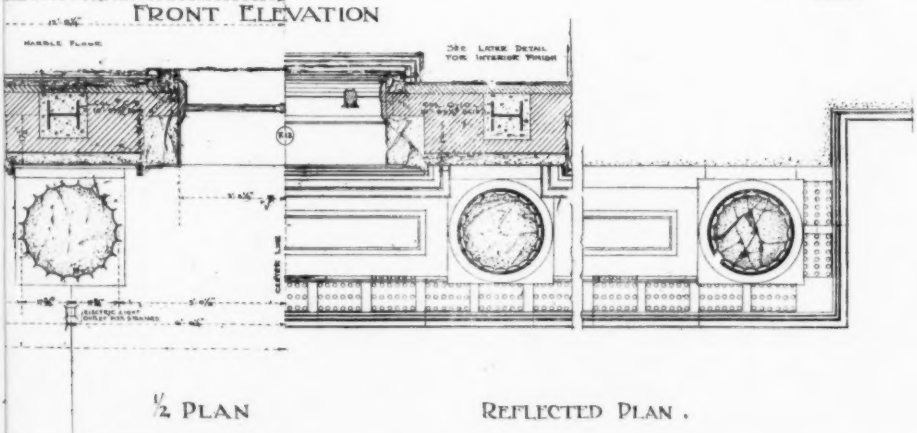
JOHN T. WINDRI



FRONT ELEVATION



SECTION



½ PLAN REFLECTED PLAN.

NOTE.- SASH TO HAVE METAL WEATHER STRIPPING AS APPROVED BY ARCHITEC ALL WINDOW FRAMES TO HAVE JOGGLE IRONS AND COPPER WIND BREAKS

ETAIL OF MAIN ENTRANCE

NG, GIRARD COLLEGE, PHILADELPHIA, PA.

HN T. WINDRIM, *ARCHITECT*

PLATE 147

WALBRIDGE SCHOOL, TOLEDO, OHIO

EDWIN M. GEE, *ARCHITECT*

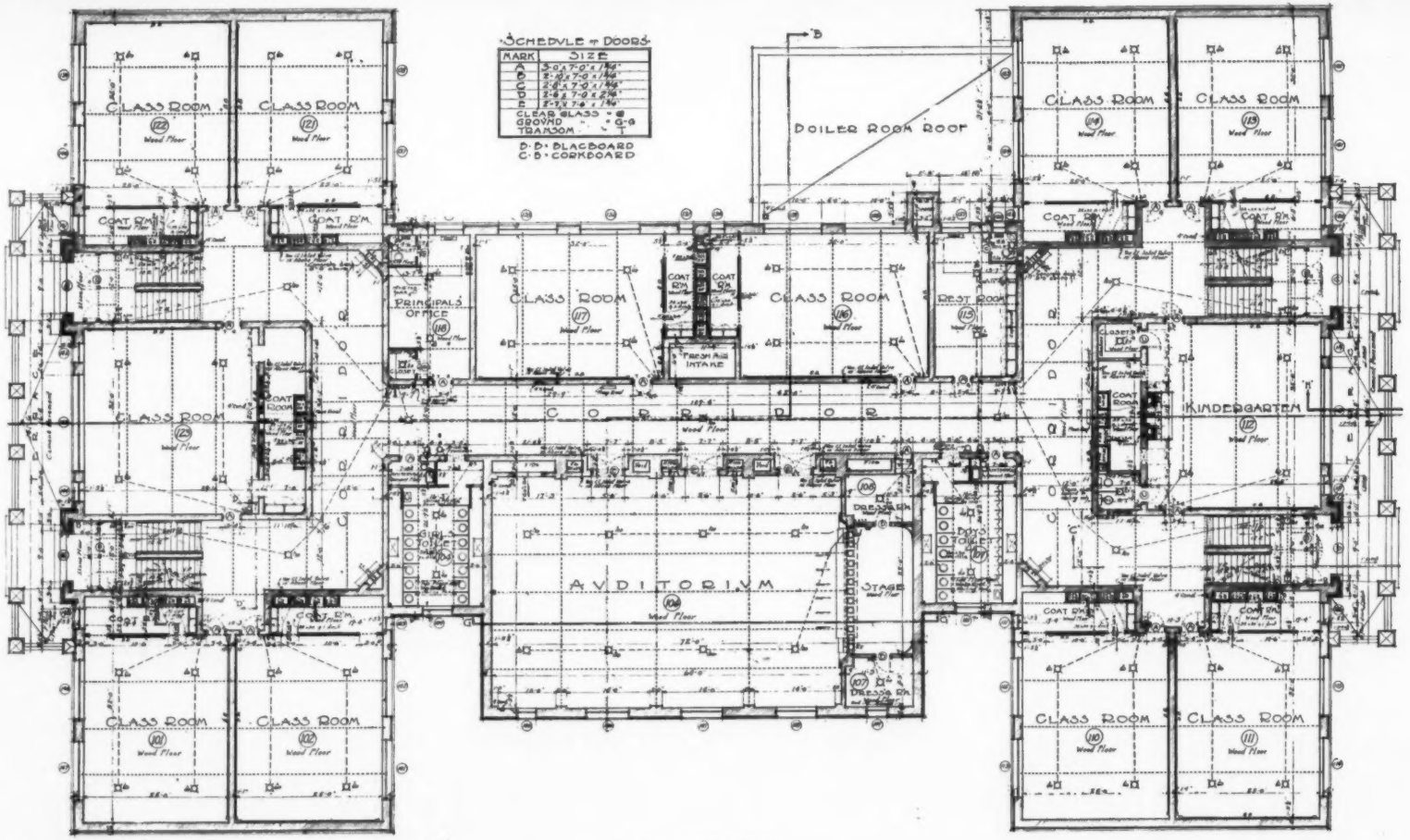
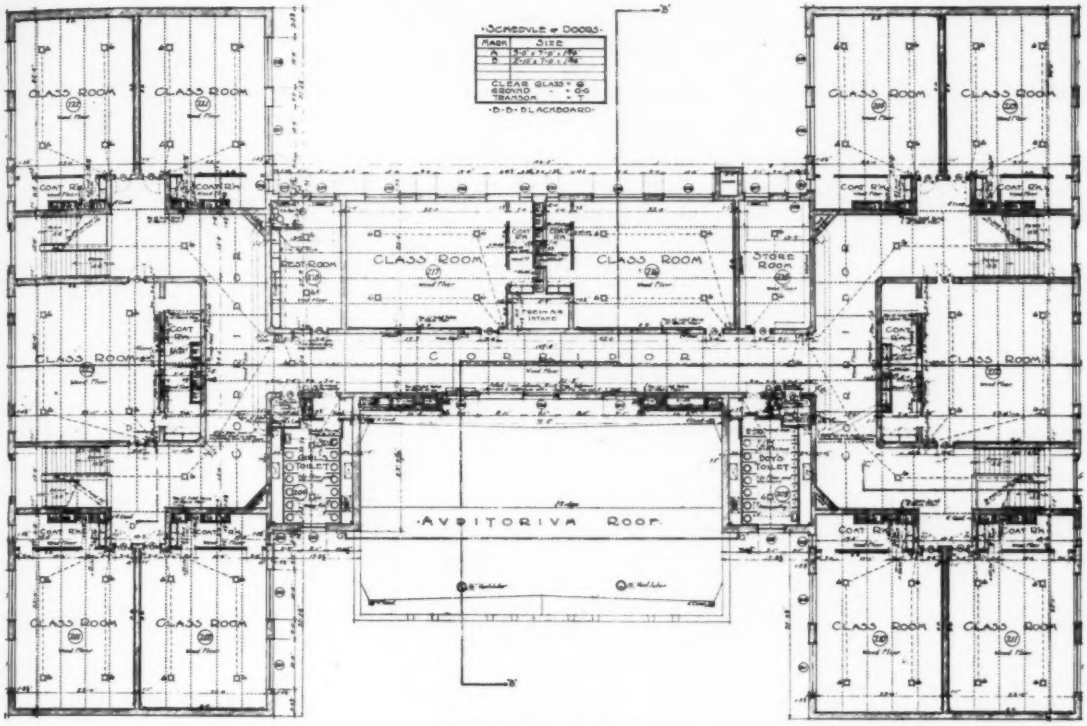


PLATE 148

FIRST FLOOR PLAN

WALBRIDGE SCHOOL, TOLEDO, OHIO

EDWIN M. GEE, *ARCHITECT*



SECOND STORY PLAN

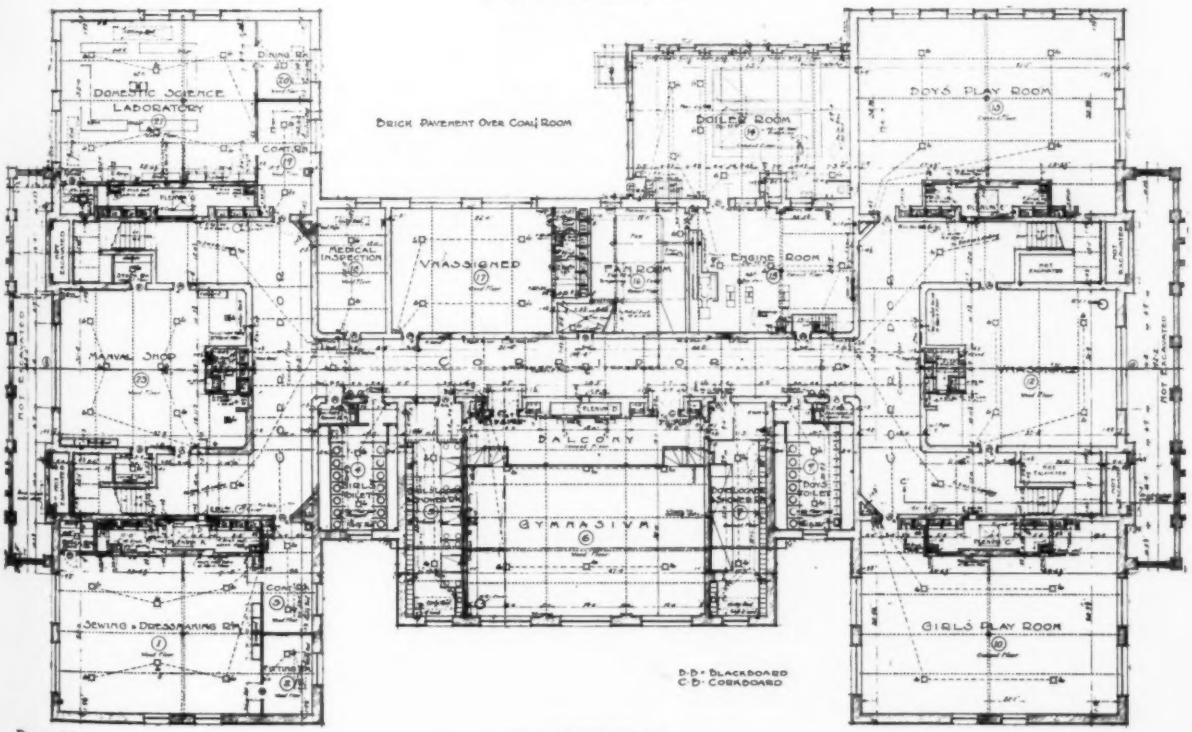
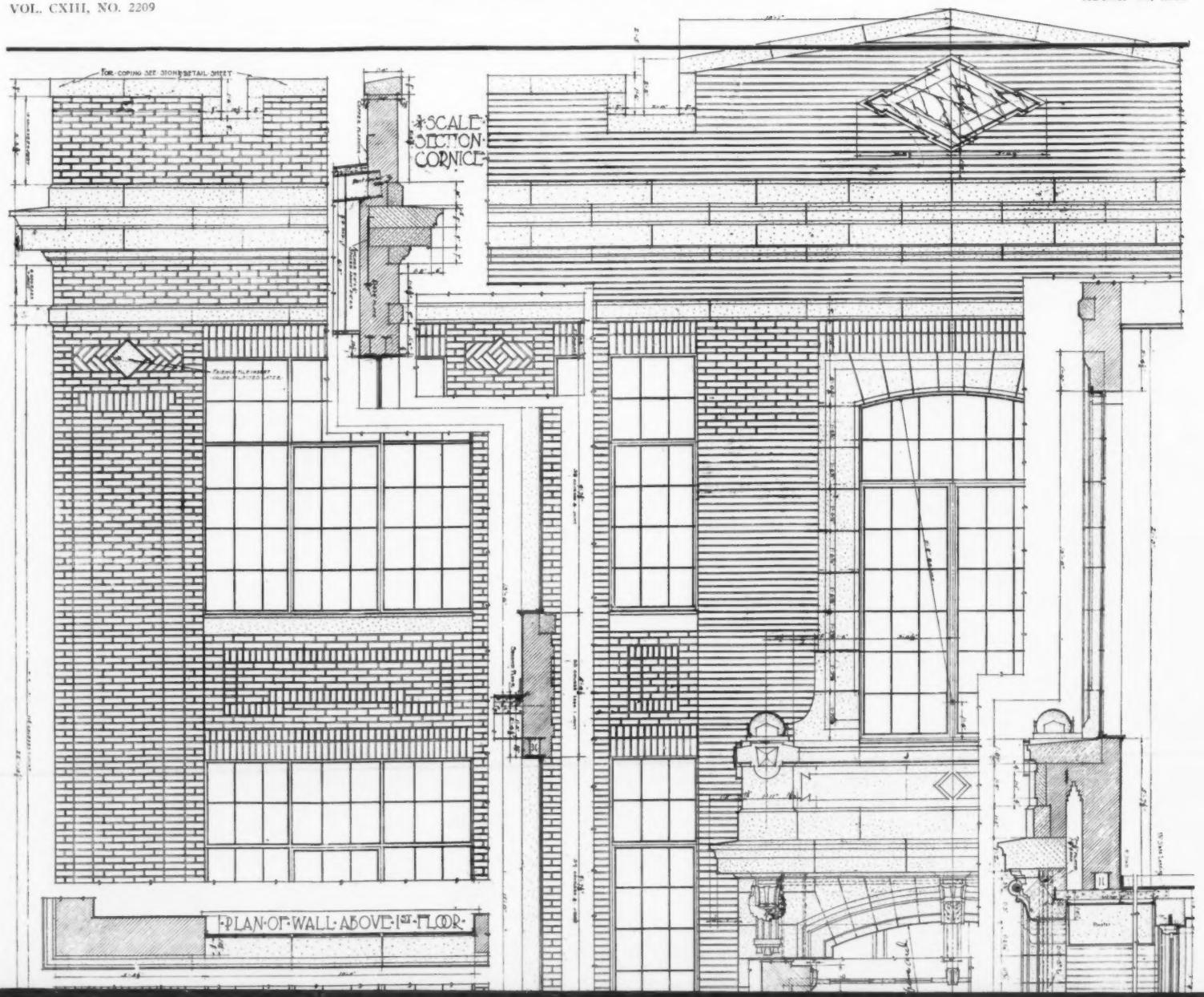


PLATE 149

BASEMENT PLAN

WALBRIDGE SCHOOL, TOLEDO, OHIO

EDWIN M. GEE, *ARCHITECT*


FOR COPING SEE STONE DETAIL SHEET
SCALE SECTION CORNICE
PLAN OF WALL ABOVE 1ST FLOOR

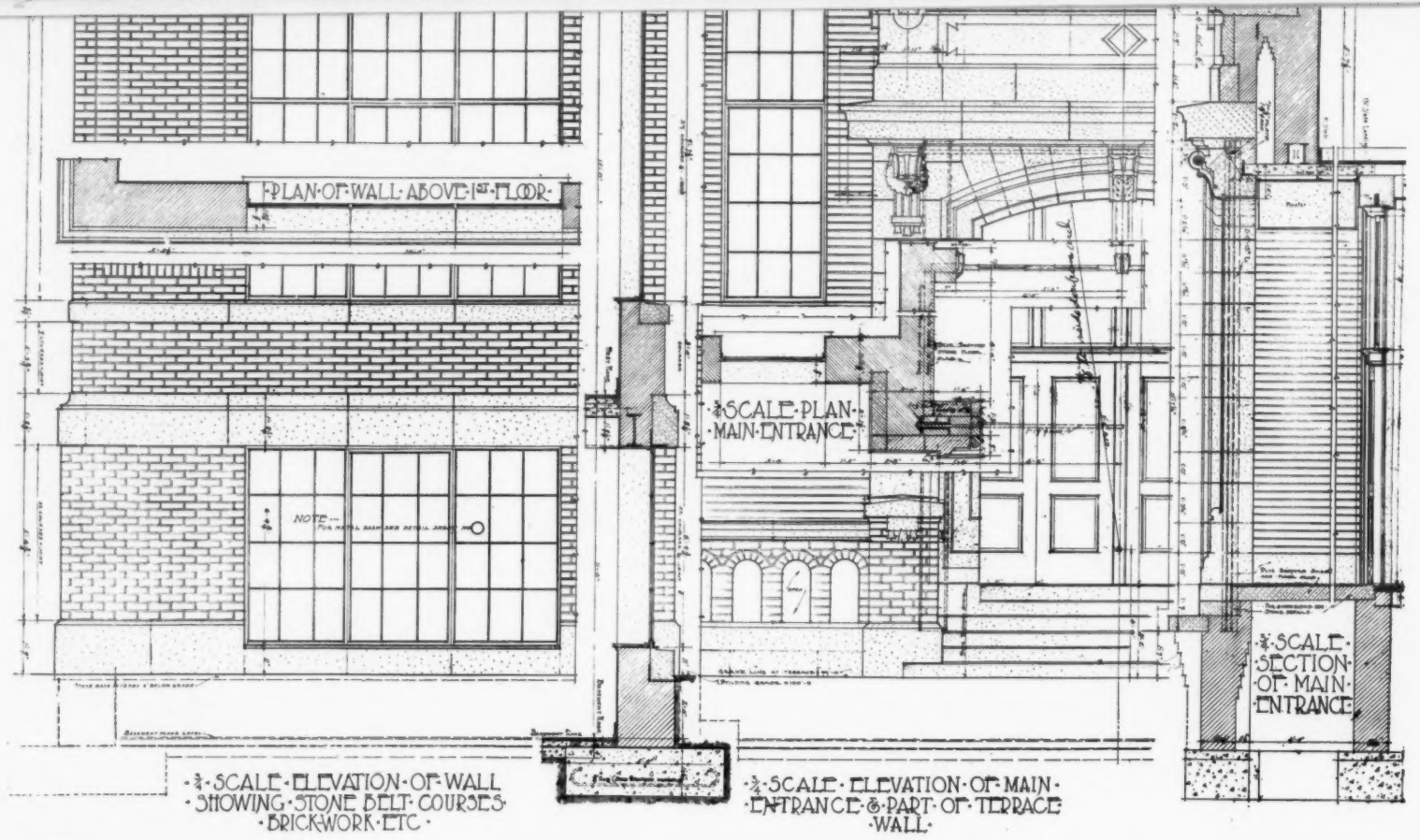


PLATE 150

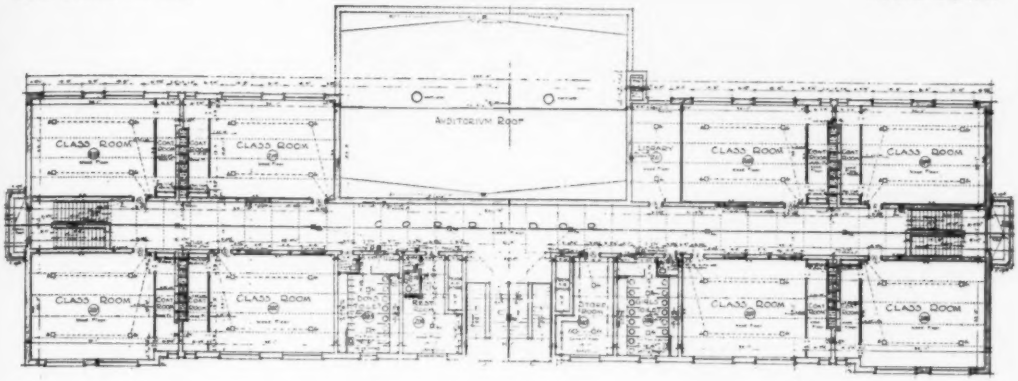
WALBRIDGE SCHOOL, TOLEDO, OHIO

EDWIN M. GEE, *ARCHITECT*

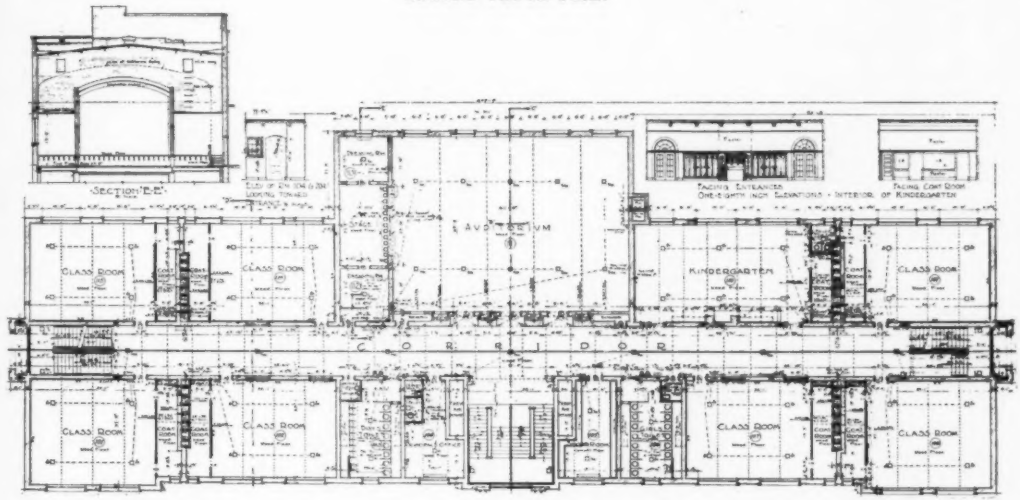
PLATE 151

GARFIELD SCHOOL, TOLEDO, OHIO

EDWIN M. GEE, *ARCHITECT*



SECOND FLOOR PLAN



FIRST FLOOR PLAN

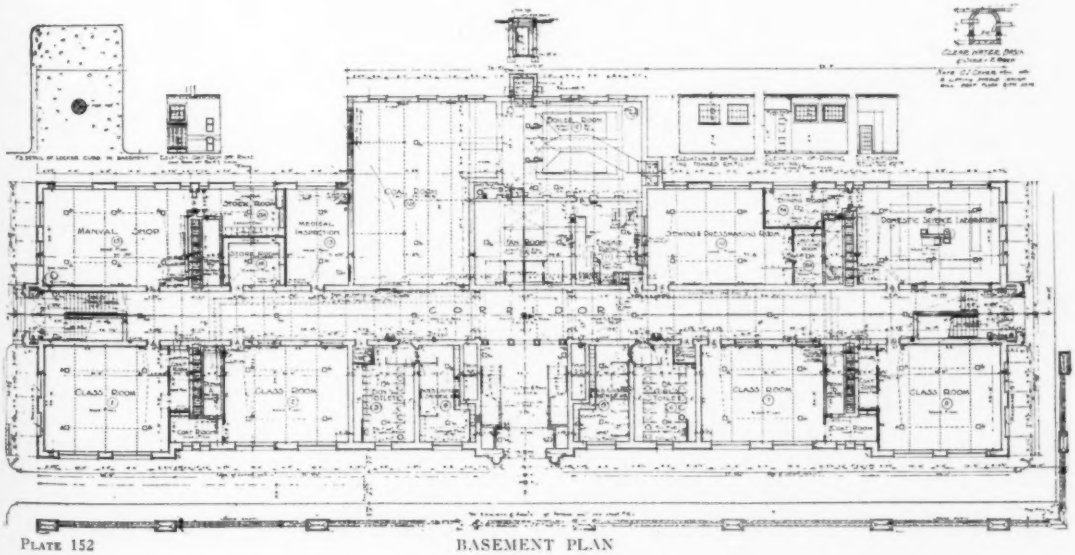
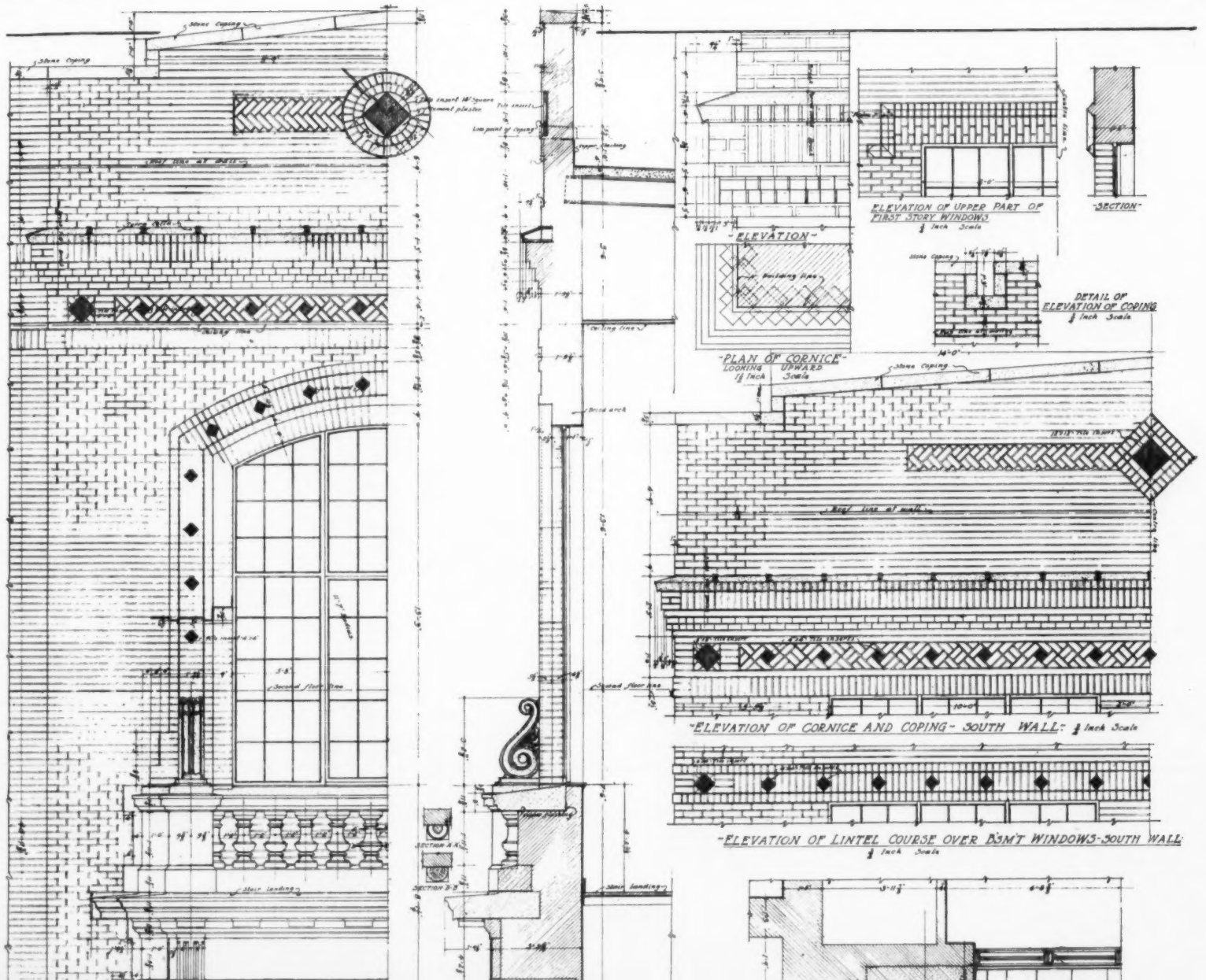


PLATE 152 BASEMENT PLAN

GARFIELD SCHOOL, TOLEDO, OHIO

EDWIN M. GEE, *ARCHITECT*


"ELEVATION OF UPPER PART OF FIRST STORY WINDOWS
1/4 Inch Scale
"SECTION"
"ELEVATION"
DETAIL OF ELEVATION OF COPING
1/4 Inch Scale
"PLAN OF CORNICE"
LOOKING UPWARD
1/4 Inch Scale
"ELEVATION OF CORNICE AND COPING - SOUTH WALL" 1/4 Inch Scale
"ELEVATION OF LINTEL COURSE OVER B'S'M'T WINDOWS - SOUTH WALL"
1/4 Inch Scale

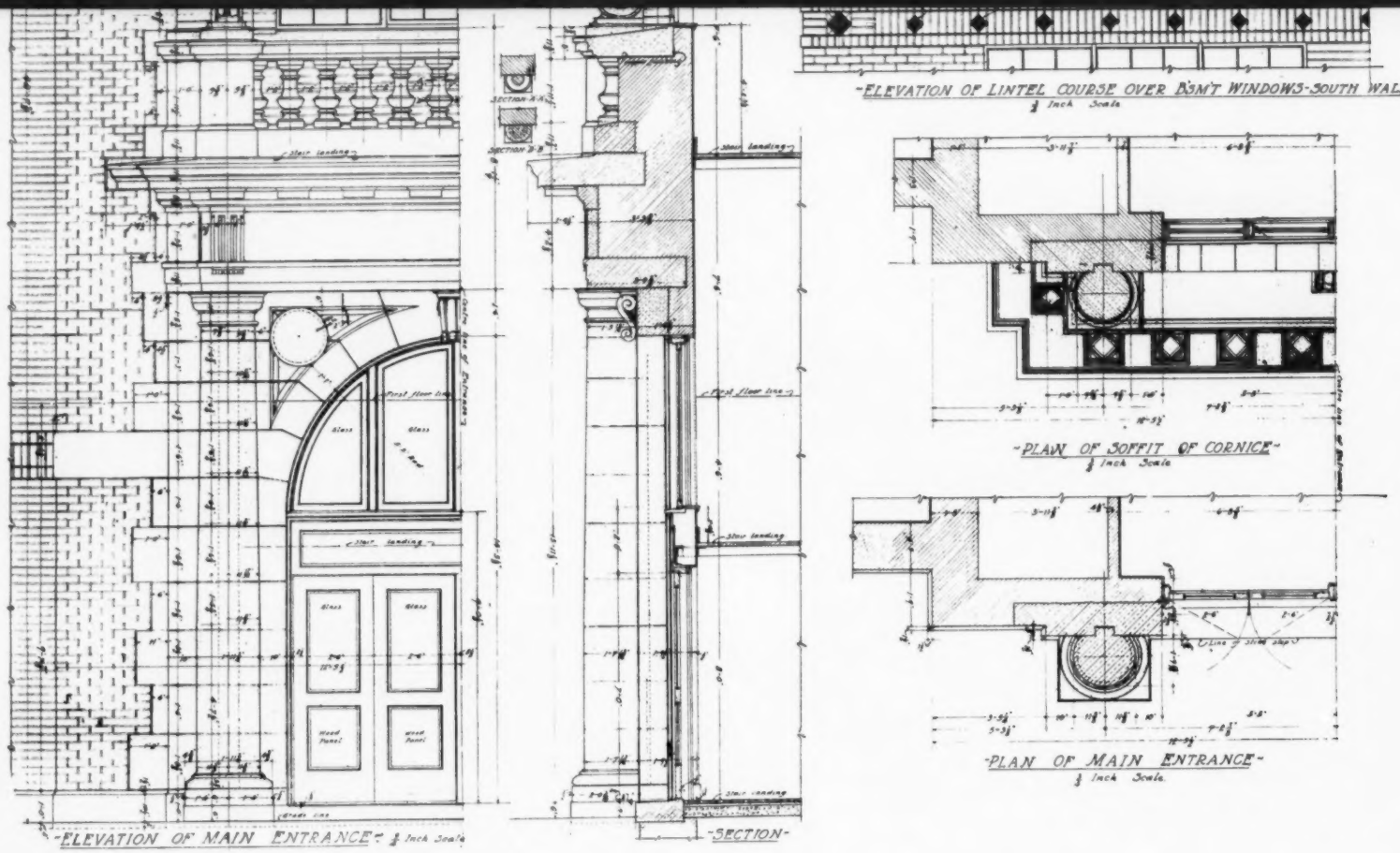


PLATE 153

GARFIELD SCHOOL, TOLEDO, OHIO

EDWIN M. GEE, *ARCHITECT*

forward, producing wealth wherewith to furnish the sinews of war.

The meeting lasted one and one-half hours, and as a result an interview with Secretary McAdoo was arranged, through the courtesy of Representative Dixon. A delegation consisting of Senator Watson, Representatives Cox and Bland and the Bedford committee met Secretary McAdoo Monday, March 11, about 2:30 p.m.

After brief introductory generalities a thorough presentation was made to the Secretary of the motive responsible for this demand on his most valuable time. The burden of the argument was placed on the premise of public welfare, and its present status not only in southern Indiana, but in many other localities as well. Special emphasis was laid on the circumstance that the delegation was not interested primarily in the material well-being of a particular industry or was actuated solely by a desire to have business bolstered up, but decidedly that it had at heart the distress and constantly increasing actual destitution of innocent citizens who are helpless and offer a grave problem in an already perplexing situation.

Mr. McAdoo stated he was not aware of the existence of idle labor, and that in shipyards, railroad repair shops and many other places there is a keen dearth of labor.

Statements related to those previously made to the Indiana congressional delegation were offered in reply, as also that in the city of Chicago over 50,000 men are said to be idle in the building crafts; that the president of the National Carpenters' Union had only a few days before reported tens of thousands of his men out of work; and reference was had further to fifty or more telegrams from all sections of the United States, indicating a surplus of labor in the numerous widely scattered communities. It appearing that only in isolated districts where war contracts are placed in liberal volume does there exist an actual shortage of labor and an air of prosperity.

It was submitted to Mr. McAdoo that the building industry involves an annual wealth producing turnover of $2,000,000,000, employing directly an average of 1,500,000 men, earning probably $6,000,000 daily and that no nation can weather successfully the sudden, almost total extinction of such a vital and supremely important factor of its industrial establishment.

The point was forcefully presented that priority is the proper policy as already applied almost everywhere, except to the construction of buildings, and that to single out one of the most important commercial arteries as a non-essential is inconsistent, if not ruinous.

There was incidental reference to the activities of the Capital Issues Committee of the Federal Reserve Board. Mr. McAdoo emphasized that the duties of that committee are purely of an advisory nature, that there is nothing compulsory in its pronouncements, that nothing had been prohibited, and that it is his desire and that of the Government to *"maintain the poise of industry."*

To this reply was made that clearly the Secretary had been misunderstood previously.

It developed in the course of the conference that the only specific reference to undesirable building operations at this time had been in connection with homes. The need of new hospitals, mercantile structures, apartment houses, warehouses and many other housing facilities was brought out. There was evident the thought in the Secretary's mind that steel is a prime requisite in building work generally, and, steel being in pressing demand in other directions, new building undertakings should be discouraged for that reason. The committee sought to explain to the best of its ability that the building industry has already adjusted itself to the long prevailing shortage of steel, and that erection of almost any type of structure, except the very tallest, is readily possible with the use of but negligible quantities of steel.

Mr. McAdoo asked what he could do to make plain what has been in his mind. It was suggested to him that a clear-cut statement to the effect that the Government means to pursue a constructive policy would serve to dispel misapprehension.

The Secretary replied that in the light of everything stated to the public on this subject in the past and the apparent misunderstandings created, further utterances would only serve to thicken the fog.

Originally intended to consume a few minutes only, the conference lasted a full hour. The conviction was carried away that considerable misinterpretation is abroad in the situation and, while as a matter of course every iota of effort must be expended in the direction of completely successful financing and prosecution of the war, the Government recognizes as of material bearing on that consummation the necessity of continued community welfare and "maintenance of poise in industry."

April Meeting of the Illinois Chapter, A. I. A.

An interesting feature of the April meeting of the Illinois Chapter of the American Institute of Architects, held on April 9, was an illustrated address on The Greek System of Architectural Polychrome and Its Application to Modern Work, by Mr. Leon V. Solon of New York. Mr. Solon is a Fellow of the Royal Society of British Artists, Fellow of British Ceramic Society, member of Art Workers' Guild, London Society of Designers. His lecture was received with much interest, and discussion of the subject followed, led by Mr. Irving K. Pond.

The meeting was conducted by Mr. Daniel H. Burnham, the new president of the Chapter, who has succeeded Mr. N. Max Dunning in that office. Mr. Dunning has recently entered the Government service as head of the Department of Specifications and Estimates, Bureau of Housing, Department of Labor, at Washington. About forty-five members, affiliates and guests were present.

Mr. George C. Nimmons addressed the meeting on the introduction of the subject of architecture into the course of instruction of American colleges, and after reading some correspondence with Dr. Donald J. Cowling, president of the Association of American Colleges, whose interest he has been enlisting in this idea, presented a resolution, which was adopted, looking toward the introduction of this subject at the next convention of the Association of American Colleges. Mr. Nimmons, who originated this plan, is acting as a committee of one in reference to it, and will make arrangements through which the matter will have consideration at the convention referred to, which is to be held next January in Chicago.

Mr. Francis W. Puckey, chairman of the Joint Committee on the Architectural Exhibition now being held at the Art Institute, Chicago, under the auspices of the Illinois Chapter A. I. A., the Illinois Society of Architects and the Chicago Architectural Club, reported on the exhibition as being better than they had expected under the disadvantages of this year's conditions, and comparing favorably with exhibitions held in other parts of the country.

Mr. Thomas E. Tallmadge, on request, addressed the meeting on the subject of the Architectural History of Illinois. Mr. Tallmadge is chairman of the historical committee, and a feature of the architectural exhibition now being held is an exhibit of Illinois architecture of the last century or more.

Following is a copy of the resolution offered by Mr. George C. Nimmons, relating to the introduction of the subject of architecture into the course of instruction of colleges in the United States:

Whereas, There is little or no instruction given on the subject of Architecture in American colleges outside of the special schools of architecture or elective art courses.

Whereas, Even a limited knowledge of this subject would be of great practical benefit to students

Whereas, There is nothing that would so encourage and help to improve the architecture of this country as a better knowledge and appreciation of it by the people, and

Whereas, Dr. Donald J. Cowling, president of the Association of American Colleges, has arranged to give a representative of the architects an opportunity at the next annual convention of this association, to be held in January, 1919, at Chicago, to present this subject for consideration by the convention and has requested that the amount of time be stated and the method of such presentation be determined, now therefore,

Be It Resolved, That the Illinois Chapter of the American Institute of Architects hereby approves the presentation of this subject at the next convention of the American College Association by a representative duly selected by the Chapter, and that the committee on this subject be instructed to complete the necessary arrangements to this end.

It Is Further Resolved, That the committee in charge be instructed to request the arrangement for an hour's time in the program of the next American College Association convention for this presentation, together with the allotment of such other time as may be thought desirable for any discussion which may follow.

Mr. Richard E. Schmidt, chairman of the Joint Uniform Registration Law Committee of the Illinois Chapter A. I. A. and the Illinois Society of Architects, presented a report expressing approval of the registration act drawn by the committee of the Institute to come before the Institute convention. On motion it was decided to refer this report to the delegates to the Institute convention with power to act on it for the Illinois Chapter.

The election of delegates to the coming convention of the Institute called for only one delegate and three alternates, for the reason that the number of delegates this year is restricted to three, and two of these are provided by the fact that the president and secretary of the Chapter are delegates ex-officio. The delegation, therefore, will consist of Mr. Daniel H. Burnham, president; Mr. Henry K. Holsman, secretary, and Mr. Richard E. Schmidt, who was the delegate elected, with Mr. George W. Maher, Mr. Frank E. Davidson and Mr. John L. Hamilton the alternates elected. Mr. Elmer K. Jensen, who is a director of the Institute, expects

to attend, and also Mr. Irving K. Pond, who, as a past-president of the Institute, has the privileges of the convention.

A letter from the secretary of the Institute was read, expressing interest in the Illinois Chapter movement by which affiliates have been included in the Chapter meetings, and stating that the idea would be recommended to other chapters.

Among the guests present was Mr. Dwight James Baum of New York, who was visiting in Chicago on his return from a trip to California.

Naval Architectural Course to Open at Minnesota "U"

GOVERNMENT'S REQUEST MET AND TEN ENROLL TO TRAIN FOR WORK AT SHIP YARDS

A course in elementary naval architecture, open to senior engineers, has been inaugurated at the University of Minnesota under the direction of the mechanical engineering department.

Ship draftsmen are in such great demand at the shipyards that the Government has requested the organization of this department at the university.

Following completion of the ten weeks' course, the student will be given a certificate which will enable him to take up work in a civilian capacity at pay from $4 to $6 a day in the shipyards.

James Edward Ware

James Edward Ware, for nearly half a century practising architect in New York, died at his home, 1285 Madison Avenue, Sunday, April 14, 1918, after a brief illness. Mr. Ware was born in New York July 16, 1846, the son of John P. and Eliza (Alvord) Ware. He was graduated from the College of the City of New York in 1864, and began to practise architecture in 1870. He was one of the pioneers in designing the modern type of fireproof warehouse—the buildings of the Manhattan Storage & Warehouse Co. at Lexington Avenue and Forty-second Street, and at Seventh Avenue and Fifty-second Street, being notable examples of his work—and also in the designing of improved city dwellings for the poor. He was one of the prize winners in the competition held by the Association for Improving the Condition of the Poor in an effort to better living conditions in the congested districts, and it was from his plans that some of the earliest model tenements were constructed. Other examples of his work are the Twelfth Regiment Armory at Columbus Avenue and Sixty-first Street and the Madison Avenue Presbyterian Church, Madison Avenue and Seventy-third Street. In later years, his sons, Franklin B. Ware, former State Architect, and Arthur Ware, were associated with him.

Mr. Ware was a member of the American Institute of Architects and of the Architectural League of New York.

George Alexander Wright Dies

Mr. George Alexander Wright, architect, died last month at his home in San Francisco after a short illness. He was senior member of the firm of Wright & Rushford, Architects, of San Francisco.

Mr. Wright was born in England in 1852, and practised his profession in that country until 1891, when he came to America. In 1875-6 he accompanied the late King Edward, then Prince of Wales, on his Indian tour, acting in a secretarial capacity. Since coming to this country his activities have been very extensive. He was one of the most energetic exponents of the Quantity System, and is known to the profession through his writings on that and allied subjects.

Localization of Industry

In the industrial survey of St. Louis, which is being prepared by Goodrich and Hoover of New York, the intensification of industry in its present locality, by means of industrial terminals, is suggested. These buildings, as recommended, would be of huge proportions and of a type to permit of flexible and expanding floor space. A series of units of such buildings would be expected to house all the manufacturing of the city, thus automatically zoning it, while at the same time affording the most ready facilities to freight depots and the river.

Antique Statue of Pentelikon Marble Found

In the course of his excavations on the Palatine, Commendatore Giacomo Boni, the celebrated Italian archæologist, has just unearthed a magnificent statue of Victory, carved from marble from the renowned ancient quarries of Mount Pentelikon, near Athens, which dates from the fifth century before Christ. The figure is 85 centimeters (nearly 3 ft.) high, and is very pure, simple and majestic in style, corresponding in pose to the celebrated Torso of Victory by Phidias, now in the British Museum. Friezes from the Parthenon and other works of the most perfect Greek style have also been discovered.—*Stone.*

Illuminated White Lamp-Posts Make Safety Islands Conspicuous

Visibility and strength are essentials in the design of safety islands for busy thoroughfares which make for greater protection against passing automobiles. According to a statement by J. F. Foster, general superintendent of the South Park Commissioners, Chicago, 270 accidents at 153 safety islands occurred in one year. These ranged from the breakage of the electric light globe to the wrecking of automobile, lamp-post and even of the platform.

Painting the island lamp-posts white instead of black, in order to increase their visibility, is now practised in both the South Park and Lincoln Park districts. Even if the island is well lighted, an automobile may skid against it or may be forced into collision with it to avoid striking another car or a pedestrian. The island should be so shaped as to turn aside cars and to effectually stop those which strike it squarely. The platform should be well anchored into the pavement, as otherwise a blow from a heavy car may displace the entire structure.

At night an automobile driver may plainly see a white post and base well illuminated by means of the small white lights, which are shielded by opaque reflectors so that there is no glare. The red-light globe at the top serves as a warning. It is stated that a globe red above and white below, to provide both warning and illumination, has not proved satisfactory. The platform 9 in. high, with a curved face, does not appear likely to serve the purpose of stopping a car that runs into it squarely. For such purpose it would probably be necessary to provide a curb wall at either end of the platform.—*Engineering News-Record.*

British Housing Plans After the War

The matter of devising ways and means to overcome the present great shortage of houses in the United Kingdom is, comments *Construction*, an after-the-war problem to which serious attention is being given by the authorities. While it is held that existing conditions must be borne until the close of hostilities, there is plenty to indicate that the government is fully alive to the fact that immediately at the end of the war a comprehensive program must be undertaken to solve this important problem. Circumstances bearing on the present situation are indicated in a recent report of the United States Consul at London, which states that the Technical Committee set up by the National Housing and Town Planning Council has now submitted its interim report to the Local Government Board. The committee took as the basis of its inquiries the statement by the president of the Local Government Board that 300,000 houses for the working classes should be built by the State in England and Wales alone. This estimate does not cover the pressing needs of Scotland. It is said that in order to carry out this program the organizing ability of at least one-half of the employers in the building trades and the labor of 400,000 men will be required. The committee points out that if 200,000 urban and 100,000 rural houses are erected, this will do not more than to make up for the shortage of new houses directly due to stoppage of building during the war, and will leave untouched the general housing problem, with overcrowded dwellings in town and country.

The report says it will be necessary at the close of the war to ask the tenants of the new houses to pay higher rents than those current before the war. For this reason the houses must be made attractive to be well worth the extra rent charged. The following points to be observed in all plans adopted by local authorities for cottage building are presented:

The houses should be broad, rather than deep, to secure ample light.

Back extensions are better avoided; all the rooms should be brought under the main roof.

Three bedrooms should be provided in all the new houses.

The houses should, as a rule, be provided with parlors.

Each house should have a bath, with hot water.

Ample window space should be given and windows carried as near to the ceiling as possible.

A layer of concrete or other approved impervious material should be laid under all floors to prevent damp rising, and a proper damp-proof course should be provided in all walls.

The level of the ground floor should be above the level of the ground immediately surrounding.

The assistance of women with close knowledge of household economy should be sought in regard to details of interior construction, such as the design of the stairs and the provision of cupboards, larders, and storage accommodation.

It is recommended that the government should furnish money for these projects only when the general plan of the housing estate or area meets with the Local Government Board's approval. The areas should be laid out on modern town-planning lines, and the number of houses per acre in urban districts should not exceed twelve.

The Government's Building Projects

Eighty-five separate undertakings, aggregating $205,000,000, are now in progress as part of the Government's building projects. There are also contemplated 120 more, representing upward of $300,000,000.

Undertakings that will be necessary to provide additional housing for troops will swell the total a further $390,000,000, while the one item of hospital construction will represent an outlay of $10,000,000.

We have become so accustomed to thinking and dealing with large figures that the grand total represented above, of almost a billion dollars, is no longer regarded as a large sum.

It is stated that in the future all work of this class will be executed on the basis of "cost plus sliding scale of fixed fee." By this method the contractors' fees will range from 1¾ per cent on the largest amounts to 7 per cent on contracts of $100,000 or less. In every instance the exact fee is fixed at the time the contract is let. If, for any reasons, there are fluctuations in costs of material or labor, the contractor receives no more or less as his fee for executing the work.

In all of these undertakings labor and material prices will be subject to the approval of the Government.

Transportation to Relieve Industrial Housing Situation

It is the opinion of Otto Eidlitz, National Housing Director, that the need for housing developments is greatly overestimated. In a recent statement he says that much of the problem of housing industrial workers could be solved by working out an adequate transportation system. The rehabilitation of buildings already standing is also contemplated as more desirable than an immediate program of elaborate housing projects.

Fire Protection Bureau

ESTABLISHED TO STOP MUNITIONS FIRES

To minimize the possibilities of fires in munitions plants and other factories engaged in war work, the War Industries Board has created a fire protection section which will maintain a close inspection of all plants engaged on Government work. It will be assisted by the Intelligence Bureaus of the army and navy and local and district fire inspection services in the country, and where circumstances warrant, it will enlist the aid of the fire marshals of the various States and ask the co-operation of insurance underwriters.

There have been many disastrous fires in war factories and grain elevators, both before and since the United States entered the war. In the fires millions of dollars' worth of munitions and grains needed by the Government and the Allies were destroyed.

Canada Sets High Mark in Output of Shipping

Canada is setting a record in ship construction which may be judged from the fact that during the coming year she will put more tonnage into the water than the German admiralty had estimated would be the entire annual production of the United States, England and France.

The growth of the Dominion's shipping program was achieved despite an unusually severe winter.

Emergency Fund Asked for Concrete Ships

Edward N. Hurley, chairman of the Shipping Board, has submitted an estimate to the Secretary of the Treasury, covering the needed emergency appropriation for concrete ships. A sum of $50,000,000 is asked to cover the acquisition of suitable plants for this work and the cost of materials and labor for carrying on the building of the ships.

Speedy Passage of House Bill Urged

Pressure is being brought to bear to consummate the speedy passage of the House bill, appropriating $50,000,000 for housing workmen at munition and shipbuilding plants, and $10,000,000 for housing clerks in Washington.

According to a statement of Rear Admiral H. H. Rousseau, the production and repair of naval vessels could be increased from 25 to 100 per cent by providing housing facilities, particularly at Norfolk, Va.

Cantonment Division to Be Known as Construction Division

The War Department has announced that the Cantonment Division will hereafter be known as the Construction Division, and will report to the Chief of Staff of the Army, instead of to the Assistant Secretary of War, as it has been doing recently, or to the Quartermaster General, as it did in the early months of the war.

Dry Rot

Dry rot is a misnomer. According to an article on this subject by C. Waterton in the *Architect and Contract Reporter,* this disease in timber ought to be designated a decomposition of wood by its own internal juices, which have become vitiated for want of a free circulation of air. If you rear a piece of timber, newly cut down in an upright position in the open air, it will last for ages. Put another piece of the same tree into a ship or into a house, where there is no access to the fresh air, and ere long it will be decomposed. But should you have painted the piece of wood which you placed in an upright position, it will not last long, because, the paint having stopped up its pores, the incarcerated juices have become vitiated, and have caused the wood to rot. Nine times in ten wood is painted too soon. The upright unpainted posts in the houses of our ancestors, though exposed to the heats of summer and the blasts of winter, have lasted for centuries, because the pores of the wood were not closed by any external application of tar or paint, and thus the juices had an opportunity of drying up gradually. On making some alterations in a passage, I put down and painted a new plinth made of the best and apparently well-seasoned foreign deal. The stone wall was faced with wood and laths, and the plaster was so well worked to the plinth that it might be said to have been air-tight. In about four months a yellow fungus was perceived to ooze out betwixt the bottom of the plinth and the flags, and on taking up the plinth both it and the laths and the ends of the upright pieces of wood to which the laths had been nailed were found in as complete a state of decomposition as though they had been buried in a hot-bed. Part of these materials exhibited the appearance of what is usually called dry rot, and part was still moist, with fungus on it sending forth a very disagreeable odor. A new plinth was immediately put down, and holes one and a half inch in diameter at every yard were bored through it. This admitted a free circulation of air, and to this day the wood is as sound and good as the day on which it was first put down.

National Academy Elects Associates

Nine associates to the National Academy of Design were elected at the April meeting of the academy, as follows:

Grosvenor Atterbury, William Welles Bosworth, architects; Rudolph Evans, sculptor; Charles Dana Gibson, illustrator; Howard Giles, Paul King, Glenn Newell, Violet Oakley, painters, and Fuori Piccirilli, sculptor.

Research Into Properties of Concrete

At a meeting of the Minneapolis Engineers' Club, on March 25, Professor Abrams of Lewis Institute, Chicago, delivered an address on "Results of Recent Researches in the Properties of Concrete."

Tests to the number of approximately 50,000 a year were made to determine valuable data governing concrete construction. The results of many of these tests have never been published. The only public utterances ever made regarding them were in the address of Professor Abrams at the auditorium in the Main Engineering Building at the University of Minnesota, Monday evening, and in a recent similar address at the Lewis Institute before an audience of engineers from 21 States.

While there is not time in the limits of a single address to go very exhaustively into the subject, Professor Abrams was able by the aid of slides to present to his auditors a fairly comprehensive idea of some of the important results achieved. Two or three points stood out prominently as the unmistakable results of the series of tests. One is that the engineer who permits aggregates to be flooded makes a grave mistake. Professor Abrams said that excessively wet concrete never gives the strength that dryer concrete gives, and it is a mistake to believe that excess water merely runs away, without permanently harming the quality of the concrete.

Professor Abrams said that the use of concrete is very largely a question of correct proportioning. Four or five different theories have been presented, and the ordinary method of proportioning is based mostly on arbitrary selectioning, but the proper method must take into account the properties of the materials themselves. Cement to-day, he said, requires the least attention of all the materials entering into concrete. Only lately has serious attention been paid to water, but the tests at Lewis Institute have proven that water is absolutely the most important element going into concrete—the element that requires the greatest care and knowledge in its use.

The quantity of water necessary to get the best results depends upon the nature of the aggregates used. Some aggregates are of a porous nature, and absorb so much water that it is necessary to use more water than in non-absorbent aggregates or the mixture will be too dry. It is necessary to use more water in a fine aggregate than in a coarser aggregate. Exhaustive tests showing strength obtained by the use of relative sizes of aggregates, varying materials used as aggregates, and by dry or wet mixes, have been made at Lewis Institute.—*Improvement Bulletin.*

Industrial Information

Dumb Waiters and Hand Elevators

The Storm Mfg. Company, 40-50 Vesey Street, Newark, N. J., has issued a bulletin descriptive of their dumb waiters and elevators. This discussion is prefaced by a statement that the bulletin has the approval of an investigating committee of architects and engineers which had visited the plant of this company, and had also inspected several installations, all of which were found to be satisfactory.

A number of different types of machines are shown in this pamphlet, with text matter, dimensions and prices. They include hand and electric dumb waiters of different types; invalid lifts; basement or sidewalk elevators; and the necessary operating equipment to be used in conjunction with these machines.

The bulletin states that the company's engineers are available for consultation on dumb waiter problems, and that catalogs and prices of their electric elevators, ash hoists and other products will be sent upon request.

New Way of Saving Fuel

Nox-Aer-Leek is a product advertised by the Barrett Company, which has offices in all the principal cities of the country, as a fuel saver. It stops infiltration of air in the brickwork of boiler settings—"thereby raising the percentage of CO_2 gas and often saving as much as 25 per cent of fuel."

This material is a plastic cement, composed of elastic bitumen fused with non-drying oils and asbestos fiber. It has the consistency of fresh putty, and is applied readily with a trowel. When this substance is troweled on to the exterior walls of the boiler setting—and it is for use on exterior walls only—it makes the setting air-tight and moisture-proof, it is claimed. It adheres firmly to the brick, and instead of drying out or becoming hard and brittle, it is said to remain permanently elastic, contracting and expanding with the walls.

It is further claimed that this material not only renders a setting air-tight, but it prevents a new setting from developing air cracks, because the brick and mortar cannot absorb and repel moisture, which action tends to break down the mortar.

About 50 or 60 lbs. of Nox-Aer-Leek will cover 100 sq. ft. of brick work, depending on the smoothness of the surface. Inasmuch as this material is quoted at a price of from 9 to 11 cents per pound, varying with the quantities purchased, the total cost is not great.

Monolithic Concrete Silos

Of particular interest at this time when American farms are being speeded up to the limit is the monolithic concrete silo. In a pamphlet entitled "Monolithic Concrete Silos for Your Farm," the Portland Cement Association, 111 West Washington Street, Chicago, presents vital facts as to the part which silage plays in modern farming. The economy effected by the use of silos, due to possible diminution of pasture area, is interesting to note, especially as it is claimed that "silage comes nearer to taking the place of grass than any other feed. . . . It is the best insurance a farmer can have against drought."

Different types of silo construction are shown, some with battlement tops, and all very trim in appearance. A photograph of one group of silos is shown, of which the statement is made that in a fire which occurred a few years ago all the other farm buildings were destroyed, and the silos remained quite uninjured.

House Organs as a Source of Information

In many of the house organs published by the various manufacturing concerns of this country, there is to be found an ever-growing source of information on technical subjects. To ignore this material is to be losing sight of really valuable information, available in simple, compact form, presented in an attractive manner, and without cost to the reader. For example:

In a recent issue of *The Dutch Boy Painter*, the

house organ of the National Lead Company, which has offices in the principal cities of this country, there is published a very practical article on house painting. This is the first of a series of articles on approved methods of painting, which bid fair to be exceedingly valuable, if one is to judge by the sample.

The methods of figuring the requirements of a house are set forth very clearly and explicitly, with a diagram. Such additional topics as The Preparation of the Surface, The Importance of the Priming Coat, and Mixing the Paint Therefor are taken up in the same practical fashion.

The Relation of Pigment to Vehicle is another subject discussed in this little publication. It deals with paint from a purely technical standpoint, and throws considerable light on a phase of the matter not usually given much consideration by the lay reader. The facts presented therein are of real interest, and should be worthy a place in the architect's file.

Factory Enamel

J. A. and W. Bird & Co., 88 Pearl Street, Boston, Mass., have on the market a special gloss paint for factory purposes. This paint, they claim, is most efficient in the development of permanently clean, light surroundings for factory employees, at a low cost. The gloss on this paint is said to be sufficient to prevent the clinging of dust, and it can be brushed and washed down year after year.

The company makes the following statements in regard to this paint:

Birco Factory Enamel is an oil enamel, made on a base of specially treated oils so combined as to be very light in color and yet retain their full elasticity.

The pigments are pure white, finely ground by special machinery, and held in perfect suspension.

This enamel, therefore, works very easily under the brush. The content also makes for a pure-lasting white, unlikely to yellow from age, too elastic to peel—in other words, the perfection of factory or mill paint.

Birco Factory Enamel is made in both flat and gloss—the flat being chiefly used as an under-coat, to be applied over old paint, new brick, wood, plaster or concrete—one coat of which serves as a first-class under-coat, to be finished under ordinary circumstances with one coat of gloss enamel.

Electric Drying Device for Public Washrooms

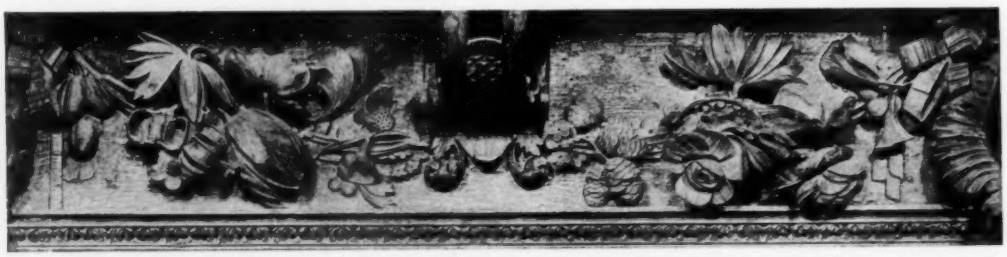
"Airdry" is a new device recently put on the market by the Groton Electrical Devices, Inc., Groton, N. Y., for drying the skin by means of warm air. It consists of a white enamel iron standard, containing a motor, a fan, a heating element, and an adjustable nozzle for directing the flow of air. A mirror is also mounted on the casing.

This device is connected with an ordinary lighting circuit, and set in operation by means of a foot lever in the base of the standard. At the rate of 10 cents per kilowatt-hour, the company's literature states that fifty people per day can be served by this utility for 6¼ cents. This should make it very desirable in public and semi-public wash-rooms—in factories, schools, etc.

The merger of the Federal Radiator Company, of New Castle, Pa., with the National Radiator Company, of Johnstown, Pa., is announced. The business will be carried on under the name of the latter company.

A Correction

In the March 20 issue of THE AMERICAN ARCHITECT an erroneous statement was made to the effect that "Nalecode" was manufactured by the Berger Manufacturing Company. This material, on the contrary, is manufactured by its inventor, Mr. Paul Mende, 405 Lexington Avenue, New York City.



Department of Architectural Engineering

The Continuous Girder of Constant Moment of Inertia

By E. A. KUNZE, *Architect*

THE following graphical solution of the continuous girder is taken from the author's unpublished work on the continuous girder of constant and variable moment of inertia.

The preliminary theory is somewhat involved and occupies considerable space and since it is our purpose here to use only the necessary steps for the rapid and practical solution of the problem, it will be passed over or at most vaguely referred to.

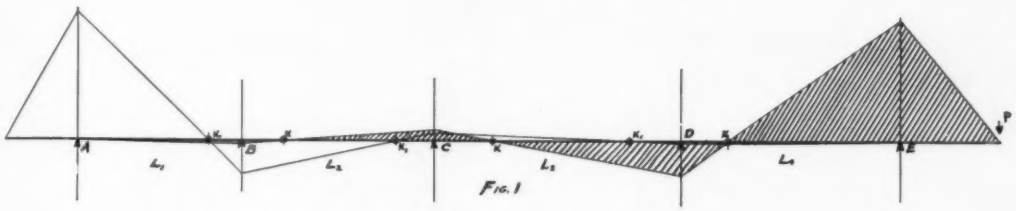


FIG. 1

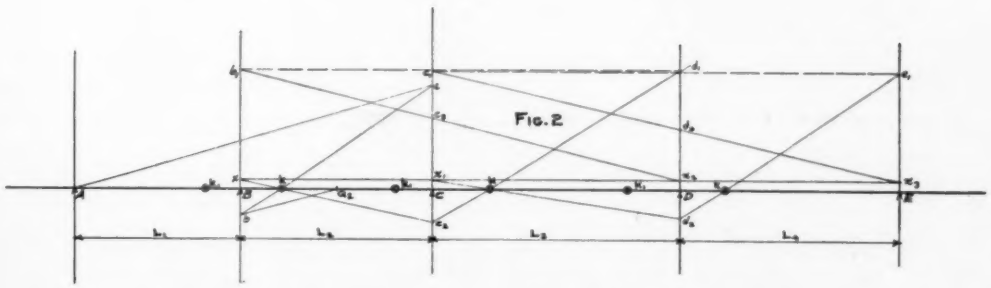


FIG. 2

Our problem will be the determining of the moments and shears at any point in a continuous girder of constant moment of inertia having more than two spans and resting on inflexible supports. Such a girder will be referred to in the following as a continuous girder series.

Were this series extended beyond the last support and a load P placed at the end of the cantilever thus formed the moment diagram would take the form shown in Fig. 1, the moments changing sign at the points of contraflexure k. By reversing the operation we observe a second set of points of contraflexure k_1.

The influence line is an equilibrium polygon developed from a force polygon whose elastic weights are taken from the elastic load diagram (see Figs. 3 and 3a). It will be seen that the elastic load diagram takes the form of a moment diagram changing sign at the points of contraflexure to the right and left of the support or span as the case may be. In working with the elastic load diagram these points of contraflexure will be referred to as fixed points.

1. Location of the Fixed Point

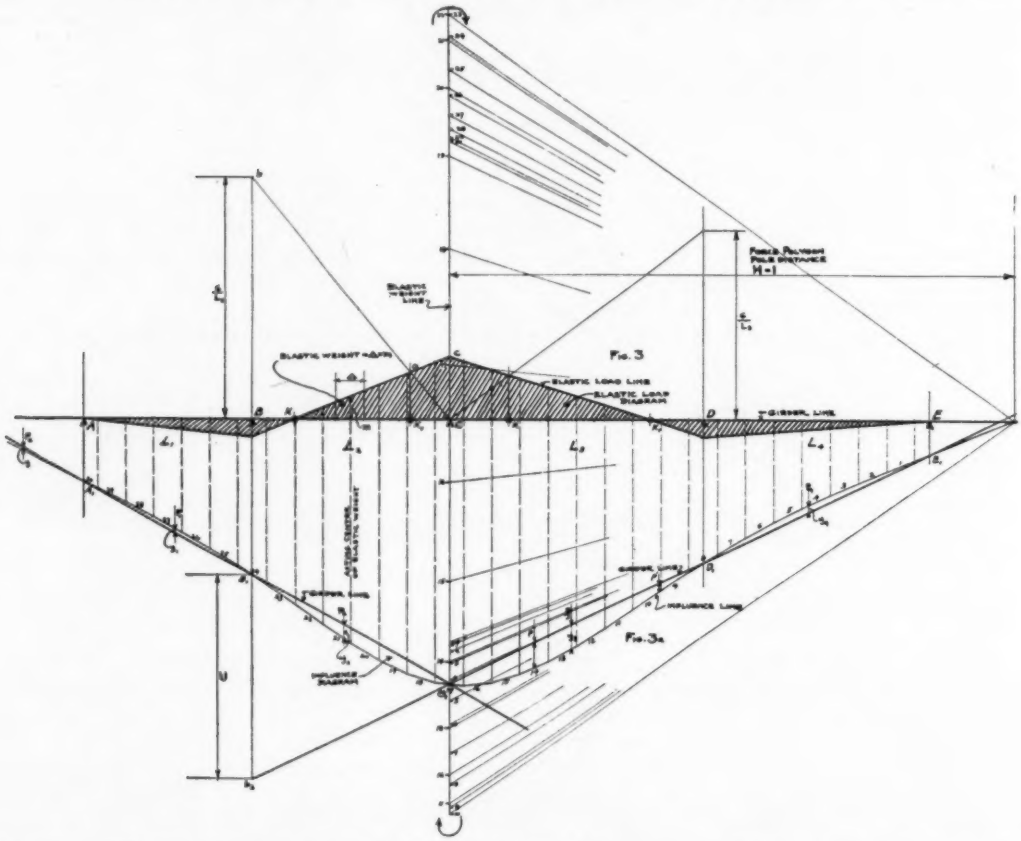
Let Fig. 2 illustrate a continuous girder series of four unequal spans L_1, L_2, L_3, and L_4 over five supports A, B, C, D and E. Point off Q_2 at the exact centre of span L_2. Draw $\overline{Ac}$ to any convenient inclination and make $\overline{Q_2b}$ parallel to $\overline{Ac}$. Draw $\overline{bc}$. k is the fixed point in span L_2. Draw the line $\overline{xx_3}$ parallel to the girder line at some convenient distance above the girder line. Draw $\overline{xk}$ and extend to c_2. Make $\overline{Cc_3}$ twice the distance $\overline{Cc_2}$. Draw $\overline{x_2c_3}$ and extend to b. Make $\overline{Dd}$ equal to $\overline{Bb_1}$. Draw $\overline{d_1c_2}$. k is the fixed point in span L_3.

Draw $\overline{x_1k}$ and extend to d_2. Make $\overline{Dd_3}$ twice the distance $\overline{Dd_2}$. Draw $\overline{x_2d_3}$ and extend to c_1. Make $\overline{Ee_1}$, equal to $\overline{Cc_1}$. Draw $\overline{e_1d_2}$. k is the fixed point in span L_4. To determine the k_1 points start at the end of the series (E) and work back in the same manner. It will be seen that the whole operation can be done without the use of the scale rule.

The fixed points being located we may proceed to lay down the elastic load diagram.

2. Influence Line for the Moment at a Support

Let it be desired to draw the influence line for the moment at support C. In Fig. 3 make $\overline{Bb}$ equal to $\frac{6}{L_2}$. (For practical purposes the vertical scale may be greatly exaggerated.) Draw a vertical through k_1 in Span L_2 intersecting $\overline{bC}$ at o. Draw $\overline{ko}$ and extend in either direction to intersection with verticals through supports B and C respectively.

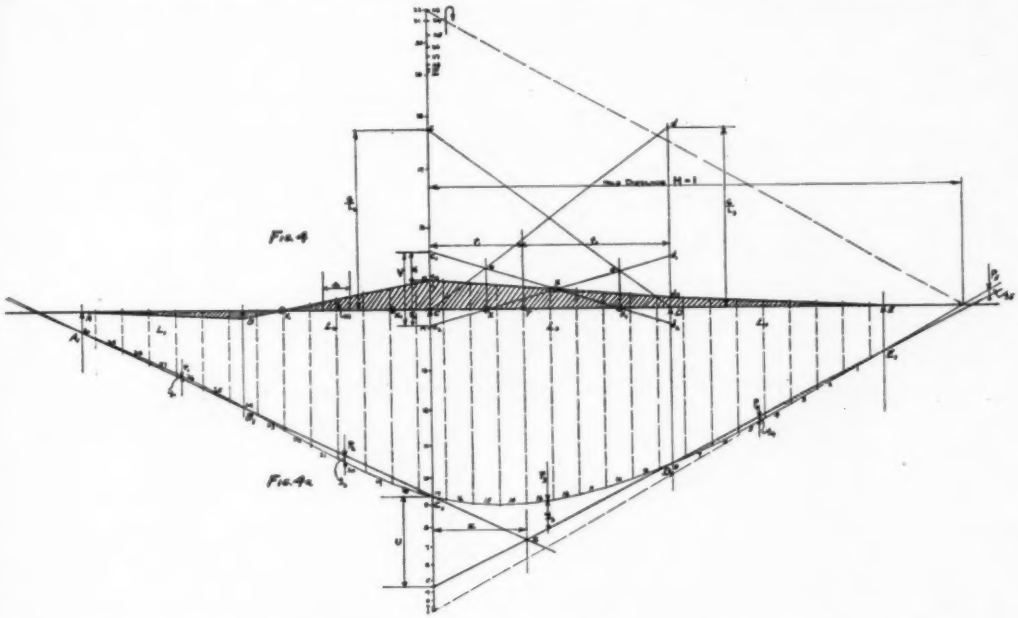


Complete the shaded figure or the elastic load diagram as shown. Divide the elastic load diagram into vertical strips of convenient but constant width Δ and lay off consecutively the area of these strips (Δ x m) as elastic weights on the elastic weight line of the force polygon, reversing when the elastic load diagram changes sign. (The area of the strips referred to will of course be Δ in the horizontal scale into the ordinate m in the vertical scale.)

Make the pole distance equal to 1 (vertical scale).

Draw the equilibrium polygon or influence line as shown in Fig. 3a. (For purposes of identifica-

tion it will be found convenient to assign a number to each ray of the force polygon and give each corresponding side of the equilibrium polygon the same number.) Extend the verticals through the points of support (Fig. 3) to intersection with the equilibrium polygon at A_1, B_1, C_1, D_1 and E_1 respectively. Draw the straight (girder) lines $\overline{A_1C_1}$ and $\overline{C_1E_1}$. The influence diagram now being completed place a load at any point. The moment at support C will be $M_c = -P_c y + P_1y_1 - P_2y_2 - P_3y_3 + P_4y_4$, the ordinates y being in the same scale as the horizontal scale. (The portions of the influence diagram for the cantilevers to the left of support A and right of support E are embraced between the girder line and the end tangents to the influence line.)



Extend the girder line $\overline{E_1C_1}$ to b_2 on the vertical through support B. Let $B_1b_2 = U$. It will be seen that $U = L_2$. Were the elastic load diagram drawn to any convenient magnitude, the pole distance of the force polygon made any convenient length and the vertical ordinates m at the centers of the strips in the elastic load diagram used as elastic weights in the force polygon the resulting influence diagram would be out of proportion $\frac{L_3}{U}$ vertically. In this case the moment at support C would become $(-P_c y + P_1y_1 - P_2y_2 - P_3y_3 + P_4y_4)\frac{L_3}{U}$.

It will probably be found more convenient to solve the problem in this manner, since the influence diagram can thus be drawn to any convenient magnitude and it will only be necessary to apply the correction $\frac{L_3}{U}$ to the influence ordinates.

3. Influence Line for the Moment at a Point in the Span

For example let this point be T (Fig. 4). Make $\overline{Cc} = \overline{Dd} = \frac{6}{L_3}$. The elastic load diagram within the limits of span L_3 for developing the influence line for the moment at support C will be the figure $Ck_1Dd_2k_1c_1C$ and for support D the figure $DkCc_2kd_1D$. The entire range of the elastic load line for points in span L_3 with reference to the vertical through C will be $\overline{c_1c_2} = V$. Let it be required to find the elastic load line for point T. The position of the point where the elastic load line for T intersects V is proportional to the position of T on span L_2 and we have the proportion $t_1 : t_2 = v_1 : v_2$. Draw $\overline{d_3c_2}$ passing through the point x. (Since all the elastic load lines pass through point x this point may be termed the pivotal point of the elastic load line.)

Complete the elastic load diagram (shown shaded) by continuing the elastic load line to the right and left of span L_2 through the fixed points and end supports.

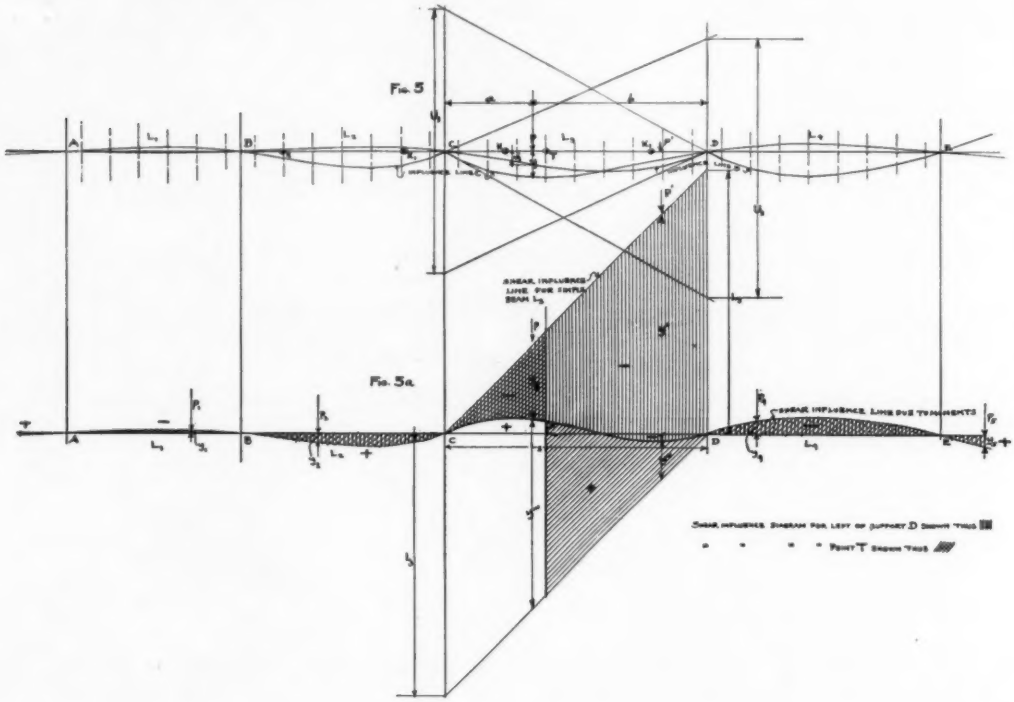
Lay off the elastic weights consecutively and algebraically on the elastic weight line in the force polygon and with a pole distance of 1 draw the

equilibrium polygon or influence line (Fig. 4a). Draw the girder lines $\overline{A_1C_1}$ and $\overline{E_1D_1}$ and extend to intersection at s under T. The influence diagram changes sign at the points of support. For loads P at any point the moment at T becomes $M_t = +P_1y_1 - P_2y_2 + P_3y_3 - P_4y_4 + P_5y_5$ or if the influence diagram is developed from an elastic load diagram of arbitrary magnitude using the ordinates at the centers of the elastic weight strips as elastic weights and an arbitrary pole distance in the force polygon M_t becomes $(+P_1y_1 - P_2y_2 + P_3y_3 - P_4y_4 + P_5y_5)\frac{Z}{U}$ This is analogous to what has already been explained with reference to the influence line for the moment at a support. Were the series extended to form cantilevers at each end, the influence diagram for the cantilever portions would be embraced between the end tangents to the influence line and the girder line. The load P_5 thus produces the moment $+P_5y_5$ at point T. The same thing has already been done with reference to the influence diagram for the moment at a support.

4. Influence Line for Shear

In Fig. 5 are shown the influence lines C and D for the moments at supports C and D respectively. Let us assume that these moment influence diagrams have their correct magnitude so that $M_c = Py$ and $M_d = Py'$. (Were the moment influence diagrams drawn to any other magnitude the moments would be $M_c = Py\frac{L_2}{U_2}$ and $M_d = Py'\frac{L_3}{U_3}$).

Were the span L_3 a simple beam the shear at support D would be $\frac{Pa}{L_3}$. Since we are dealing with a continuous girder, however, we must add to this, algebraically, the small shear element produced by the moments due to continuity. The moment at C



produces the shear $+\frac{Py}{L_3}$ over the entire span L_3 and the moment at D produces the shear $-\frac{Py'}{L_3}$ over the entire span. The algebraic sum of these two shears then is our small shear element due to continuity and the net shear just to the left of support D due to the load P will be $S = \frac{Pa}{L_3} + \frac{Py}{L_3} - \frac{Py'}{L_3}$. (The y ordinates in the moment influence diagrams are, of course, always measured in the same scale as the horizontal scale.)

In Fig. 5a we have, for convenience, considered the shear influence diagram due to the moments of continuity as the algebraic sum of the moment influence diagrams, or L_3, too large. The shear influ-

ence diagram for the simple beam L_3 has therefore been increased in proportion or made L_3 too large. The net shear at the left of support D due to the load P thus becomes $S_d = -Py_3 \frac{I}{L_3}$, that is $\frac{I}{L_3}$ is the correction constant for the shear influence ordinates. (Were the moment influence lines drawn to any other magnitude the height of the simple shear influence diagram at the support D would become $L_3 \times \frac{L_3}{U_3}$ and the final net shear ordinates would have to be corrected by the constant $\frac{U_3}{L_3^2}$.)

The total shear just to the left of support D placing the loads as shown is finally $S_d = (-P_1y_1 + P_2y_2 - Py_3 - P^1y^1 - P_4y_4 + P_5y_5)\frac{I}{L_3}$.

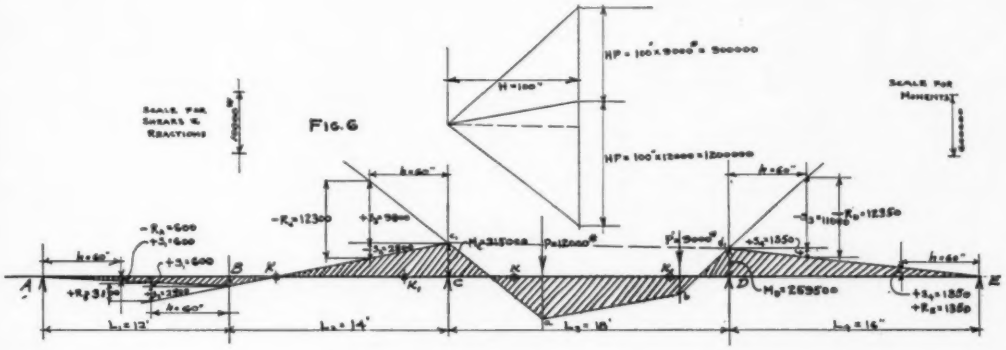
The shear influence diagram for a point in the span (for example the point T) is shown (shaded diagonally) in Fig. 5a and needs no further explanation. Placing the loads as shown the shear at point T becomes

$$S_t = (-P_1y_1 + P_2y_2 - Py_3 + P^1y^{11} - P_4y_4 + P_5y_5)\frac{I}{L_3}$$

It will be seen that with the above methods the problem can be solved for any system of external loading no matter how complex. Where a uniformly distributed load occurs it may be divided into a number of small parts, each of which is to be considered a concentrated load. Where a fixed system of loading occurs an influence line should be drawn for the moment at each support adjacent the spans loaded, and the moments at the supports determined.

If these moments are introduced as measurements on the vertical through the supports and above the girder lines, the upper extremities of these measurements can be connected with simple moment diagrams and the moment diagram for the entire series thus laid down. For example, in Fig. 6 consider span L_3 loaded with the two loads P = 12,000 lbs. and P^1 = 9000 lbs.

The ordinate to the influence line for the moment at support C, under P (Fig. 5) scales 21″ and under P^1 7″. The moment at C is therefore $M_c = 21 \times 12{,}000 + 7 \times 9000 = 315{,}000$. The ordinate to the influence line for the moment at support D under P (Fig. 5) scales 11.5″ and under P^1 13.5″. The moment at D is therefore $M_d = 11.5 \times 12000 + 13.5 \times 9000 = 259{,}500$. Lay off these two moments to a convenient vertical scale on the verticals through C and D respectively (Fig. 6). Make the pole distance in the force polygon any convenient length in the horizontal scale (here H=100″) and on the load line lay off the two loads HP=1,200,000 and HP¹= 900,000 to the vertical scale mentioned above. Draw



the simple moment diagram $c_1abd_1c_1$ connecting the upper extremities of the moments at the supports. Complete the moment diagram for the entire series as shown. The moments can be scaled direct, using the vertical scale.

In the shear diagrams the signs will require careful attention.

A downward shear against a support at the left of a span will be a minus shear. A downward shear against a support at the right of a span will be a plus shear. Likewise an upward shear against the left support will be plus and an upward shear against the right support minus. The signs of the reactions are more obvious and can readily be observed from the moment diagram. An upward reaction against the girder is a minus reaction and a downward reaction a plus reaction.

In cases where some definite system of loading is given the method of determining the shears and reactions as shown in Fig. 6 may be used to advantage. Since the moment diagram is drawn so that the moments can be scaled direct a small force polygon having a pole distance of 1″ could be introduced at a support, the rays of which would be parallel to the bounding lines of the moment diagram immediately adjacent that support. The shears would appear on the load line of the force polygon and

would be correct to the vertical scale of the moment diagram. The reaction would be the sum of the loads as scaled on the load line. Since it is impossible, however, to work to such a small scale the pole distance will have to be increased accordingly (made 60″ in Fig. 6) and the scale on the load line increased an equal amount. In the illustration one vertical moment unit is equal to 600,000 inch pounds. If the pole distance in the force polygon for shears and reactions is made 60″ the scale on the load line becomes $\frac{600{,}000}{60} = 10{,}000$ lbs. to each vertical unit. The shears and reactions, then, can be scaled direct by using this latter scale.

In each particular problem various methods of simplifying the mechanical work will present themselves.

The figures given in Fig. 6 will not be found to be exact when investigated analytically on account of having been scaled from a small drawing, but will be close enough to make the analytical check satisfactory. The larger the scale of the drawing the more accurate of course will be the results.

The shear just to the left of support D will also be found in Fig. 5a.

$-S_3 = (-Py_3 - P^1y^1)\ \frac{I}{L} = (-12000 \times 5 - 15.25 \times 9000)\frac{I}{18} = -10958$ and just to the right of support $C + S_3 = (+Py^{111} + P^1y^{11})\frac{I}{L_3} = (+12000 \times 12.8 + 9000 \times 2.7)\frac{I}{18} = 9883$: a close enough check.

From an inspection of the moment diagram in Fig. 6 it will be seen that the points of contraflexure in span L_3 are in a different location than the k and k_1 points. The reason why the k points are referred to as fixed points in contradistinction to points of contraflexure is therefore obvious.

Improvements in Settling Tanks for Small Sewage Disposal Plants

By WALDO S. COULTER, *Assoc. M. Am. Soc. C. E., M. Am. W. W. Ass'n*

The writer contributed an article to THE AMERICAN ARCHITECT of January 24, 1917, entitled "The Operation of Residential Sewage Disposal Plants in Actual Practice," in which it was pointed out that the disturbances occasioned within the ordinary single-story septic tank by the putrefactive processes established in the sewage deposits caused this type of tank to "unload" sewage matter into the tile field or other feature provided for final oxidation. The criticisms embodied in that article were wholly destructive, and it was intended to supplement it by a second article setting forth remedial measures. Circumstances have operated to defer the writing of the constructive article until this time.

The first steps taken to prevent the "unloading" of sewage matter from single-story septic tanks were in the form of a second single-story tank, placed in series with the first, for the purpose of intercepting and redepositing the matter thrown off by the first tank. These were known as "primary" and "secondary" septic tanks. The first large-scale installation in this country was made at Columbus, Ohio.

It was soon found that the tandem tanks failed to overcome the difficulty. The sewage matter disgorged by the primary tank served to set up active putrefaction in the secondary tank, which in turn unloaded its deposits into the filters, etc. The secondary tank did serve to prolong the period intervening between the commencement of operation and the beginning of unloading into the filters, but not sufficiently to be of much value. The Columbus tanks have, during the past two years, been converted gradually into two-story tanks, at great expense.

This tandem arrangement of single-story tanks has been applied to a limited extent to residential plants as a "patented" system. In this case emphasis has been laid, not so much on the intercepting qualities of the secondary tank as on certain alleged marvelous oxidizing properties it has been said to possess.

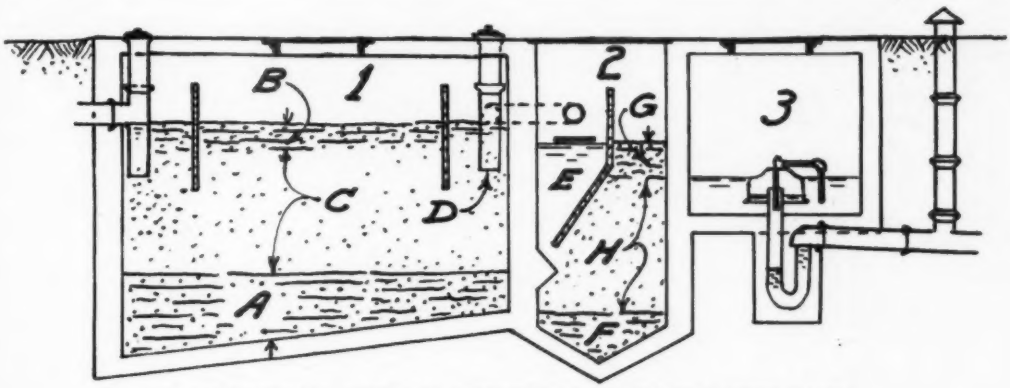
The next advance in municipal work was the two-story septic tank, commonly known as the "Imhoff" tank, it having been adapted by a German engineer of that name from the Travis tank at Hampton, England. The two-story tank consists of a settling compartment with steeply sloping sides, converging to a trapped slot or opening at the bottom, superposed above a septic chamber or sludge compartment. Settleable sewage matters are deposited while the sewage flows slowly through the upper chamber, and slide down the sloping sides and through the slot into the sludge compartment below. All the disturbances arising from putrefaction are confined to the lower compartment, rising gas bubbles and gas-entrained solids being excluded from the upper chamber by the trapped form of the

slot and diverted to vents provided for the purpose. Floating matters are retained in the upper chamber by suitable baffles and are removed from time to time.

The purpose of this arrangement is to secure the settlement of suspended sewage matter without the disturbing influences of rising gas bubbles, etc., and to prevent the ejection of gas-entrained matter vomited forth by putrefying accumulations of sewage "mud," while at the same time retaining the sludge digesting properties and the long periods between cleanings peculiar to the septic tank.

In practice it has been found that where the sewage is "stale" or septic before it reaches the tank, such as is usually the case where it has to traverse long distances through the sewers before reaching the disposal plant, the two-story tank generally operates satisfactorily. On the other hand, stale sewage has its solids quite completely disintegrated, the many finely divided particles of low specific gravity do not settle readily, and the efficiency of the tank is correspondingly lowered.

Quite commonly with "fresh" sewages, and sometimes with stale sewages, the two-story tank develops what is known as "foaming." It will be observed that the liquid in the lower compartment, or sludge chamber, remains practically stagnant, all flowing through being confined to the upper or settling compartment. As a result, the liquid standing in constant contact with the sewage deposits takes large quantities of organic matters into solution and tends to become viscous. Gas bubbles escaping at the vents blow this viscous liquid into a froth or foam which, when gas ebullition is extremely vigorous, rises over the tops of the vent walls and discharges froth, scum and solids into the settling chamber and over the surrounding ground surface. The tendency to produce viscosity in the lower compartment and to establish vigorous gasification is most marked in the case of fresh, strong sewage. Fresh sewages also produce excessive quantities of scum or gas-borne matter in the vents, frequently choking them and forcing the gas and rising sewage solids back and up through the slot into the settling chamber.



LONGITUDINAL SECTION THROUGH A COMBINED TYPE TANK
(Means for removing sludge not indicated)

1—Single-story septic tank.
2—Two-story secondary tank to entrap sewage matter unloaded by No. 1.
3—Siphon chamber.
A—Putrefying deposits on tank bottom.
B—Scum composed of floating objects and sewage matter lifted from A by entrained gases.
C—Rising gas bubbles, gas-entrained solids rising from A and settling back from B after liberation of gas, and sewage matter in state of agitation.
D—Sewage from No. 1 carrying off matters "unloaded" by the tank.
E—Upper or settling compartment of two-story tank.
F—Putrefying deposits in lower compartment.
G—Vent containing scum composed of sewage matters lifted from F by entrained gases.
H—Rising gas bubbles, gas-entrained solids rising from F and settling back from G after liberation of gas.

So widespread has been the occurrence of "foaming" that well-informed engineers look well to the conditions before recommending the installation of two-story tanks of standard design. These difficulties can be overcome by the installation of certain features in the design, but these are of recent origin and do not form a part of current standard practice; furthermore, they would be unsuitable for a residential sewage disposal plant.

The point of interest in connection with the small plant is this:

The two-story tank will retain practically all settleable sewage solids, without foaming, if the sewage is first "broken down" and partially settled in a primary single-story septic tank. That is, if a small two-story tank is placed between the ordinary type of septic tank and its siphon chamber it will protect the tile field by intercepting the matter unloaded by the single-story tank. In order to

release the minute gas bubbles in floating or suspended matter lifted from the bottom of the single-story tank, and so permit it to settle again, the sewage from the primary tank should be delivered to the settling chamber of the two-story tank, with a fall of 6 or 8 inches on to a "splash board."

In no case should a two-story tank be installed as the sole unit of a residential plant. The floating feces, paper, the grease, etc., will accumulate in the upper chamber, stick to the sloping sides, and convert it into a filthy mess of low efficiency as a settling device. It is furthermore liable to "foam." Of course, constant daily attention will prevent some of these troubles, but no residential plant should be installed on the supposition that it is to receive painstaking and irksome attention.

The accompanying sketch illustrates a combined type installation, such as has been suggested. It will be noted that the secondary two-story tank is small and may be constructed in such a manner that the total cost will not be greatly increased.

The two-story tank is patented, and a small royalty fee must be paid for its use, amounting to about $10 or so for a residential plant. As the patentee is an enemy, no fee is payable during the war, though collection can probably be made after the conclusion of peace.

Book Review

MECHANICS OF THE HOUSEHOLD. By E. S. Keene, Dean of Mechanic Arts, North Dakota Agricultural College. Full cloth, size 5½ x 8 inches, 391 pages, illustrated. McGraw-Hill Book Company, Inc., 239 West 39th Street, New York.

THIS book is the first of its kind and is of value to architects and engineers who are interested in residential construction. The problems of mechanical equipment for buildings of this class differ from the larger problems involved in commercial structures, and are worthy of greater attention, as a course of study, than they have been accorded heretofore. The fact that any house, rural or urban, may be provided with all domestic conveniences included in the heating, plumbing, lighting, water supply and sewage disposal, and other appliances, indicates the general use of domestic machinery in great variety.

To understand the application and adaptability of this mechanism requires a knowledge of its general plan of construction and principles of operation. In this book the essentials of each type of mechanism are described and its application to each requirement made plain to the reader.

Of the thirteen chapters, the first five treat of the heating plant. Steam, hot-water and hot-air furnace plants are described and illustrated; temperature regulation as adapted to these systems of heating and a chapter on the management of heating plants completes this portion of the book.

A chapter on plumbing describes the construction of the different fixtures used for sanitary purposes and the different kinds of valves and other articles used in connection with them; and the water service, both hot and cold, required for domestic and sanitary purposes. The chapter on water supply is very complete and covers the entire range of this subject, including water analysis, sources of supply and the sources of water pollution, the different types of wells and well pumping equipment. Also the different types of water supply systems and the apparatus suitable to each. A chapter on sewage disposal completes this phase of domestic engineering.

Combustibles, consisting of the various kinds of coal, peat, wood, charcoal, coke and briquets, are fully described and their comparative value as such, based on the standard measure of British thermal units, discussed in a chapter devoted to this subject.

Atmospheric humidity and ventilation are covered in chapters devoted to each of these very important subjects. Gaseous and liquid fuels, with their application to heating, cooking and lighting and with a description of the particular apparatus suitable for each fuel and use, are fully explained.

The concluding chapter on electricity treats of the theory of light and lamps; domestic mechanisms, such as toasters, flat-irons and heaters; buzzers, bells, telephones and batteries; meters, switches, sockets and the many other articles which enter into the use of electricity.

While all these subjects are treated in a scientific manner, the presentation is such that the ordinary layman and householder can understand the various topics discussed. The information given in this book it such as all persons need in the conduct of their ordinary living operations.

THE VATICAN GARDENS, ROME, ITALY