

THE AMERICAN ARCHITECT

VOL. CXII

WEDNESDAY, SEPTEMBER 5, 1917

NUMBER 2176



STE.-CROIX OF QUIMPERLÉ. EXTERIOR FROM SOUTH

The ancient dispositions of the church were considerably altered when the edifice was rebuilt in 1862 after the collapse of the central tower. At present, the upper row of windows opens above the vaults of the side aisles. Possibly there may originally have been a gallery.

The principal entrance to the church is situated in the rectangular western arm seen to the right in the photograph. This was denatured at the time of the Renaissance.

Architectural Rambles in Brittany

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I. STE.-CROIX OF QUIMPERLÉ

NO country of the Occident, not even Spain, possesses an architecture so rich in the quality of imagination as Brittany. The Celtic temperament is here displayed in all its fascination and wayward charm. This exuberance of invention is perhaps more apt to appeal to the

traveler and seeker after novelty than the architect or the archeologist. Breton architecture is as exotic, as unexpected, as the most fantastic constructions of the Far East, which at times it so unexpectedly resembles.

The fact that Breton architecture is in certain ways so un-European has led to undue neglect both

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FIG. 4—INTERIOR OF STE-CROIX

The tower was supported by four enormous piers. The crypt of 1029 extends from the eastern apse through the central portion of the edifice, and is surmounted by the highly raised choir seen in the photograph. The interior of this church is not only one of the most strikingly original Romanesque designs extant, but is also one of the most beautiful. The powerful piers, the broad simple handling of masses, the sense of height, and the restrained details impart to this building in a remarkable degree the qualities of grandeur and repose.

of its absolute beauty and of its archeological importance. We are apt to think of this art as an eddy apart from the great currents of European civilization, centuries behind the artistic evolution taking place elsewhere, as, in short, rural and reactionary in character. This impression is not altogether inexact for the XVI, XVII, and even XVIII centuries. When the rest of France had embraced the Renaissance in its highest development, in Brittany, as in England and America, Gothic architecture still continued to live on. The architectural history of Brittany, however, has not always been marked by the same conservatism. In the XI century the Romanesque architecture of Brittany was in advance of that of the Ile-de-France.

Ste.-Croix of Quimperlé is undoubtedly the most interesting Romanesque edifice in Brittany. Indeed, in it we find typified all the romance, all the imagination, all the poetry of the Celtic race. It is the wildest, the most extravagant, the most incredible and the most clever of Romanesque churches. In a singular degree it expresses the character of the land and of the people among whom it is placed.

The early history of the monastery transports us at once into the magic land of Celtic poetry. The beautiful legend of St. Guthierne has been printed in Le Men's admirable edition of the history of Ste.-Croix, written in the XVII century by Dom Placide Le Duc. I shall translate as literally as possible the naïve Latin, being quite conscious, however, that I lose a great part of its charm:

"Guthierne, when he was a young man, went out one day with his father to make war against his enemies. In that day Guthierne and his father were victors, and Guthierne slew the son of his sister, for he did not know that he was his friend. After he had found out that it was the son of his sister he repented at having committed this fault, and he wept, and after that he went out in the desert and lived in a great valley in the northern part of Britain, and there he performed penance for a year's time, and no one lived with him, and he made for himself a little cell, and in the cave next to it there was running water, and there was a great stone next to the bank of the river, and in that river he submerged his body every night and every day, and when he came out from the river upon the rock he prostrated himself

and prayed. Thus he lived in that place for a whole year. On a certain day a hunter came to the place, and seeing the youth seated and praying incessantly on the stone, he questioned him and said, 'Why, my son, dost thou live here?' and the youth replied, 'I do what I deserve to do,' and he made the hunter swear that he would tell no one that he was in that place. And after that the hunter went to the house of the king, Guthierne's father, and told everything that he had seen and how the young man who sat and prayed upon the rock was like unto the son of the king, and the king said to him, 'Let us go to the place and let us see the man thou hast described,' and after that they came to the place where the young man was living, and they saw

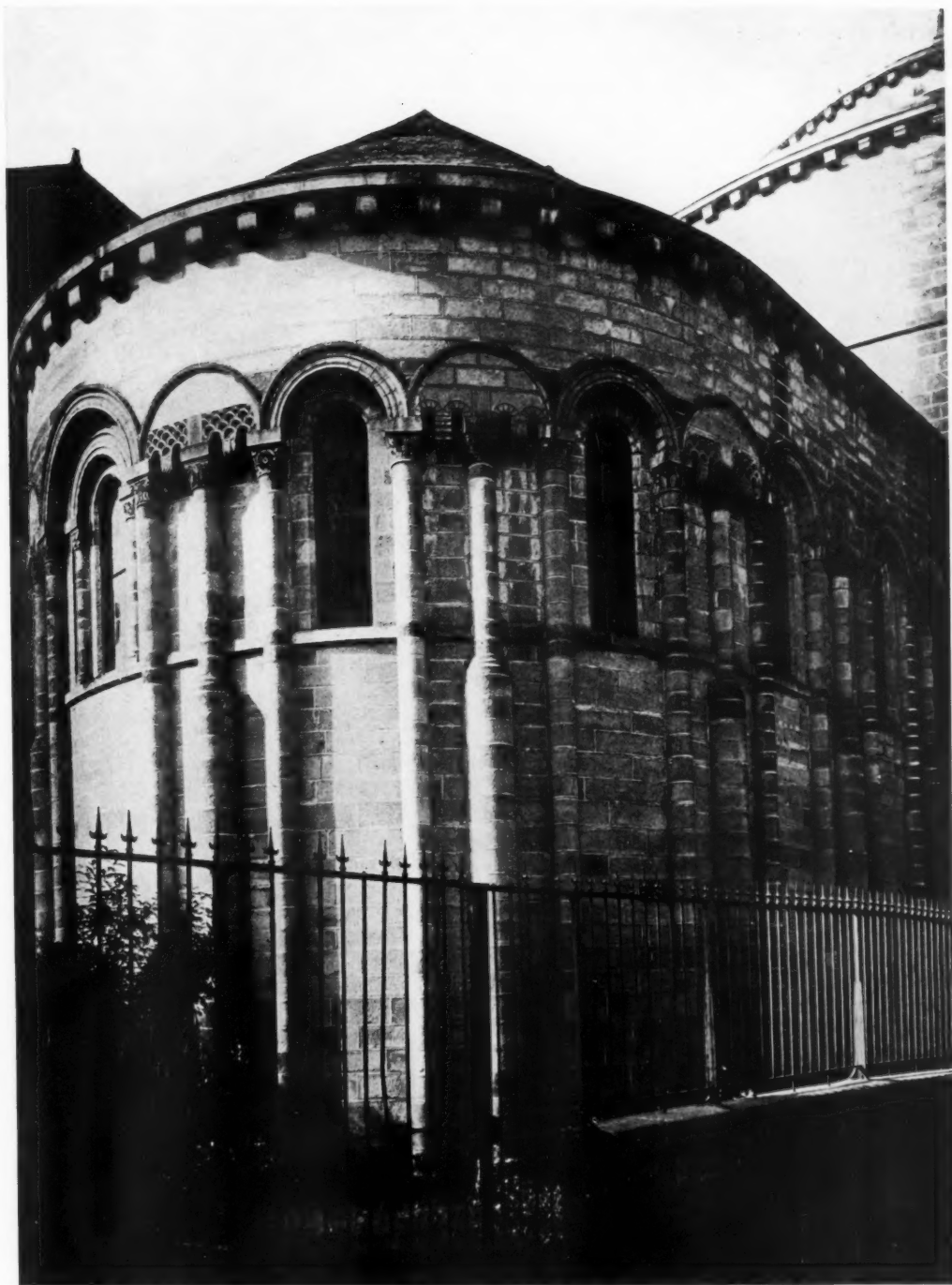


FIG. 2—EXTERIOR OF THE EASTERN APSE, STE.-CROIX OF QUIMPERLE

This is the most richly ornamented portion of the building. The arched corbel-tables, grouped two and two, indicate Lombard influence. The scale ornament above them in certain bays was probably inspired by early Christian monuments of Rome in which this motive fre-

quently occurs. In the reconstruction of 1862, many of the ancient capitals were preserved, others replaced by modern copies. As is evident in the photograph, the capitals show a mixture of Breton and Norman influences.

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him performing his penance by the river. But the youth fled into his cell and wept. And his father addressed him, saying, 'Oh my son, why dost thou do thus? Thou must come with me to my palace

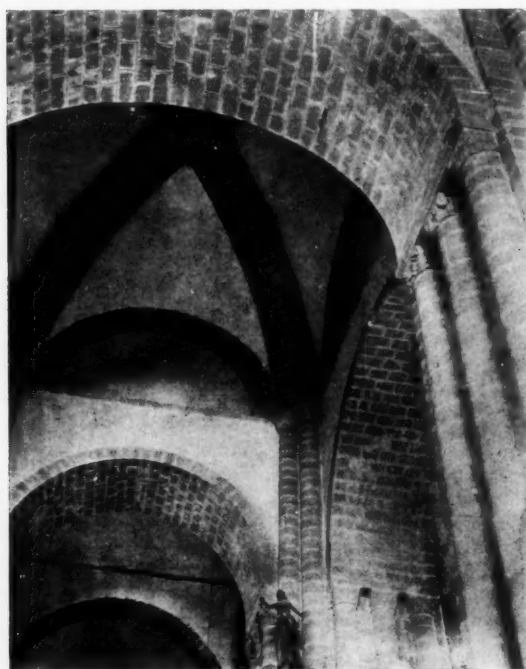


FIG. 5—CENTRAL VAULT AT STE.-CROIX OF QUIMPERLÉ

The church is of particular interest for the rib vault which it contains. Being authentically dated 1083, this is the earliest rib vault of certain date north of the Alps. Before 1862, it was surmounted by a tower. I have explained in my *Construction of Gothic and Lombard Vaults* why the rib vault could be more easily constructed than any other type of vault beneath a tower. In fact, in France the earliest rib vaults are almost always found in this position.

and receive the kingdom of thy father.' But Guthierne refused, and his father said to him, 'I shall make for thee a monastery, and place in it a multitude of monks.' And Guthierne remained there another year and prayed. And the Angel of the Lord came to him and said, 'Go to that other place which the will of the Lord has selected for thee.' And he went out accompanied by two servants on the highway, and they heard the voice of a certain woman. And Guthierne said to her, 'What ails thee, woman?' and she replied, 'Oh, servant of God, I had one son, but he has been killed in war.' And he said to her, 'Why dost thou carry his head?' and she replied, 'Since I was not able to carry his body to his monument.' And he said to her, 'Go before us to his body.' And they went together, and came to where the body was, and Guthierne said, 'Give to me

his head in order that I may join it to his body.' And when he had prayed, the man of God blessed the corpse, and immediately the dead was brought to life, but he who had been dead commenced to upbraid Guthierne, saying, 'Why hast thou brought me back from the good place in which I was?' But Guthierne said to him, 'It is better for thee to remain with us and with thy mother.' And he who had been dead replied, 'That I do not wish to do.' But the holy man said to him, 'Nevertheless remain, and say to all the good which thou hast seen, and I shall pray with thee that thou findest again that place from which thou hast come.' And he who had been dead received the benediction of the saint, and remained with his mother. But the saint and his servants went on to the banks of the river which is called Tamar, and there they remained a long time. And the Angel of the Lord came to them, saying, 'Look upon the sea daily, and there shall come to you a vessel in which you shall enter.' And they sailed away to a certain island where they abode for a time. Afterwards the Angel came to them and said, 'Go to that place of promise which is called Anaurot.' And St. Guthierne went to the appointed

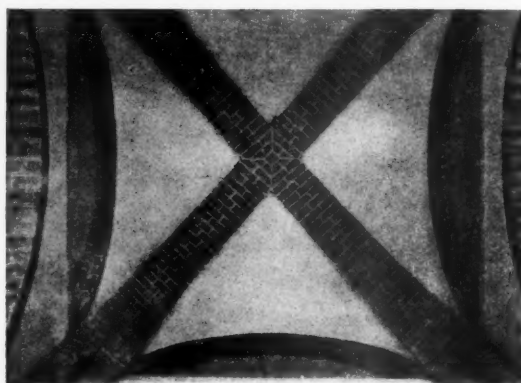


FIG. 6—THE RIB VAULT OF STE.-CROIX OF QUIMPERLÉ

This vault differs from the early rib vaults of Lombardy only in that the width of the diagonals has necessitated the introduction of vertical joints—that is, of course, if the existing vault be in this particular a faithful copy of the original. The stereotomy of the intersection would also seem to prove that contrary to custom both diagonals had been erected at the same time.

place, and abode there to the end of his time, performing many miracles."

It was in this promised land of Anaurot, afterwards known as Quimperlé, that was founded in the XI century the monastery of Ste.-Croix.

In the marvelous collection of Breton legends published by Albert le Grand, surely one of the most fascinating books ever compiled, there is told

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another legend which refers to the new church at Quimperlé. It occurs in the life of St. Goeznou, and is of especial interest for the light it throws upon the medieval building trades, although unfortunately I am unable to determine at what period the legend assumed its present form. In consequence of a miracle, the Count Comorre founded a monastery for St. Goeznou, who summoned for the works of construction artisans from all directions. His brother, St. Majan, a hermit, gave the plan and design of the building. When the monastery was finished the church was dedicated by St. Houardon, Bishop of Leon, in the year 642. In the year 675 St. Goeznou went with his brother, St. Majan, to visit St. Corbasius, who was building a monastery in the place where at present is the city of Quimperlé. Here God withdrew St. Goeznou from the world by a strange accident. For while he was examining the building in company with St. Corbasius, the conversation happened to turn upon the monastery long before built by St. Goeznou, which the saint began to describe, praising the work, especially the choir



FIG. 7—CAPITAL FROM THE CHURCH OF CASTELNUOVO SCRIVIA, IN PIEMONTE

The coupled columns, or shafts, below this capital are strikingly analogous to those which support the diagonal ribs at Ste.-Croix of Quimperlé, as seen in Fig. 5. This similarity is an indication of Lombard influence in the Breton church.

of the church, for the embellishment of which St. Majan had employed all his skill, for he was an excellent architect. This discourse displeased extremely a master-builder employed by St. Corbasius, who considered that St. Goeznou, by praising another of his profession in his presence and pre-

ferring another's work to his, had wronged him. He, therefore, conceived a strange hate towards St. Goeznou, and mounting upon the scaffolding which had been erected to roof the church, and passing above the head of the saint, he let fall, as it were by accident, his hammer directly upon the saint's head.

Of the church associated with this curious legend little is known. The existing monastery of Ste.-Croix was founded by the Count of Cornouaille, Alain Cainard, in the year 1029. Capitals in the existing crypt of Ste.-Croix dating from this period



FIG. 8—DETAIL OF BASES, STE.-CROIX OF QUIMPERLÉ

Lombard influence at Ste.-Croix is also indicated by the bases which are regularly adorned with griffes, and sometimes consist of inverted capitals, both Lombard motives. The character of the profiles with many superimposed tori also suggests Lombard influence.

give reason to suppose that the church was reconstructed at this time. A half century later another rebuilding of the church was undertaken. This is recorded in the chronicle of Ste.-Croix by the laconic notice:

MLXXXIII.—In hoc anno beati Gurloesii corpus de tumulo erigitur. Restauratio ecclesiæ sanctæ Crucis.

It is, in fact, the building of 1083 that has come down to us.

The plan of Ste.-Croix is, so far as I know, unlike that of any other church in northern Europe. The central feature is the crypt placed in the middle of the edifice, and enshrining the tomb of St. Gurloës. Four enormous piers rise over the raised platform or choir surmounting this crypt, and carry the rib vault which is the feature of greatest archeological interest in the church, and to the study of which we shall presently return. A circular wall incloses the four free-standing piers, from which it is separated by an aisle. To the east projects a rectangular arm terminating in an apsidal chapel. To the west is a similar arm forming the entrance vestibule and sharply deflected to the north. On the axes to the

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north and south are apsidal chapels. The side aisles are covered with groin or barrel vaults with transverse ribs. The whole building was formerly crowned by a central tower, but in 1862 this col-

great width has necessitated the introduction of vertical joints. Since the ribs are all semi-circular, the vault is much domed. The wall ribs, in two unmolded orders, are carried on a sort of shelf lunette.

At Ste.-Croix we have, then, a Lombard rib vault, erected in Brittany in the year 1083. This is the earliest rib vault of authenticated date north of the Alps, and proves that the Lombard construction had arrived as far north as Brittany at least ten years before the alleged date of the rib vaults of Durham, and twenty years before the construction appeared in the Ile-de-France.

It becomes a matter of considerable curiosity to determine how this construction could have reached

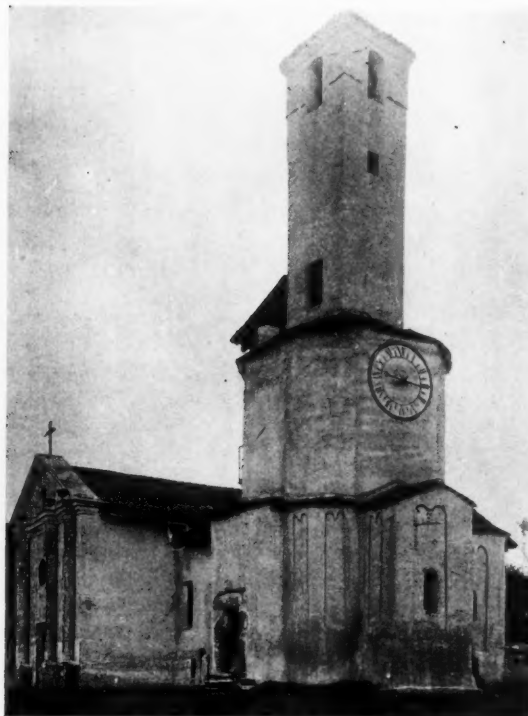


FIG. 9—BAPTISTERY AT S. PONZO CANAVESE, NEAR TURIN, PIEMONTE

This building, erected C. 1005, may have inspired the plan of Ste.-Croix. Like Ste.-Croix, it is a circular structure surmounted by a campanile, a motive which, I believe, is found only in these two buildings. At S. Ponzo the central rotunda is supplied with four absidioles on the axes precisely as at Ste.-Croix. Although in plan so analogous, the buildings in actuality bear little resemblance to each other. It is precisely this result which might be expected if an attempt had been made in Brittany to reproduce the Lombard edifice on the basis of an oral description or a sketch.

lapsed while an attempt was being made to restore the piers upon which it rested. Indeed, the fall of the tower entailed the ruin of practically the entire monument. The church was rebuilt without the tower in as nearly as possible the original form. The structure as it has come down to us is, however, a modern copy, not an original monument.

Although a copy, Ste.-Croix possesses extraordinary archeological interest, which, as has been intimated, centers in the rib vault of the middle compartment. The photographs will give a clear idea of its details. In plan it is nearly square, measuring 7.36 x 6.46 meters. The flat, unmolded ribs are of completely Lombard character, except that their



FIG. 10—DETAIL OF THE ORNAMENTAL ARCADE IN ONE OF THE APSES, STE.-CROIX OF QUIMPERLÉ

Such arcades characteristic of apses and absidioles in Breton churches were doubtless introduced as a reminiscence of the ambulatories generally used.

Quimperlé at so extraordinarily early a date. A hint, although, unfortunately, not as explicit a one as might be desired, is contained in the documents relating to the history of the abbey. Orscand, bishop of Cornouaille, was the brother of Alain Cainart, who founded the monastery. The bishop took a



FIG. 3—STE.-CROIX FROM THE NORTH

The cloisters were rebuilt in the time of the Renaissance. Certain windows of the central rotunda of Ste.-Croix, at least as rebuilt in 1862, are shafted.

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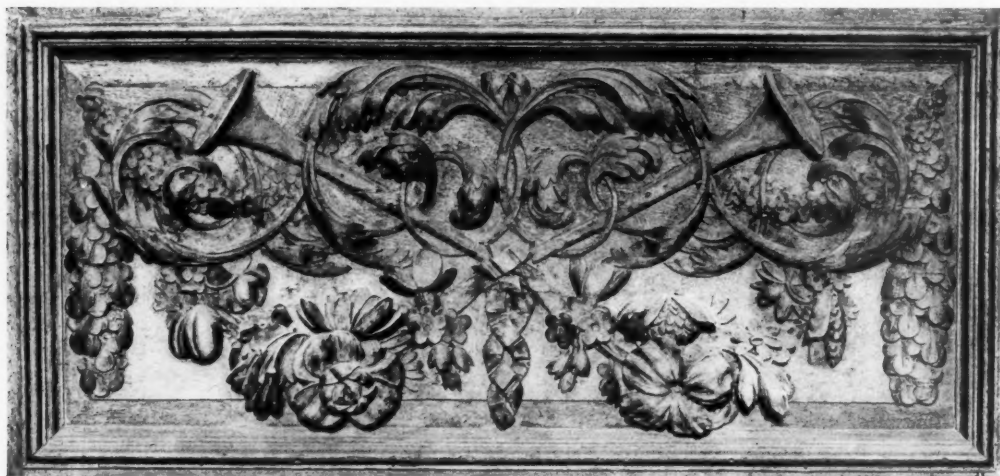
most lively interest in the pious enterprise of his brother, and participated actively in advising the latter upon all details of the new abbey. He also occupied himself with obtaining for Ste.-Croix various privileges and immunities. In the interests of the abbey he attended the council of Vercelli held by the Pope Leo IX in 1050. Now, Vercelli is situated in the center of the region where the rib-vaulted construction had been discovered about ten years before this council. Sannazzaro Sesia, the earliest extant example of the rib vault, is but a few miles distant. On his journey to Vercelli, the bishop Orscand could hardly have failed to visit the city of Novara, in the cathedral of which new rib vaults had just been erected. It is, therefore, not unreasonable to suppose that he may have brought back with him the news of the important constructive discovery made in Piemonte, and have proposed that it should be adopted in the new church which was probably already projected for Ste.-Croix. Actually, this construction was not undertaken until some thirty-three years later, but the plans of the bishop Orscand may well have been preserved.

In Ste.-Croix there are not lacking other indications of Lombard influence. The whole scheme of the church shows the closest analogy with an extraordinary structure at S. Ponzo Canavese (c. 1005). In both we have a circular edifice with four symmetrically placed apses, crowned by a campanile. The analogy is the more striking because no other buildings of this type, to the extent of my knowledge, are extant. S. Ponzo is situated at the foot of the Alps, near the road leading to France, where it might easily be visited by a traveler from Brittany en route for Vercelli. Other distinct traces of Lom-

bard influence are not lacking in the church of Quimperlé. Inverted capitals used as bases are frequent in Lombard edifices. The arched corbel-tables of the choir of Ste.-Croix are grouped two and two, precisely as at S. Ponzo Canavese, in the campanile of the cathedral of Novara, and in numerous other Lombard edifices. The colonettes supporting the system of Ste.-Croix are strikingly similar to those of Castelnuovo Scrivia; although of later date, the latter undoubtedly perpetuate an earlier Lombard mannerism.

The dominating influence of Ste.-Croix at Quimperlé is, therefore, Lombard. In its decorative detail, the church, of course, belongs to the local school of Brittany, but the larger structural features, which give the building its striking character, were derived from Lombardy. In some of the ornament, the influence of the architecture of Normandy is evident. It may also be suspected that the cruciform plan may have been inspired by the oratory of S. Croce in the Lateran. It was, however, the Lombard influence that was predominant.

Some doubt may not unreasonably be felt whether the documentary evidence indicating that this church was built in 1083 is entirely worthy of credence, and whether the ornament of the choir be not so advanced in character as to force us to conclude that the existing building is later in date. This doubt can only be set at complete rest when the architecture of Brittany in the Romanesque period is given a thorough and systematic study such as it has not yet received. In a subsequent paper, however, I shall indicate some of the reasons which incline me to believe that Ste.-Croix could only have been executed in the ninth decade of the XI century.



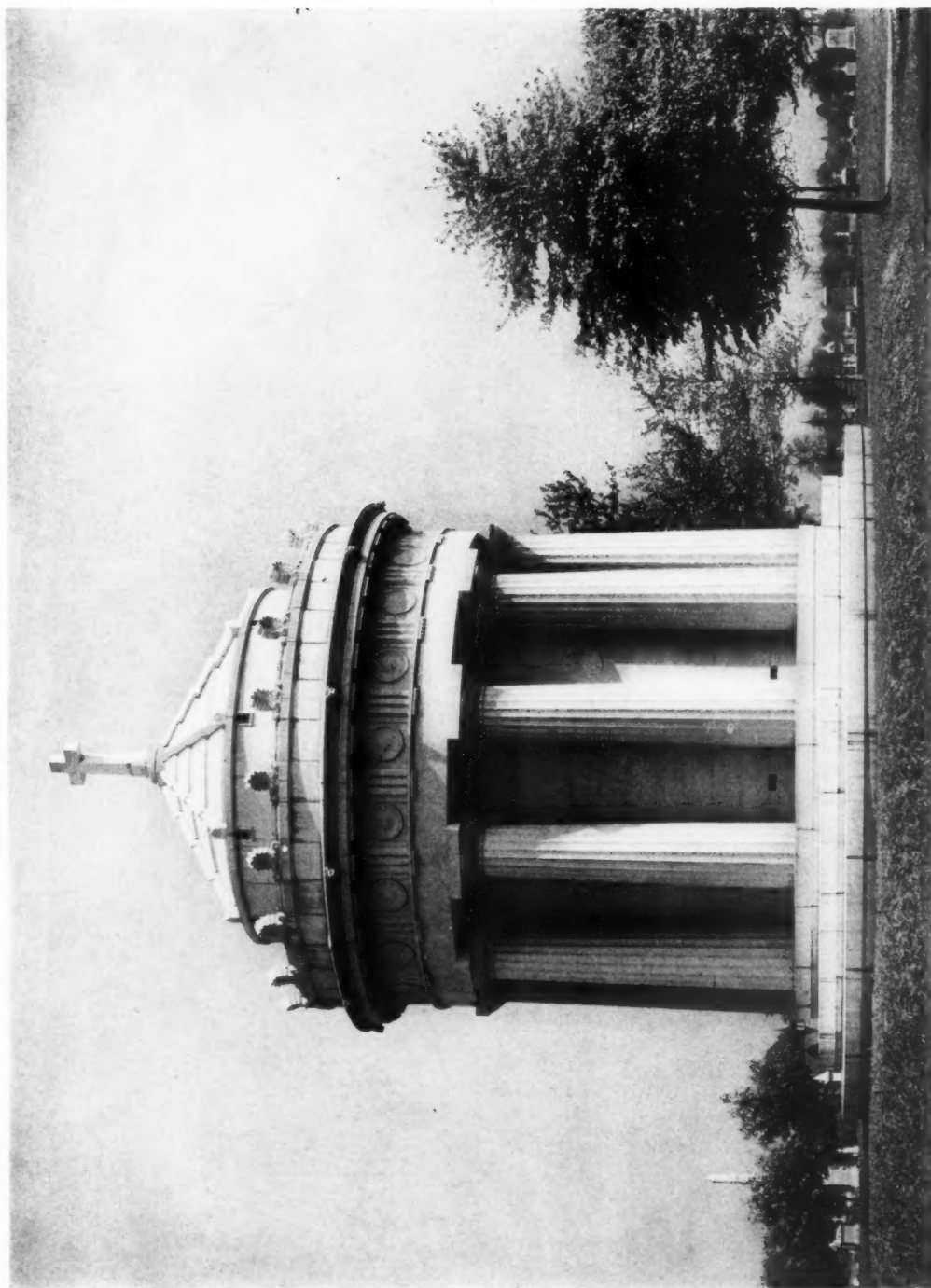
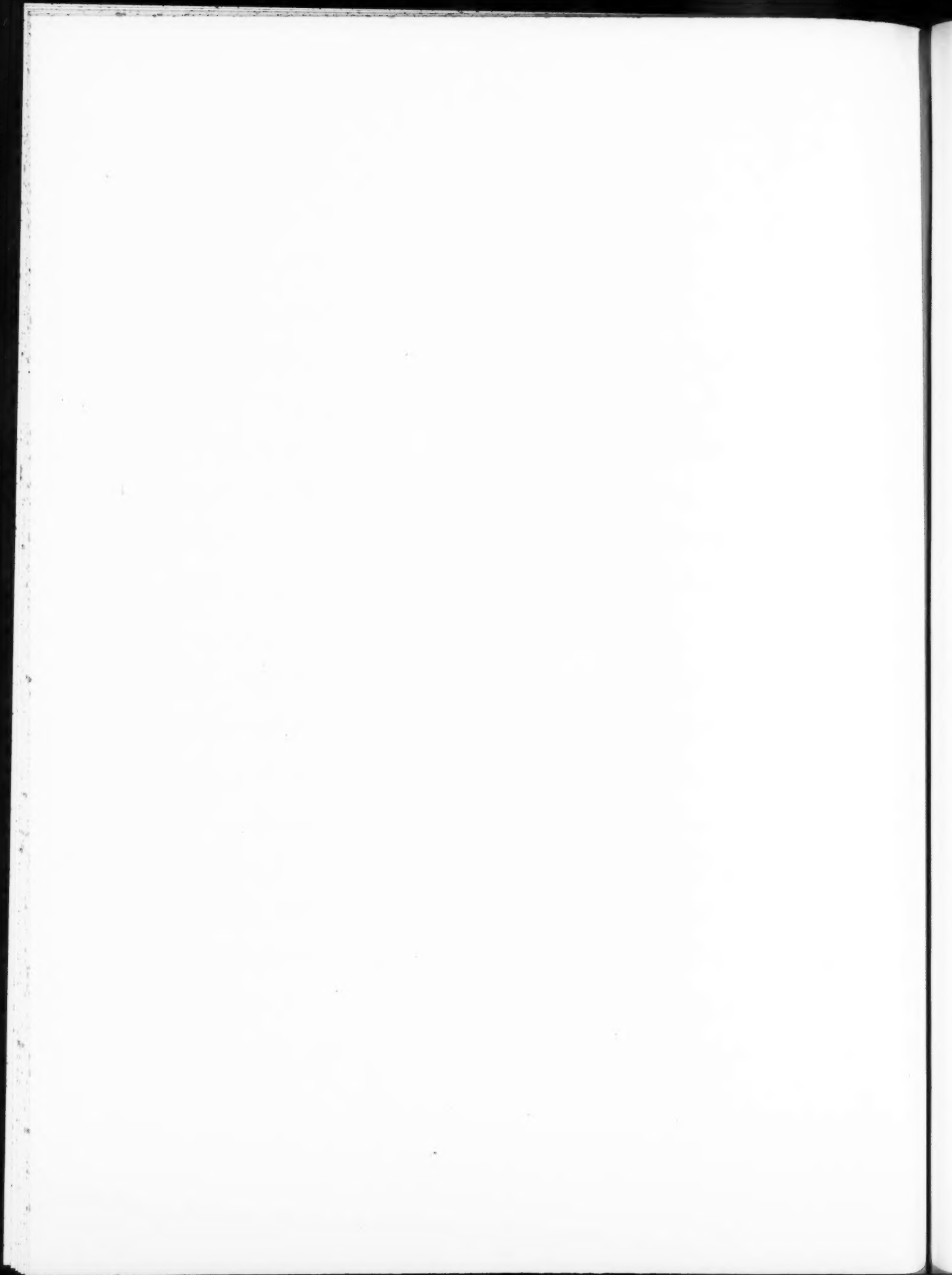
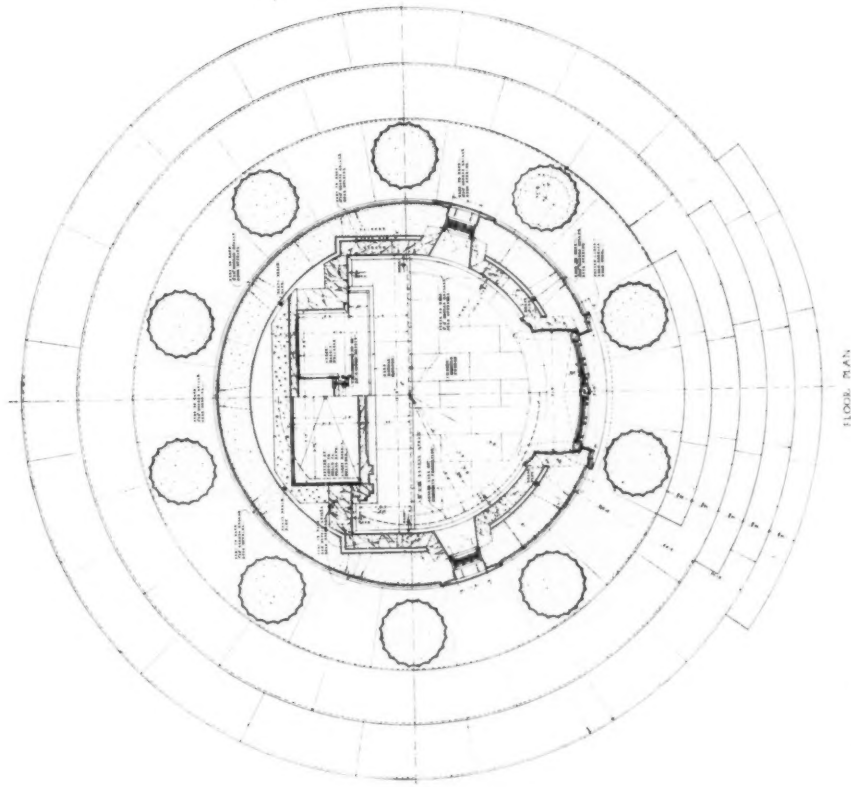


PLATE 94

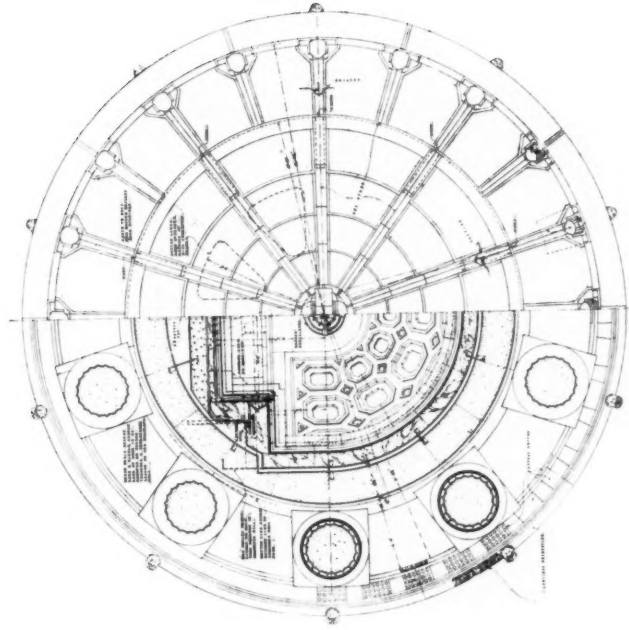
MAUSOLEUM, HOLY CROSS CEMETERY, DELAWARE COUNTY, PA.

JOHN T. WINDRIM, ARCHITECT



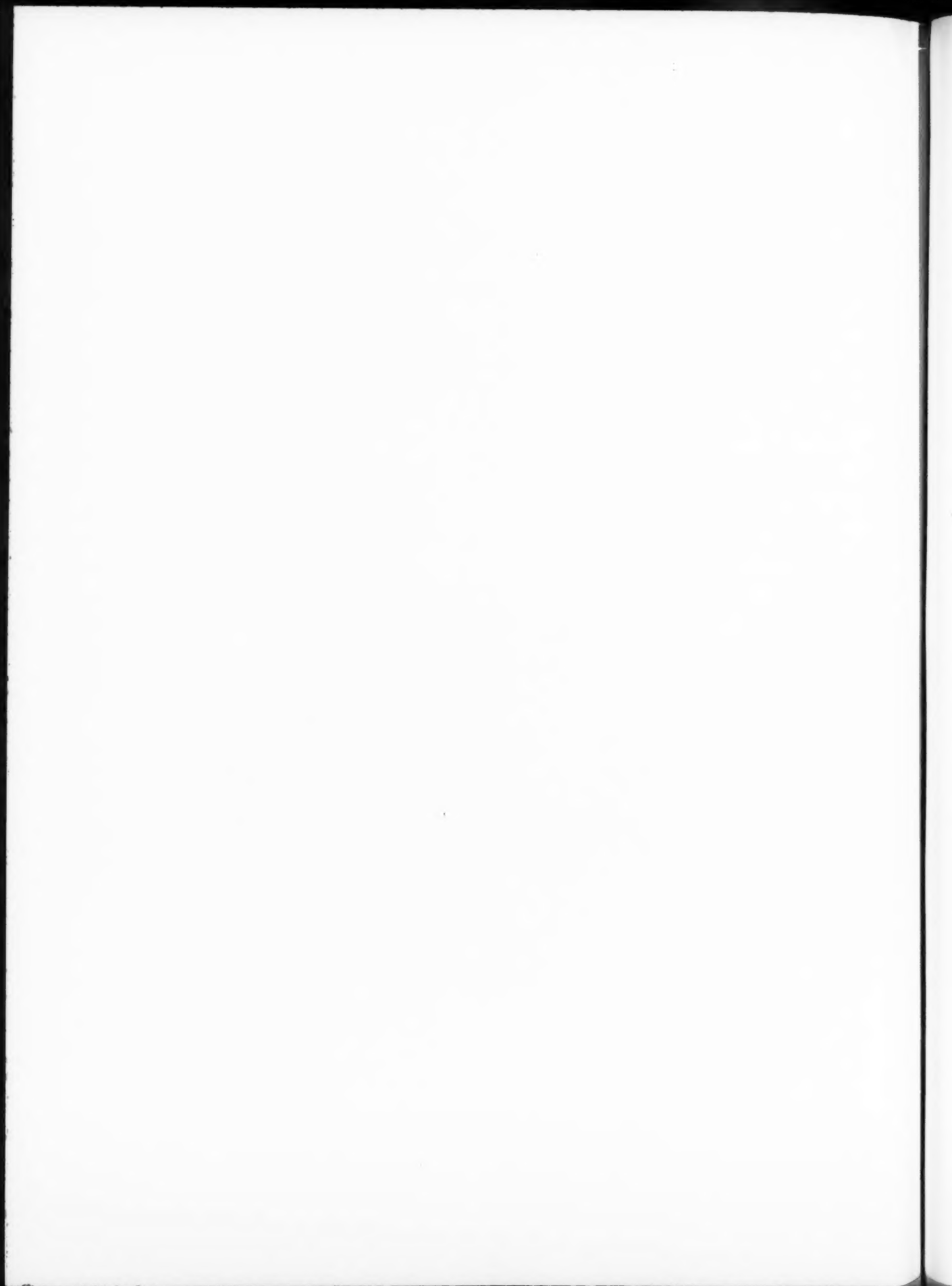


FLOOR PLAN



HALF CEILING PLAN

HALF ROOF PLAN



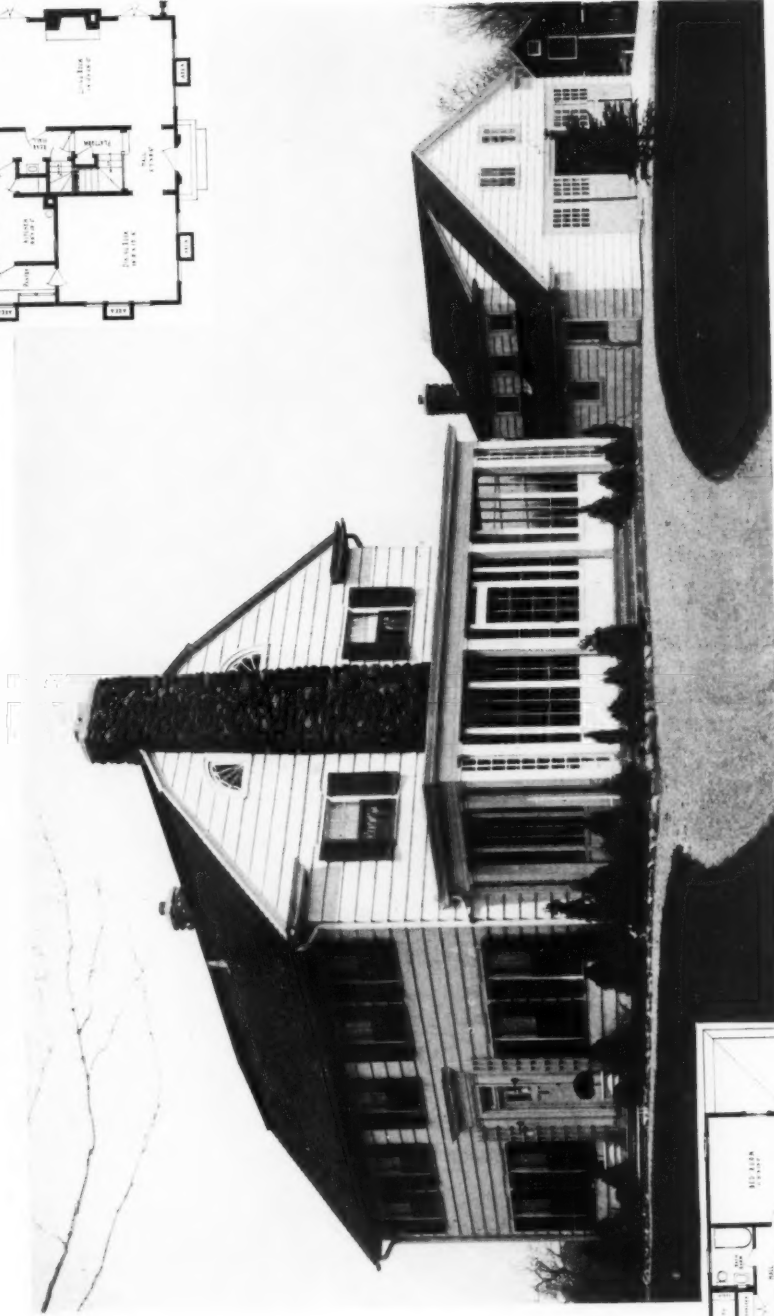
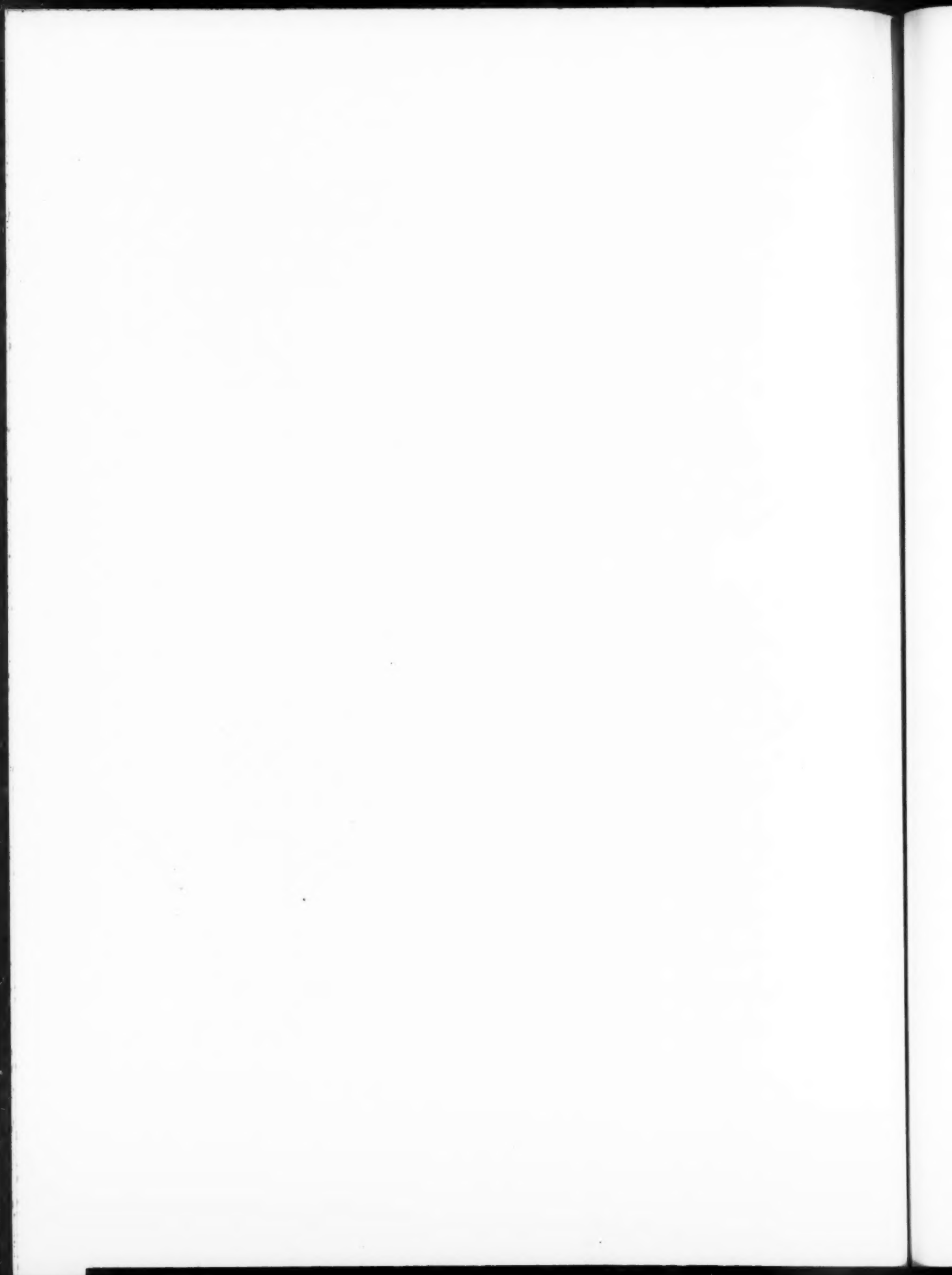


PLATE 97

HOUSE OF GEORGE R. COAN, WOODBRIDGE, CONN.
BROWN & VON BEREN, ARCHITECTS



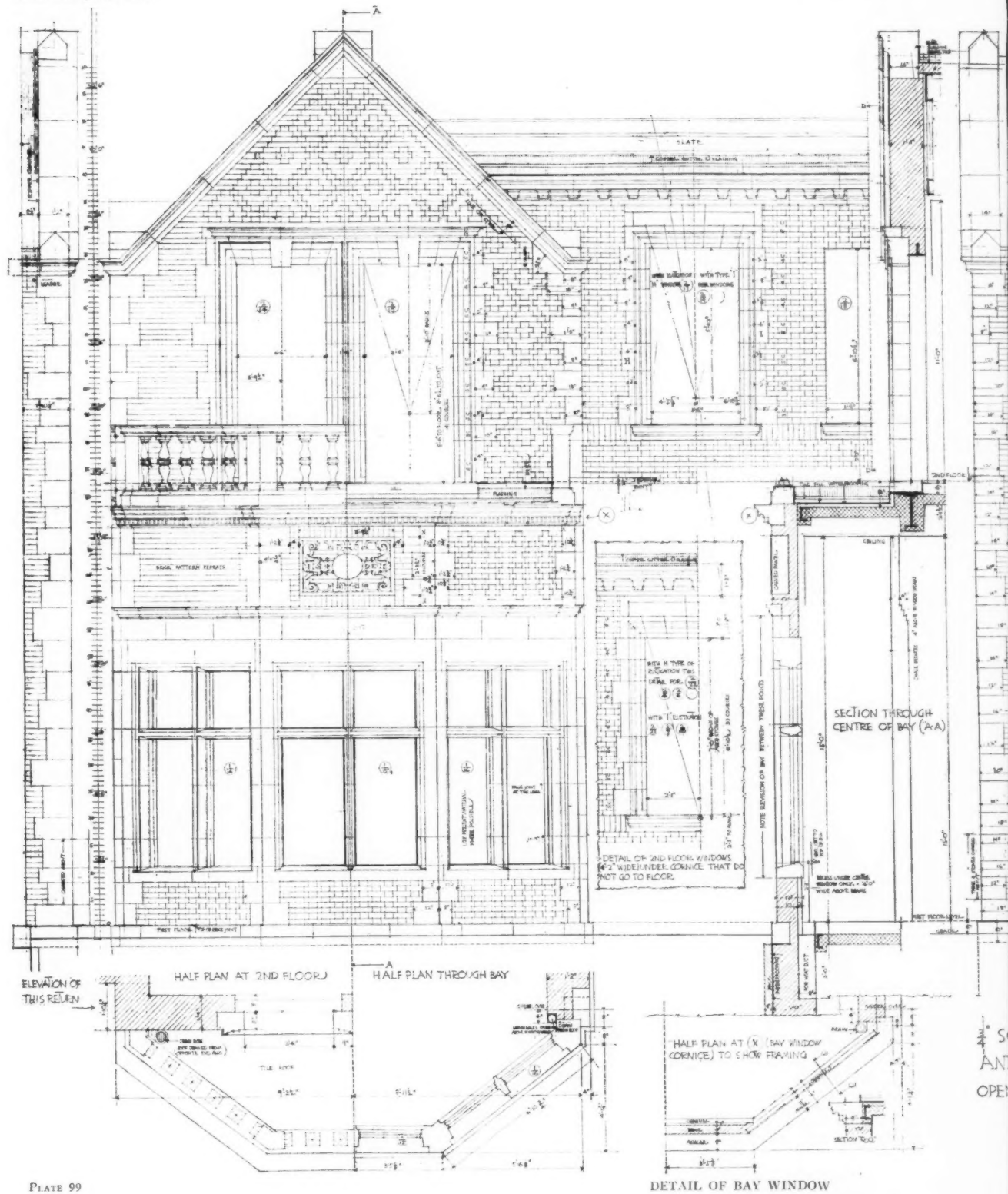
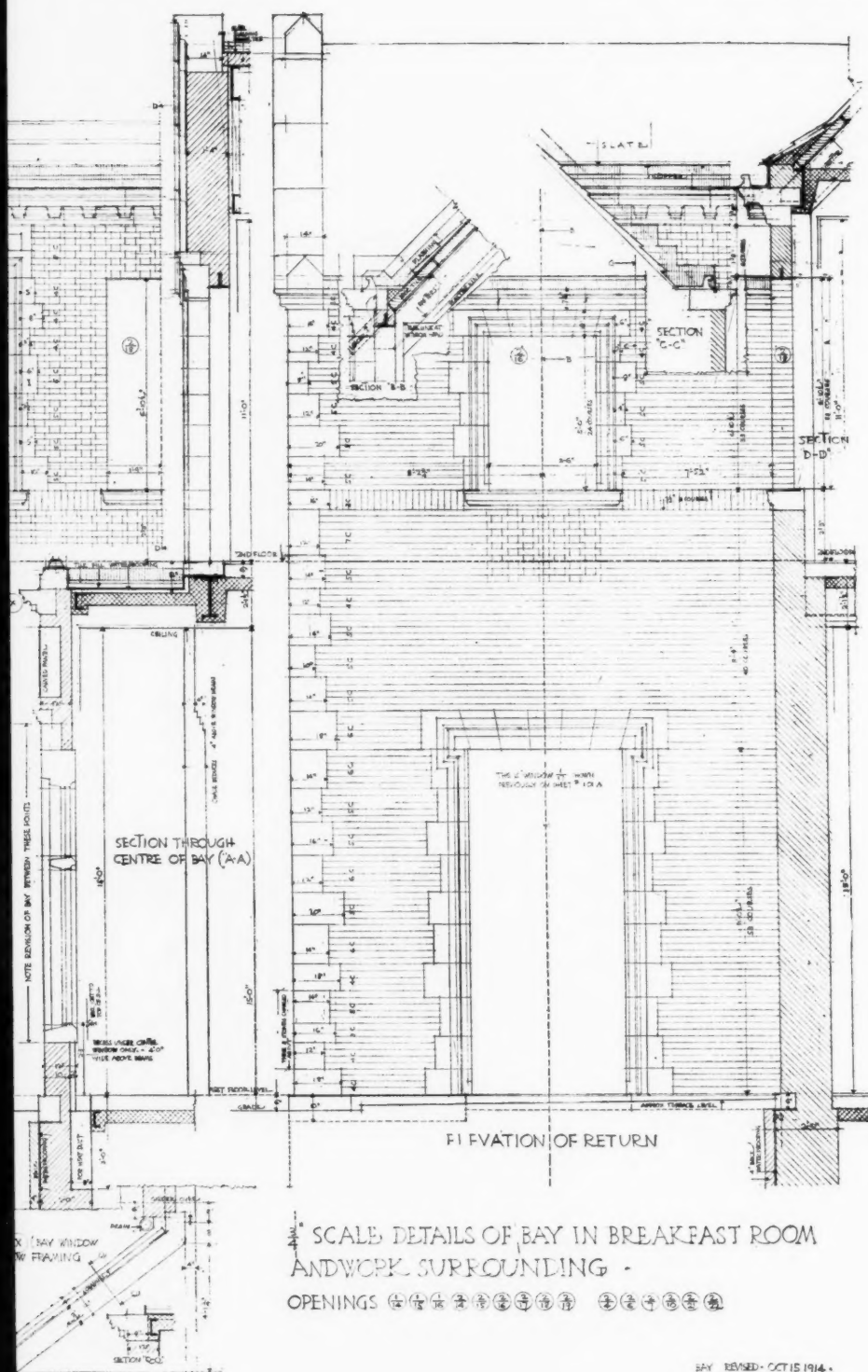


PLATE 99

HOUSE OF J. INSLEY BLAIR, TUXEDO PARK, N. Y.
CARRERE & HASTINGS, ARCHITECTS



BAY REVISED - OCT 15 1914.

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THE AMERICAN ARCHITECT

Founded 1876

PUBLISHED EVERY WEDNESDAY BY

THE ARCHITECTURAL AND BUILDING
PRESS, INC.

No. 243 West Thirty-ninth Street, New York

G. E. SLY, PRESIDENT

E. J. ROSENCRANS, SECRETARY AND TREASURER

Address all communications to "THE AMERICAN
ARCHITECT"

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TEN DOLLARS PER YEAR, POSTAGE PAID
ALL OTHER COUNTRIES . . \$12.00 PER YEAR
SINGLE COPIES (Regular Issues), 25 CENTS

CHICAGO OFFICE, *Mallers Building*
Page A. Robinson, *Western Manager*

Owned by United Publishers Corporation—H. M. Swetland, President;
Charles G. Phillips, Vice-President; W. H. Taylor, Treasurer;
A. C. Pearson, Secretary.

Entered as second-class matter January 6, 1909, at the Post Office at
New York, New York, under the Act of March 3, 1879.

VOL. CXII SEPTEMBER 5, 1917 No. 2176

The Education of the Architect

ENGLISH architects during the past year have in their deliberative bodies, particularly the Royal Institute, given much time and serious discussion to the problems pertaining to architectural educational methods.

With perhaps more thorough and well grounded methods than exist in any country excepting France, there appears to be a very decided tendency toward a careful consideration of every suggestion that will serve to further improve the form of education for the practice of architecture.

There is apparent a strong feeling towards the adoption of some course that will make it possible to discourage the continuance of study on the part of students who have shown that they lack the essentials of success in the profession of architecture and to find a way to place such "misfits" in another course of study more suited to their abilities.

When a student is for one reason or another drawn into a profession for which he is obviously unsuited, it not only serves his own interests but those of the profession as well if he can be induced to seek other fields in which he would be more qualified to work.

Every man knows how difficult it will be to accomplish this purpose. The discussions in the Council of the R. I. B. A. take this condition into full account, but there does not appear to have been advanced any method that would successfully accomplish this transplantation of professional misfits.

Professor Lanchester, the Chairman of a recent R. I. B. A. conference, expressed the opinion that in a certain sense the education for the profession of architecture could not begin too early, that the development of the faculty of observation, essential in every phase of art education, should be nurtured and developed as soon as it appears. Trained observation is undoubtedly the basis of all success in the practice of any form of art, but unfortunately this faculty is too often dwarfed or smothered by educational methods that, although honestly devised, often rob the student of a power, the cultivation of which is the very essence of his future success.

Professor Lanchester's contention that the cultivation of the highest power of observation is the first and greatest essential in architectural education is undoubtedly correct, as is also his opinion that specialized training may come comparatively late. It is the introduction of such specialization in the early years of an art education that hampers the future progress of the student.

Mr. A. E. Richardson, in the course of one of these conferences, advanced the opinion that the investigation of history as an aid to accomplishment in the practice of building should proceed on the lines of adaptation of modern needs. He contended that it was the "family likeness" of all building evolved during the past three thousand years that should be brought to the attention of the student. He also urged that marked developments, such as the classics of Greece and Rome, the idylls of the Renaissance, and the modern classics of Europe and America should receive fuller attention than they do at present.

To quote from Mr. Richardson's remarks: "This attention is essential if we are to advance either in construction or design, and just as the parallels of the classics in literature offer consolation to us in these times, so the buildings of the past can be referred to, to inspire confidence for the future."

Throughout all the arguments advanced during these important conferences, there constantly appears the desire to give highest training to the development of the power of observation. In short, this would seem to be the great essential. It is believed that no system of education in any phase of art excels that produced in France, where it is the custom for students to be taken to great modern buildings "there to observe the mysteries

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and workings in being of those buildings," and to learn by actual observation the reason for specific things that have been introduced into the plan, or that are suggested in the design.

Reference has been made in these columns to the method of instruction in art pursued in Paris more than seventy years ago by Boisbaudran. The fact that the first and greatest essential of this feature was the training of the memory in art, and that there came from his atelier a great many men who achieved the highest position in their profession, would seem to prove that any form of education in art that fails to recognize the necessity for the development of every power of observation and the retention of things observed, is lacking in the essentials of well grounded preparation to insure future success.

War-Time Memorials

THE National Retail Monument Dealers' Association, during its recent convention in Philadelphia, resolved on the appointment of an art jury of its members to pass upon all proposed designs for war memorials. The association will offer the services to the Government or any State, community or organization in the country, of an expert art jury to serve without remuneration. Steps will be taken to bring the matter before Congress and to urge an indorsement of a plan that will make it necessary that any design for a proposed monument must first receive the approval of this jury or one equally competent, before it may be erected.

This is a movement that should receive general indorsement. The unrestricted placing of monuments has led to many artistic errors. In this country the memorials are a source of constant regret. No individual would care to meet the storm of popular protest that would follow a suggestion resulting in the removal of any of these disfiguring monuments or memorials, so they must needs remain. But we can and should guard against similar errors in the future. The action of the National Retail Monument Dealers' Association makes it possible to secure a better form of commemorative art, with the co-operation of the very body of men who will probably have the largest influence in the character and design of future memorials to be erected.

The artistic errors in the placing of monuments in Paris have been the subject of much criticism. The efforts to rid the city of the least desirable have affected the political fortunes of many men who have tried to effect a necessary reform. While their intentions have undoubtedly been of the best and they have only sought to serve the artistic interest of the community, they have nevertheless been assailed by every faction whose hero has fallen under the ban of bad artistic presentation.

Experience always teaches costly lessons. It would be decidedly unwise if in these and similar matters affecting the display of public art, we fail to take heed of the errors of the past. No form of memorial can be said to be an expression of respect if its artistic presentation is so poor as to invite adverse criticism.



The Isolated Lighting Plant and the Country House

BY F. LAURENT GODINEZ

THE production of artificial light for the country house involves the combination of several elements, which if properly combined result in an efficient and satisfactory installation. Among the several commercially available systems, there is included a gasolene engine, "belted" to an electric generator, with or without a storage battery. The outfit is sold, bolted to a platform, so that it can be operated upon any level surface. The fuel tank for gasolene or kerosene is usually secured to the engine by brackets, being no closer than the fuel tank of the automobile as placed in the cowl, behind the dash-board. Some of these "belted" outfits are provided with radiators for a water cooling system, but the most efficient types are one-cylinder motors operating on a fairly constant load factor—if used with storage batteries. Such usage permits the engine to be run at infrequent intervals, and then at a fixed load for battery charging, or in the event of unusual demands requiring its operation in connection with the battery, abrupt load variations are intercepted by the battery, to the advantage of the engine. Without the battery the engine is subjected to the same strains as an automobile motor when it strikes the hills, and these are too severe for a small, air-cooled, one-cylinder plant designed with a limited load factor.

These "belted" outfits are fairly efficient if sufficient attention is given to their operation. The belt must be kept tight, and even then there is a certain amount of "slippage" which reduces the efficiency of light production much below the direct-connected plant. Most of these power systems are belt-connected and require cranking, and this must be done nightly unless there is a storage battery to carry the lighting load for several days at a time. Plants of the "belted" type can be purchased from \$150 to \$1,000 for the larger power units. They furnish the conveniences of "electric lights," but there are a great many inconveniences included at the operative end. Without a storage battery these units will be found unsatisfactory for lighting, owing to the fluctuation in speed which causes a corresponding fluctuation in light, and voltage regulators are an expensive addition to such plants. This "flicker" is bad for the eyes, and worse for the nerves. It can be seen in many city installations where the lights and elevators are supplied from

the same source. Consequently when one goes up the other goes down and vice versa. The storage battery absorbs all these irregularities and supplies an equal, even light until recharging becomes necessary.

This brings us to the ideal power system, one which possesses all the advantages and none of the disadvantages of others. It is a plant (one of several typical outfits) which will supply current for an equivalent of fifteen lights for five nights' average use at a cost of one gallon of kerosene. Plants of this class consist of a *direct-connected* engine and generator (no belt being used) in connection with a storage battery which will carry the lighting load for several days. The average use of artificial light in country houses is less than two hours per day, and the battery furnished with such plants will carry the load of fifteen lamps from eight to ten hours. It then becomes necessary to run the engine, and recharging is complete within four hours. The engine will operate for five hours on one gallon of gasolene. Cranking is eliminated by a self-starter. Lubrication has been greatly simplified and a small quantity of oil, applied weekly, and in some systems at one point only, is the sole essential. The fuel tank is attached to the engine frame and will hold several gallons. On the basis of one hour's operation with kerosene, eight twenty-watt lamps can be burned for half a cent, and these special Mazda lamps at 32 volts provide a very generous quantity of light. Since the engine is subjected to a constant load-factor in battery recharging it is possible to eliminate the possibility of freezing in cold weather. Plants of this description are made in various sizes, but as a rule the same sized engine and generator will carry twice the load in connection with a larger battery. The battery will carry twice the number of lights as the smaller battery, or the same number for twice the time. For such work the storage battery has been greatly refined and is not subject to the heavy jars and jolts which disintegrate it so rapidly in the motor car. On account of this freedom from such disturbances it has been possible to add several refinements reducing the maintenance factor to a minimum. When the battery becomes "dry" the water line can be clearly seen through the glass jars, and in some plants a float in a pilot cell indicates when it is necessary to start the engine for

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recharging. The instruments on the switchboard (located on the engine in most plants of this class) show the amperage or quantity of energy stored. Storage batteries like these represent the highest type of battery efficiency, and are used wherever it is possible to avoid jolts or jars. They are specified to a great extent in submarine naval construction. Like the automobile battery these new cells will not freeze in the coldest weather, if properly supplied with water, and fully charged.

The installation of these "self-contained" power plants is a matter of extreme simplicity. The engine is bolted to a concrete base, and the battery is placed upon a step-like stand which holds sixteen cells, eight on each step. Two wires lead from the battery to the engine, and two more from the electric generator to the cut-out or switchbox containing the terminals of the house-wiring service. The power plant is equipped with an automatic switch so that when the batteries are fully charged the engine is automatically stopped. Plants like these are sold without fixtures or wiring and cost from \$300 to \$400 for the complete generating apparatus, including engine and generator (self-contained) and the storage. The actual work can be done by unskilled labor in less than two days' time. The voltage or electrical pressure is about 32 volts, with which lamps of corresponding voltage must be used. These can be obtained from any electrical supply dealer and are also furnished by the manufacturers of the apparatus who carry a complete stock of electric domestic appliances. The devices are obtainable at the prescribed voltage with motors attached, or else in the form of a general utility motor on a movable stand fitted with various sized pulley wheels and several belts, which can be "belted" to existing equipment.

Power plants of this type will easily supply every lighting and power requirement of the average country house and even those of larger size will find it much more economical to depend upon extra reserve storage battery aid for unusual lighting or power demands than to operate a large plant inefficiently on less than its intended load factor. Country houses not too far apart can cooperatively maintain an isolated plant providing it is done on a small scale, without paid maintenance.

Distance is a very important factor in such cases for it involves a loss of energy due to the resistance of the supply wires which lead from the generator to the lights. Two small houses with a two-hundred foot interval could jointly operate one of the smaller units described very efficiently. At twice that distance the transmission resistance would necessitate a larger battery for economic operation.

The subject of wiring the house comes last but not least. At low voltages, all fire risk from wir-

ing is practically eliminated, but the cost per outlet remains approximately the same as the cost for the regular commercial voltage circuits of 110 to 220 volts. This is due to the larger wire and increased copper which is necessary with the low voltage system, and this item offsets the saving effected by the elimination of many safety appliances otherwise prescribed. With labor figures based on an average of the past three years, and including a 10 per cent increase on present-day costs of material (to date) the wiring of the country house will cost \$7.50 per outlet (base-board, side-wall, ceiling, switch, or floor) for concealed wiring in old houses with hardwood floors. Without hardwood floors \$5.50 to \$6.25 per outlet, and in new houses during construction \$4 to \$5 per outlet. These figures are based on tabulations including over 40,000 recent operations. The cost per outlet is a bugbear which often prevents one from enjoying the conveniences of electricity after it has been installed. Without being extravagant it is possible to secure a minimum number of outlets which will give a maximum service. This involves an analysis of each room, its object, purpose and the personality and habits of its occupants, particularly as regards lighting design. Very often it is not possible to give this detailed study to the problem and consequently allowances must be made to compensate for the personal equation. The best way of accomplishing this consists in assigning outlets where they *must* meet *every* requirement. For all domestic electric appliances the base-board outlet is a necessity and should always be installed with *double* receptacles in the same plate, thereby doubling the convenience of each outlet.

All dining rooms, living rooms, and libraries should be provided with center floor outlets of approved water-proof construction. It is a great convenience to provide remote control for all switch outlets, and not a proportionately great expense. Ceiling outlets should contain two circuits leading to control switch. Accessibility is the feature of control placement, and under no conditions should switches be located so that doors must be closed (after opening) for their manipulation. All control switches should be specified with flush plates so that the plate can be made absolutely flush with the wall, and concealed by the wall treatment. Toggle switches can be adjusted so that their operation is practically noiseless, and this is a feature which, with other radical details of refinement, should be included in every modern installation.

In wiring the country house it is very advisable to arrange emergency control switches which will flood the entire house with light, and these should be located in every bedroom entrance and exit. The service wiring and control of these emergency

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circuits should be protected against all disturbances, and the wiring channels and outside underground ducts kept secret until transmission difficulties or cable replacement render necessary the turning over of the original plans to the local electrician. The improvement in flood lighting projectors due to the advent of the Mazda type of lamp, and which have become known as a medium for revealing architectural expression at night, place at the disposal of the owner of the country house a positive method of burglary insurance. These projectors placed within invisible protective housings on each side of the house illuminate surroundings so brilliantly that no offender would dare venture within the danger zone. It is possible to have this protective lighting intermittently operated by a clock switch throughout the night, but the power plant entrances and transmission wiring should be burglar proof. Protective interior lighting must be entirely separate from the regular fixture equipment as a means of insuring positive action.

If the regular equipment is used, keyless lock sockets may be substituted, preventing the removal of lamps and necessitating the use of the remote control switch exclusively, which is not an inconvenience with carefully arranged lighting. The lock socket serves another useful purpose in connection with a lamp chart for each outlet. In this way the efficiency of maintenance is assured and lamp replacements are made correctly. The indiscriminate replacement of lamps is directly responsible for the depreciation factor of most lighting installations. If a system is correctly designed both the esthetic effect (visual) and the utilitarian efficiency (physiologic and economic) depend upon the maintenance of the original design in every respect. I have frequently encountered conditions where dissatisfaction with installed lighting equipment was due to the substitution of larger or smaller lamps for those of the correct size. Advanced lighting design is not a matter of guesswork, and with the extreme brilliancy of modern illuminants safe, artistic, useful lighting can only be realized by the most thorough analysis and minute attention to hitherto neglected details.

The subject of remote control is one which always causes trouble when the item of initial cost is discussed between architect and client. Records of electrical installations prove that after living in the house the average client installs as extras many of the electrical conveniences in the form of remote control and additional outlets which were originally omitted by his order. The expense of these devices is trivial compared with their utility. The cost of an automatic closet light is insignificant compared with the fire risk of one lighted match. Remote control can be simplified where ap-

pearances do not count, or in later installations by the use of the pull chain socket. This device is obtainable with a screw-lamp base and is attachable to any regular Edison lamp socket. A cord from the pull chain leads to the head of the stairs and a small brass check spring (or a heavy rubber band) relieves the small socket chain of the abrupt strain from hard pulls and jerks. By continuing the length of the chain at the pull socket near the light operated it may be lighted and extinguished at that point, or from the other end of the control line.

There are many such practical modifications which while essentially utilitarian solve many difficulties arising from oversight or perhaps a sense of false economy. Under these conditions their use is permissible and gratifying. Remote control has been entirely eliminated in many specifications, but the inability to control light from a distance takes from electricity one of its most desirable features.

The concealed installation of signal systems is a matter for predetermination and is properly a part of the electrical wiring specifications, including provision for local and outside telephone service. The design of a signal system depends absolutely upon the intimate peculiarities of each problem. The noisy electric bell or gong has been superseded by the quiet buzzer and flash-light. The most flexible systems afford a means of adjusting day and night signals from one point so that the varying requirements of service are fulfilled by immediate responses. In this way the automatic repetition, duplication and registration of signals by duplex circuits with registering annunciators eliminates the annoyances of the ordinary methods. Convenient placement of call buttons at several points for night and day service is a necessity. Emergency call terminals, including those controlling emergency lighting, should be converted from their base-board outlets by flexible conduits to points within beds, facilitating operation without detection. The ability to send a positive warning signal without detection in a crisis is beyond economic comparison at the critical moment. The material employed in signal systems, unless of the highest grade, will cause prohibitive maintenance costs, exceeding by 20 per cent the first cost of quality material within three years. This is particularly true of intercommunicating telephone systems, owing to their necessarily complicated mechanisms upon which the function of audible sound transmission depends. The best of these outfits are designed with call buttons and connectors for the various sub-stations on one flat plate with the transmitter and receiver. This plate is flush with the wall, and can be merged with the wall treatment if desired.

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Another type contains the operative mechanism in a metal casing which projects from the wall and resembles the ordinary house telephone of the hotel. Unquestionably the desk-type telephone is more convenient than the wall-set, but since every guest room must be provided with an outside telephone it is a matter of considerable expense to arrange for two instruments of the desk type in the same room. An elaborate though effective plan consists of a series of telephone base-board outlets in duplex, the house telephone outlet, and the outside telephone outlet side by side, but each equipped with special connectors, attached to each telephone. The outlets are placed near tables and desks and at bedsides and the instruments are connected when the rooms are occupied. With very large installations a better plan is to conduct a central switch-board with an operator in charge. All exterior service wiring for telephones and lighting, unless housed in underground conduit, is subject to serious disturbances. No telephone equipment without insulated receiver terminals is safe, and should not be specified. Telephone wires often become crossed with high voltage power cables and the exposed metal terminal has frequently caused instantaneous death by contact. This fact has been recognized in the design of the latest type of telephone for public service and the wiring terminals at the end of the receiver are totally inclosed within heavy insulating material.

Every power system and lighting system is provided with lightning arresters, but there can not be too many additional precautionary measures. The fire problem is one which depends greatly on local conditions. Where houses are completely isolated and miles from any organized department a plentiful supply of extinguishers (large and small), with frequent fire drills is the only remedy. Unless the power plant is of a larger capacity than those described it would be difficult to operate a fire pump at sufficient pressure. In localities where fire departments are within range the assortment of extinguishers can be reduced. Since a large number of fires originate in servants' quarters there is a tendency to introduce automatic sprinklers at that point whenever there is sufficient water pressure to insure their operation. There are fire signals intended to give warning automatically, but these are not entirely suitable for the country house and their installation expense is very great.

The Education of the Architect

A series of informal conferences have been held at the Royal Institute of British Architects throughout this year, during which there have been discussed at much length the problems pertaining

to the education of the architect in England. The many and often diverse opinions expressed by various members of the profession of high standing in England have been of unusual interest. Below is printed a series of extracts from addresses made during the Third Conference held this year:

"In one sense the education of the architect cannot begin too early. It has been claimed that the faculty of observation essential in every branch of art must be encouraged as soon as it appears. It frequently is, only to be smothered by ill-devised educational methods at a later stage. The appreciation and comprehension of the facts by which we are surrounded, and their relationship measured in time and space, is the true object of education, and the observation necessary to acquire this should be in play throughout. Book studies are only useful in so far as they facilitate and quicken this. The substitution of book studies for the actual factors of life is disastrous to mental development, but this is too often the effect of the conventional type of education. Of course, specialized training may come comparatively late, but if the previous instruction has been on sound lines not only will the special studies be more easily assimilated, but the bent of mind will be much more obvious when it comes to the choice of an occupation. Apart from the cases when a youth is for extraneous reasons drawn into a profession for which he is unsuited there are far too many in which this occurs through lack of the means of knowing what his natural qualifications are, these having been obscured by a false system of education."—H. V. LANCHESTER, Chairman.

* * *

"In the encouragement of architectural training it is essential that renewed attention should be given to the appreciation of the conditions of modern life. Following the customs of the French, students should be taken by their professors to great modern buildings, there to observe the mysteries and working in being. They should examine a railway station, note the crowds to be accommodated, the volume of traffic and goods arriving by rail, the offices and business arrangements, the conveniences, the roads for vehicular traffic ancillary to the railway tracks, the thousand-and-one details. They should inspect the Parliament houses, the cathedrals, the public offices and Government departments, the clubs, the staging of an opera as well as the design of the auditorium, the shopping centers, life in hotels, flats, and private houses. What does a measured drawing teach other than the scenic arrangement of doors and windows, with perhaps the application of column or pilaster? What can be gained by laboriously measuring the

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bay of a cathedral if the ulterior purpose of the building is ignored?

"In France a more academic system obtains. In the first place, there is the tradition of the Grand Prix, with its almost unbroken succession of monumental planning; and secondly, a more humanistic attitude to the requirements of the populace, and greater collaboration between architects, engineers, painters, sculptors, writers and politicians. The politician is included, for his influence is all-important in ensuring the smooth running of the educational machinery. In France architecture is just as much a part of the national outlook as literature. Both expressions are understood by all classes in varying degree, and a certain momentum to practice is ensured irrespective of local custom, fashion and prejudice.

"If there is a branch of training that needs revision in addition to the mechanical side it is the one embracing the investigation of history. Whether the time is mature in this country for the consideration of one general style—a policy encouraged in France—is a matter for discussion. But it is obvious that existing methods of teaching architectural history, by treating the phases as phenom-

ena, are wrong. The investigation of history as an aid to accomplishment in the practice of building should proceed on the lines of adaptation to modern needs. The family likeness of all buildings evolved during the past three thousand years should be brought to the notice of the student. Marked developments, such as the Classics of Greece and Rome, the idylls of the Renaissance and the modern Classics of Europe and America, should receive fuller attention than they do at present. This is essential if we are to advance either in construction or design; and just as the parallels of the classics in literature offer consolation to us in these times, so the buildings of the past can be referred to to inspire confidence for the future. Evolution is the only true theory that can be followed and its manifestations studied with advantage. We also desire to reach the ideal by the shortest road and the least fatigue; some expect a new type of design to arise out of materials; they convince themselves that time-honored methods are out of sympathy with the high pressure of modern life, and overlook the chief factor in their dream, which is that the ideal is only attained by climbing the steps of generalized ideas."—A. E. RICHARDSON.

Fire Destroys Valuable Relic of World's Fair

Fire, a result of defective electric wiring, caused the destruction, at Springfield, Ill., on August 17th, of the Dome Building, and the great dome which was a part of the horticultural building at the World's Fair at Chicago and which had been purchased by the State of Illinois in 1893 for \$100,000 and taken to Springfield. The loss is estimated at \$150,000.

Federal Trade Commission Building

Correction of two points in the article on the Office Building for the Federal Trade Commission, which appeared in the August 15 issue of THE AMERICAN ARCHITECT, should be noted: The sheet steel of the forms used for casting the T-beams was 26-gage; the total cost of the building was approximately \$250,000.

Personal

Daniel H. Burnham, Jr., and Herbert Burnham, sons of the late Daniel H. Burnham, designer of the Chicago plan and the Columbian world's ex-

position, have revived the firm name of D. H. Burnham & Co., and have opened offices in The Rookery, Chicago, for the practice of architecture. The Messrs. Burnham were formerly connected with the firm of Graham, Burnham & Co., recently dissolved.

O'Donnell & Wolfe, architects of Sandusky, Ohio, announce the opening of a branch office at Elyria, Ohio, in Suite 303 of the Lorain County Bank Building. The office will be in charge of Mr. O'Donnell. Manufacturers are requested to send samples and catalogs.

Horatio R. Wilson, who had practised architecture in Chicago for over 30 years, died recently of heart disease in his office at 1215 Lumber Exchange. Mr. Wilson was 60 years old.

Frederick Westcott, architect, of Spokane, Wash., has opened an office at 626 Rookery Building, and would be pleased to receive manufacturers' literature and samples.

Druckenmiller & Williams, architects, announce the removal of their offices from the Land Title Building to 1537 Chestnut Street, Philadelphia, Pa.

Industrial Information

A Floor to Increase Shop Efficiency

A flooring material for industrial establishments, which is asserted by the manufacturers to be capable of withstanding hard wear and which is at the same time noiseless and resilient under foot, is KReo-Blox, made by The Kettle River Company of Minneapolis, Minn. These blocks are creosoted yellow pine and northern tamarack. They are laid with a vertical grain to preserve both the chemical and the mechanical life of the wood. A handsome booklet containing letters of testimony as to the durability, dustlessness, ease of replacing worn parts and the tendency to maintain a general contentment and efficiency among workmen, is illustrated with cuts showing wearing tests of this material in actual factory and foundry use.

The same company is a large producer of sandstone, with quarries at Sandstone, Minn. Two pamphlets are obtainable by persons interested in this material. These publications contain quarrying pictures and illustrations of buildings made or trimmed with Port Wing sandstone from the Kettle River quarries, compression tests and testimonials from architects and builders.

Holt Roof Connections

A catalog of the roof vent and leader connections manufactured by the Barrett Company, 17 Battery Place, New York City, gives full descriptions and illustrations of six types of drainage connections, with price lists. There is a table giving leader sizes for specified roof surfaces, and a series of illustrations on the "whys" and the "don'ts" in roof drainage. Specifications for roofing materials and construction, given in the back of the catalog, are backed by a 20-year guarantee "on all jobs of 5000 sq. ft. or more, * * * provided the roof is laid by a roofing contractor approved by the Barrett Company, in strict accordance with the specification and subject to Barrett's inspection and approval."

Gas-Heated Steam Radiators

A steam radiator using gas for fuel is made by the Tirrell Gas Machine Lighting Company, 103 Park Avenue, New York, and described in a 20-page folder issued by the company. This radiator is made with a water reservoir at the base of the steam coils, below which extends a special odorless Bunsen gas burner. The supply piping is fitted with a

simple thermostatic valve. When the expanding steam reaches a five-pound pressure in the coils it automatically acts upon the valve to cut off or to reduce the gas supply to maintain a five-pound pressure in the radiator. This automatic control of the gas supply, it will be understood, renders the system most economical of operation. As each radiator is a complete unit, economy may be effected by the operation of only those radiators where heat is desired. All parts are protected by sheet steel plates to insure safety and cleanliness.

Steel Forms for Concrete Work

Architects interested in concrete construction should investigate the claims of the Blaw Steel Construction Company of Pittsburgh, Pa. This company manufactures steel forms, using economy and beauty of construction as chief arguments for their use. A post card stating the kind of work contemplated will bring literature and prices.

Boilers Which Have Made Good

A testimonial to the success of the Kewanee smokeless boiler is a collection of photographic reproductions, arranged in booklet form and circulated by the Kewanee Boiler Company, Kewanee, Ill., showing buildings in which their boiler installations have given satisfaction. A list of over 2500 Kewanee-heated buildings in the United States and Canada is a feature that cannot fail to impress the reader.

Thomson Direct Current Astatic Watthour Meters

Bulletin No. 46209 of the General Electric Company, Schenectady, N. Y., recently issued, describes the construction and uses of two new astatic electricity meters, types CS and CS-3, of their manufacture. These meters are both suited to direct-current installations of relatively large size. The astatic principle is employed for the purpose of minimizing the effect of external magnetic fields which are often encountered in large direct-current circuits. Details of all important parts are illustrated and dimension and wiring diagrams for different connections and current requirements are given.

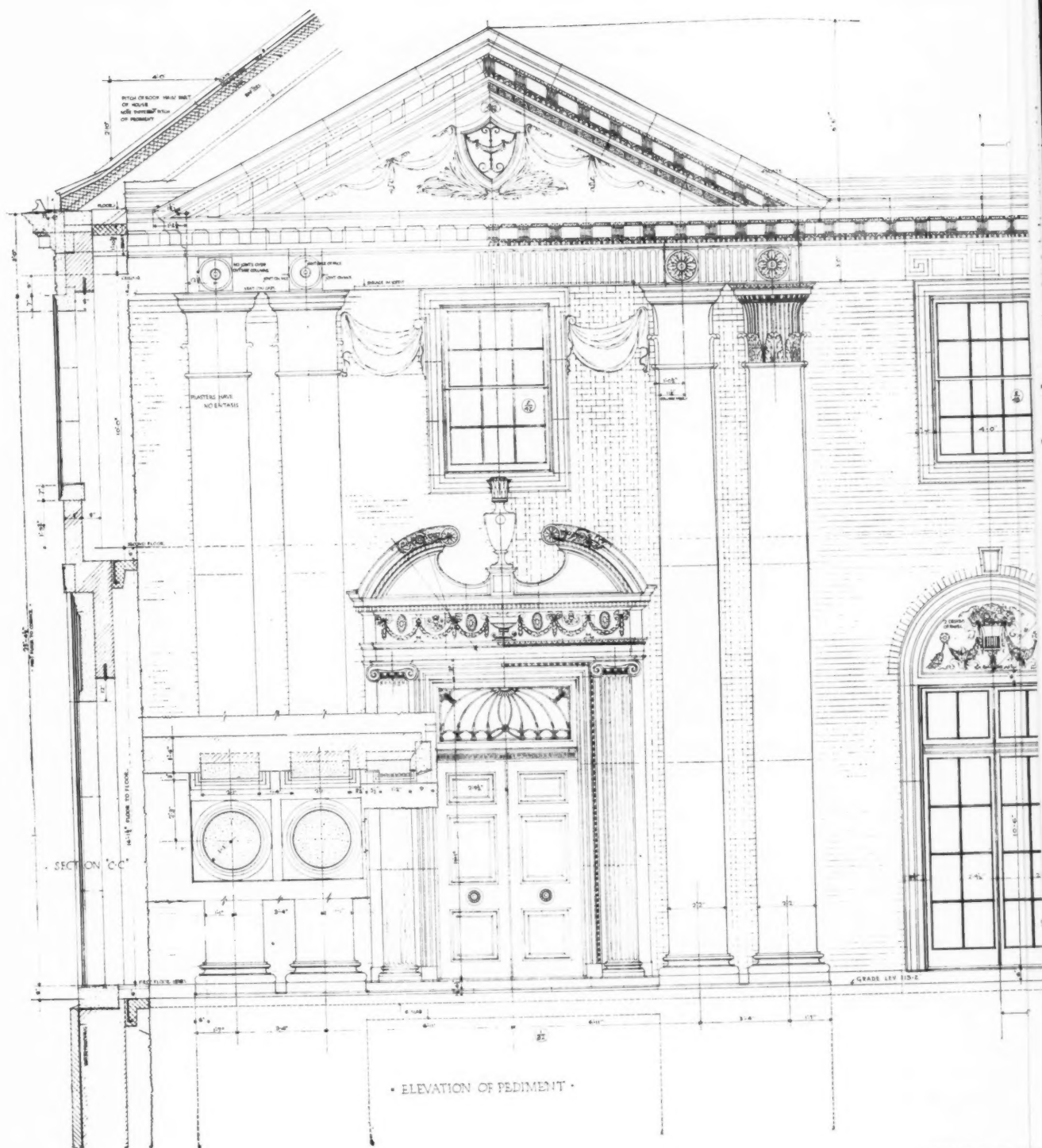
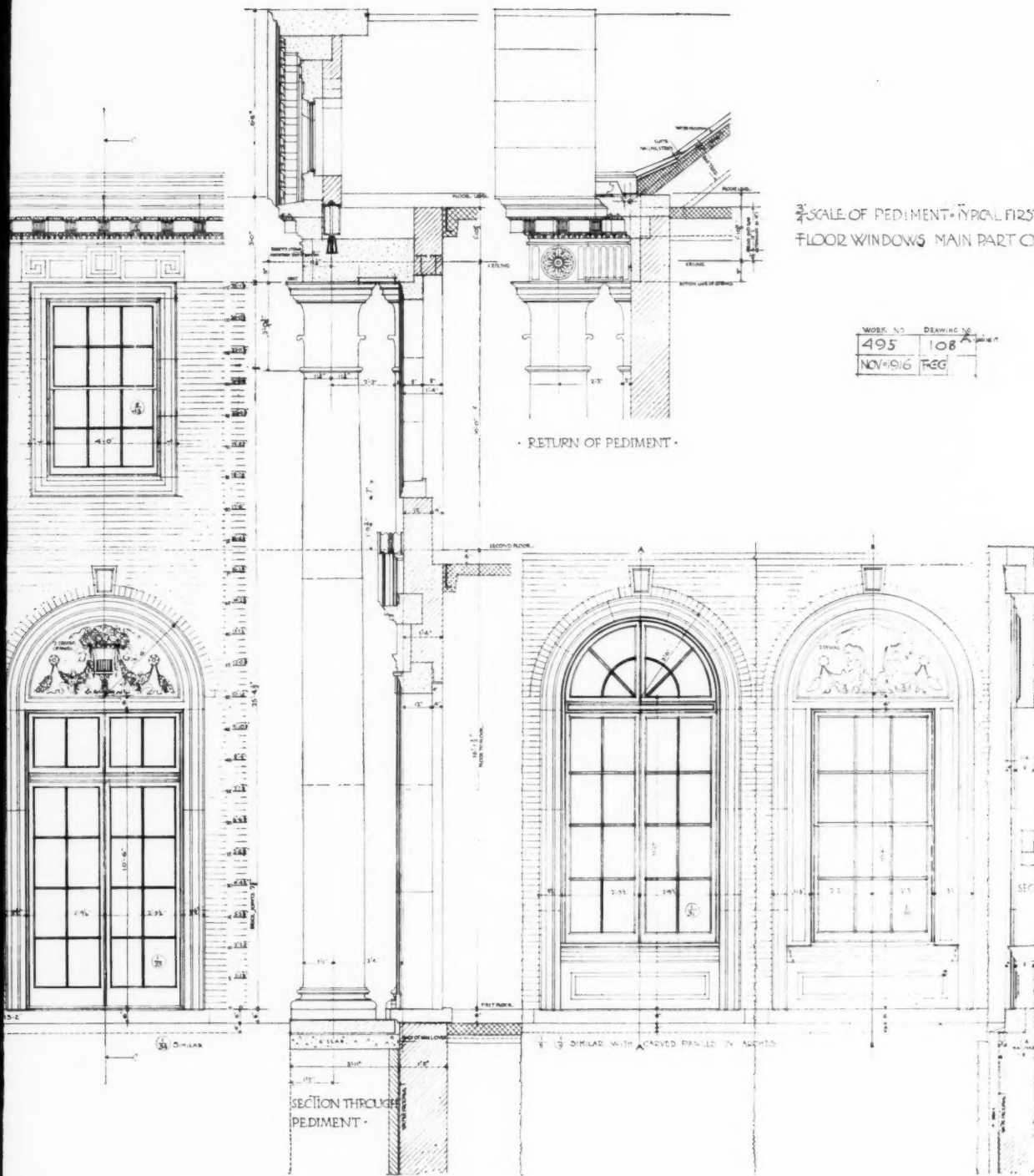


PLATE 98

DETAILS OF MAIN

HOUSE OF ALFRED I. DU PONT

CARRERE & HASTINGS



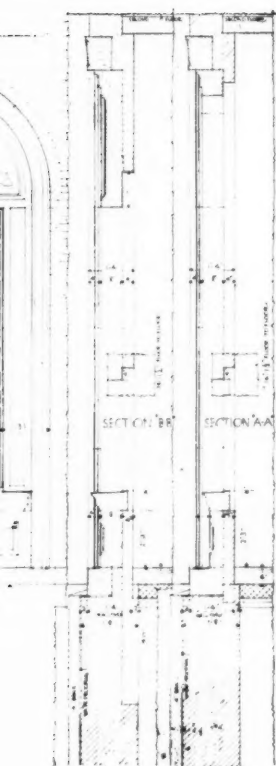
DETAILS OF MAIN ENTRANCE

RED I. DU PONT, ROSLYN, L. I., N. Y.
FRERE & HASTINGS, ARCHITECTS

SEPTEMBER 5, 1917

NT-TYPICAL FIRST & 2ND
MAIN PART OF HOUSE

SAVING NO
OB
EC





THE PLAZA, VITORIA, SPAIN

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