THE ARCHITECTURAL FORUM

ARCHITECTURAL ENGINEERING & BUSINESS

IN TWO PARTS PART TWO

FEBRUARY 1930

BOOK DEPARTMENT

GENUINE ANTIQUE FURNITURE

A REVIEW BY

CLIFFORD WAYNE SPENCER

IT is an obvious fact that the greater the demand for objects of art, the greater the temptation for the unscrupulous to provide clever counterfeits to foist upon the unsuspecting or inexpert collector. It is likewise true that as the demand for such objects grows greater and greater, the care and skill devoted to the making of dishonest reproductions are increased in an equal proportion, making the counterfeit even harder to detect. The great and increasing desire on the part of great numbers of people to acquire pieces of furniture which they believe to have great worth because of their antiquity has led to a vast traffic in spurious pieces, which are either out-and-out modern reproductions with signs of age faked so cleverly as to require considerable expert knowledge to enable the collector to distinguish between the genuine and the imitation, or else they may be genuine old pieces of little or no original value from an artistic point of view, which have been worked over by skilled workmen in such a way as to greatly increase their value in the eyes of the inexperienced purchaser.

The authentic pieces of furniture which form the basis of all this traffic are surprisingly few in number. They were originally owned only by the very rich and were made by master craftsmen who had prepared themselves by long years of experience as apprentices and who were subject to rigid restrictions by their various guilds as to the quality of the work which they were allowed to sell. It is to be expected, therefore, that the pieces which are really the product of these old masters have lasted and have enough intrinsic artistic worth to make it very profitable to manufacture plausible imitations in such numbers that the great mass of furniture purporting to have come down from our ancestors is positively astounding. Many people who have made a life study of genuine antique furniture have become very proficient in detecting counterfeits and have even developed an instinct which seems to warn them if a piece represented as antique is not all that it should be. From time to time these experts have published information intended to provide the inexperienced collector with tests whereby he may judge the reality of pieces presented for his purchase. Such works, however, have also had the effect of providing the antique counterfeiters with information as to just what purchasers will be looking for, and being thus forewarned they are able to prepare for the scrutiny of people who have obtained their knowledge from such books. The only way to become anything like a competent judge of antique furniture is by devoting a great deal of time to the careful study of really fine pieces of the various styles, the authenticity of which is beyond question, and then by subjecting all prospective purchases to a most careful scrutiny. If the various features of the genuine are well in mind, it will not usually be difficult to discover flaws in the cheaper imitations. The best method of conducting a scrutiny is to search for blemishes or evidences of age that by their location or nature will seem illogical in imitations. The matter of becoming a connoisseur of furniture is not one that should be undertaken lightly, since it involves a fairly accurate knowledge of the history of many nations; their arts and the origins and significance thereof, including that of interior decoration; of the history of ornament and of heraldry; a knowledge of the history of the craftsmen's guilds and of their laws, privileges and responsibilities; a sound knowledge of wood grains, inlay and veneering, all this in addition to a finely attuned sense of proportion and of what constitutes good workmanship, not to mention instinct, and well developed powers of intuition and deduction.

For the study of the various historic styles in furniture design, with special regard to the detection of imitations, Major Arthur De Bles has prepared a volume which may well be used as a guide. The work is the product of a lifetime of study of furniture and kindred subjects, Major De Bles being an Englishman who has spent large portions of his life in America and France. He has lectured in every great museum in the country, and for the past ten years has delivered lectures throughout the season at the Metropolitan Museum of Art in New York. The book comprises a very complete guide to a study of the historical types of furniture treated as *styles* and not as *periods,* as the author points out that it is an error to speak of different groups of furniture as periods when many of them such as Sheraton, Louis XVI, Hepplewhite, Adam, Directoire and Empire styles were more or less contemporary. As there is very little evidence, in concrete form, as to what was the furniture of the earlier civilizations, the author starts his discussion of the styles of furniture with the Gothic of the thirteenth century, pointing out how this type followed the prevailing architectural style not only in ornamental detail but in form as well. The furniture was in reality miniature reproduction of the architecture, and practically all that is still extant belonged to the fifteenth century, the decadent period of Gothic art. Although this was the decadent period for architecture, the same was not true of furniture, and the few genuine pieces that have come down to the present time constitute some of the finest carved furniture in existence. As was true of the architecture, the furniture is characterized by the five-point arch and elaborately carved tracery. In this as well as other portions of the work the author displays a considerable knowledge of architecture, and the way in which he links the furniture styles with the prevailing architectural motifs of the various periods is both in-

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teresting and enlightening. The various types of Gothic furniture that might conceivably be offered for sale are examined carefully and studied in connection with their historic background in order to give an idea as to just what were the conditions under which this type of art was produced.

In reading the account of the Renaissance here given one realizes that this is not merely a description of pieces of antique furniture alone but that it may serve very well as a handbook for a study of the history of art in general, and that it is written in a most readable manner. In this style, as was the case with the Gothic, the furniture was almost purely achitectural in form as well as in detail. To such an extent is this true that cabinets produced in this period not infrequently resemble the facades of palaces of the day, having miniature columns, pilasters, arches and balconies, crowned by complete entablatures combining cornices, friezes and architraves in the classical manner. As in the Gothic style, chests were perhaps the most important articles of furniture of the Renaissance, having been used as traveling trunks, seats, tables, and even as beds. The manner in which the exact dates of such pieces can often be deduced from the coats of arms enblazoned on them is very interesting, pieces being so marked being more desirable for that reason and therefore quite frequently utilized as models by the makers of faked pieces, although, as the author points out, it is usually possible for one thoroughly familiar with the arts of heraldry and blazonry to detect flaws in the execution of the coats of arms.

In any discussion of Renaissance art or architecture, it is but natural that most importance should be placed on the Italian Renaissance, since it was in Italy that the style had its inception and highest development, due probably to the great wealth and commercial importance of the Italian cities during that period of history. In the present volume two chapters are devoted to Italian Renaissance furniture and the corresponding art and architecture, with detailed descriptions of the variations likely to occur, depending on the province or city in which they were made. The French variation of Renaissance furniture was, like French architecture, adapted largely from the Italian and differed from it only in minor details. With the English Tudor and Elizabethan styles, furniture tended to become less and less architectural in character and came into much more popular use. Before that time furniture had been a rare luxury, to be used only by the nobles and kings, with the result that most of the furniture of the earlier periods is rather monumental and impressive in its richness of carving and general proportions. Later, however, more general popular use led to the making of furniture which was characterized by a simple, sturdy dignity that makes it fit well into almost any setting. These pieces as well as the more elaborately carved draw tables, court chests, etc., are frequently the models for reproductions, honest or dishonest, and should be carefully scrutinized before being purchased. Major De Bles goes into great detail in regard to the construction and characteristic features of this type of furniture in order to point out little tell-tale discrepancies that may serve to put the stamp of disapproval on pieces dishonestly represented as being genuine antiques. The style of transition in France corresponding to the Tudor is known as Louis XIII. This the author of the present work characterizes as being uninteresting. The Jacobean style, which

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THE DESIGNING OF THEATERS

A WORK BY

JOSEPH URBAN

SIX theaters are illustrated in a volume entitled "Theaters by Joseph Urban." The text and illustrations are less a contribution to the mechanism of the stage than they are a clear statement of a philosophy of the theater. Mr. Urban is not particularly concerned with the stage; it is the auditorium which he would change. His aim is to make of stage and auditorium one thing,—actor and audience a single body of interchanging emotion. By thrusting his action into the auditorium, by partially surrounding his audience with side stages and by elimination of the proscenium arch he aims to recreate the spacial unity of the antique theater where the action was surrounded by the spectators. A theater in which every member of the audience can see and hear well is his ideal of a mechanically perfect theater. It matters less what manner of staging is selected when the proper support for actor and spectator has been attained. All of his buildings and schemes for theaters are equipped adequately and simply for the handling of the customary stage properties. The most recent schemes, however, go beyond the "painted drop" conception of staging and open possibilities of mass movement beneath a scheme of lighting which, not confined to the stage, envelops the audience directly in the mood of the production, while the action, ceasing to present a tableau effect beyond a frame, acquires plastic reality within the auditorium.

"Theaters" is distinguished by a real belief in the theater. It harks back continually to those theaters which

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George Alexander
Architect

were a real part of the life of their communities,—to periods of dramatic art when the theater was a real emotional experience capable of lifting the spectator from the round of daily life to the realm of a stronger beauty, life, and brilliance than is found in daily existence. It is illustrated by buildings expressive of the kinds of theatrical production now prevalent. The "revue" type is shown in the Ziegfeld Theater; the motion picture house by the Paramount Theater in Palm Beach; the actors' theater built for a sense of intimacy for the actor and concentration for the spectator is illustrated in the Reinhardt Theater. The Jewish Art Theater treats the community theater and stock company problem as a real entry different from the commercial type of building, which Mr. Urban would prefer to see pass out of existence. The designs for the Metropolitan Opera House, prepared at a time when a site on West 57th Street was being considered, show close analysis of the demands which a New York opera house would be called to meet. The plans for the auditorium contain features which result from Mr. Urban's desire to establish spacial unity between stage and audience and are the fruit of long experience in designing opera settings and pageantry. The Music Center is developed as a festival hall for orchestra, the opera and the dance. It is an ideal scheme which he prepared, of a type which scarcely exists in America, —the free-standing building. It is marked in plan by great amplitude of access and circulation to accommodate the crowds of the democratic theater and by an absence of the features of royal theaters in Europe,—the grand approach, the tiers of boxes and the overwhelming spaces devoted to social display. Promenades there are, and ample buffets and lounging spaces, but throughout there prevails a sense of variability of function, an elasticity of use novel to the present-day theater. While it does not depart from the traditional theater forms as widely as Geddes' plan for an "Inferno" to be given in Madison Square Garden or Strinad's scheme for a stage almost surrounding the audience, the auditorium and the amphitheater of the Music Center are full of possibilities for the development of a more powerful theater than has yet been realized. It is Urban's theory that the needed inspiration for the development of the theater must come today from the architect and not the dramatist; that here exist dramas such as the operas of Wagner which, given opportunities for more ample production, will reach heights of splendor never attained in the theater; that the development of these possibilities is the function of the architect, and that the dramatists will be inspired to new attainment when they are given the possibilities of new expressions by the building itself.

If the theater, and particularly the theater with music, is to again achieve reality, some change must take place in its form. The average theater building is an impersonal solution of bare current needs. It is seldom that one finds an effort to meet more than these needs, and rarer still is it that the quality of imagination enters into the problem. It is from such love of the thing itself as Mr. Urban shows for the theater, from vision founded on long experience, that the new arises in art and that an age goes forward to realize its greatest capabilities.

THEATERS. **By Joseph Urban. Text and Illustrations. Price $7.50. If autographed by Mr. Urban, $10. Theater Arts, Inc., 119 West 57th Street, New York.**

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THE EDITOR'S FORUM

THE NEW EXPRESSION IN THE ARTS

BY

EDWIN AVERY PARK

THE sun once more rises upon a sightly vista for art. Dust and debris are settling. In retrospect we may look back toward a horizon, that of four centuries ago, and realize that the art of that great day and that of our own are rooted in the same earth. That obscurity which has until recently intervened is being gently dissipated. Its enigmas and its incongruities will become matters of anecdote.

In using the term "modernism" to designate the current trend of art, the application is as dubious as the art it usually qualifies. Modernism, as a name, will not do. It is stationary only as is that spoke of a wagon wheel which for one instant remains vertical, supporting the load. Equally evanescent is the art of the modernist period, the fantastic, amusing vogue of the couturier's moment, the department store window. Modernism, as a term, is, however, being used to qualify something of vastly more consequential significance. It is being applied to the skyscraper. If modernism means a return to a veritable creative orientation of art, then the skyscraper is modernist. But there is nothing modern about that. Few have known it, since the Renaissance with its alluring graces charmed the artist's compass chart and left him adrift. But it is as ancient as the pyramids.

We are not being modern; that is an awkward, self-conscious caper. We are learning by taking thought to pick up the lost thread of a development,—that of the great art of the world. A skyscraper is a spontaneous expression arising out of necessity. It differs from the art of the past four centuries as does science from alchemy. It is an eternal principle,—nothing of the moment.

The modern art of Europe will not do for us. It is their heritage, the expression of their psychology,—not ours. It is sophisticated. We are not. They have a deep nationalism where we have a melting pot; they have at the same time a milieu of individualities which are typical of their nationalism, while we have merely hope and energy. Our task is to mould and direct this hope, this energy, on this side of the Atlantic. It will mould and direct itself as it shakes off self-consciousness and prejudice. Our attitude toward our art must become one of attempting to understand it, not to like or dislike it. The statement "I do not like that" is a confession of prejudice and impotence. Our contemporary art will find itself in a comprehension of its own entourage, of the daily life and needs from whence it proceeds. The cathedrals came so into the world. We need no help, but we do need time.

The significant modernism, the creative movement of this country, is coming from within. The mutations of our national life are so rapid that art pants after them to catch up. It was not so in classic days, when a hundred years saw the change which is had in five today. The automobile and the skyscraper have evolved in 20 years; the Greek temple of the latest period was not different, save in details, from that of the earliest.

We have already well defined changes in everyday life. These form our basic program. They lead to the apartment house, the office building, the quick lunch, etc. Old forms fail to house these new needs. Built-in furniture is not a fad, it is an evolution. Where and when new materials may be used in conjunction with this new program of needs, we find a new art. That does not mean to cast out wood and brick and build with concrete, or to make all furniture from bent metal tubing. There is still nothing wrong with brick and wood, and we have plenty of them. They are cheaper, sounder still economically. But we may plan differently, and we may use machines more intelligently. We may use to advantage many of the new metals, new tools and compositions, and we may get rid of excessive machine-made ornament, replacing it by color and good proportion. And there is our tradition. I do not mean that of the American Indian, but our heritage of taste developed at a time when, for a few decades, we laid the foundations of a national style, only to have them subsequently swept aside by our budding genius for machine play.

If the conservatives among us would make the effort to understand what thinkers in the new field are doing, and if they could persuade themselves above all that the new movement is nothing more than an attempt to reclaim a lost principle necessary to creative work,—freedom from prejudice,—a principle which is responsible for the very existence of the older styles so greatly venerated, then they would be more appreciative and understand the new expression in all the arts.

VOLUME LII

THE ARCHITECTURAL FORUM

NUMBER TWO

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THE ARCHITECTURAL FORUM is published monthly by Building Division, National Trade Journals, Inc., 521 Fifth Avenue, New York.

H. J. Redfield, Chairman of the Board and Treasurer; Howard Myers, President and General Manager; John Thomas Wilson, Vice-President; James A. Rice, Vice-President; C. Stanley Taylor, Vice-President; Henry J. Brown, Jr., Secretary.

Yearly Subscription, Payable in Advance, U. S. A., Insular Possessions and Cuba, $7.00. Canada, $8.00. Foreign Countries in the Postal Union, $9.00. Single Copies: Quarterly Reference Numbers, $3.00; Regular Issues, $1.00. All Copies Mailed Flat. Trade Supplied by American News Company and its Branches.

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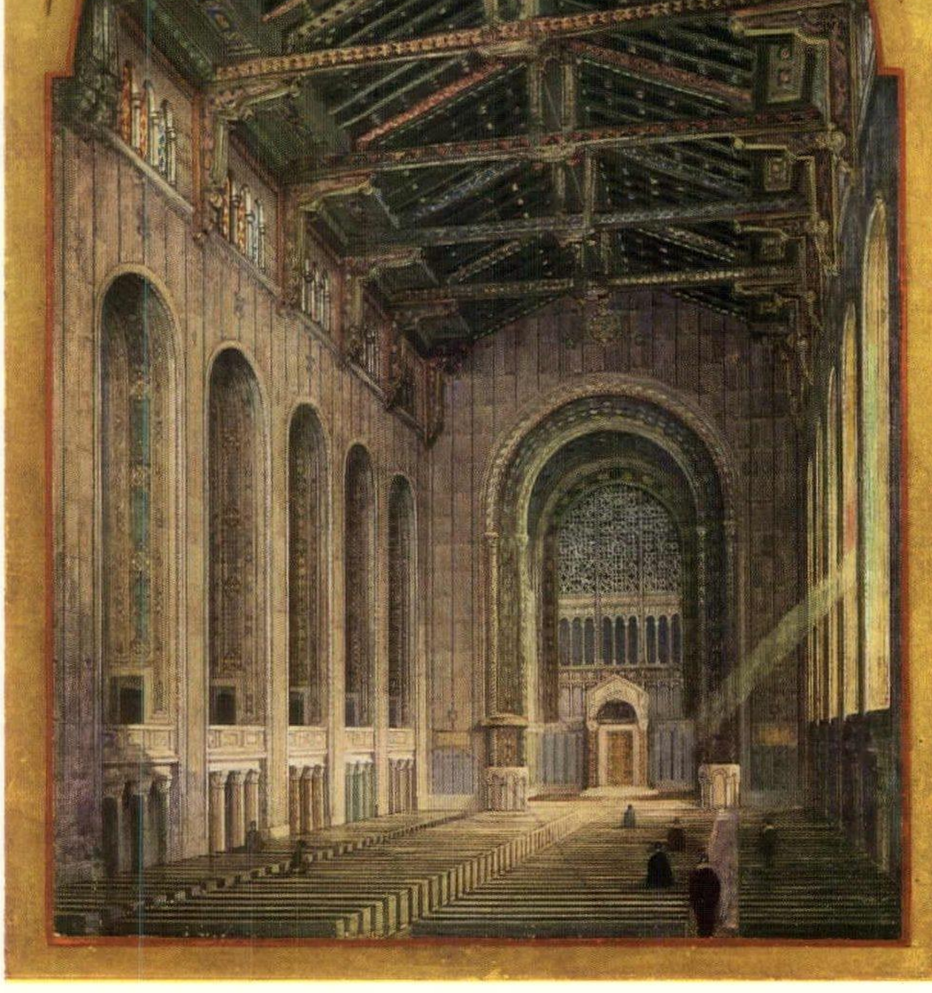


INTERIOR OF TEMPLE EMANU-EL, NEW YORK
FROM A COLOR SKETCH BY HAROLD GROSS
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS

THE
ARCHITECTURAL
FORUM

VOLUME LII NUMBER TWO

FEBRUARY 1930

THE TEMPLE EMANU-EL, NEW YORK

KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS

BY

CHARLES BUTLER

THE new Temple Emanu-El, New York, is situated at the northeast corner of Fifth Avenue and 65th Street, on an L-shaped plot fronting 150 feet on Fifth Avenue and 253 feet on 65th Street. The northerly 50-foot section is occupied by Beth-El Chapel, set back about 20 feet from the Fifth Avenue line, to disengage the facade from that of the Temple itself and to permit of a small grass plot in front. The Temple proper, 100 feet in width, has a depth, including the sanctuary, of about 200 feet. The easterly 50 feet on the street is occupied by the 8-story Community House, with its tower which forms the link between the two buildings. The congregation also owns the low apartment building to the east of the Community House, thus protecting its light on that side, and providing the possibility of future extension of this portion of the group.

The Temple in plan follows the basilica type common in Italy, while the Chapel is a two-domed structure reminiscent of the Byzantine churches of the Near East. The general character of the group is an adaptation of very early Romanesque as it was used in Syria and the East, and occasionally in Sicily and southern Italy, where it was influenced by the Eastern and Arab invasions. In the design of both Temple and Chapel, almost as frankly as in the Community House, it is recognized that any historic style, if used as a source of inspiration today, can furnish us as it were only the characters of an architectural alphabet, but not its phrases. American religious life must express itself anew to meet the changed forms of its service, just as our secular life, though using some of the old characters, has invented architectural forms that tend toward a new and distinctly American expression. As a matter of fact, from a structural point of view the forms adopted in this design have a functional purpose, aside from their æsthetic value.

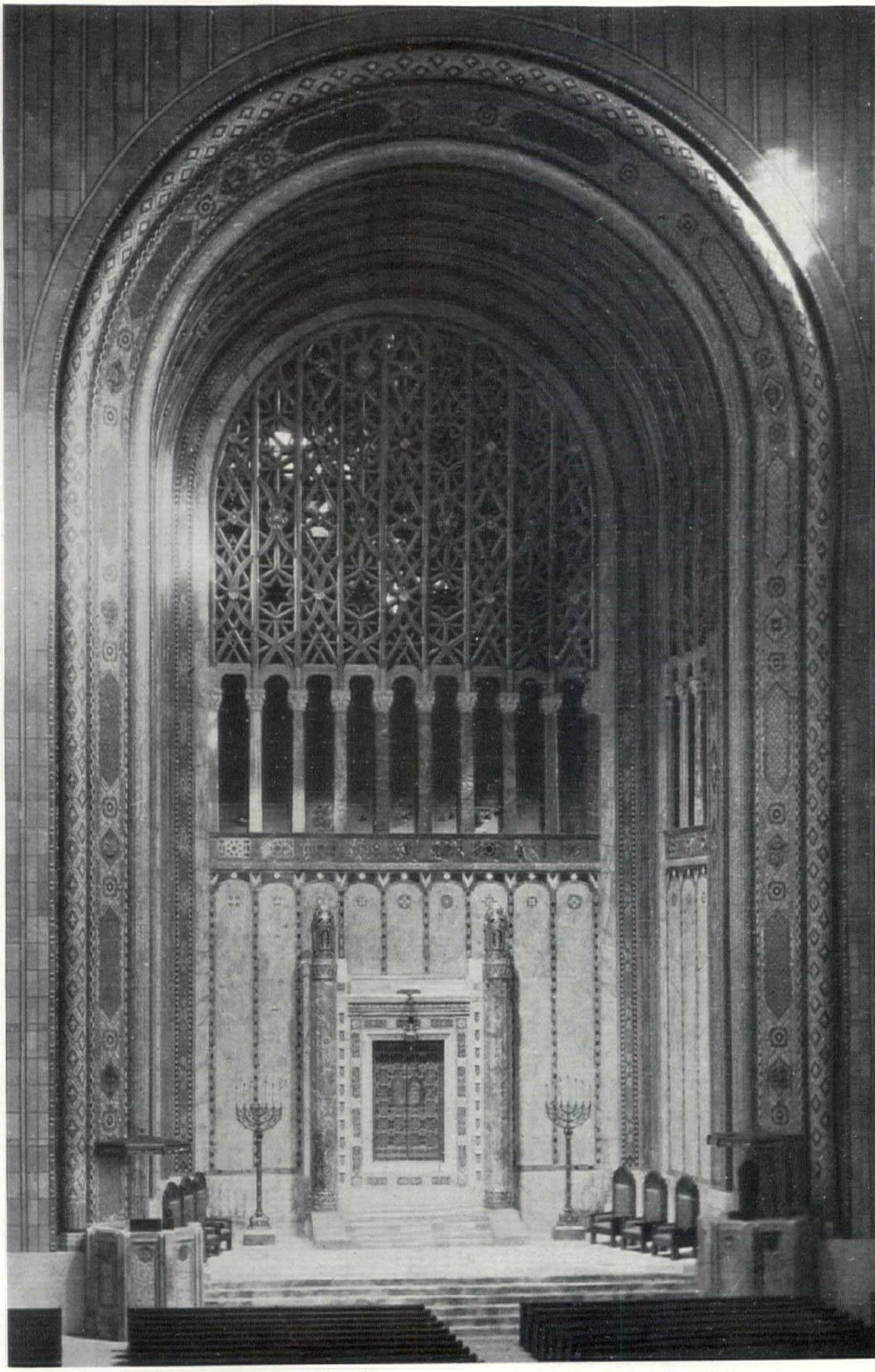
The walls are actually self-supporting, while the buttresses of the exterior and the trusses of the interior are respectively the stone- and plaster-covered structural steel members necessary to bridge the span of the great nave. This span is far greater than would have been possible for a vaulted edifice. The exterior walls of all the buildings of the group are of variegated limestone, selected for warmth of tone and tooled in such a manner as to accentuate the variety of color in the stone. The dominating feature of the exterior is the great recessed arch on Fifth Avenue, enclosing three entrance doors and the rose window with its supporting lancets. The gabled entrance portico with its flanking staircase towers backs up against the main west wall, the front wall of the great area which forms the main body of the Temple. This large arch of the front expresses on the exterior the main feature of the interior of the Temple. It is duplicated over the west gallery by a similar arch, while an arch and vault of about the same dimensions spans the sanctuary and repeats the architectural note at the east end. On either side of the nave, five smaller arches connect the main piers, covering the side aisles and galleries which are connected by passageways through these piers. There is thus established in the Temple a unity of expression, whereby the interior and exterior of the structure indicate clearly both the general form of the main mass and the definite features which mark each portion of it. We may see in this unity a distinctive and appropriate piece of religious symbolism, aside from its artistic values.

On the exterior the motifs of the carved decorations have been drawn in general from Hebrew symbolism; thus, the symbols of the Twelve Tribes of Israel appear in the carved band of ornament of the recessed arch, while other religious symbols are incorporated in the carving around the entrance doors, and sacred texts in Hebrew characters appear on the front of the Chapel and Community House. The entrance vestibule extending across the Fifth Avenue front is entered by the three main doors and from the south and north stair towers, and is about 18 by 66 feet. The walls and floors are of Siena travertine, warm yellow in tone and with the strong marking and interstices characteristic of all travertine. The square wainscot slabs have been cut so that the veining forms a pattern on the walls. The ceiling is of walnut with exposed beams resting on carved corbels, and the vertical surfaces of the ceiling beams and the carving of the corbels have been picked out with silver and gold leaf. The vestibule is illuminated by standing lamps of wrought iron, which throw the light upward to the ceiling, while daylight is introduced through two windows which appear on the facade as carved stone grilles and on the interior as richly colored stained glass. At either end of the vestibule are the towers containing the stone stairways leading to the west gallery. The stone walls of these stairways have been selected as the appropriate places for the many carved memorial inscriptions required in a building of this type. Over the vestibule is the west gallery, seating over 200. The adjoining south stair tower contains in its upper portion the echo organ, a decorated pierced plaster screen permitting the sound to pass into the Temple.

The main body of the Temple is 77 feet wide between piers and just under 150 feet in length, from the east wall of the vestibule to the sanctuary steps, with a height of 103 feet to the under side of the ridge of the ceiling. There are 49 rows of pews divided by three aisles and with two exterior aisles along the outer walls passing through the piers. The seating capacity of the main floor is just over 2,000, and from every seat there is an unobstructed view of the pulpits and the Ark. The sanctuary, raised about 3 feet above the level of the Temple floor, is reached by six steps. Where the sanctuary opens into the Temple proper there is a great recessed arch decorated with glass mosaic, against the base of which are set octagonal carved pulpits, executed in Siena marble, with carved walnut sounding boards. The walls of the Temple are covered from the top of the Senonville stone base up to the ceiling with acoustic tile, in shades varying from light to dark buff, the darker shades appearing near the tops of the walls. The application of these tiles, which are required to reduce reverberation, is in no way in imitation of stone. The individual tiles are about 19 by 20 inches, and there are inserts of gold tile in vertical strips about 4 feet on centers, to accentuate the height of the interior. Special tiles are utilized to form patterns in the reveals of the side arches and on the north and south walls, while the openings of the arches are outlined in marble. The side galleries are supported by marble columns,—red, green and yellow,—two columns of the same color being used in each arch to support the carved stone capitals and gallery fronts.

French Vaurion stone is used for the flooring of the aisles and for the interior finish of the stair towers. The ceiling of the Temple consists of a series of steel trusses covered with plaster, with the tie beams and rafters exposed. The plaster protection over these steel members is painted in rich reds, blues, yellows and greens, with gold used freely on the chamfered edges of the pierced ceiling panels. These panels are backed up with acoustic felt, to absorb the sound rising from below and to prevent reverberation and echoes. The richness of color in the ceiling is planned to contrast with the russet brown of the walls and with the darker colors to be used in the permanent clerestory windows. The depth of color of the permanent windows will also tend to accentuate the impression of mystery produced by the darker treatment of the upper portion of the building. These windows are the work of Owen Bonawit, Montague Castle, Powell of London, Guthrie, and Oliver Smith, the latter being responsible for the rose window as well as for two of the side windows.

The artificial lighting of the Temple and sanctuary is entirely by recessed lights in the ceiling soffits, no exposed fixtures being used. The sanctuary is about 30 feet in depth and just over 40 feet wide, with marble floor and marble wainscot on side and back walls carried up to the level of the choir gallery, about 25 feet above the sanctuary floor. This gallery is cut off from the sanctuary by a pierced railing, surmounted by marble columns of varied colors carrying arches. These in turn support the pierced plaster grilles and conceal the organ, part of which is placed over the choir gallery and part above the sanctuary vault. All of this work is rich in color through the use of varied marbles and the decoration of plaster surfaces. On the Ark itself there is focused the main decorative treatment of the interior. The columns of the Ark are of French Benou Jaume marble, which varies from deep purple to orange, while the frame of the opening is of Siena marble with mosaic inserts. The Ark



THE MAIN SANCTUARY AND ARK
THE TEMPLE EMANU-EL, NEW YORK
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GOODHUE ASSOCIATES, CONSULTANTS

doors are of bronze, pierced to afford a glimpse of the red velvet coverings of the Scrolls of the Law, while the columns are enriched with bronze bands and crowned with small bronze tabernacles designed to harmonize with the bronze lamp for the perpetual light suspended before the Ark.

The Chapel, to the north of the Temple, has been purposely kept low. The entrance through a single pair of bronze doors is at the south corner, adjoining the Temple. The west end of the Chapel is lighted by a group of three stained glass windows, above which pierced stone grilles are utilized to light the choir and organ lofts. All of the Chapel windows were executed by the d'Ascenzo Studios of Philadelphia. The two domes in the interior are supported by columns of pink Westerly granite, while the side walls rest on columns of Breche Oriental marble, separating the nave from the aisles at the north and south. The walls supported by these columns extend above the roofs of the side aisles up to the penetration line of the domes and are pierced with quatrefoils filled with stained glass. At the east end of the Chapel there is a shallow sanctuary covered by an arch of mosaic in which blue is the dominant color, while against the back wall, on which the Ten Commandments appear in Hebrew lettering, is set the Ark, executed in wrought steel with enameled ornament. The stained glass window in the east wall of the Chapel is a relic of the old Temple Emanu-El at 43rd Street, where it occupied the east end of the sanctuary. The lighting of the Chapel is by means of two great chandeliers hung from the centers of the domes and finished in steel and enamel to harmonize with the Ark. The Chapel is 50 feet wide and 84 feet deep and 45 feet high, and seats about 350 people.

The basement beneath the Temple proper contains the banquet hall, with its accessories, kitchen, coat rooms, rest rooms, and lavatories. The banquet hall extends the full width of the Temple, is 110 feet in length, and is planned to seat 650 persons at small tables and up to 1,000 at other functions. At the west end is a speakers' platform. The side aisles, nearly 20 feet in width, are raised three steps above the general floor level. To the east of the Temple there rises the eight-story Community House, containing on the ground floor an assembly room. With its gallery it seats 750, and is provided with a speakers' platform. This auditorium serves especially the Sunday School for opening and closing exercises. Above the assembly room are the Temple offices, choir rooms, and music library, a general library of 25,000 volumes, and 28 classrooms for the use of the religious school, together with minor assembly rooms seating 100 and 175, respectively. On one of the upper floors are the offices and library of the Hebrew Union College, while the eighth floor contains a study and secretary's room for each of the rabbis and a meeting room for the trustees.

The mosaic work in the Temple sanctuary was studied in detail and designed by Miss Hildreth Meiere and executed by the Ravenna Mosaic Company of Berlin, while that in the Chapel is the work of Heinigke & Smith. The Chapel Ark is the work of Oscar Bach, the remainder of the decorative wrought iron having been executed by Samuel Yellin of Philadelphia, and Frank & Company of New York. The chandeliers in the Chapel and the seven-branched candelabra in the Temple are by the Edward F. Caldwell Company, the remainder of the electric fixtures by Black & Boyd, and the Segar Studios. The interior marble work was done by the Traitel Marble Company.

The models for all interior and exterior carving and for the bronze entrance doors were prepared by Ricci & Zari. In the development of the color scheme of the interior the architects were assisted by Messrs. Harold Gross and James Monroe Hewlett. The painted decorations of the ceiling and walls were executed by the W. K. Hase Decorators, Inc. The great organ and the echo organ in the Temple were designed and constructed by Casavant Freres, of St. Hyacinthe, Quebec, while the Chapel organ, removed from the old Temple, was rebuilt by Laws, of Beverly, Mass. The pews in the Temple and Chapel were furnished by the American Seating Company, and the sanctuary furniture by the Nahan Cabinet Corporation. The bronze doors on the front and the bronze work on the Temple Ark were produced by the General Bronze Corporation. Eli Berman & Company furnished the pulpit canopies and the entrance vestibule woodwork. The special hardware was furnished by Ostrander-Eschlman. The Guastavino Company furnished the acoustic tile with which the interior is lined, and the Johns-Manville Corporation the acoustic felt back of the pierced ceiling panels, which, like all the plastering, was executed by the Owen Evans Company. The exterior planting was done by Mrs. Marjorie Sewell Cautley. The Cauldwell-Wingate Company were the general contractors and among the principal sub-contractors were: Goodwin Construction Co.,, foundations; A. E. Norton, structural steel; James McCullough, plumbing; Peet & Powers, electrical work; Alvord & Swift, heating and ventilating; Edward Shuttleworth and George Brown & Co., cut stone work; W. W. Morrow, roofing.

The consulting engineers for heating and ventilating were Messrs. Jaros & Baum, and for the electrical work Messrs. Eadie, Freund & Campbell. Dayton C. Miller of Cleveland was the consultant on acoustics. The structural steel was designed by Eugene W. Stern, consulting engineer.

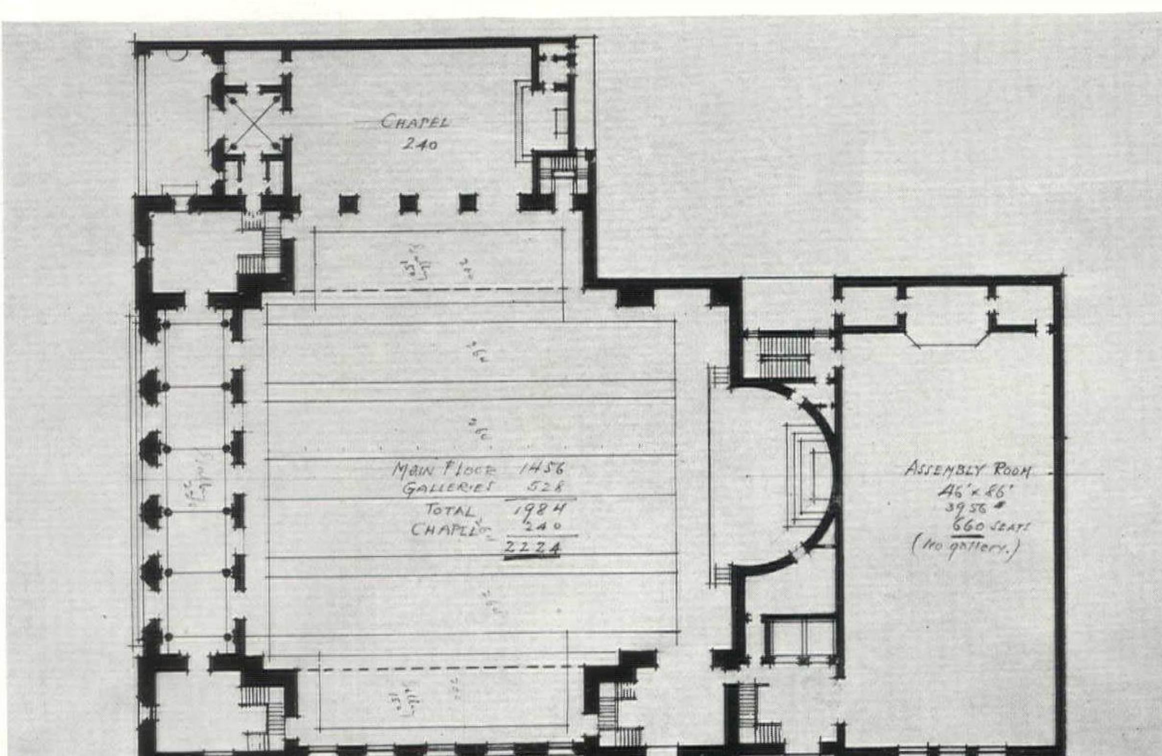
THE PROBLEM OF THE TEMPLE AND ITS SOLUTION

BY

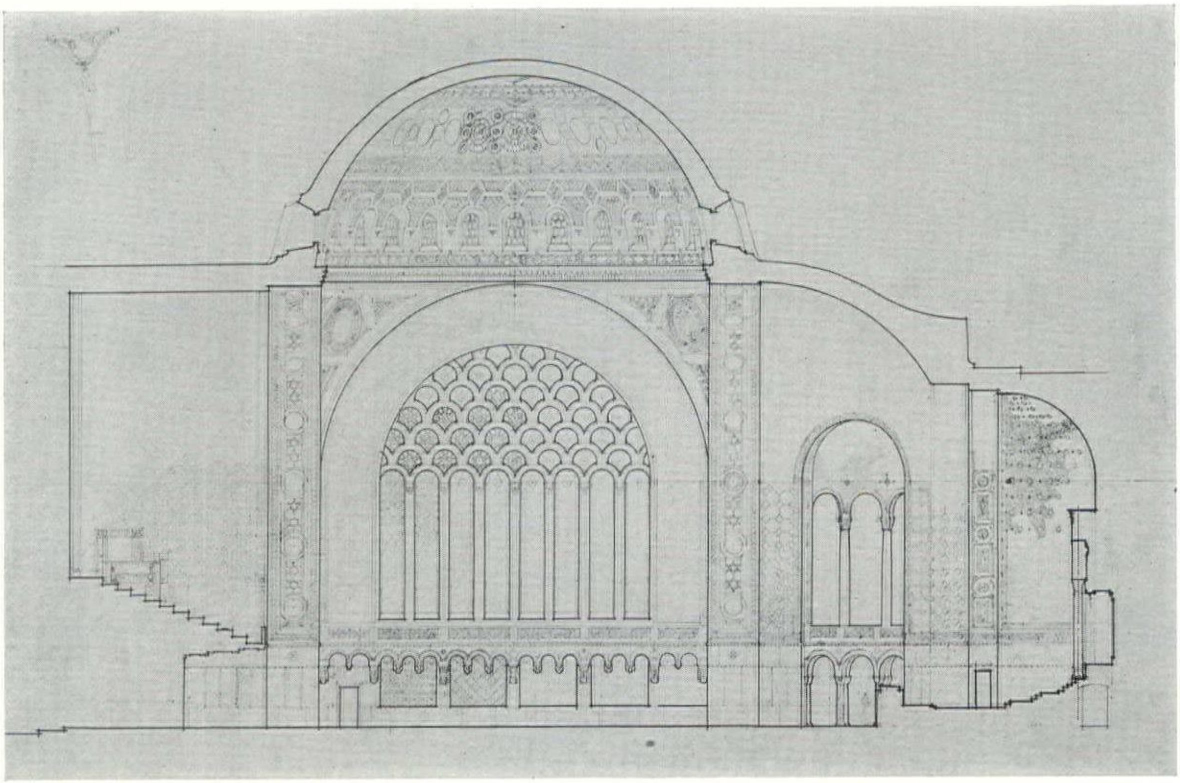
CLARENCE S. STEIN

THE purpose of this article is not to describe the Temple Emanu-El. Mr. Butler has done that. It is rather to explain how the architects arrived at the particular solution of the problem. Like all finished designs, it looks very simple now. It seems quite apparent to us that the way we planned and designed the Temple Emanu-El was *the* way to do it. Yet as I look through the piles and piles of preliminary studies it is quite apparent that there are many ways in which the building might have been arranged. In fact we have enough designs of temples to supply all the United States for years to come. The problem was to arrange on a plot which had been purchased on the corner of Fifth Avenue and 65th Street a group of three buildings,—Temple, Chapel and Community House. The Temple was to have a seating capacity of 2,500, all seats having a clear view of the Ark and the pulpits; 2,000 of these seats were to be on the ground floor, which had to be clear of all columns and supports that might obstruct the view of the sanctuary. The plot measures 150 feet on Fifth Avenue and 253 on 65th Street. It forms an ell, of which the north 50 feet on Fifth Avenue is 200 feet deep.

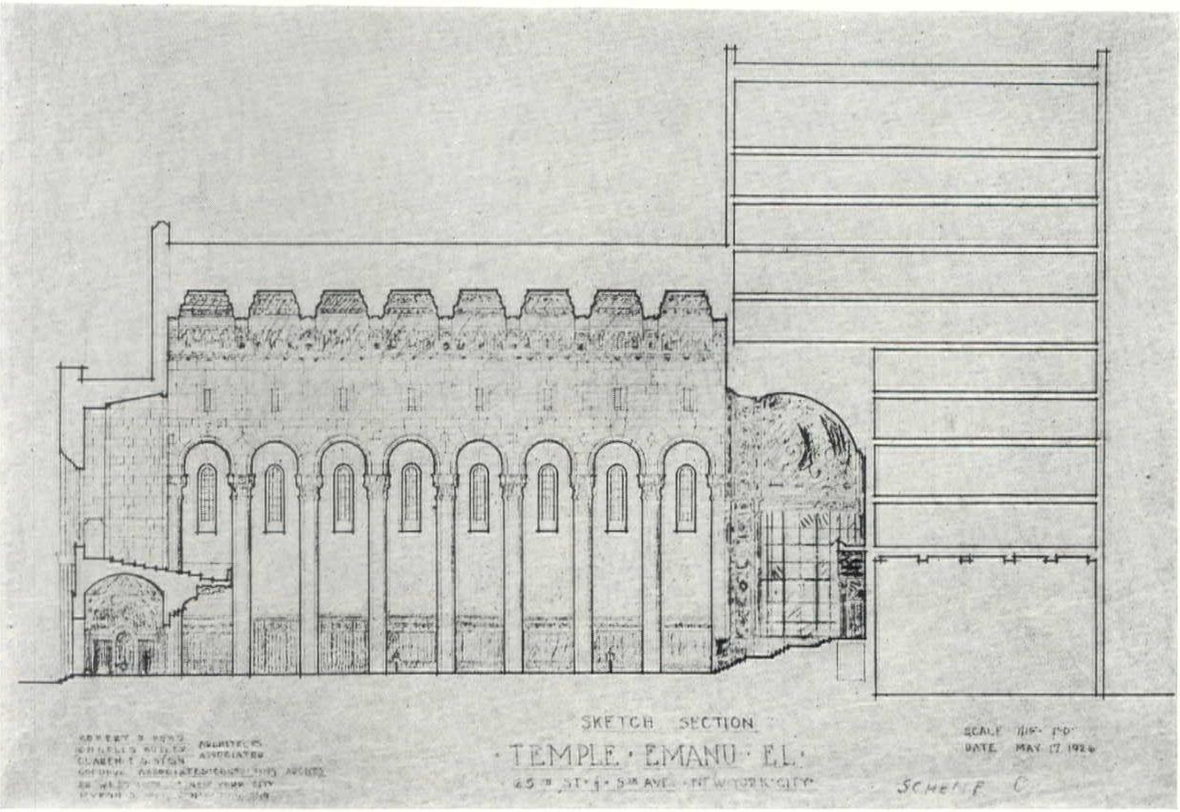
Four years ago, in December, 1925, when the trustees of the Temple asked our firm,—Robert D. Kohn, Charles Butler and Clarence S. Stein,—to undertake the designing of the building, each of us started immediately to make a sketch of a *parti*. We worked for some time independently of one another. At the same time, our consultants, who were the Goodhue Associates, made various sketches. It was apparent to all of us from the beginning that the Temple should be placed at the corner. We felt it would be more impressive there from the point of view of mass, but the governing factor was the necessity of securing the best space for the required seating capacity. The requirements of the Community House were such that it was evident it would tower over the Temple itself. To this height we added tanks and elevator machinery, which made it possible to develop part of its bulk as a tower. There was suggested the possibility of placing this tower on the Avenue, between the Temple and the apartment building to the north. It took only one sketch to make it quite apparent that a tower of

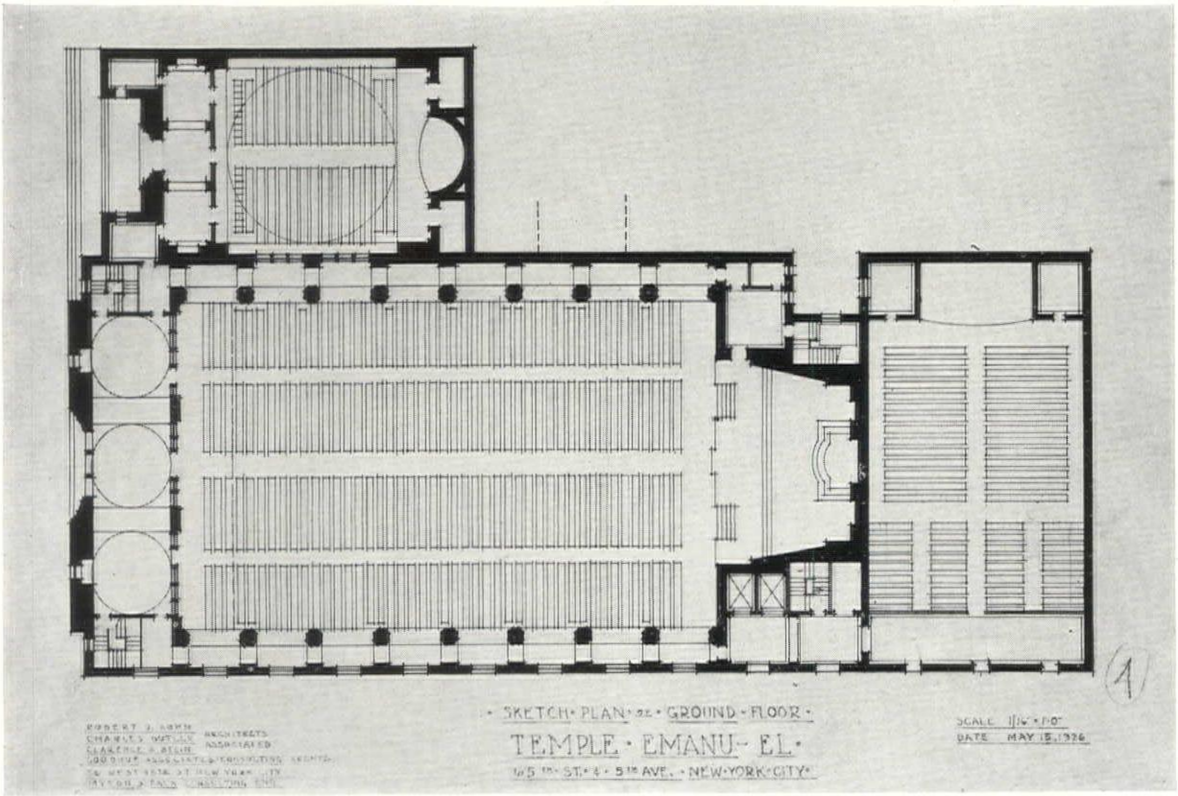


EARLY PLAN, BUILDING WITH DOME
THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS

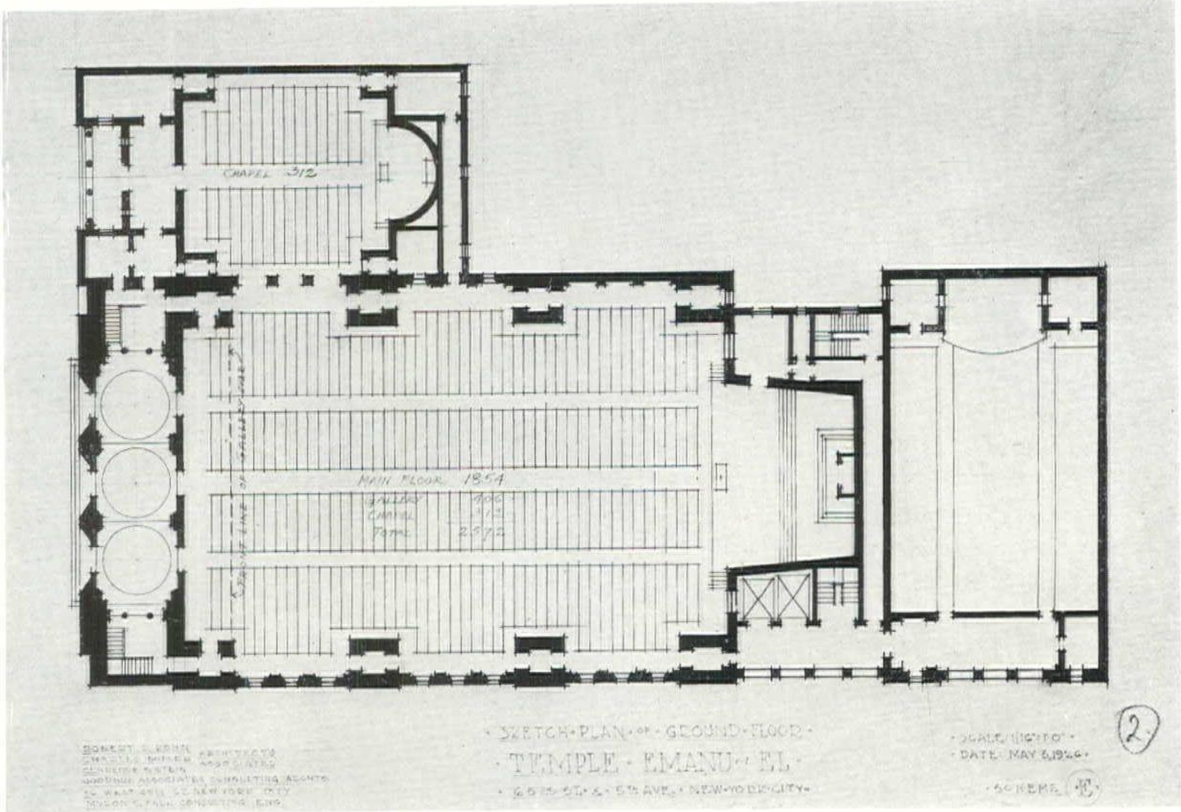


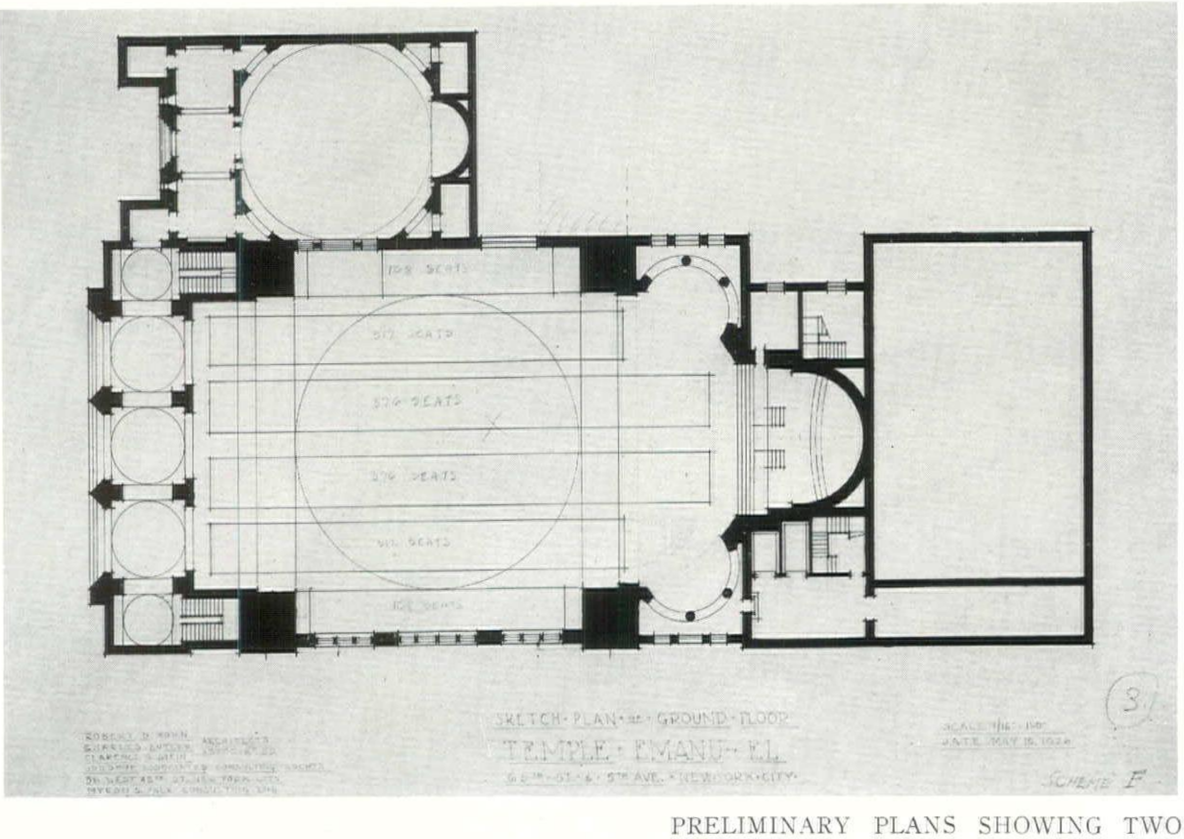
PRELIMINARY STUDIES, SECTION AND PLAN, DOMICAL TYPE OF BUILDING THE TEMPLE EMANU-EL, NEW YORK KOHN, BUTLER & STEIN, ARCHITECTS GOODHUE ASSOCIATES, CONSULTANTS



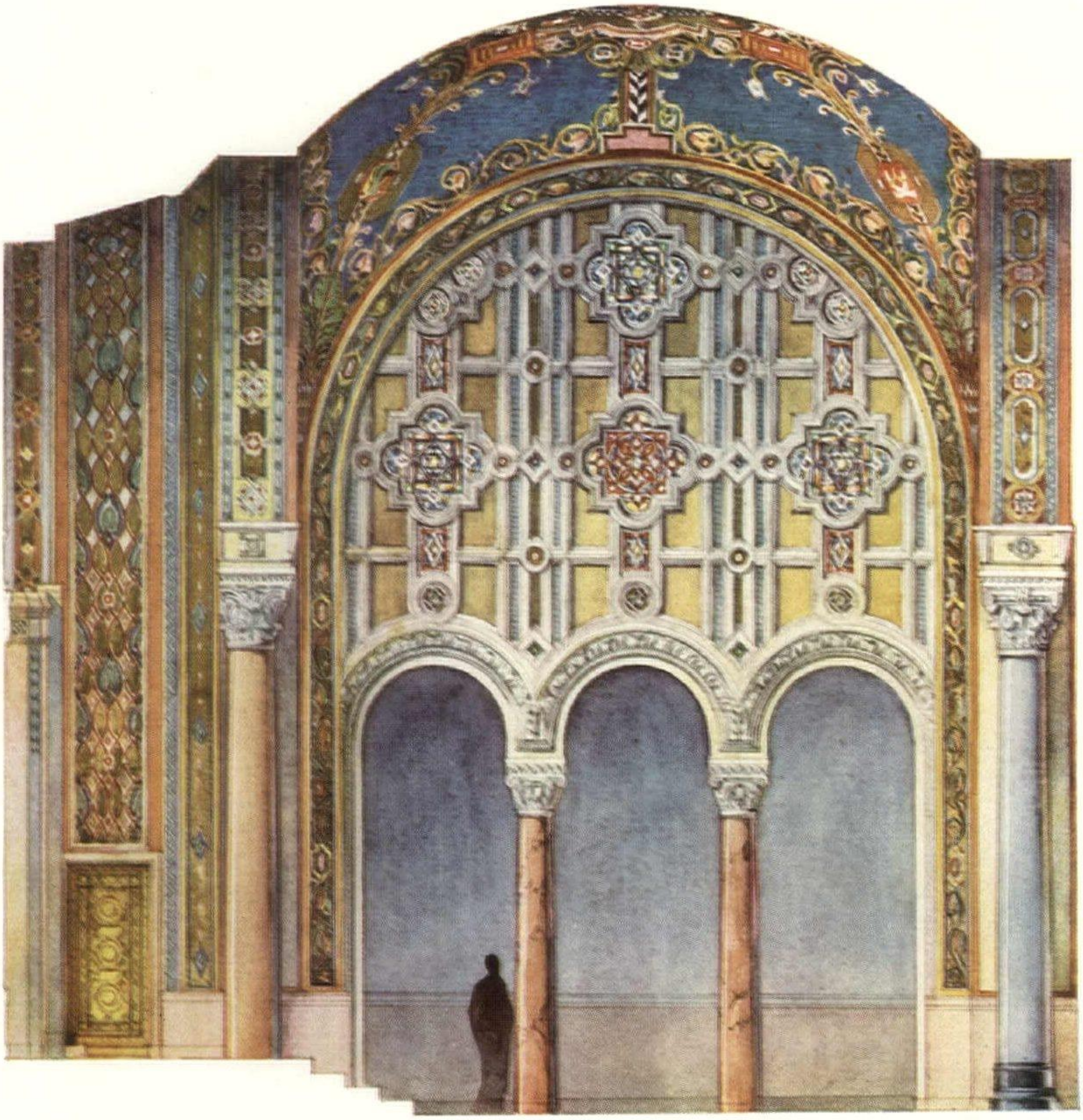


PRELIMINARY STUDIES, SECTION AND PLAN, BASILICAN TYPE OF BUILDING THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS

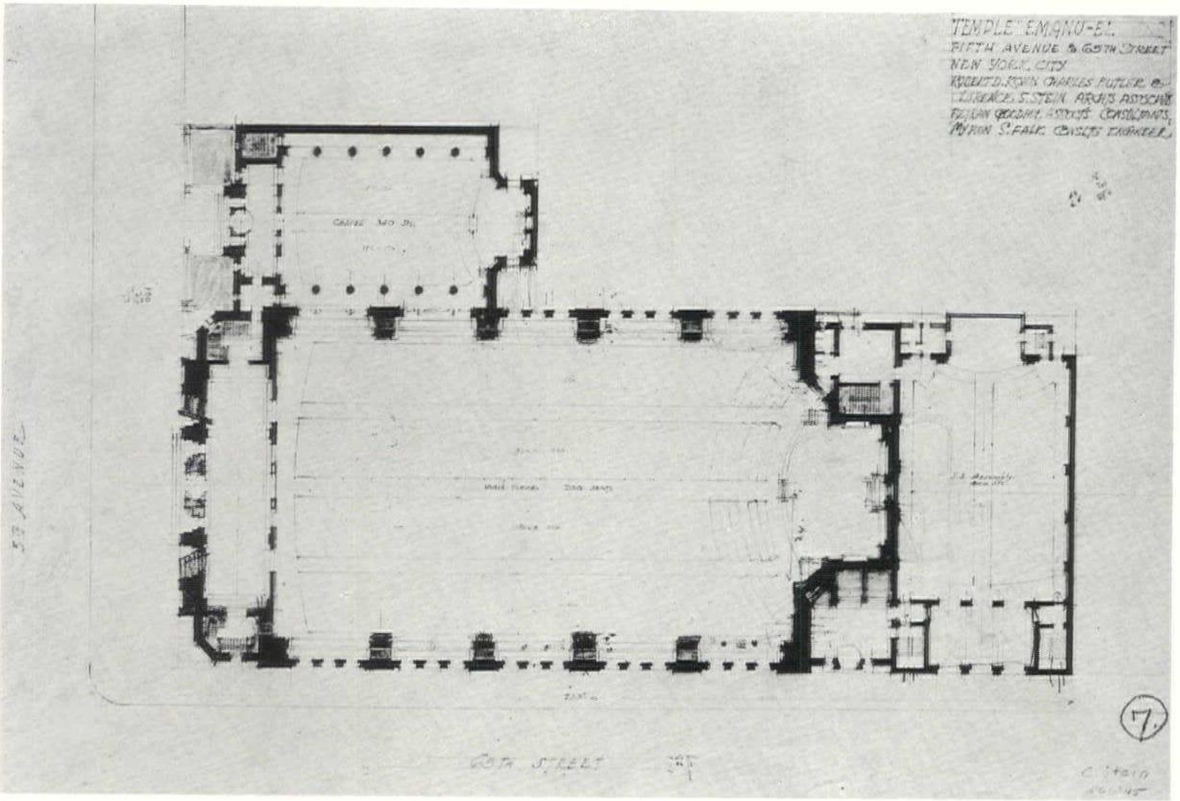


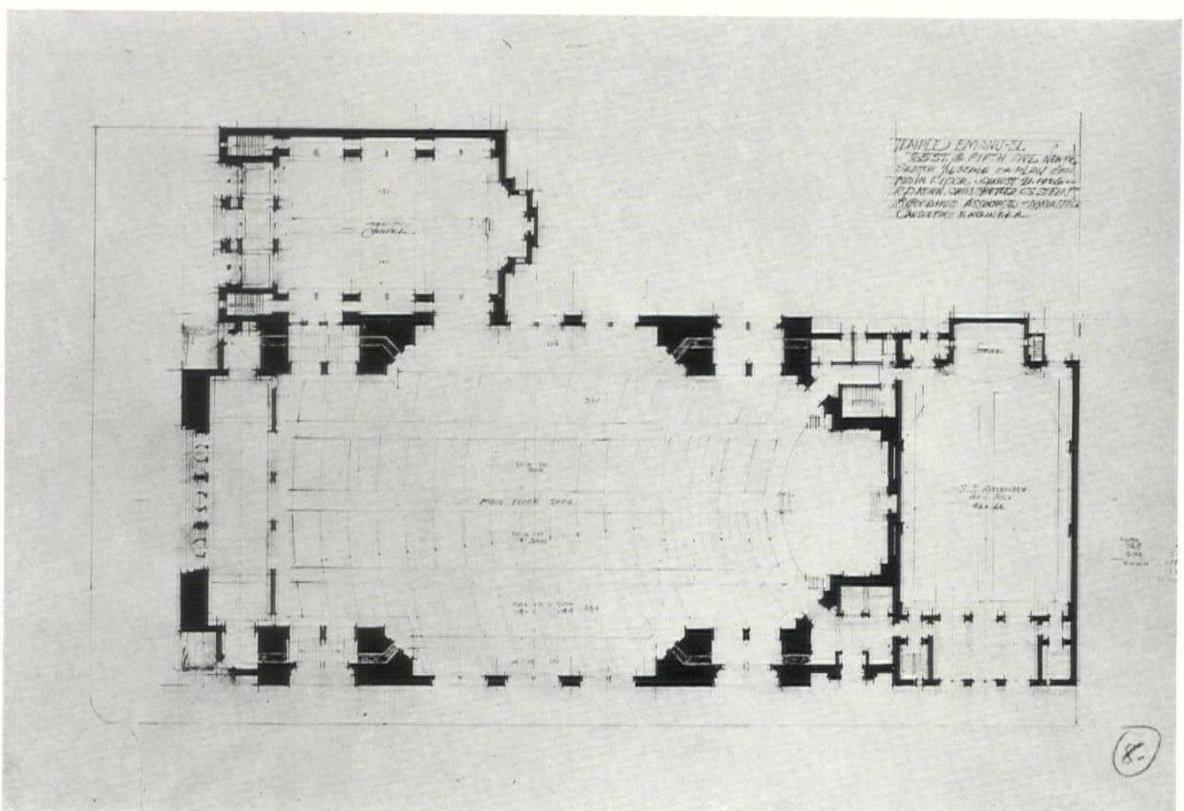


PRELIMINARY PLANS SHOWING TWO DIFFERENT TYPES OF ARRANGEMENT
THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS



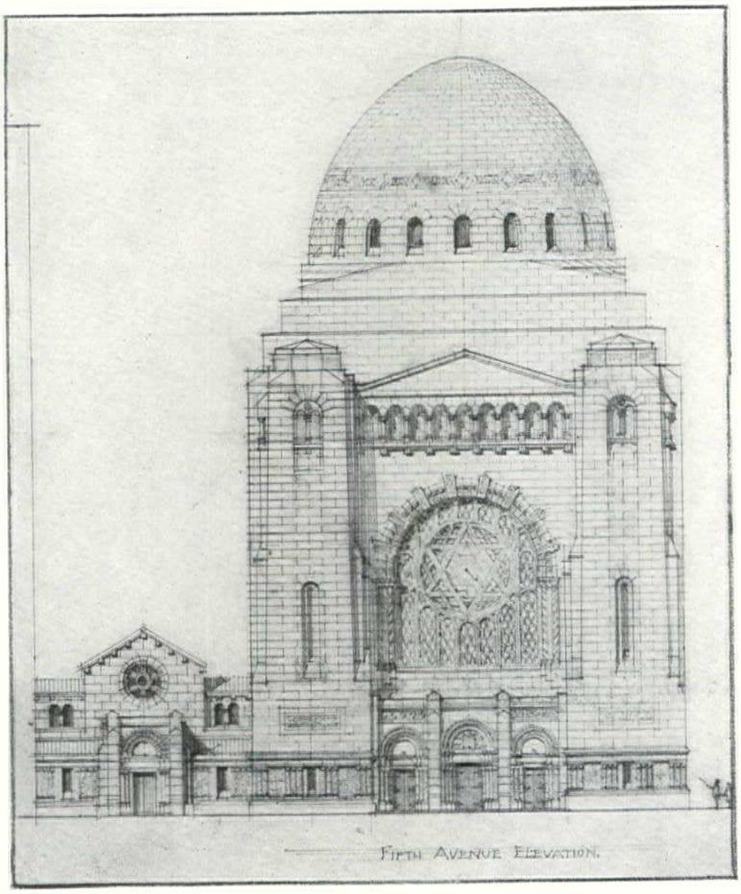
ONE BAY OF CHAPEL, TEMPLE EMANU-EL
FROM A COLOR STUDY BY HAROLD GROSS
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS

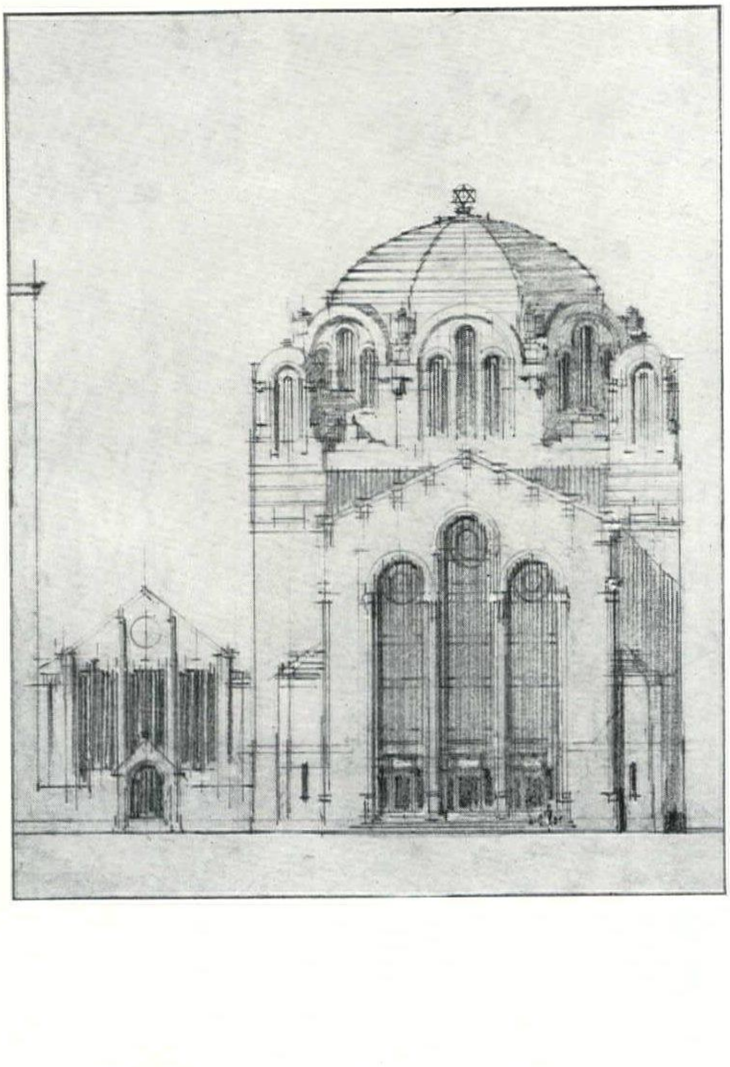




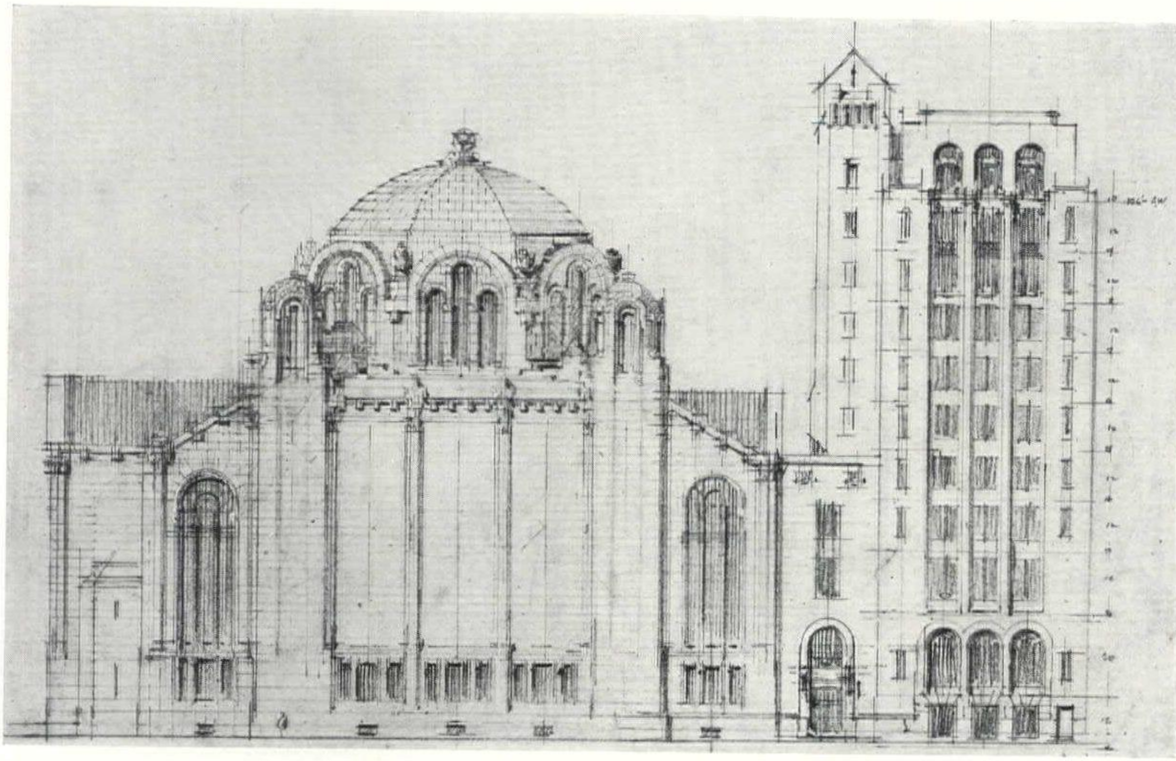
LOWER PLAN PROVIDES FOR DOME
THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS

SKETCH SHOWING DOME, ARCHED WINDOW, CORNER TOWERS AND TRIPLE ENTRANCE. BELOW, ANOTHER STUDY FOR DOMICAL BUILDING. SIDE ELEVATION OPPOSITE



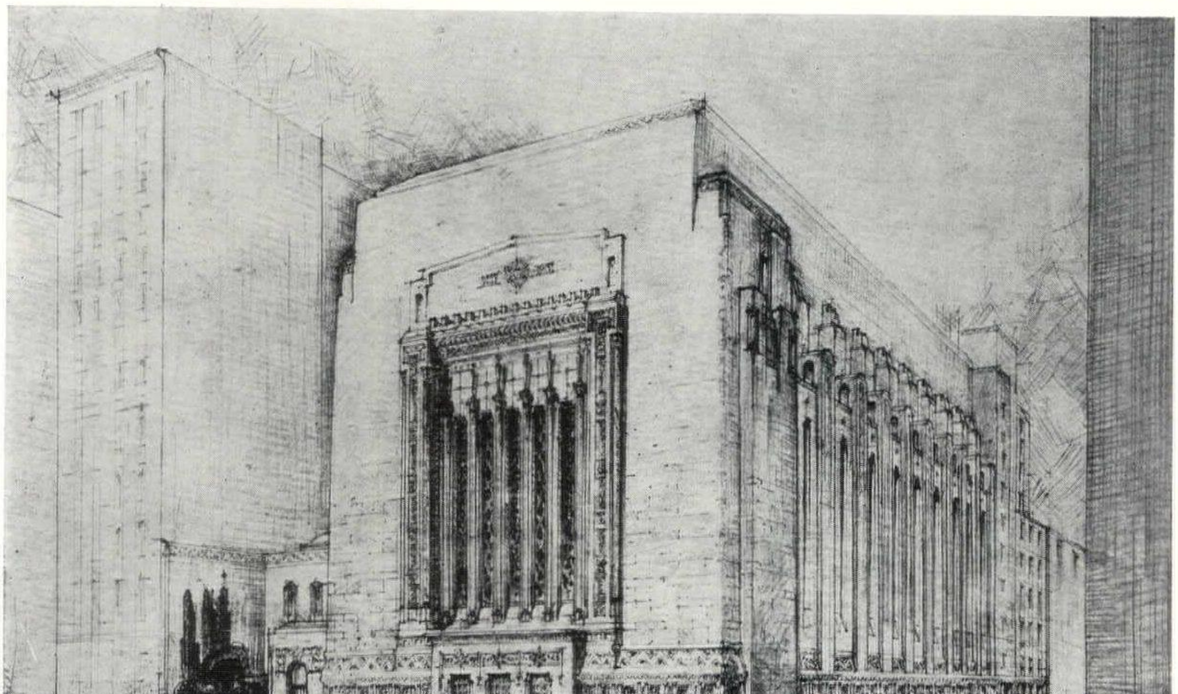


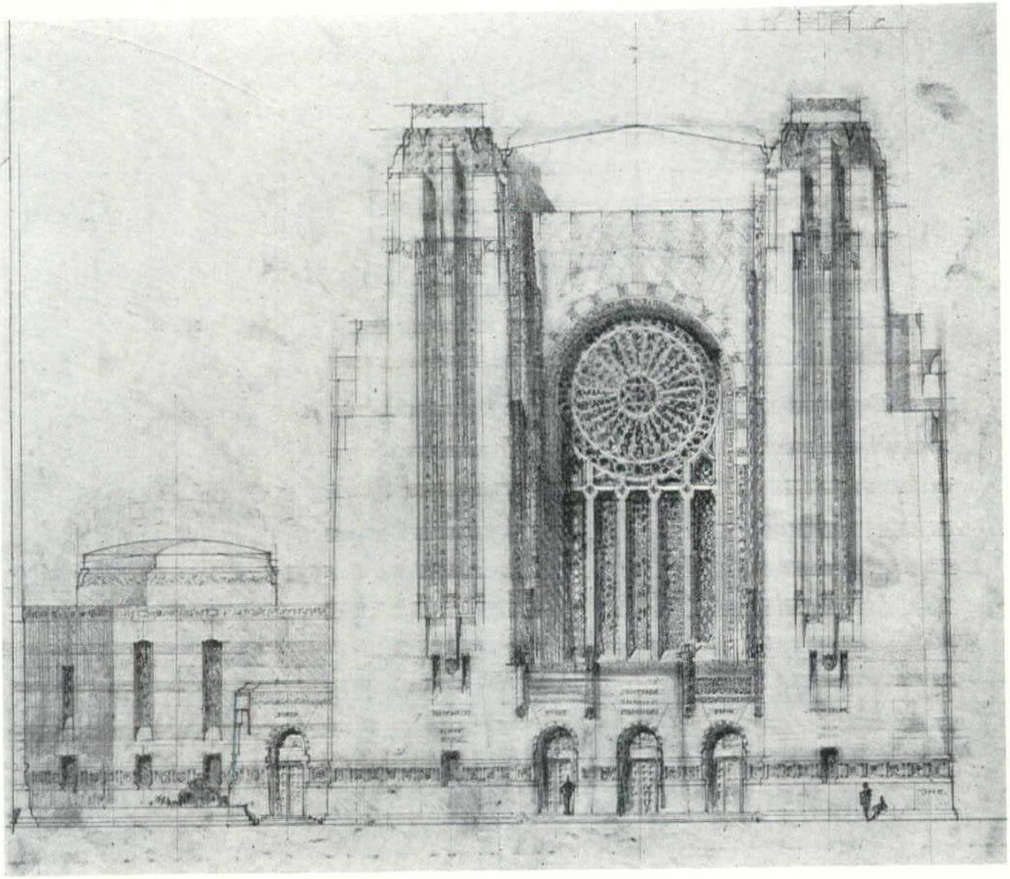
STUDY IN BYZANTINE STYLE FOR THE TEMPLE EMANU-EL, NEW YORK. KOHN, BUTLER & STEIN, ARCHITECTS. GOODHUE ASSOCIATES, CONSULTANTS



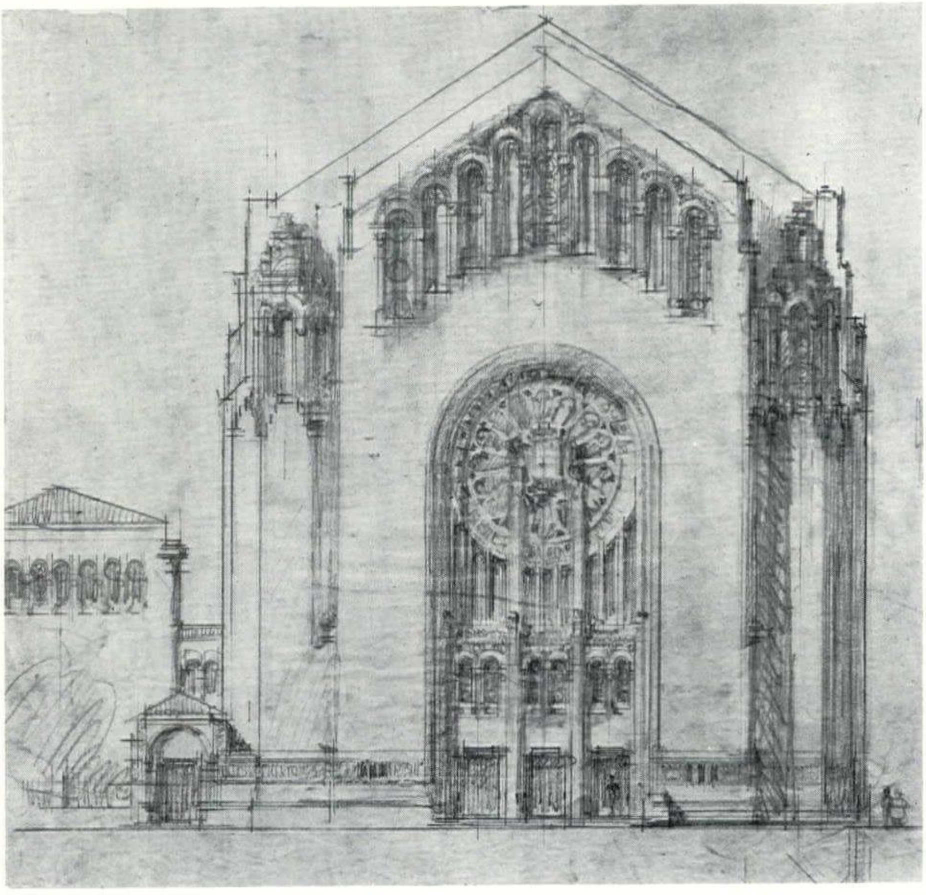
SIDE ELEVATION STUDY IN BYZANTINE STYLE. FIFTH AVENUE FRONT SHOWN ON OPPOSITE PAGE AT THE BOTTOM

THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS

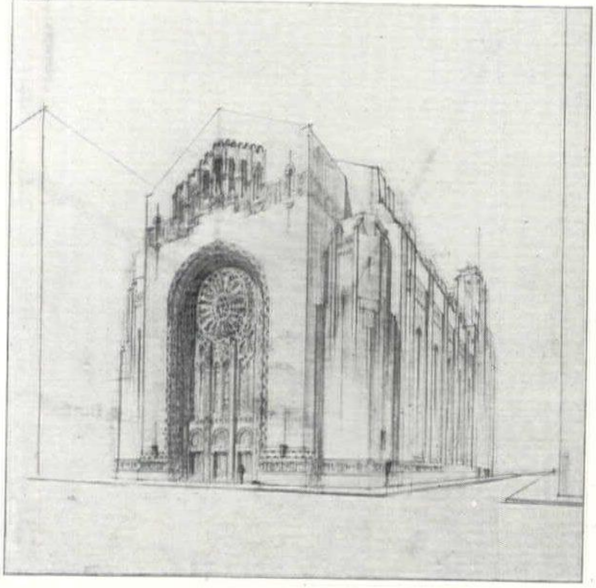


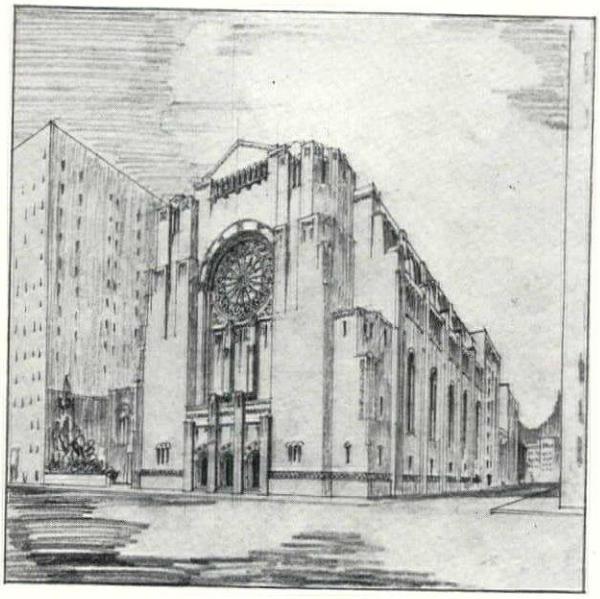


TWO STUDIES IN THE FREE MODERN ADAPTATION OF THE ROMANESQUE STYLE



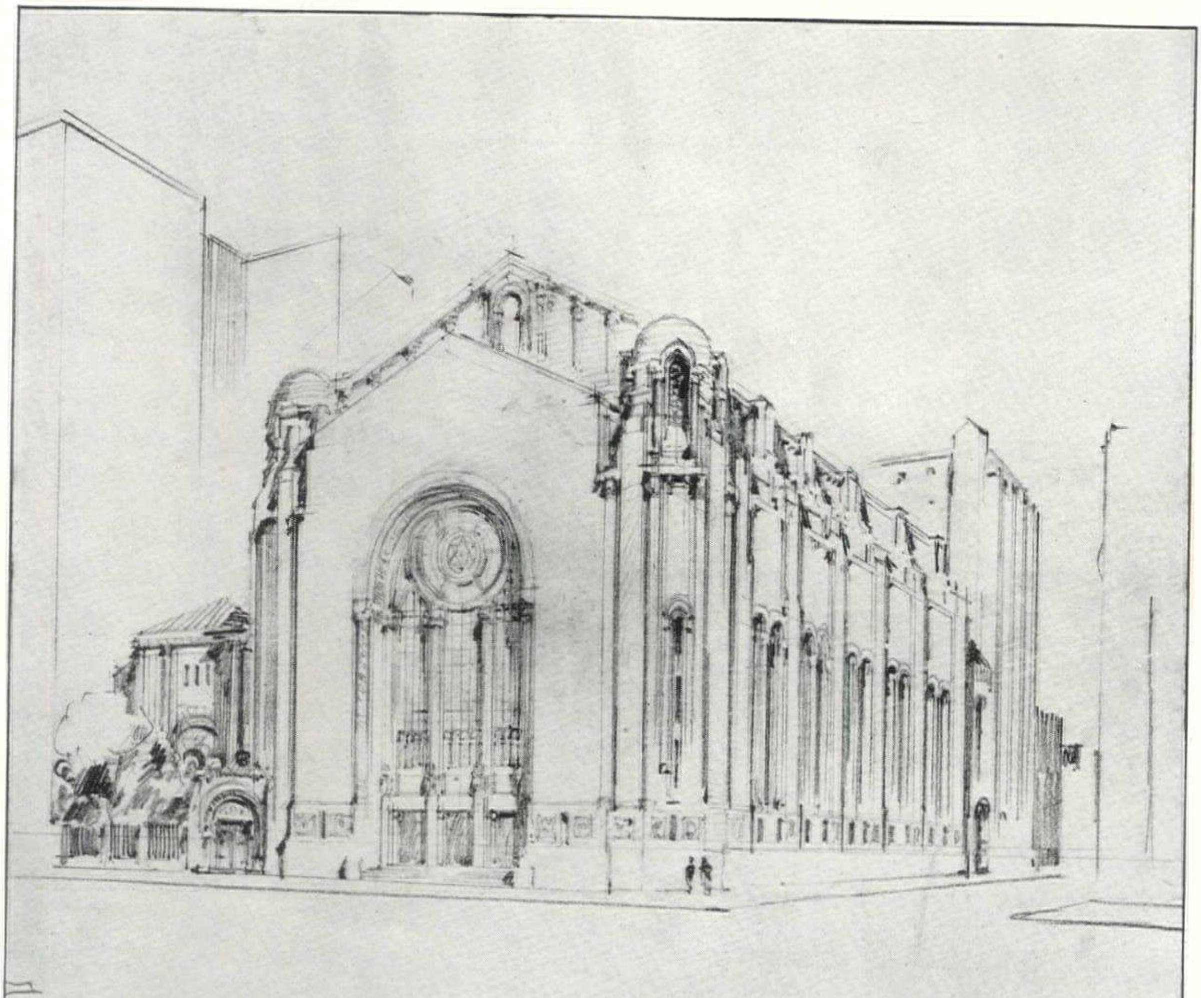
THE TEMPLE EMANU-EL, NEW YORK. KOHN, BUTLER & STEIN, ARCHITECTS. GOODHUE ASSOCIATES, CONSULTING ARCHITECTS

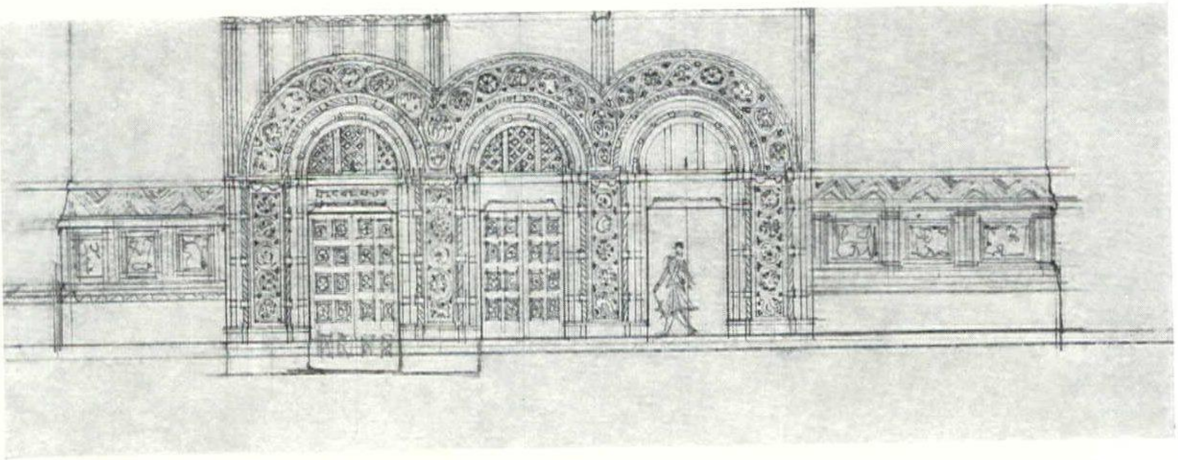


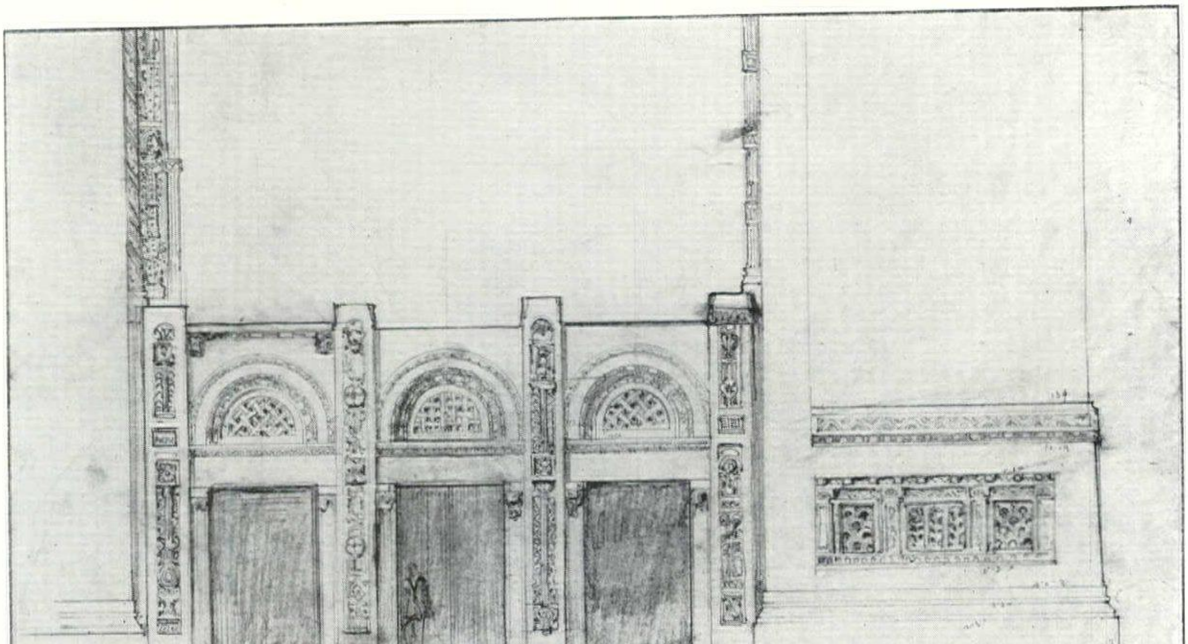


THREE PERSPECTIVE STUDIES FOR THE NEW TEMPLE IN A FREE, BOLD AND MODERN ROMANESQUE MANNER

THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS







STUDIES FOR FIFTH AVENUE DOORS
THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS

a height more or less corresponding to that of the apartment house alongside it would not afford the best means of separation. A building of the mass and dignity of Temple Emanu-El, of course, should have been placed in the midst of a certain amount of open space. In fact, we would have been willing, in order to secure such a space, to have placed it in a less prominent location, but with a full block front. We did our best to get a small amount of green adjoining the neighboring apartment by setting the Chapel back from the street and arranging the planting in front of it, so that as one approaches from the north there would be a feeling of separation between the apartment house and the Temple. To show their appreciation of the manner in which we protected their light by placing the low building next to the apartment house, the owners of the structure agreed to follow, at their own expense, whatever design was suggested by us to harmonize the south wall of their structure with the Temple.

In looking over the preliminary sketches we worked on for the first six months, it is interesting to find that practically all of them are devoted to a study of floor plan and general mass of the interior, without consideration of the exterior appearance of the building. We explained to the chairman of the building committee that the exterior "would find itself" once we had solved the more important practical problems of interior arrangement of seating and had worked out a general scheme of the interior to serve the requirements of the services of the Temple and to express the spirit of the religious services to be conducted in the building. The chairman of the building committee, I am sure, did not altogether comprehend our point of view, but he was broad minded enough to let his architects go their own way in spite of their seeming eccentricities.

In spite of great variety as to detailed arrangements, the plans considered divided themselves into two definite types,—one a domed structure, the other the basilica type. There has been a growing tendency in this country and abroad to use domes as coverings for synagogue buildings. There are examples in Philadelphia, San Francisco and Boston, as well as in Paris and Florence. It is a splendid structural form for covering large areas, but it has probably been used quite as much because of its suggestion of the Oriental. We felt there was no more reason why a Jewish temple should look like a Mohammedan mosque than like a Christian church, and as we were undecided between the two types of plan, we made studies in drawing and models of both. Ultimately we all agreed it was best to give up the domed structure because it was not the best form to fit our plot. Even though a dome in these days can be built without the amount of buttressing that is used in the old structures, such as Hagia Sophia, the external appearance of a domed structure in which the dome itself must come to the very edge of the property seemed unsatisfactory. There remained two possibilities,—one was the cross, which in spite of the fact that it was used in the old Temple Emanu-El has the objection of being too closely related to the Christian Church, and the other a simple basilica.

The basilica appeared to fit our problem of a maximum number of seats with clear view of the Ark and pulpits. We made various attempts to use more than the 100 feet of width for the Temple proper, but finally decided that all schemes of plan trickery were of little help, and that it was much better to be satisfied with 100 feet of width in one arm of the ell. After taking off space for external walls, piers and two aisles, there was left a distance of 77 feet clear span. This is one of the largest church spans in New York. This great width was the source of our difficulty in dealing with the next problem, which was to give pleasing proportions to the great area. Of our total depth of 253 feet we were forced to give up enough for a Community House, the sanctuary, and the entrance vestibule on Fifth Avenue. This left only 150 feet, but this was increased somewhat by including the space above the entrance vestibule and balcony as a portion of the whole. We feel that the length could not have been very much increased, even if we had had the ground, without making some of the seats too distant from the sanctuary for either sight or hearing. The cost factor also entered to limit us to approximately 150 feet. We accentuated the height by the use of vertical lines, both in carrying the piers up as high as possible without breaking the line and by the use of vertical lines of gold tile as decoration. The great interior was covered with a ceiling rather than with a vault for a number of reasons. In the first place, there was structural difficulty in vaulting an area of this width with the thrust taken by narrow buttresses. Besides this, we felt we could get a greater appearance of length by covering it with a ceiling, accentuating the length rather than the width. This was done by bracketing out the ceiling in a horizontal plane and then breaking into a line following the roof, in a manner somewhat similar to that found in certain Mohammedan roofs in Egypt. The ceiling also gave us an opportunity for a suggestion of the Oriental in pattern and color.

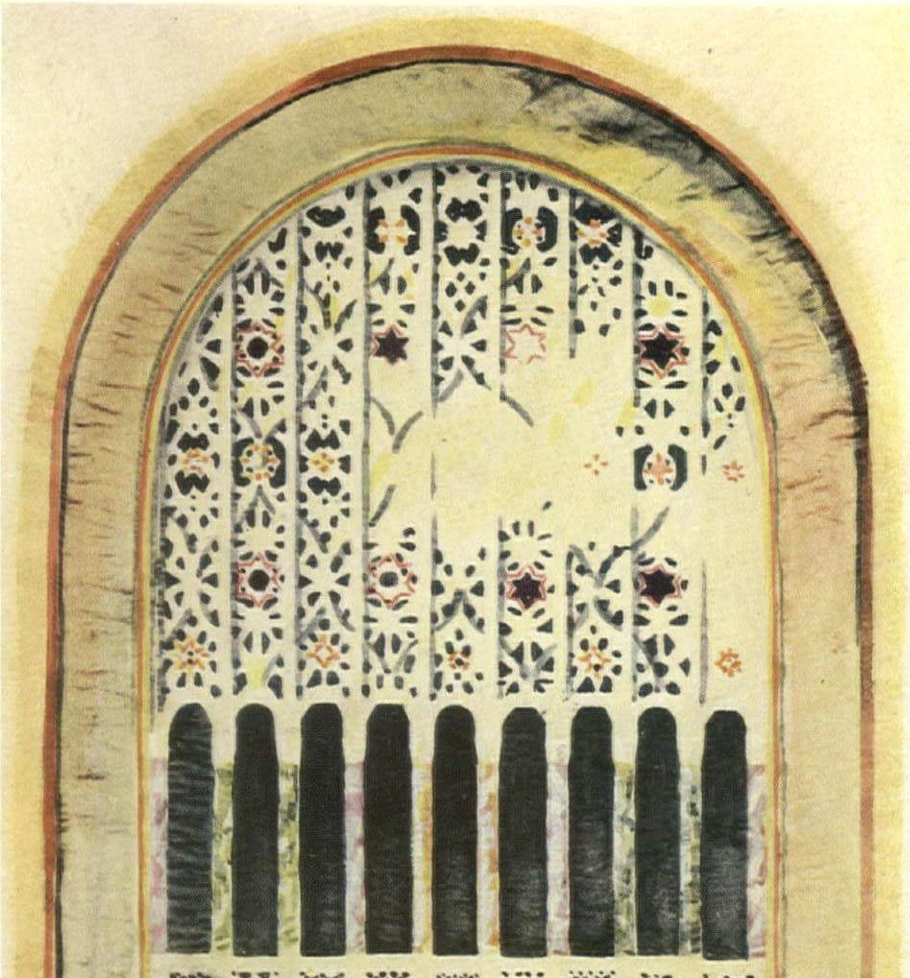
As will be seen, the shape and proportions of the interior were governed by the practical requirements of the plan. The decorative treatment was to a great extent suggested by the materials necessary for acoustic purposes. We were advised by Professor Dayton C. Miller of Cleveland that the acoustic tiles made by Guastavino were of the greatest value for this purpose. These were used purely as a wall covering, without any attempt to imitate stone. We graduated brown from light to dark as we went upward, so as to accentuate the height. For the same purpose the light was thrown downward, leaving the upper portion of the walls and ceilings in shadow. There is only a small amount of decorative pattern on the walls. Most of the rhythm of design came from the use of vertical lines of gold. As we continued our studies we gradually eliminated more and more of the decoration we at first thought necessary. The detailed design of the ceiling was also considerably affected by the need of killing echo. The panels were perforated in such a way as to form a pattern, and felt was placed a short distance behind to help absorb the sound waves. The color pattern of the ceiling was studied in the office only at small scale. It was worked out in detail in place and studied from the floor of the Temple. Although the interior was kept as simple as possible, in contrast the sanctuary walls were richly covered with marble and mosaic. Here it was not only possible but better to have a hard surface to help throw the speaker's voice toward the congregation. There is a single center to the Jewish service, that is the Ark, in which the Scroll of the Law is kept. Naturally, this was made the center of decorative interest. So that this might be in clear view of the congregation, we induced the building committee to permit us to change the usual arrangement of Jewish temples by placing two pulpits, one on each side of the sanctuary, instead of a single reading desk directly in front of the Ark. The choir is placed in a gallery above and back of the Ark, and above the choir is the great organ, the pipes of which are concealed by a pierced plaster screen.

The problem of the Chapel was practically that of designing a second synagogue in which smaller services could be held. This Chapel we felt should open into the Temple but should be arranged so that it could be used separately. In our earlier sketches, when we had considered a dome covering for the Temple, we designed a Chapel with a beamed roof. When the basilica type was chosen for the Temple, we tried first one dome and then two domes. We at first thought of covering these domes with rich decoration of mosaic. In fact, two of the architects took trips to Sicily, giving as the excuse the need of study of the mosaics at Palermo. In spite of this, it was finally decided to leave the vaults simple, on the theory that they should not compete in richness with the ceiling of the Temple.

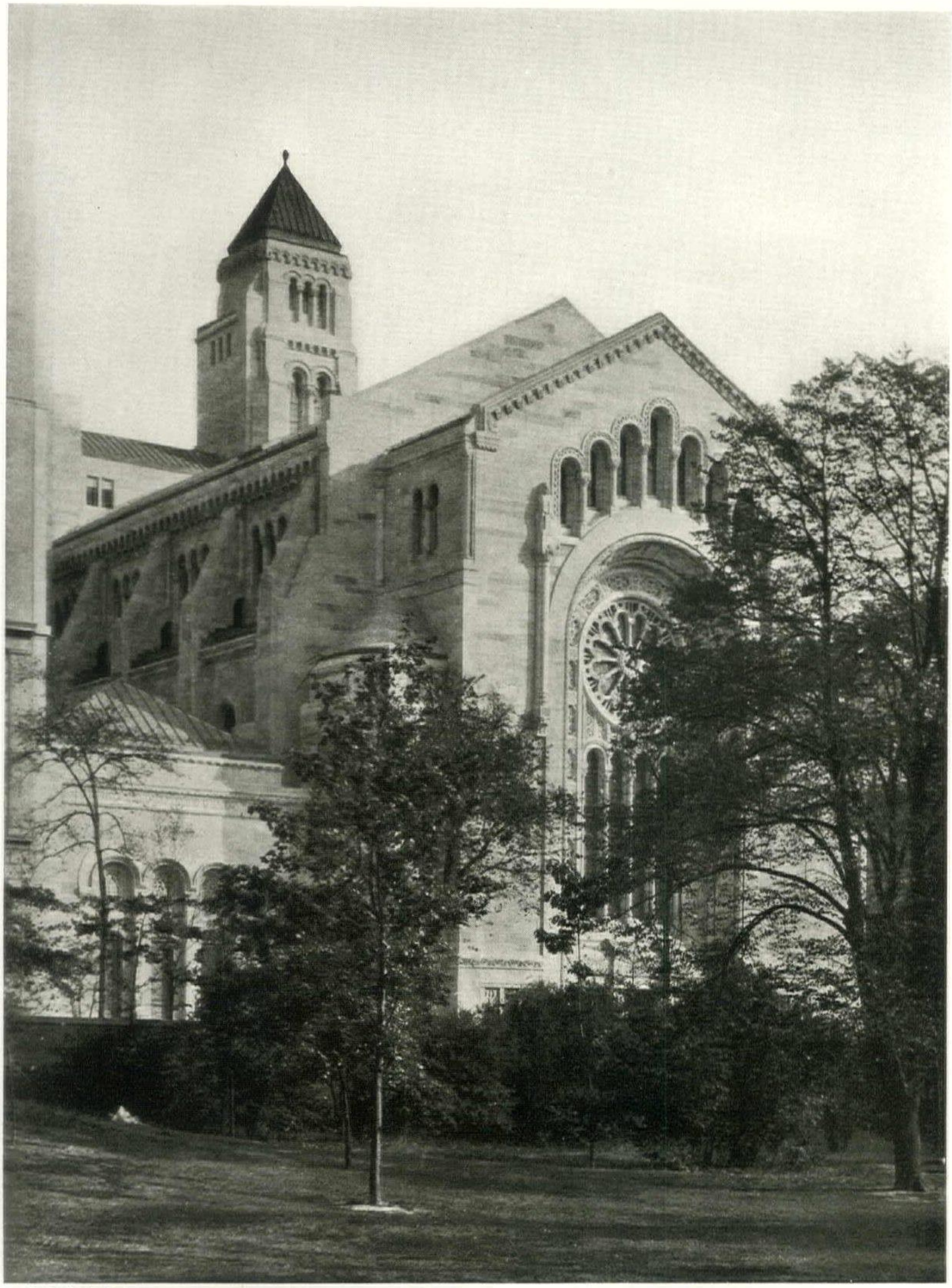
The exterior of the building is purely a covering of the structural mass. The general design marks the location of the vestibule with balcony above and two flanking stairs, five bays of the auditorium, the Chapel and the Community House. The illustration of the section shows how the buttresses cover the supports of the roof and how in the interior the lines of the framework of the ceiling are related to the steel construction.

The style of ornament to be used in the detail was the last thing we considered. Really, there is no precedent for style in Jewish architecture, or rather I should say there is precedent of every kind. In each country where the Jews have been permitted to give outward expression to their places of worship, they have followed the style of the country and time in which the building was erected. One can find temples of Moorish style in Spain; of Gothic in Prague; of Colonial in Newport; and neo-Classic and neo-everything else in New York and elsewhere throughout the United States. So we felt ourselves free in choice of detail with which to ornament the structural form. We finally decided to develop it from the Romanesque as used in the south of Italy under the influence of the Moorish, because it was an expression of the intermingling of Occidental and Oriental thought. We might just as well have started with some other style, as the detail gradually developed into new forms and certainly new scale in the drafting room and in the sculptor's studio. Above all, it was scale that governed our form. We felt that a building which must be small as compared with the skyscrapers of New York must secure its dignity through simplicity of form and largeness of scale.

In connection with the study of details and the execution of the work, we feel that credit should be given to various members of the office staff who were most closely associated with the work, —the Messrs. Harold Gross and Leon H. Hoag, designers, and Albert Lueders, draftsman. The work drawings were prepared under the supervision of Edward L. Kear, and the work on the site was directed from start to finish by William Timmermann. Mention should also be made of the very interesting structural steel design of the great trusses in the Community House and the Temple proper with their supporting members, as worked out by Eugene W. Stern, consulting engineer. In connection with the study of the building, Mr. Kohn says: "It would be impossible today for any one of the three architects to say who is mainly responsible for the designing of this group. Each had a hand in it, each fought and bled and almost died in opposition to, or in favor of, each step in the procedure. But they tell us now that the building has a feeling of unity throughout. We three are still fast friends and are friendly with the various consultants. That is surely an unusual and enviable record breaker in modern architectural practice!

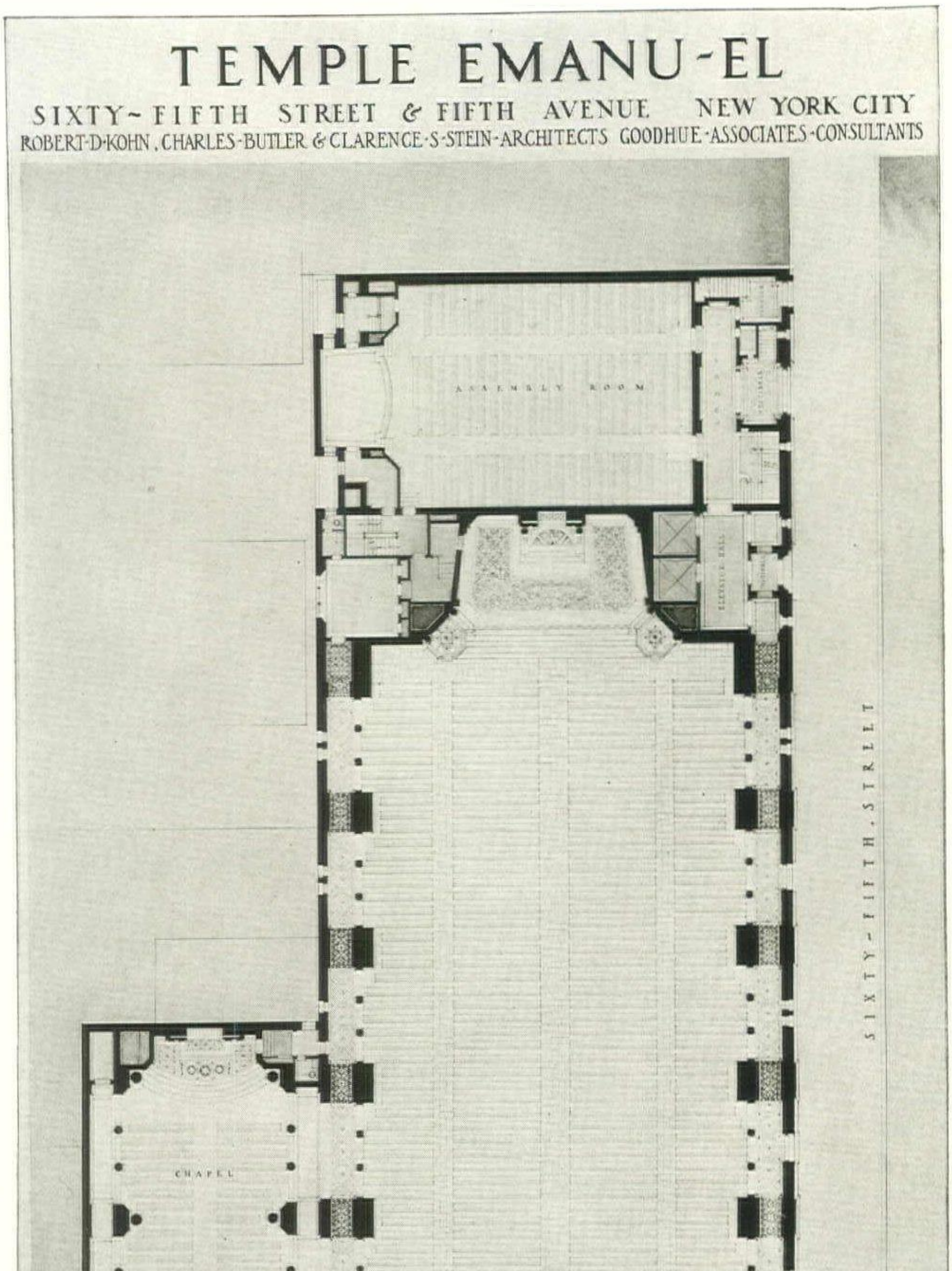


COLOR STUDY FOR THE BRONZE, MARBLE, AND MOSAICS
ARK AND SANCTUARY, TEMPLE EMANU-EL, BY H. GROSS
KOHN, BUTLER & STEIN, ARCHITECTS ASSOCIATED
BERTRAM GROSVENOR GOODHUE ASSOCIATES, CONSULTANTS



Benj. J. Lubschez

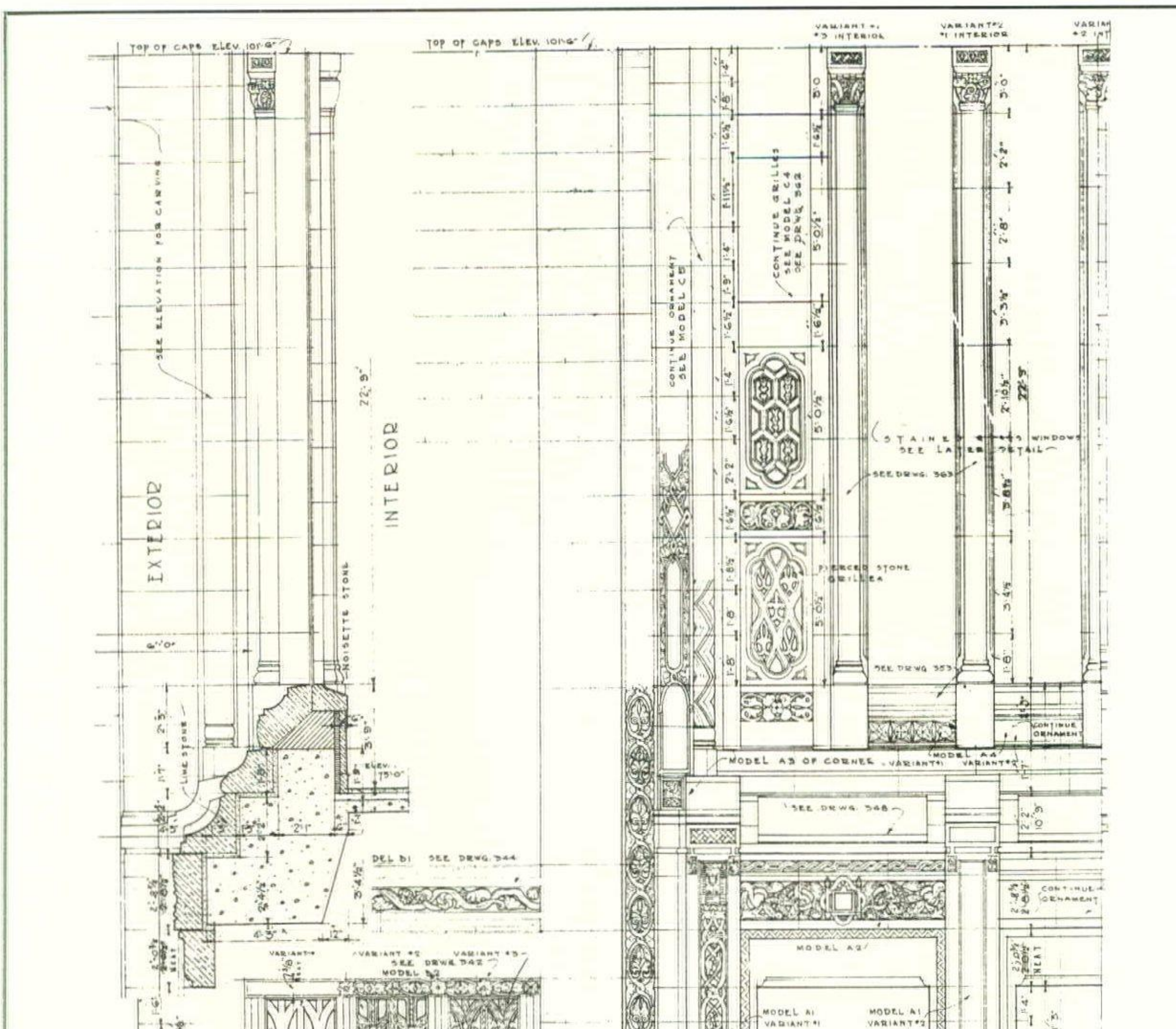
THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS



THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS

Benj. J. Lubschez

VIEW OF FIFTH AVENUE FACADE
THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS



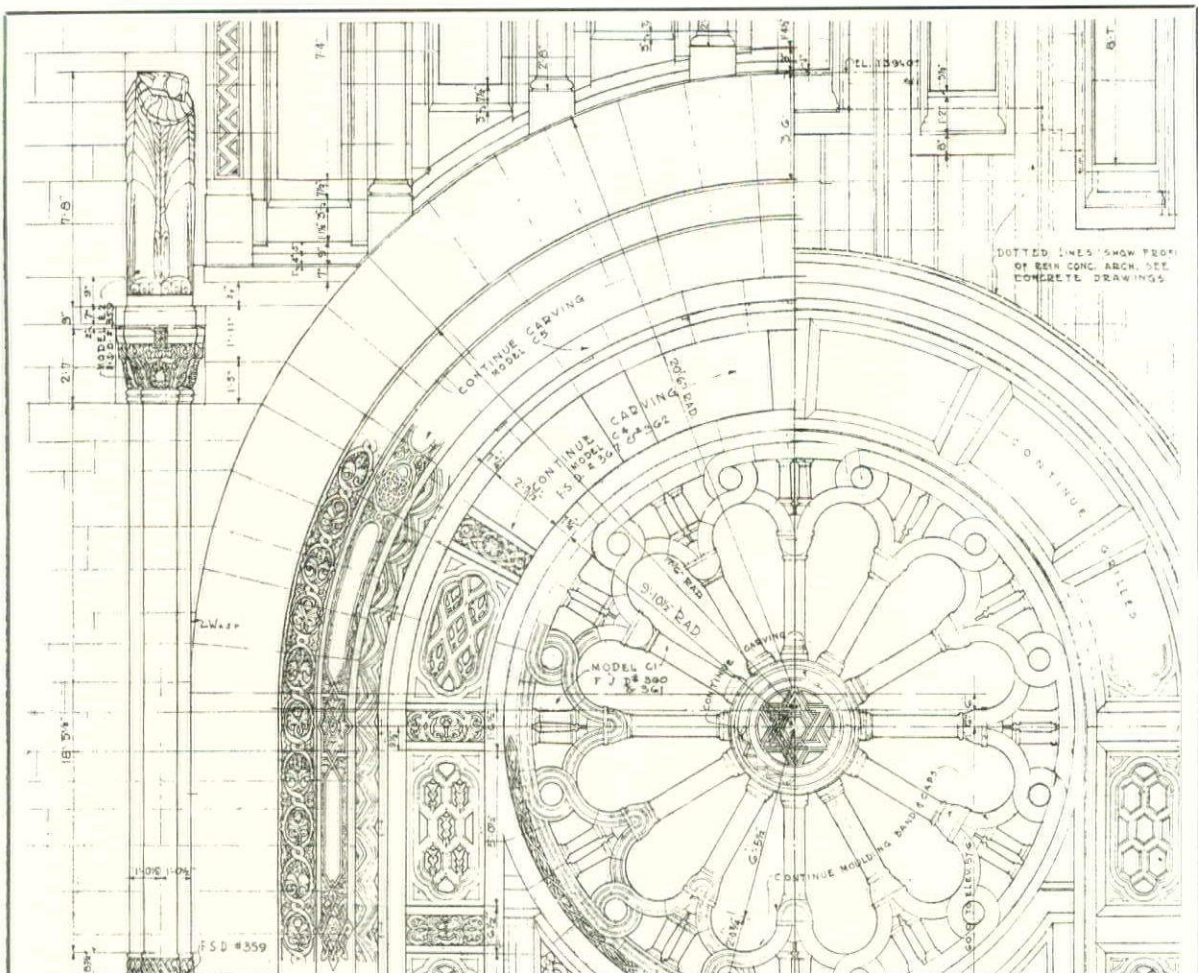
DETAILS. ENTRANCE DOOR AND SIDE WINDOW IN THE TEMPLE EMANU-EL
KOHN, BUTLER & STEIN, ARCHITECTS; GOODHUE ASSOCIATES, CONSULTANTS

Benj. J. Lubschez

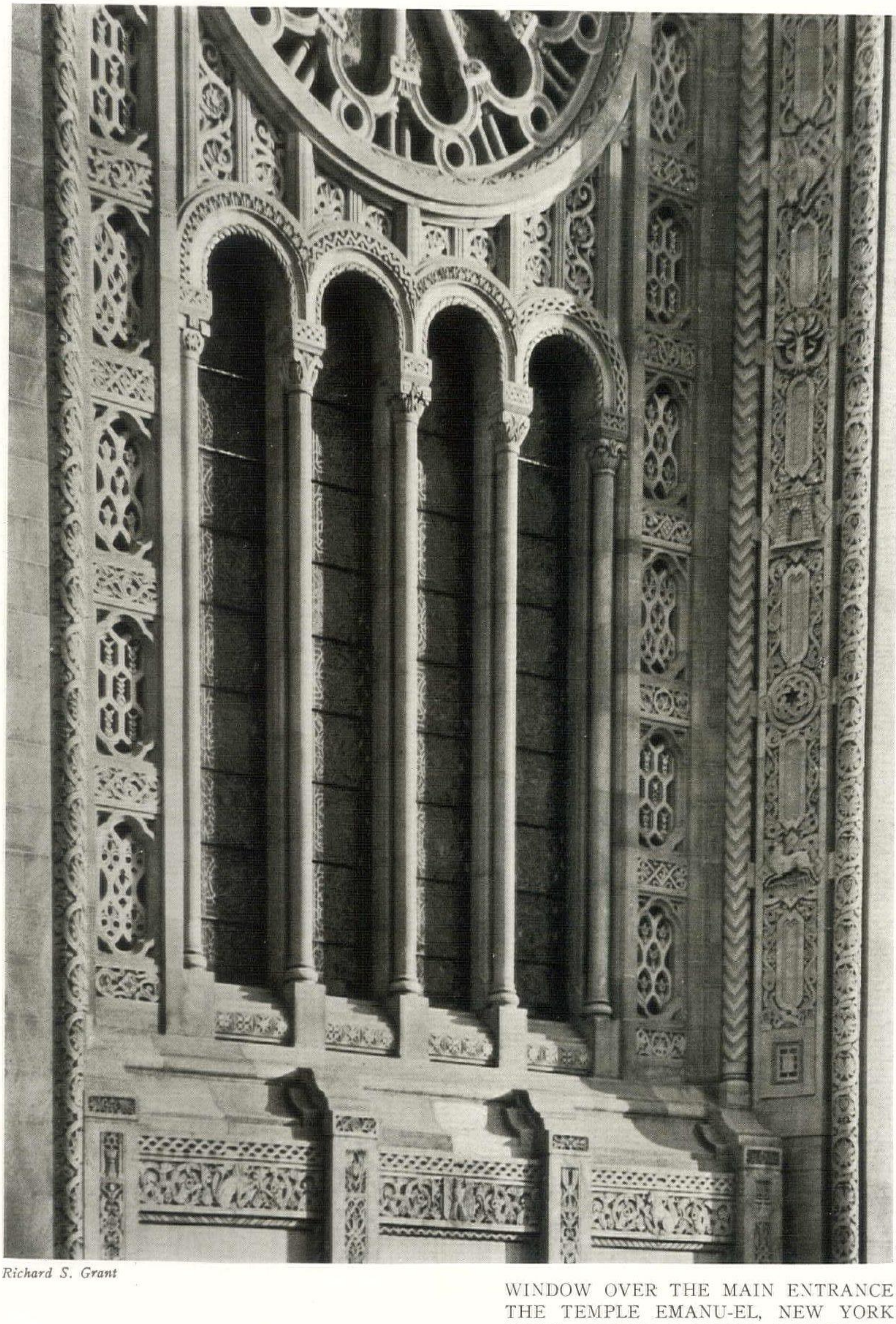
DOOR IN FIFTH AVENUE ENTRANCE
THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS

Benj. J. Lubschez

ROSE WINDOW BY OLIVER SMITH
THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS



DETAILS. THE TEMPLE EMANU-EL
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS

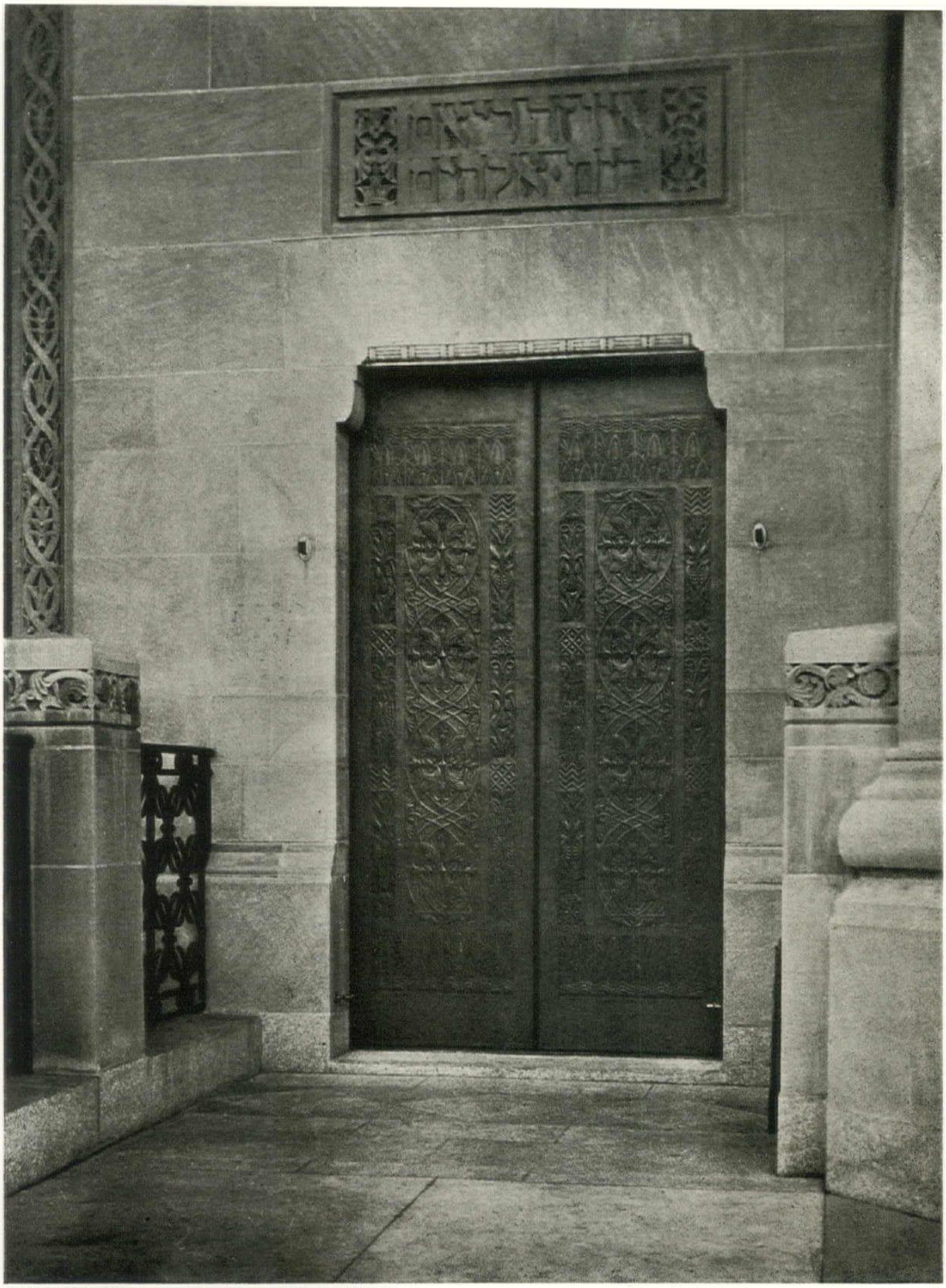


Richard S. Grant

WINDOW OVER THE MAIN ENTRANCE
THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS

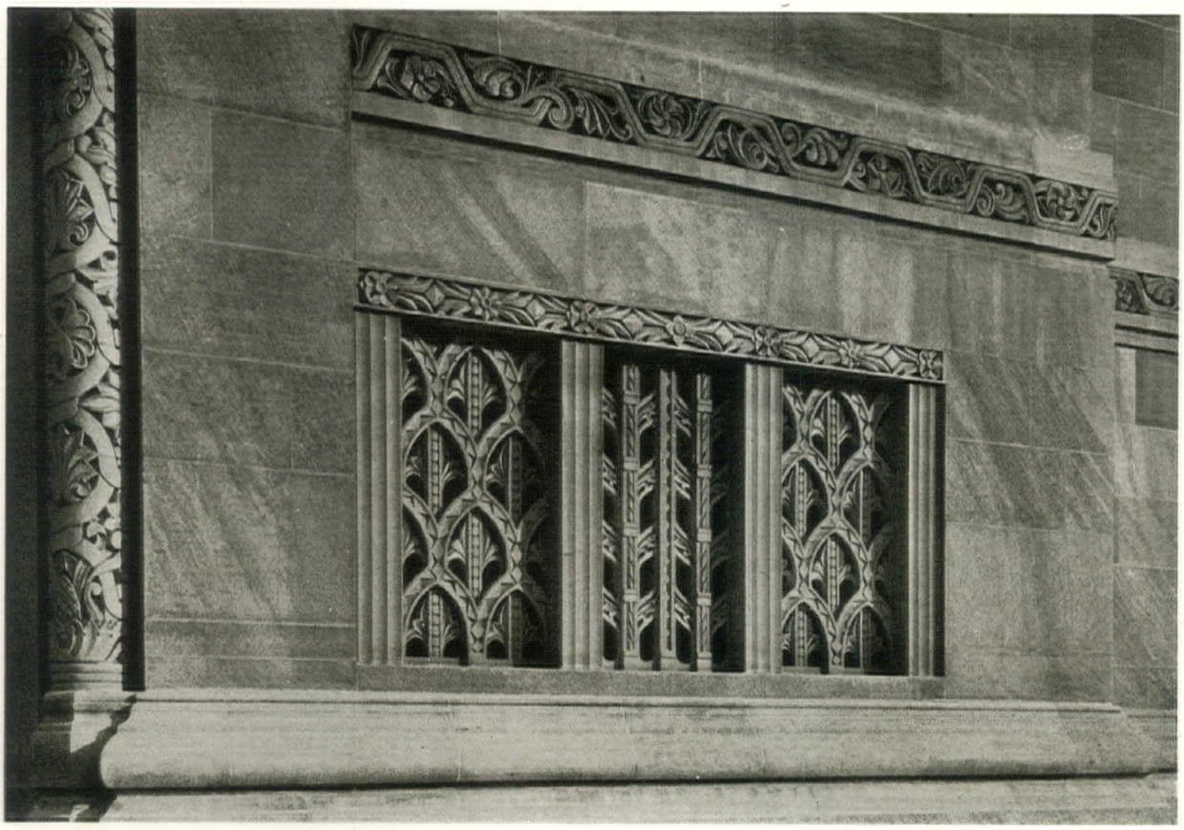
Benj. J. Lubschez

VIEW OF CHAPEL FROM FIFTH AVENUE
THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS



Benj. J. Lubschez

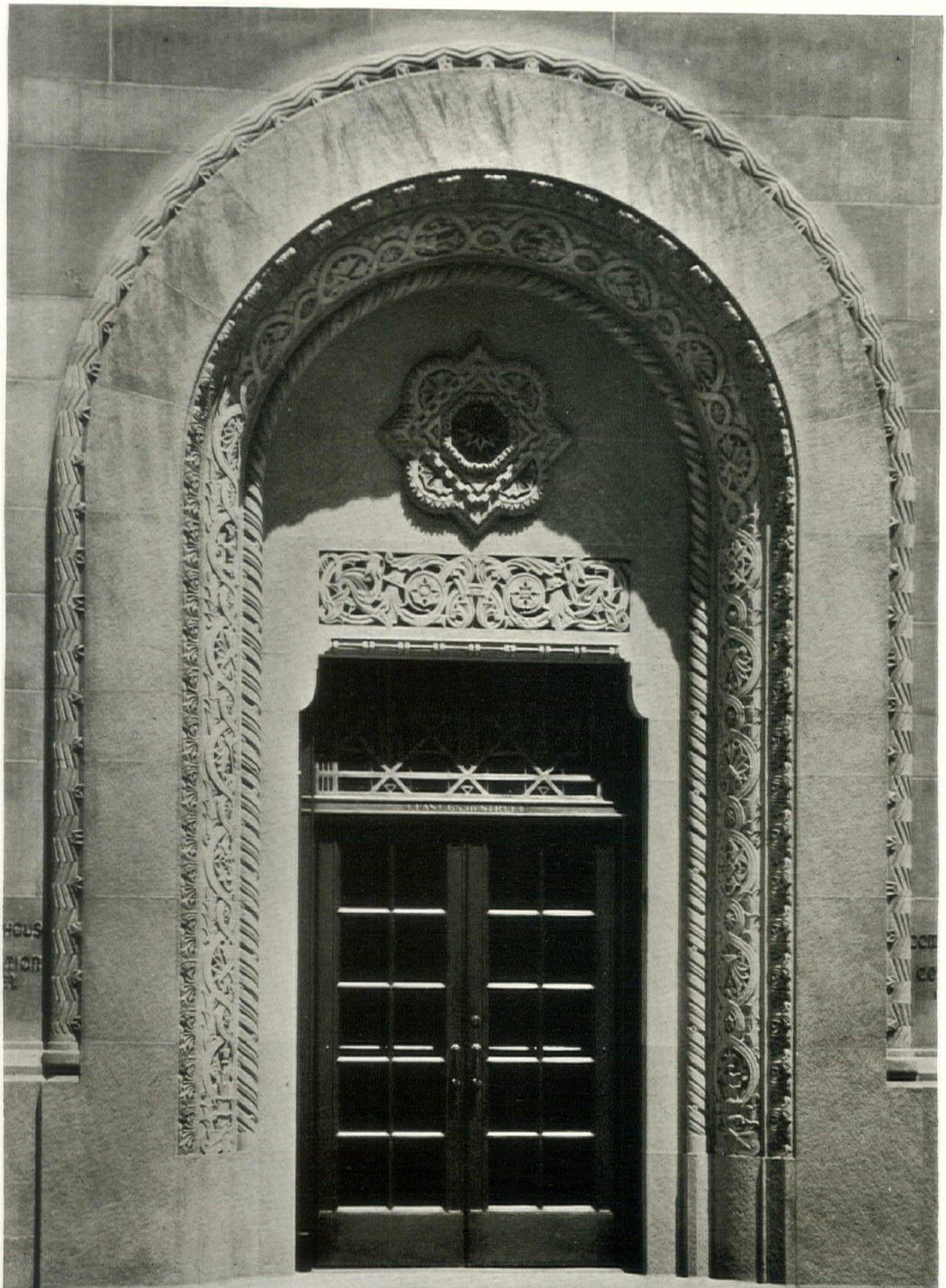
ENTRANCE DOOR TO THE CHAPEL
THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS



Richard S. Grant

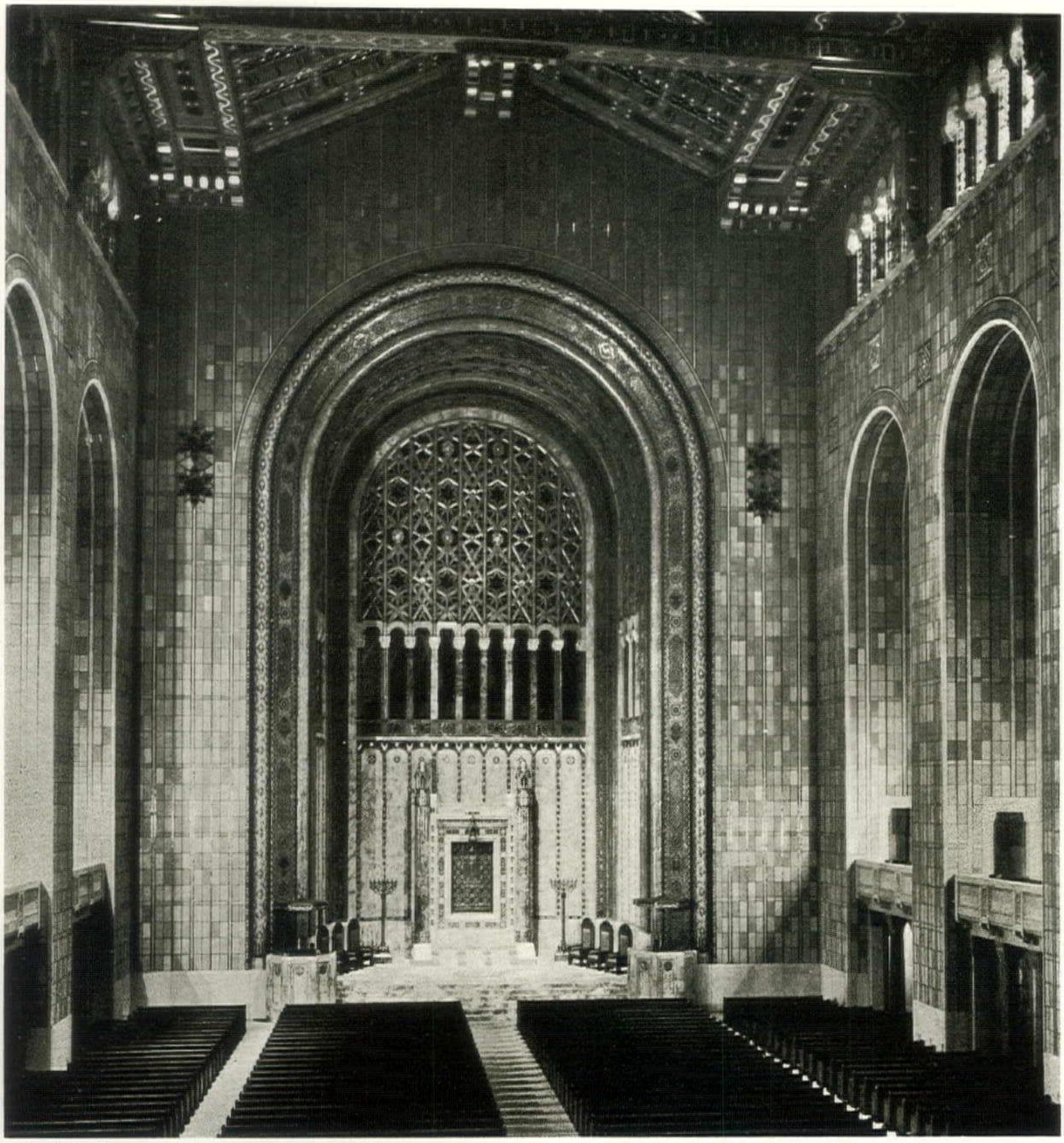
CARVED DECORATIONS ON THE FIFTH AVENUE FACADE. BELOW, DETAIL OF ARCHITRAVE AROUND SIDE ENTRANCE

THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS



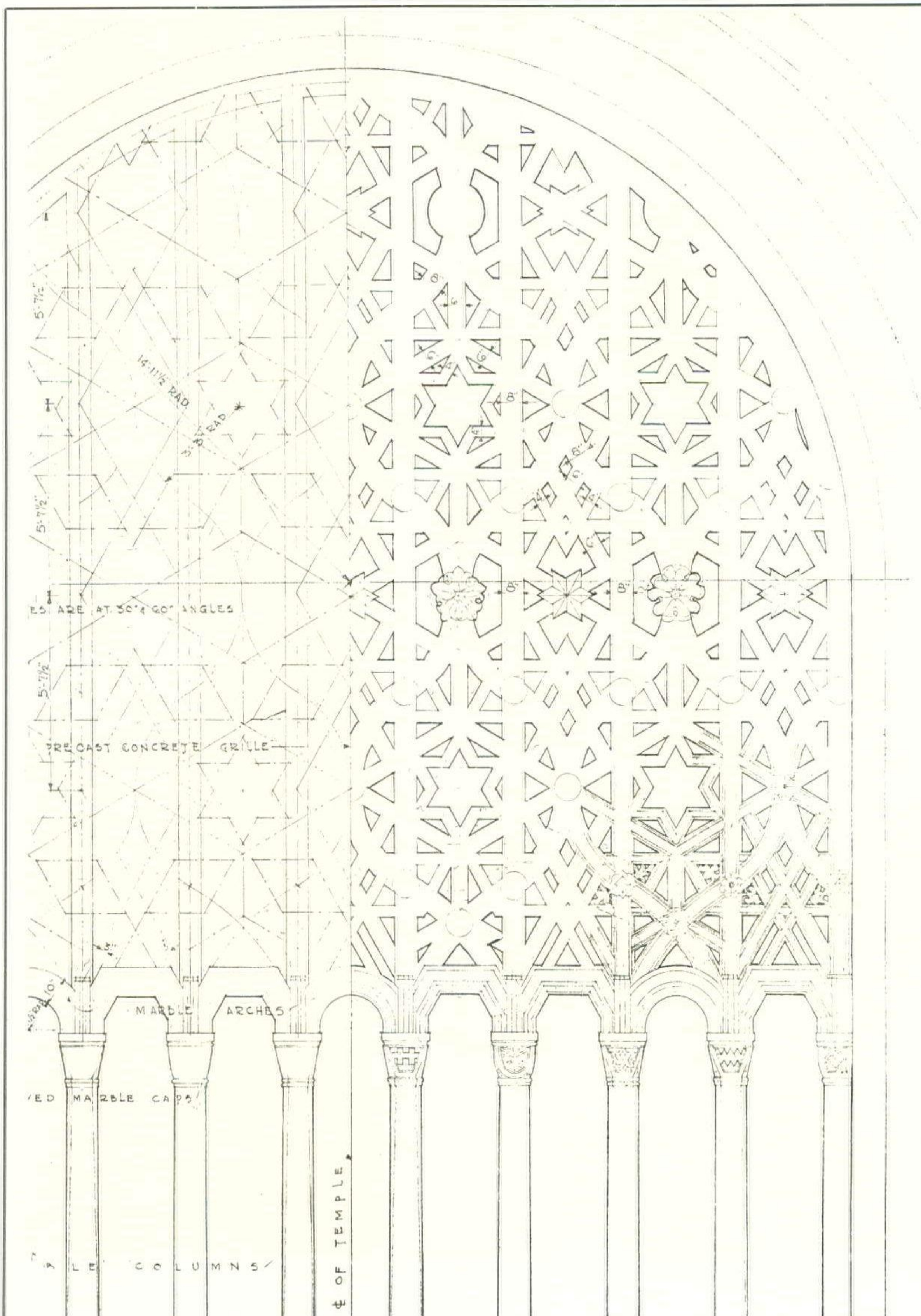
Richard S. Grant

ENTRANCE TO COMMUNITY HOUSE
THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS



Richard S. Grant

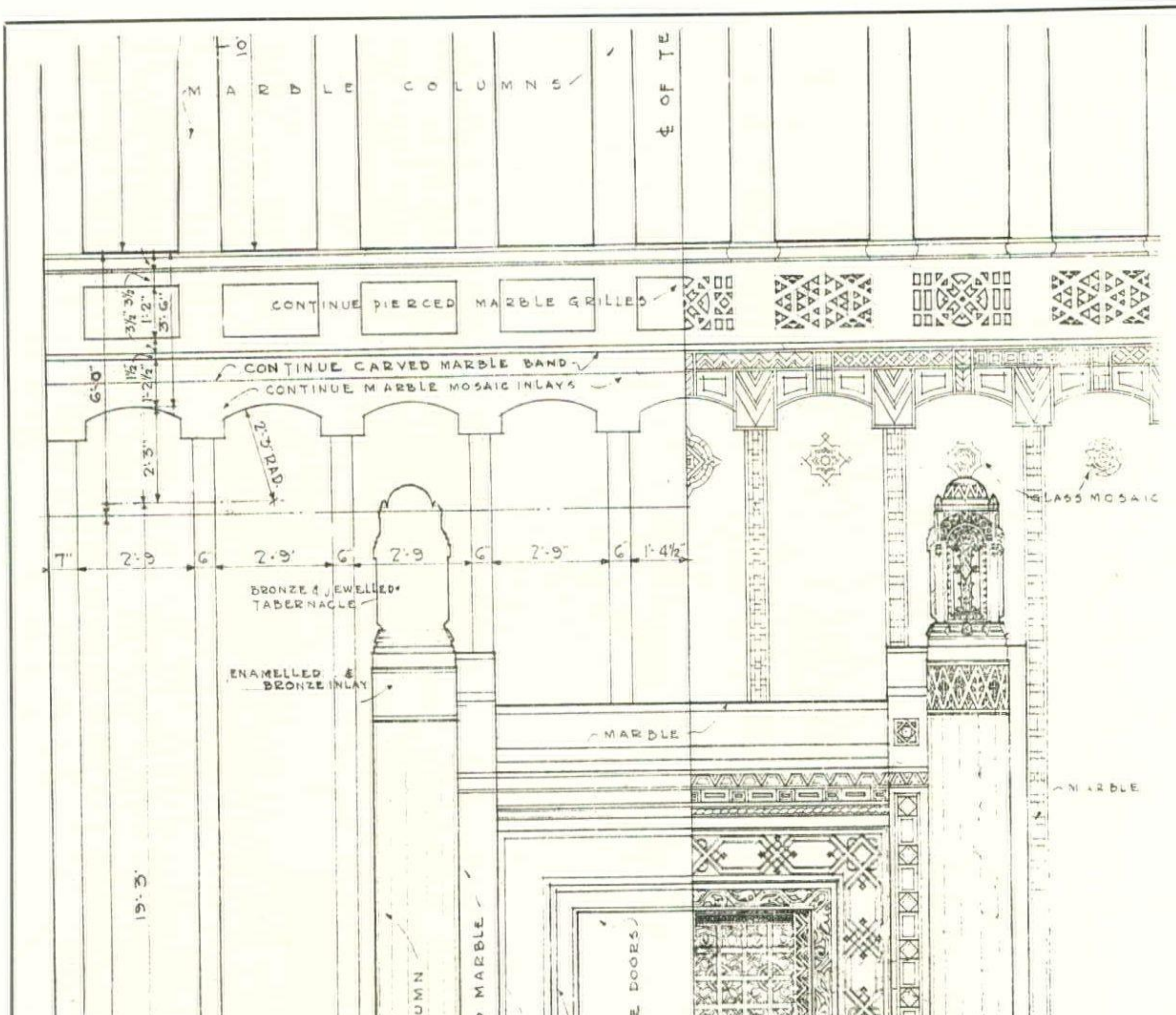
INTERIOR, SHOWING SANCTUARY
THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS



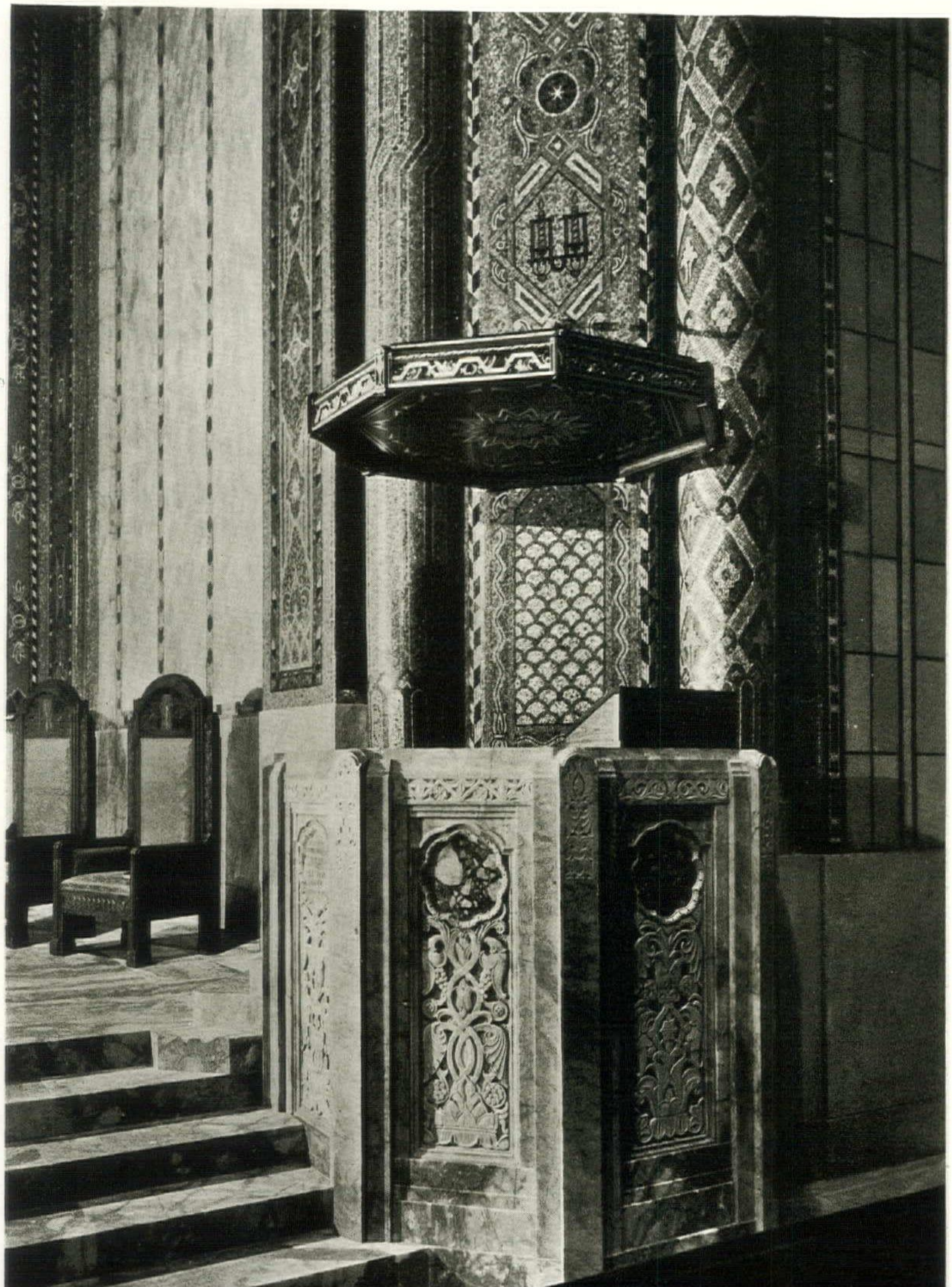
DETAIL, ARCH OVER SANCTUARY
THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS

Richard S. Grant

THE ARK IN THE MAIN SANCTUARY
THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS

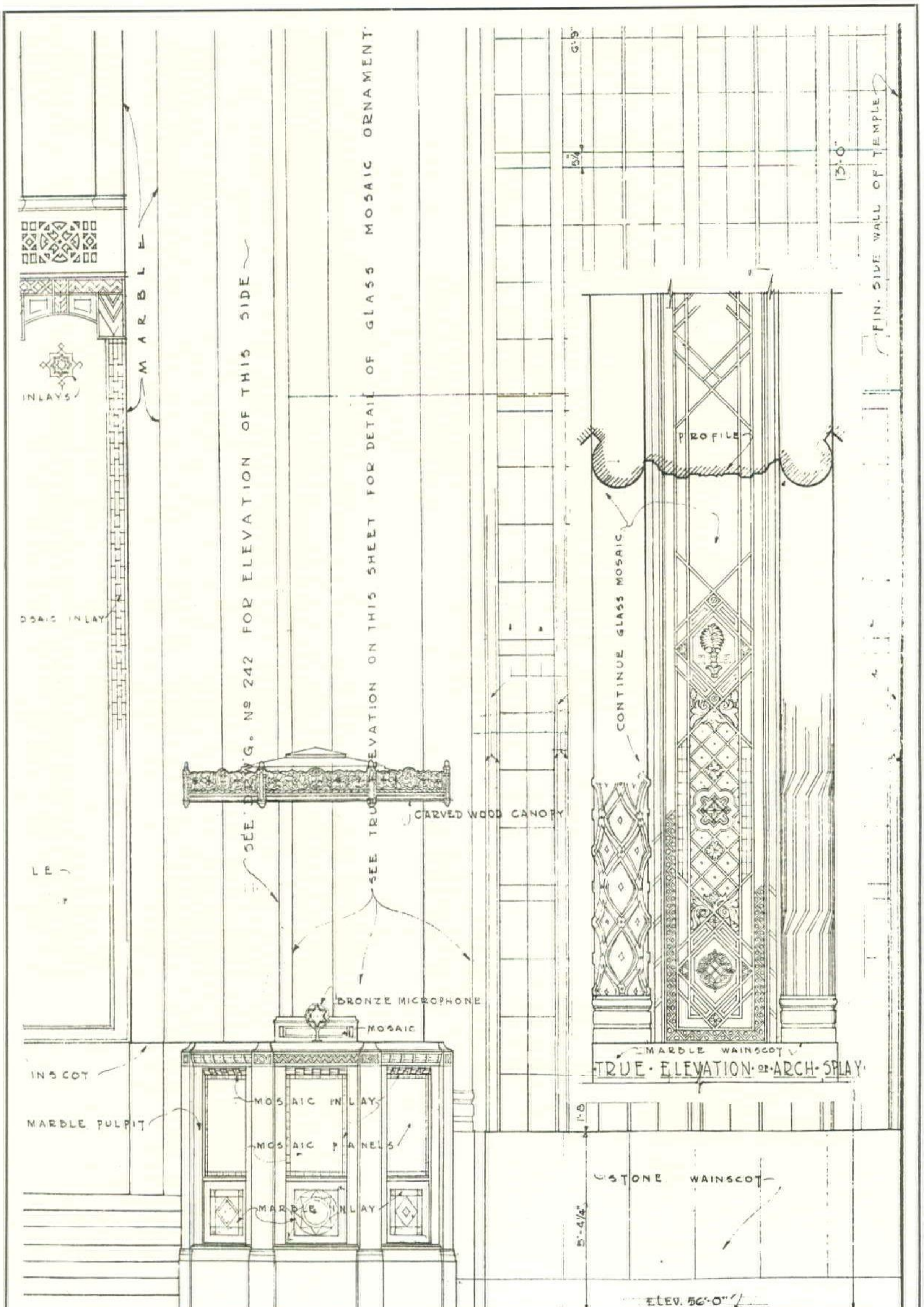


DETAIL, ARK AND SANCTUARY
THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS



Richard S. Grant

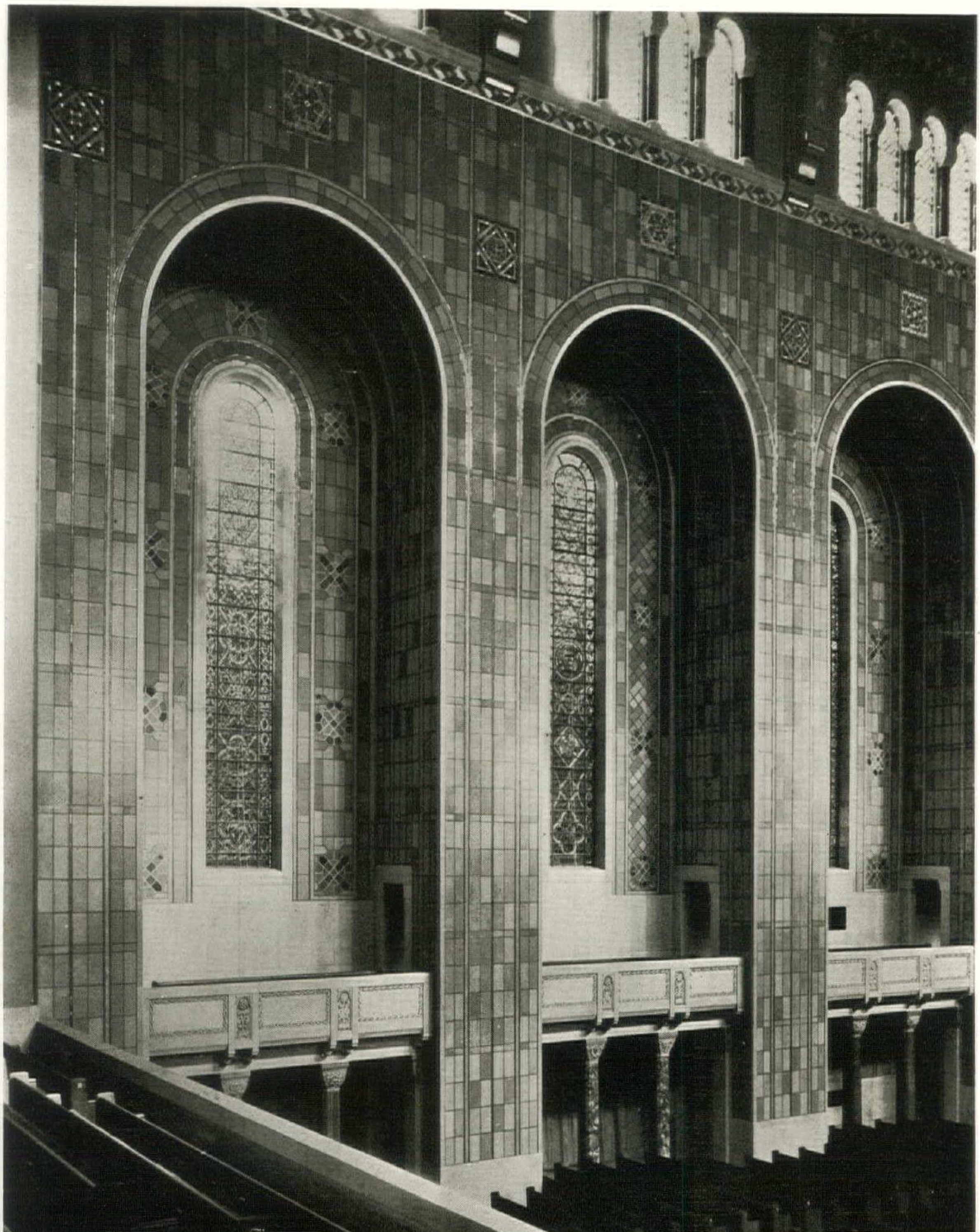
ONE OF THE TWO MARBLE PULPITS
THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS



DETAILS. THE TEMPLE EMANU-EL
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS

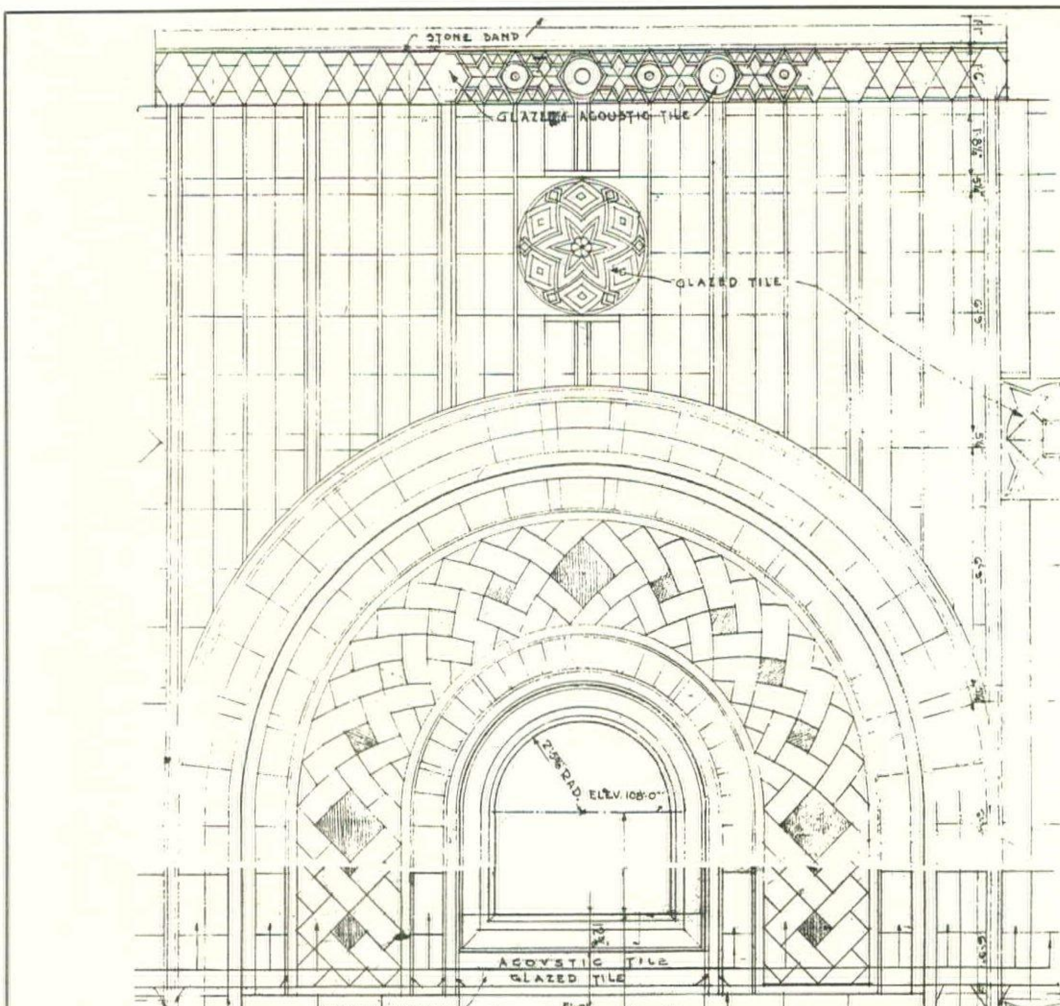
Richard S. Grant

A CORNER OF THE SANCTUARY
THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS

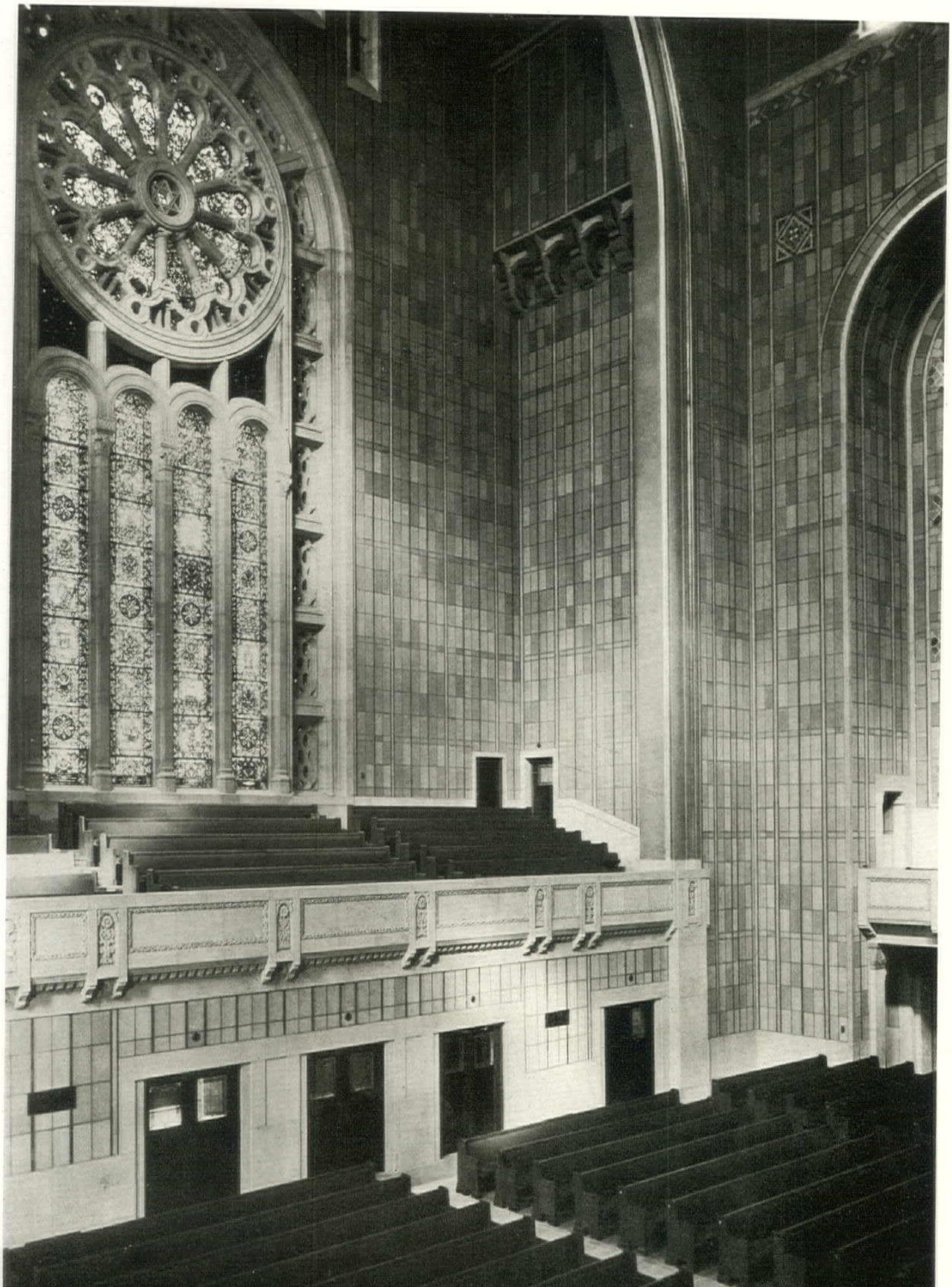


Richard S. Grant

TILE COVERED WALL ARCHES
THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS

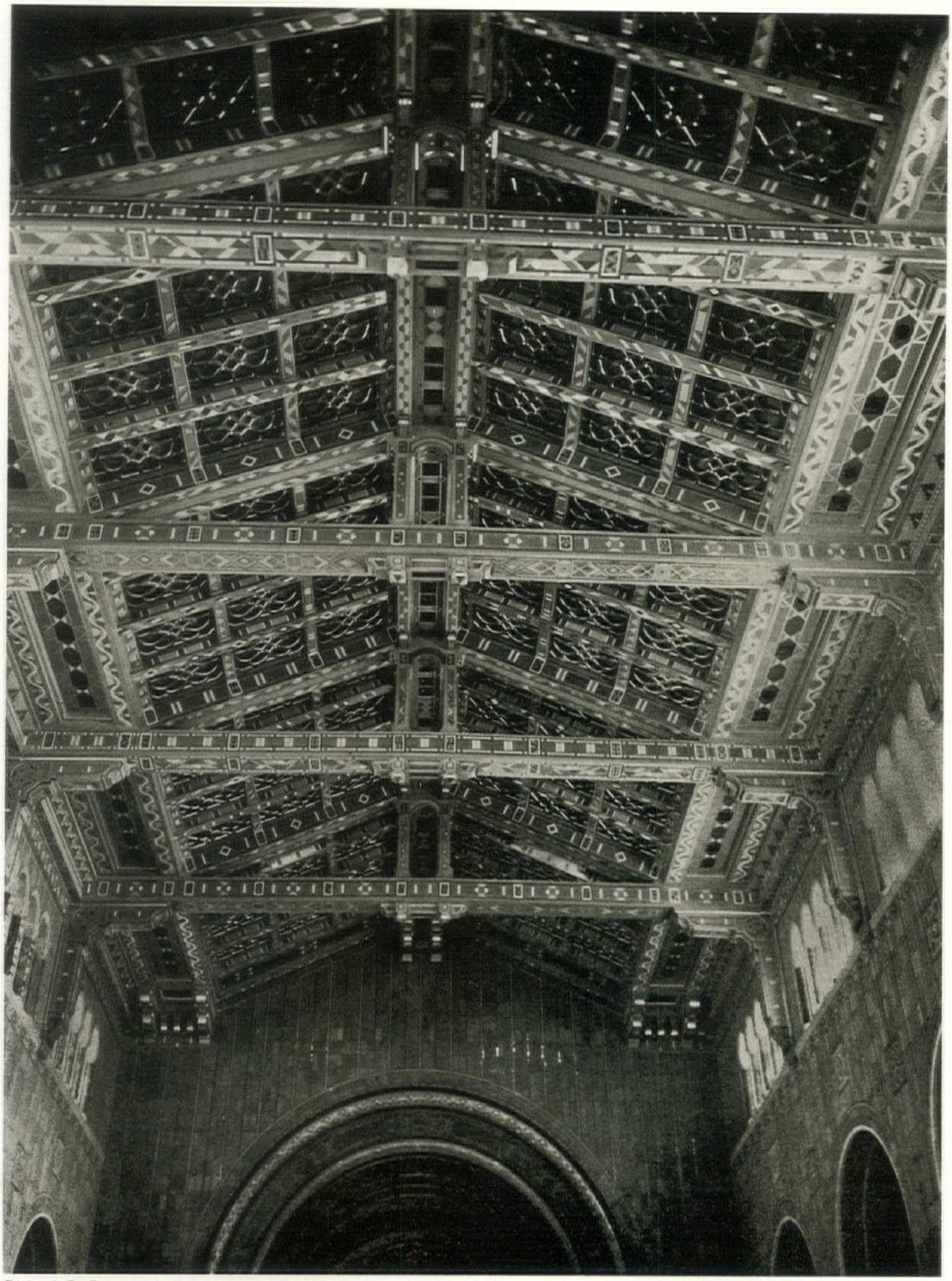


DETAIL, SIDE WALLS AND GALLERY, THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS; GOODHUE ASSOCIATES, CONSULTANTS



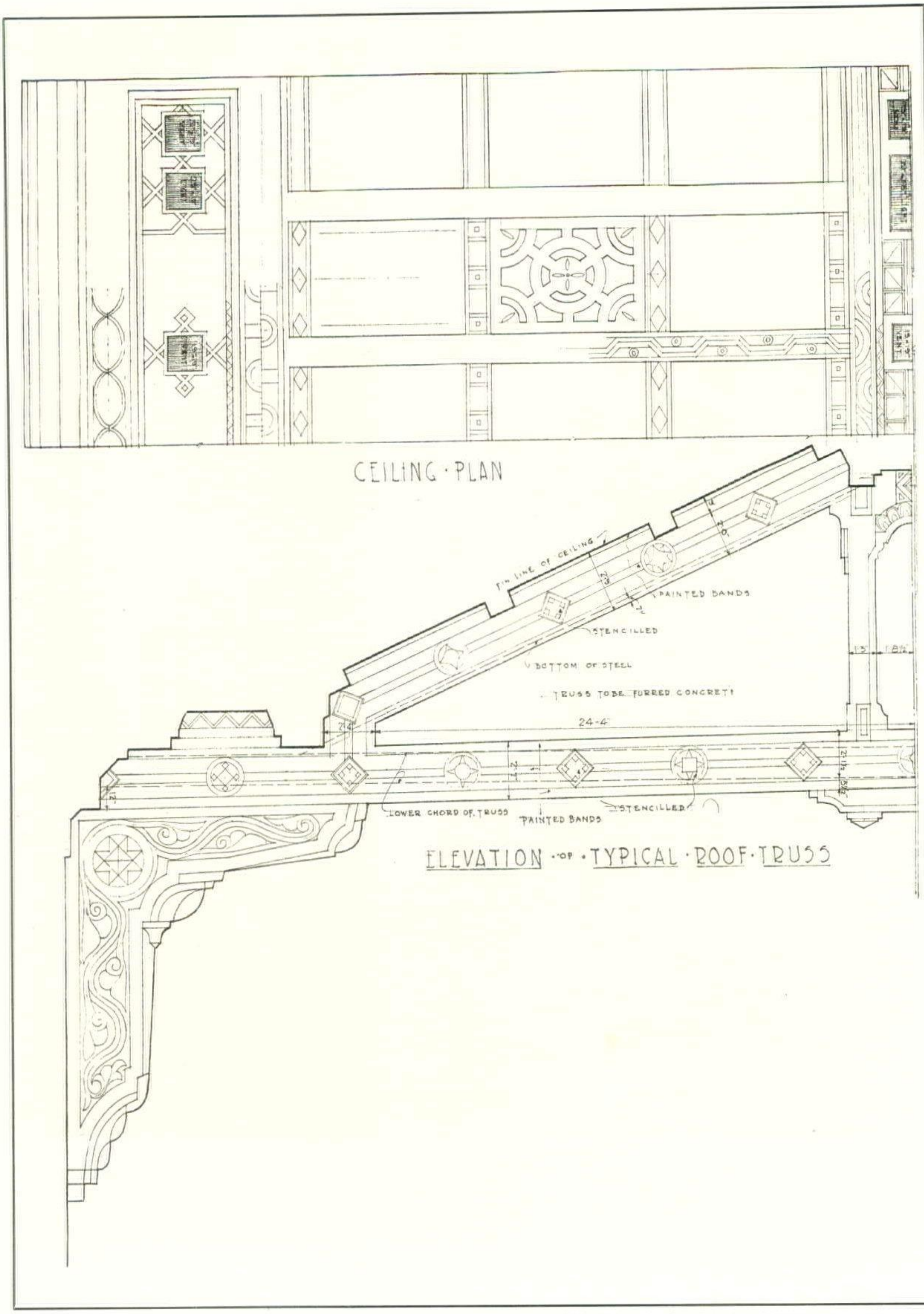
Richard S. Grant

GALLERY OVER MAIN ENTRANCE
THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS



Richard S. Grant

DETAIL OF ROOF DECORATIONS
THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS



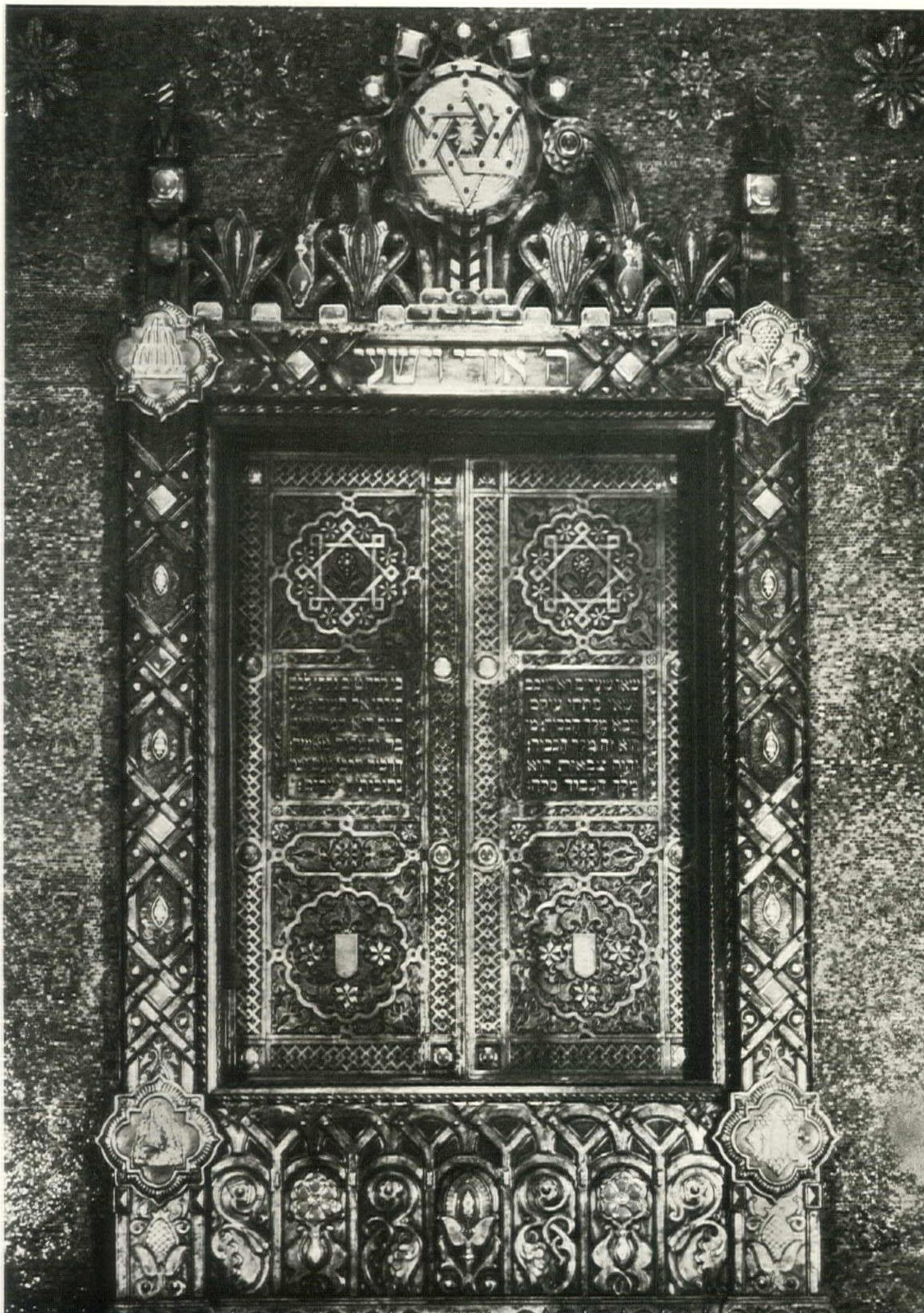
DETAILS. THE TEMPLE EMANU-EL
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS

Benj. J. Lubschez

THE WEST END OF THE CHAPEL
THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS

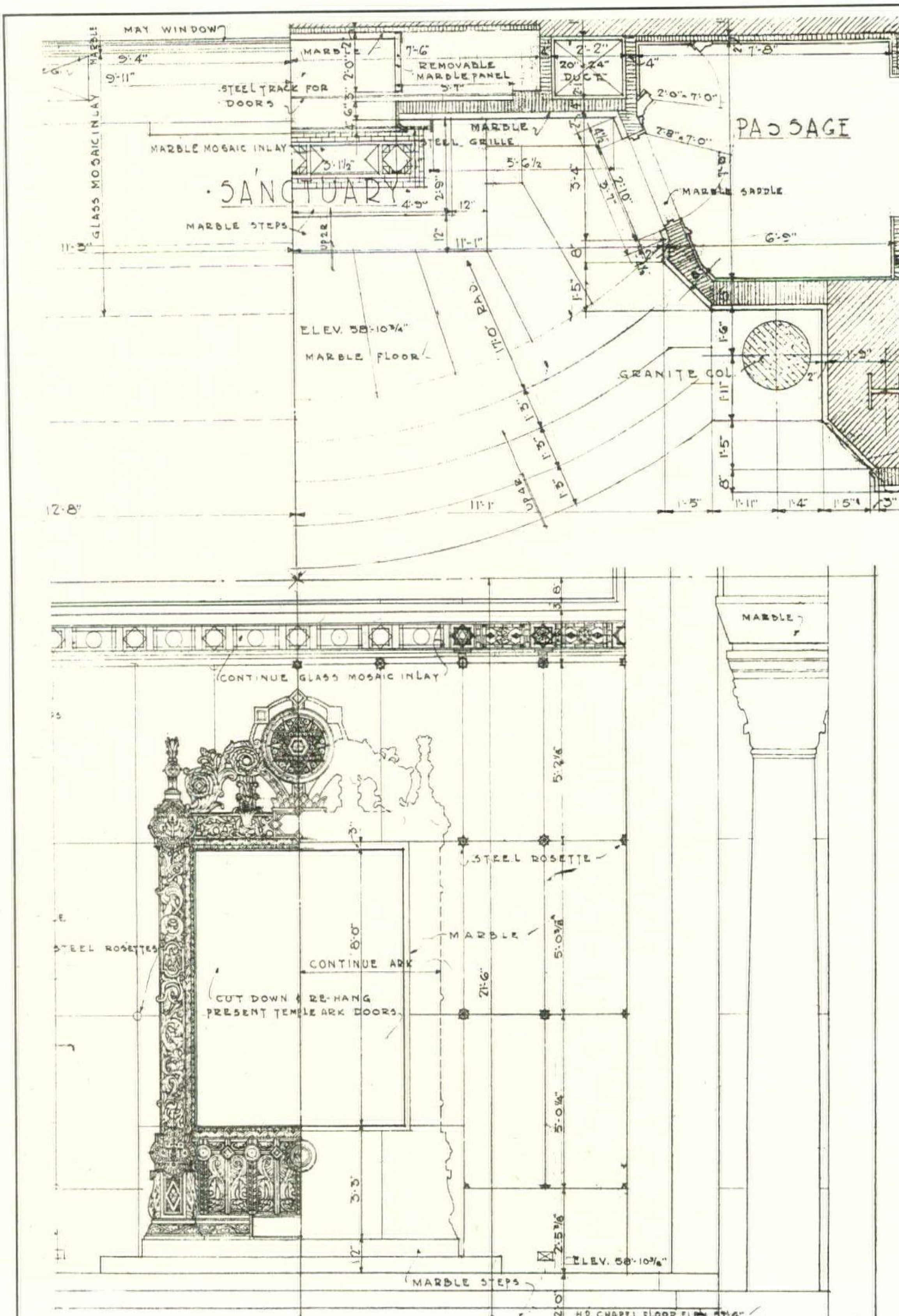
Benj. J. Lubschez

SANCTUARY AT EAST END OF CHAPEL
THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS



Richard S. Grant

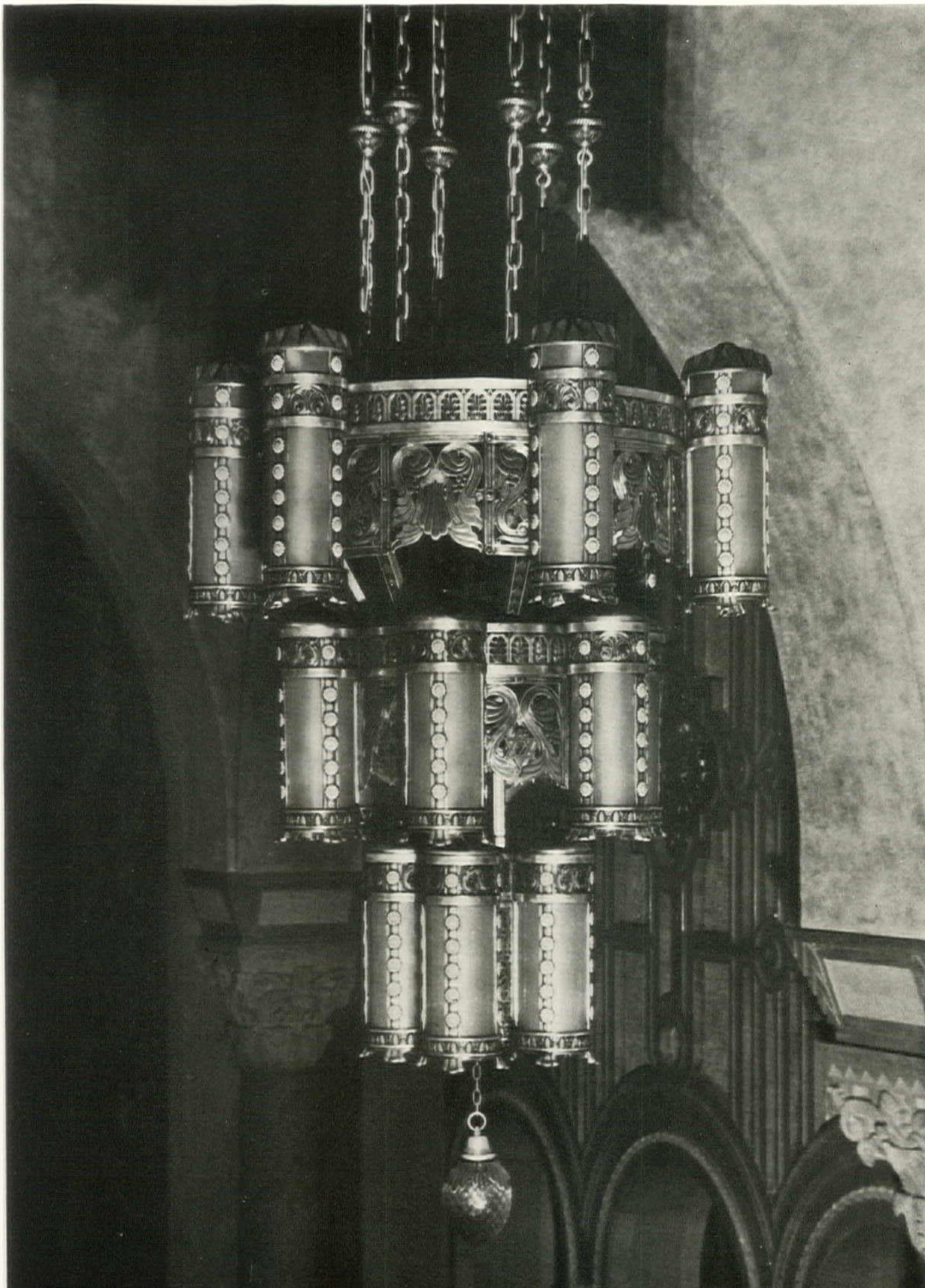
WROUGHT STEEL ARK IN CHAPEL
THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS



DETAIL OF ARK IN CHAPEL
THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS

Richard S. Grant

DETAIL OF ARCADE IN THE CHAPEL
THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS



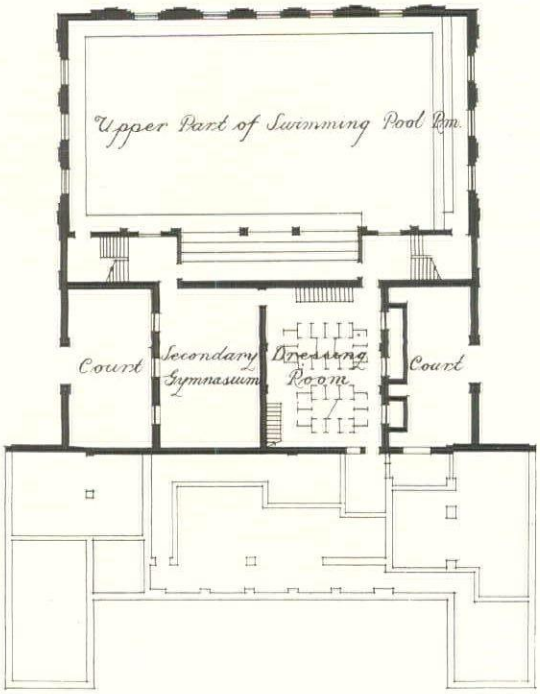
Richard S. Grant

WROUGHT STEEL CHANDELIER IN CHAPEL
THE TEMPLE EMANU-EL, NEW YORK
KOHN, BUTLER & STEIN, ARCHITECTS
GOODHUE ASSOCIATES, CONSULTANTS

Photos. Rittase

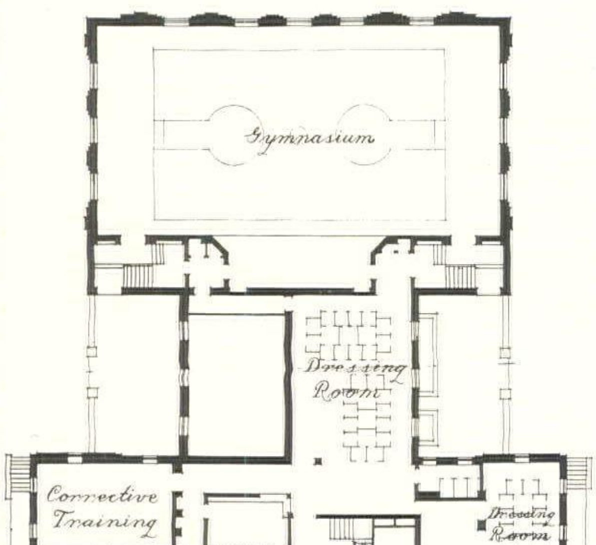
WOMEN'S PHYSICAL EDUCATION BUILDING
WEST VIRGINIA UNIVERSITY, MORGANTOWN
DAVIS, DUNLAP & BARNEY, ARCHITECTS

WOMEN'S PHYSICAL EDUCATION BUILDING
WEST VIRGINIA UNIVERSITY, MORGANTOWN
DAVIS, DUNLAP & BARNEY, ARCHITECTS

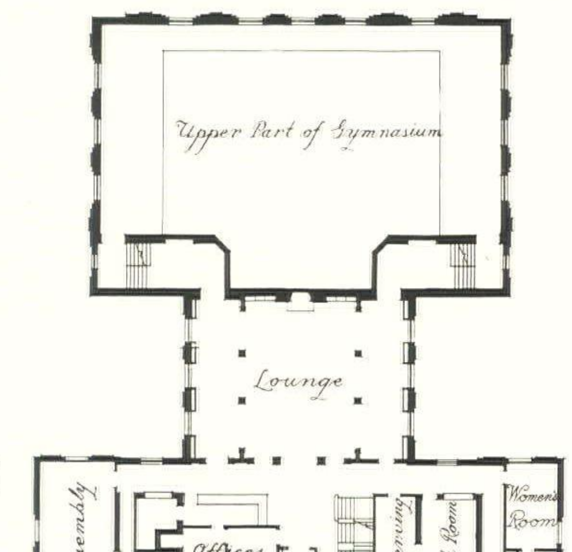


SUB-BASEMENT

BASEMENT

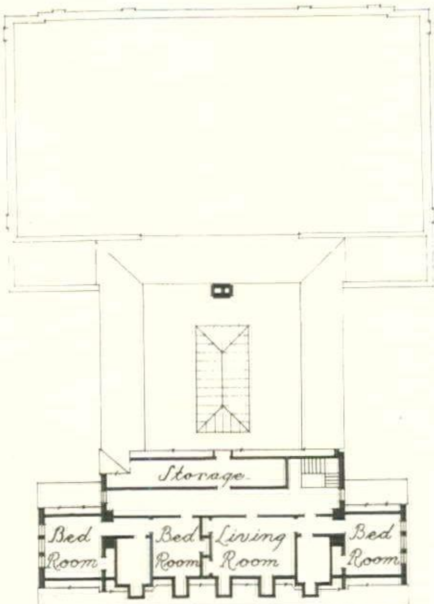


MAIN FLOOR



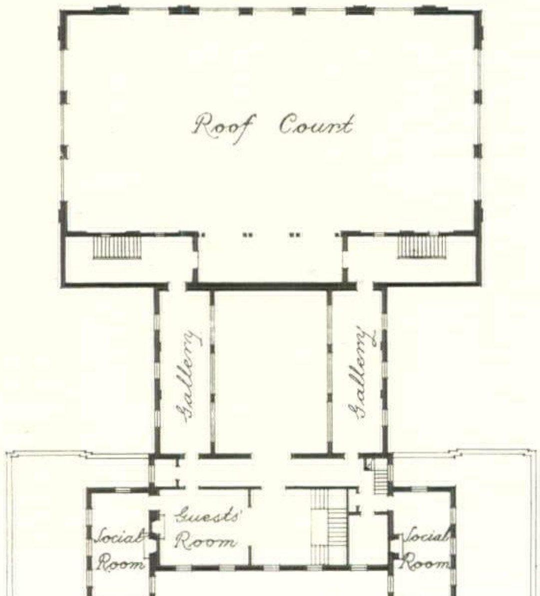
MAIN ENTRANCE DOOR AND PORCH
WOMEN'S PHYSICAL EDUCATION BUILDING
WEST VIRGINIA UNIVERSITY, MORGANTOWN
DAVIS, DUNLAP & BARNEY, ARCHITECTS

WOMEN'S PHYSICAL EDUCATION BUILDING
WEST VIRGINIA UNIVERSITY, MORGANTOWN
DAVIS, DUNLAP & BARNEY, ARCHITECTS



THIRD FLOOR

SECOND FLOOR



A WINDOW IN THE LEFT HAND WING
WOMEN'S PHYSICAL EDUCATION BUILDING
WEST VIRGINIA UNIVERSITY, MORGANTOWN
DAVIS, DUNLAP & BARNEY, ARCHITECTS

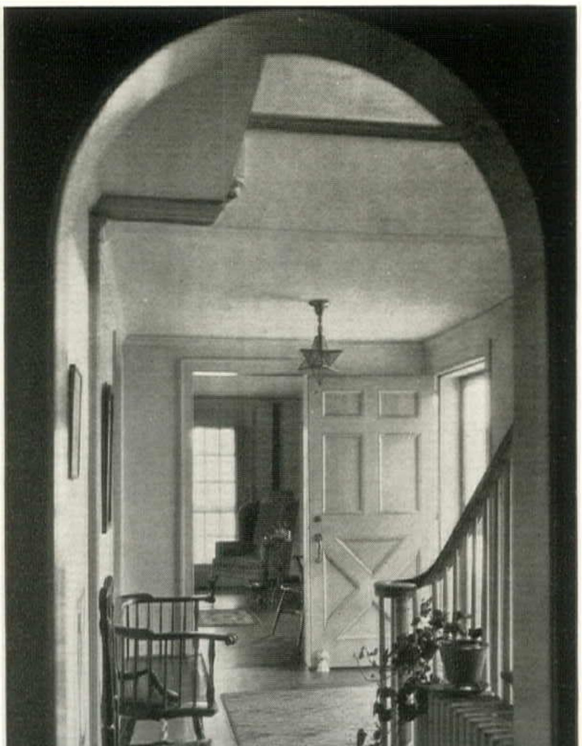
DETAIL OF THE ENTRANCE COURT
WOMEN'S PHYSICAL EDUCATION BUILDING
WEST VIRGINIA UNIVERSITY, MORGANTOWN
DAVIS, DUNLAP & BARNEY, ARCHITECTS

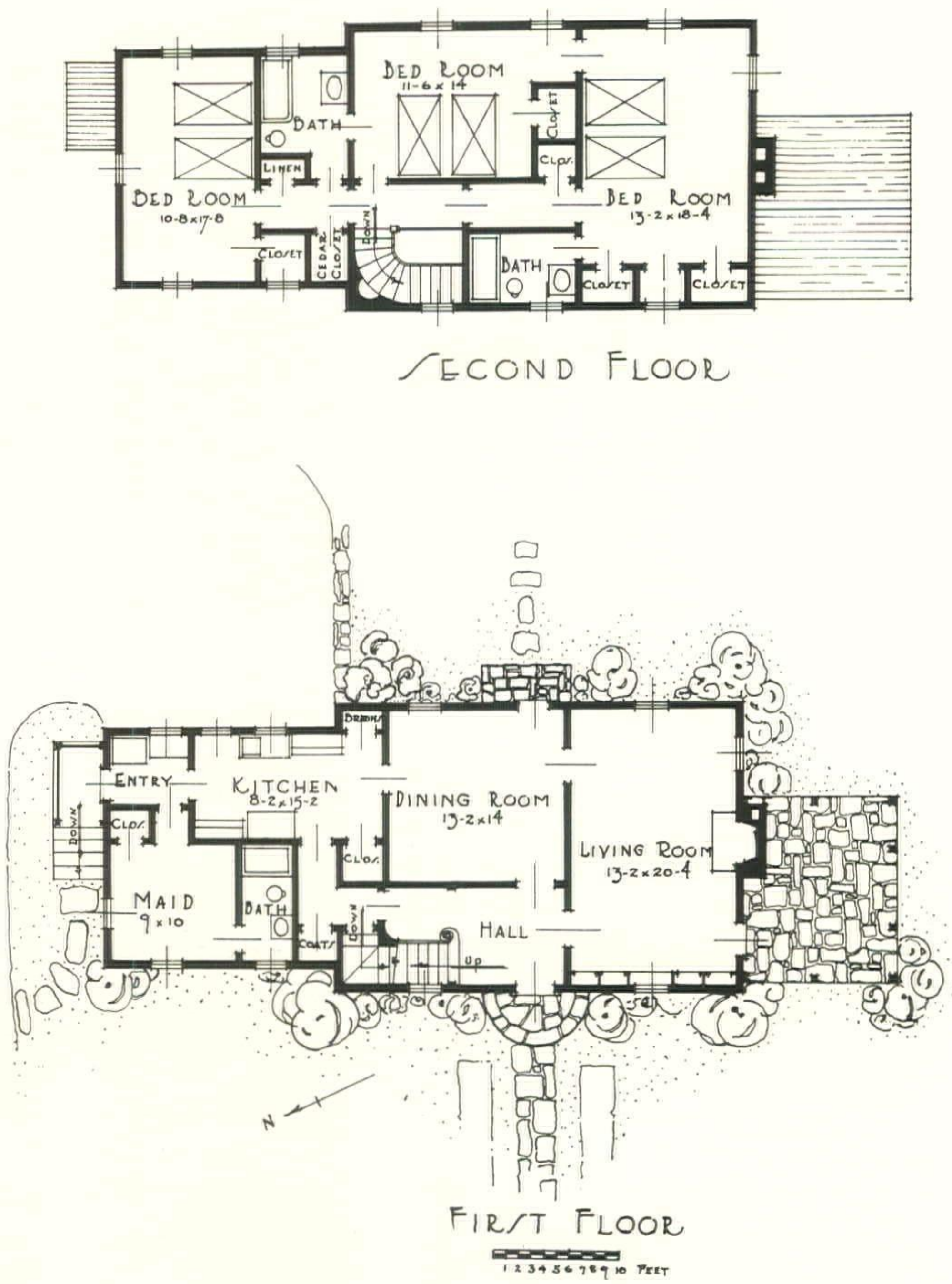
AN EARLY AMERICAN FARM HOUSE, EASTCHESTER, N. Y.
JAMES JENNINGS BEVAN
ARCHITECT AND OWNER

Photos, Van Anda

DINING ROOM

ENTRANCE HALL

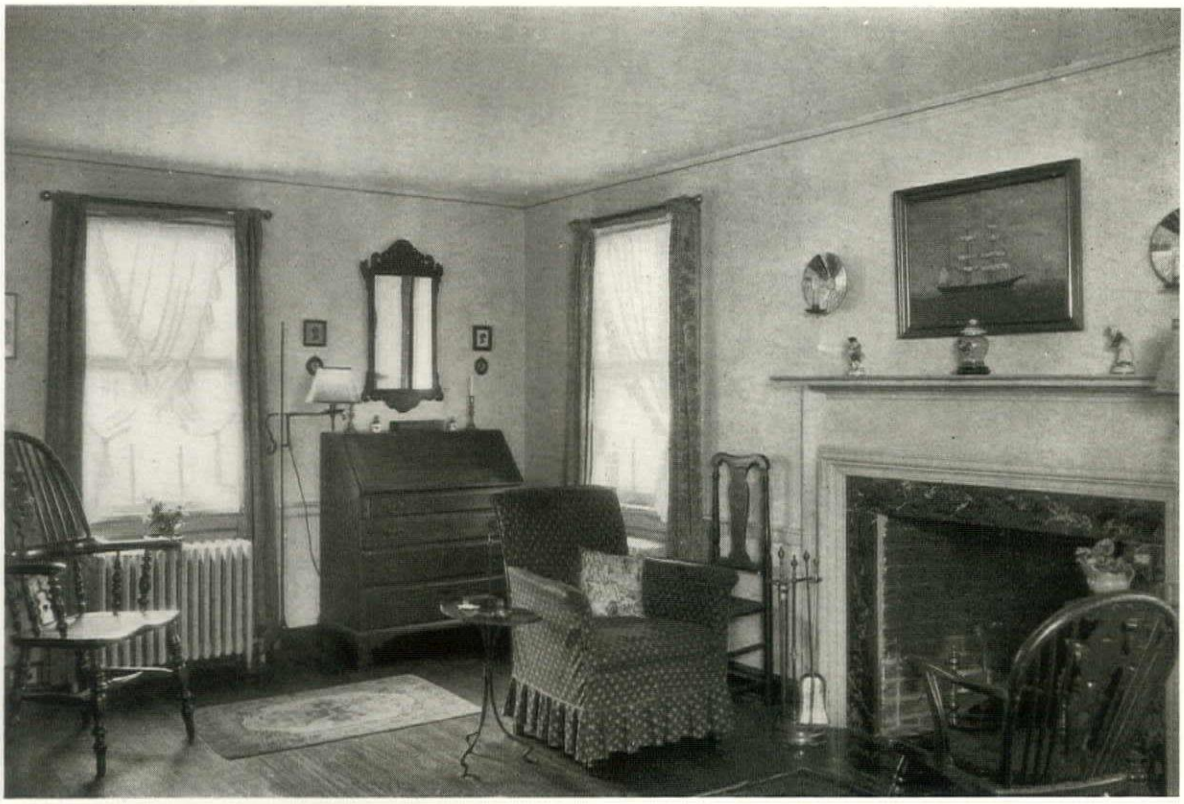




AN EARLY AMERICAN FARM HOUSE, EASTCHESTER, N. Y.
JAMES JENNINGS BEVAN
ARCHITECT AND OWNER

AN EARLY AMERICAN FARM HOUSE, EASTCHESTER, N. Y.
JAMES JENNINGS BEVAN
ARCHITECT AND OWNER

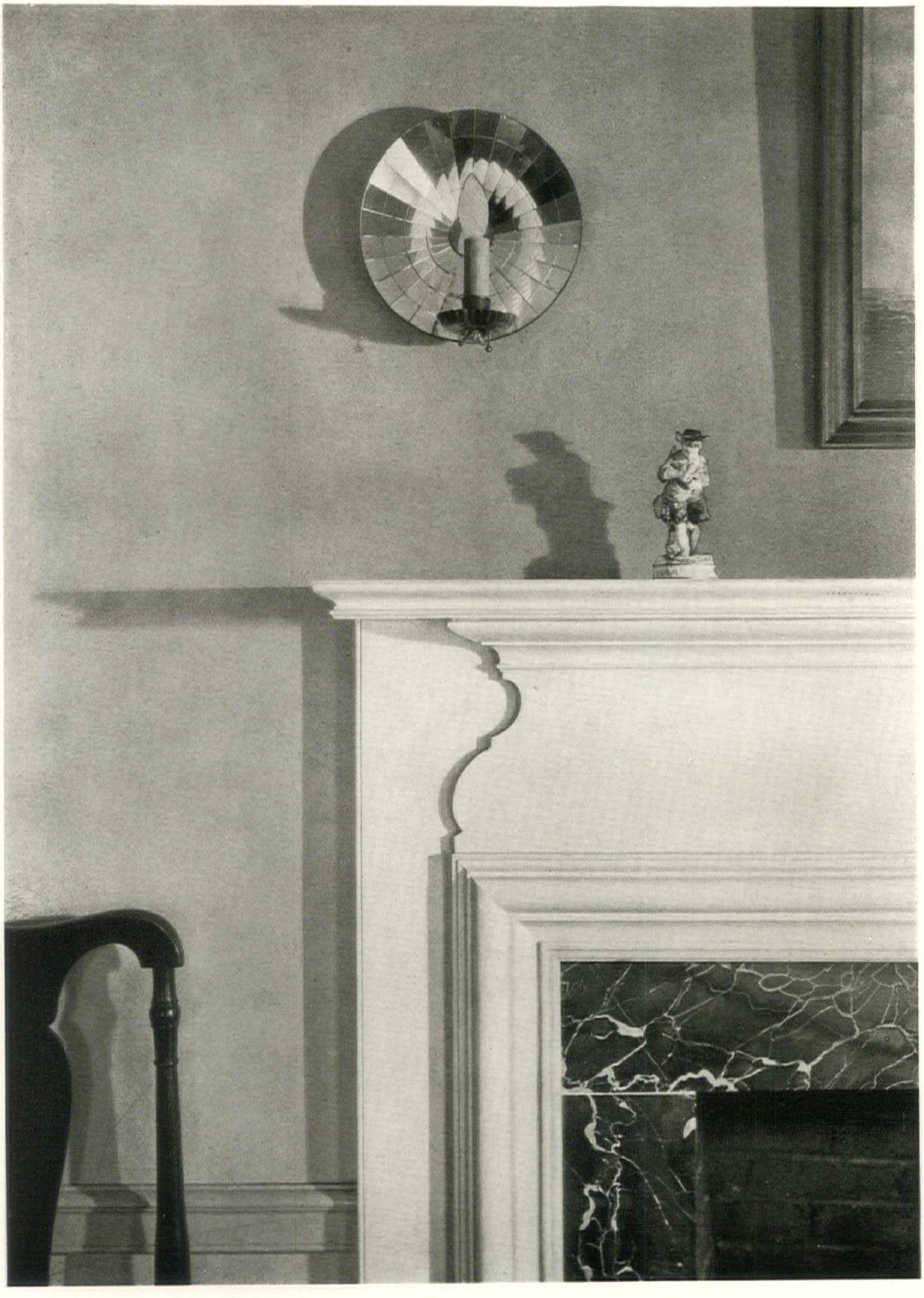
STAIR HALL, EARLY AMERICAN FARM HOUSE, EASTCHESTER, N. Y.
JAMES JENNINGS BEVAN
ARCHITECT AND OWNER



AN EARLY AMERICAN FARM HOUSE, EASTCHESTER, N. Y.
JAMES JENNINGS BEVAN, ARCHITECT AND OWNER

SOUTHEAST CORNER OF THE LIVING ROOM

SOUTHWEST CORNER OF LARGE BEDROOM



MANTELPIECE IN THE LIVING ROOM, AN EARLY AMERICAN FARMHOUSE, EASTCHESTER, N. Y. JAMES JENNINGS BEVAN, ARCHITECT AND OWNER

Photos, Van Anda

GENERAL VIEW, STORE BUILDING
FOR STEWART & CO., NEW YORK
WARREN & WETMORE, ARCHITECTS

MAIN ENTRANCE, STORE BUILDING
FOR STEWART & CO., NEW YORK
WARREN & WETMORE, ARCHITECTS

WATER COLOR STUDY FOR CENTRAL WINDOW
DELIVERY ROOM, DETROIT PUBLIC LIBRARY
PARIS & WILEY, DECORATORS

THE GRISAILLE GLASS OF PARIS & WILEY

BY

CHARLES DE KAY

SUNLIGHT and moonlight are miracles of the commonplace that meet us and abide by us through life. They lie at the root of several of the religions of which we have records. Did one ever notice that their beams are most enchanting, most beautiful, when they speed along the horizon and have to make their way through strata of dense air? In centuries comparatively recent, men have reacted to that suggestion; after calling light into their abodes through windows of clear glass, they have mixed that glass with color. Thus, half consciously it may well be, they emulated the charm, the awe of the sun and moonrise, of sunset and moonset. Tired of life's practical side, they strive by these and other ways to rise to planes where imagination reigns.

Glass in colors was used in ancient days along the Ægean shore and up the Nile. What marvelous small objects did not the Egyptians fuse in furnaces! To what cobalt and lapis lazuli blues, what carmine and ruby reds the inventory of Tutankh-amen's tomb bears witness! But use of rich glass for windows was the invention of Europe, and the time was the so-called Dark Age, when architects of the cloud-hung north took sunlight in hand and filled church and minster, palace and town hall with gleams and bursts of color. It was as if they had pondered rainbow and moonbow and clouds at sunrise and sunset in order to flood the gloom of great covered spaces with tracts of color from translucent glass, trapping sunlight in glorious shifts and holding it there for the delectation of generations to come.

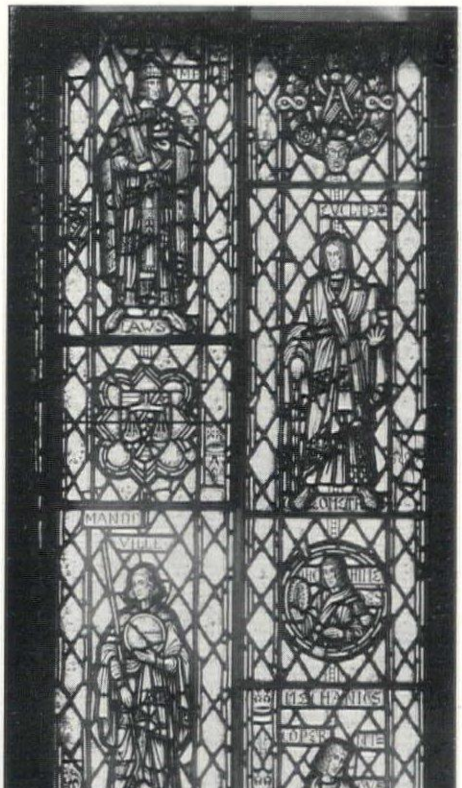
Dark interiors during the early Christian centuries set imagination to work. Windows of Romanesque and Romantic styles for church buildings, built up to the time of the Renaissance and beyond, glowed with hues borrowed from the outer world. Today under a different climate American architects and glass workers have a wider field and encounter problems more varied, for the solving of which new points must be met. Stained or enameled glass is still wanted for cathedrals and chapels, but always for even greater supply there comes the call for residences in town and country, for libraries, hotels, theaters, town halls, and state capitols. Into these buildings much light must enter, but colors also are imperative; a heroic instead of a dreamy or reverent mood is sought. Such windows are rivals of the mosaics and paintings on ceiling and wall; they adapt themselves to schemes which are monumental, historical, emblematic, descriptive. Without competing with painting to tell a story literally, they can fill a place of their own where their function is akin to that of music. Owing to our clear skies and abundant sunlight, a new arrangement is demanded,—a fresh combination of colors, if the interior is to be well lighted by day; yet as the shadows grow outside and dusk approaches and the illumination springs up from within, the beauty of the window must not fail, though it may change to some degree. In other words, the windows of such secular buildings must be so treated that under all conditions, by night as well as by day, the mood they echo, the tale they tell shall be intelligible, legible, effective.

Of course, at bottom this demand is the same that windows of churches of the early Christian era and the middle ages answered after their fashion, the difference being that in those times the men and women to be impressed were partly pagan and wholly unlettered. Colored windows were pages of a great picture book that related in new terms the story of Christian love. In our day and generation it has come about that stories by painters,—except when told by the old masters,—are scoffed at. Pictures of history and sentiment, *genre* paintings and those literal to life are scorned as infantile. But that is all to no purpose; stories are in demand; even in glass work there is room; the rage for the kinema shows how powerfully the current sets. The demand for colored glass in windows and as mosaic on walls has scarcely begun. *Quand meme,* it will be asked to serve, even to teach history, reflect political movements, recall the departed great,—and at the same time add beauty of color and form to interiors. Without donning the mantle of the prophet, one can foretell that in America at least its future holds a mighty promise.

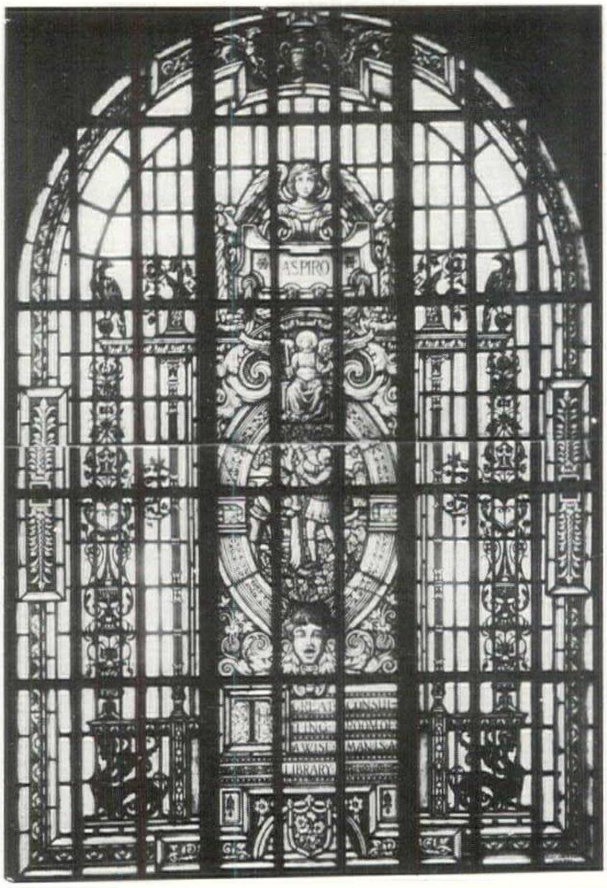
It was not mere chance that a master of stained glass in modern times was born an American. Without copying the architects and artists of France who raised colored windows to the peak in the thirteenth, fourteenth and fifteenth centuries, ere the art weakened and lost its path, John La Farge reached their level by methods all his own, impelled by his inborn feeling for color. He set an example which Europe as well might follow. Without losing sight of the lessons taught by La Farge, glass workers of today are bound to enlarge their borders through new inventions and in answer to more complicated demands. One of his admirers,—if not a pupil of John La Farge,—is William Francklyn Paris of the firm of Paris & Wiley, New York. He is a writer on the fine arts and architecture, author of "Decorative Elements

ROOF DECORATIONS AND WINDOWS
BAPTIST CHURCH, GRAND RAPIDS
PARIS & WILEY, DECORATORS
COOLIDGE & HODGDON, ARCHITECTS

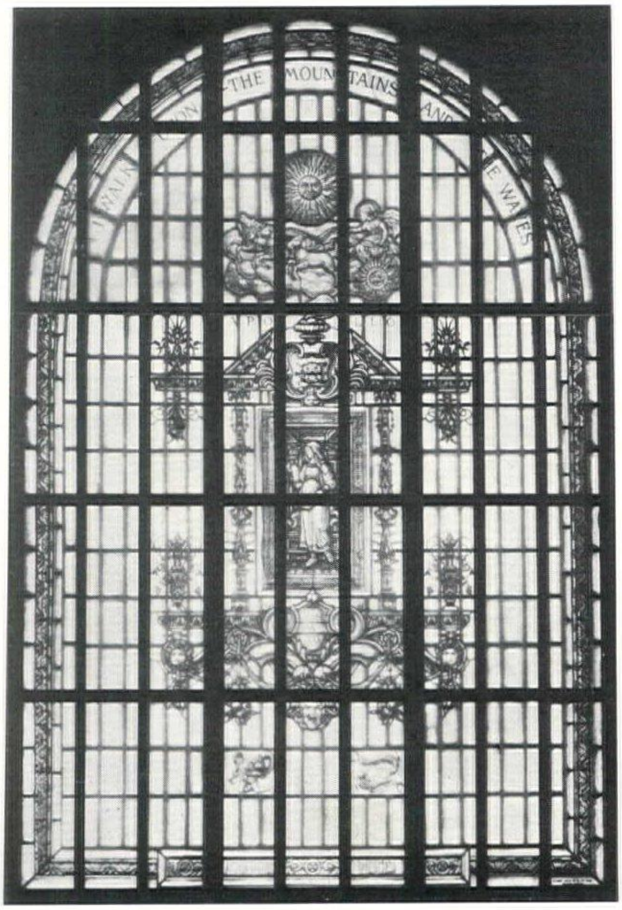
WINDOWS IN MAIN HALL, ELKS' NATIONAL MEMORIAL, CHICAGO
PARIS & WILEY, DECORATORS
EGERTON SWARTWOUT, ARCHITECT



LIBRARY WINDOW, UNIVERSITY OF WASHINGTON, SEATTLE
PARIS & WILEY, DECORATORS
CARL GOULD, ARCHITECT

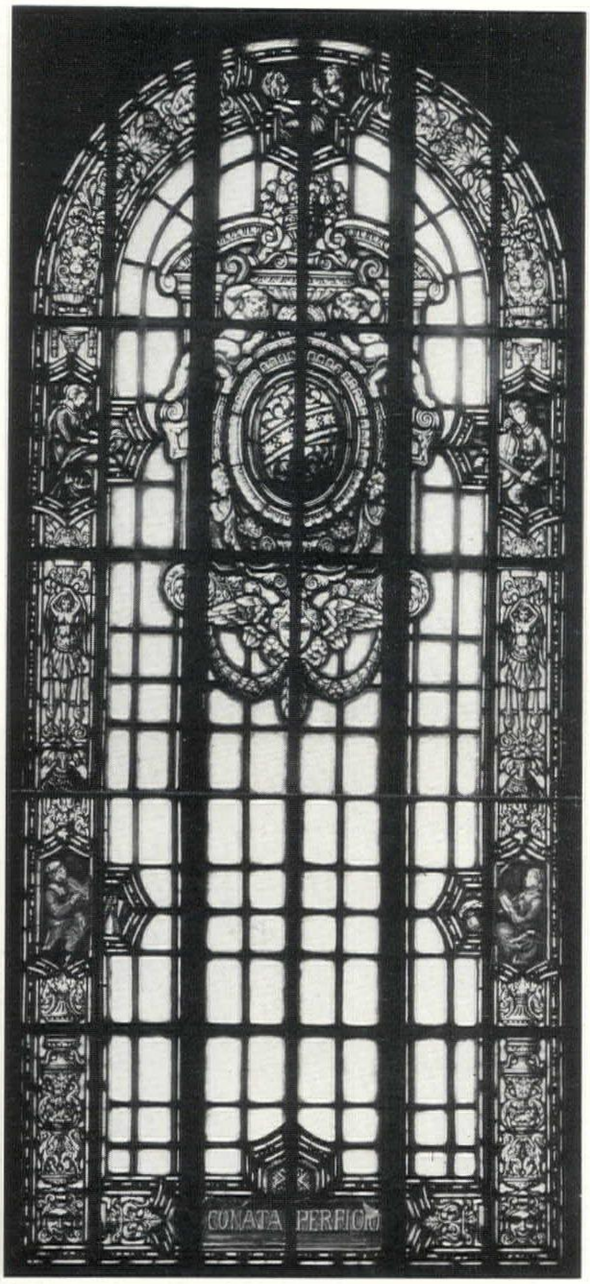


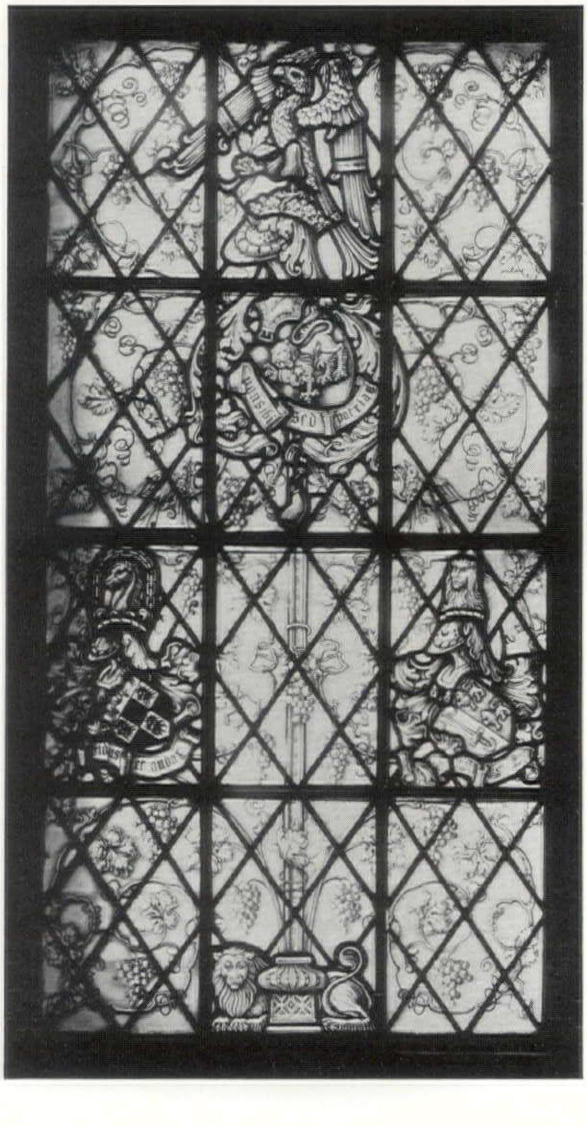
ONE OF THE SERIES OF WINDOWS. DELIVERY ROOM. DETROIT PUBLIC LIBRARY PARIS & WILEY, DECORATORS CASS GILBERT, ARCHITECT



SIDE WINDOW OF WEST WALL OF THE DELIVERY ROOM, DETROIT PUBLIC LIBRARY PARIS & WILEY, DECORATORS CASS GILBERT, ARCHITECT

THE STAIR WELL WINDOW OF CARVED AND MOULDED LEADS DETROIT PUBLIC LIBRARY PARIS & WILEY, DECORATORS CASS GILBERT, ARCHITECT





WINDOW DESIGNED IN AN ALL OVER ELIZABETHAN PATTERN AND HERALDIC EMBLEMS FOR THE APARTMENT OF MRS. CLINTON OGILVIE, NEW YORK PARIS & WILEY, DECORATORS

DETAIL FROM CHANCEL WINDOW
FIRST M. E. CHURCH, JAMAICA, N. Y.
PARIS & WILEY, DECORATORS
JOSEPH HUDNUT, ARCHITECT

in Architecture" and other books and articles. The volume was adopted by the U. S. Department of Education in its reading course entitled "How to Know Architecture." He is an occasional lecturer on the fine arts before the American Institute of Architects and various colleges and universities. Frederick J. Wiley is an artist remarkable for skill in suiting the composition of a window to the kind of interior it should aid in embellishing. He has had a long career as an artist in glass, but he has done much also in mosaic, decorative painting, tapestries, and plaster relief. The firm has contributed a great variety of decorative work to a number of capitols, churches, libraries, club houses, colleges, and private residences too numerous to name here. It is with the stained glass of Paris & Wiley that the present article has to do.

Unlike mosaics which, when composed of cubes of the proper quality, continue to exert a part at least of their appeal under artificial lighting, stained glass windows are likely to lose when dusk descends, and they presently offer confused tracts, grilles of iron, bars of support, stone mullions and traceries of lead. Remedy for this has been sought by treating the supports in a way to compensate for the loss of colors eclipsed by the darkness outside through enrichment of the frame work and grilles. Of course, even after dark, translucent glass can be made to tell by artificial light applied outside, but this clumsy trick is seldom advisable, and for a series of great openings it is out of the question. The firm of Paris & Wiley has made special study of methods to overcome the gaunt, wan look in windows lighted after dark from within. One method is a special treatment just mentioned, of forming the leading that binds the pieces together so as to form an agreeable pattern. The leads are broadened and formed. Surface treatment of bars and leads may include modeling in low relief, gilding and enamel, and this color, along with bold and interesting design, compensates not a little for the vanished glass, so that inner illumination brings out beauties not suspected before. Designs for the fenestration of late Gothic and Renaissance structures are varied to comply with the period chosen by the architect in order to obtain harmony between the inner and outer building. The result in certain cases gives a suggestion of fine reliefs. Carved and moulded leads may be left as they are and show like pewter, or they may be emphasized here and there with gilding at the discretion of the artist, or else colors may be added, enamel on metal, to suggest the tints of flowers, butterflies, birds. The music room in the home of Frederick J. Fisher, a residence designed by the firm of George D. Mason & Co., of Detroit, architects, has been embellished by Paris & Wiley with a polychrome panel in which the scheme of leads modeled in low relief, discreetly lightened by color, has made a notable success; it is beautiful by night as well as by day,—a combination of lights and darks, rich glass and metals.

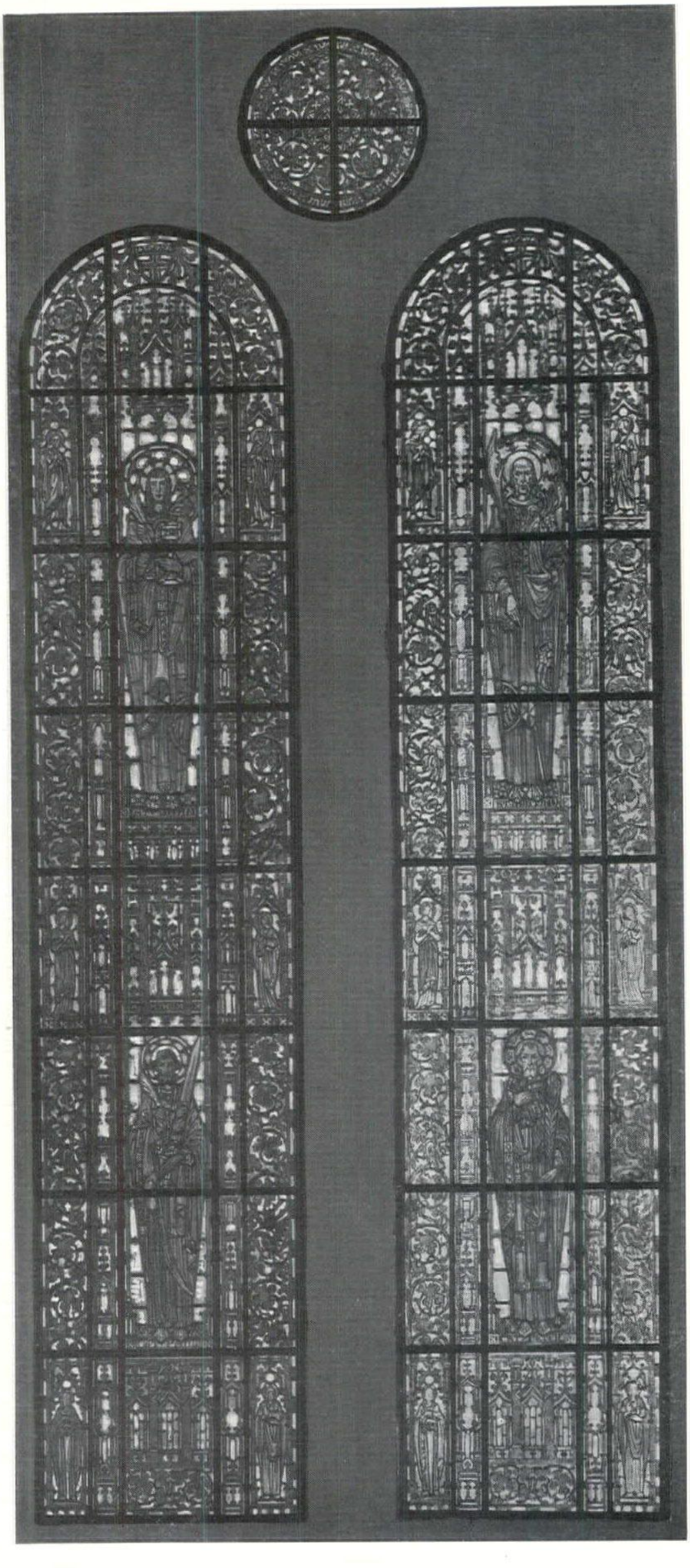
In Chicago, Messrs. Coolidge & Hodgdon built the great library for the University. For this building Paris & Wiley designed and set in place the first of 14 windows 30 feet high, each showing four or five figures the size of life, part of a group of no less than 64 scholars, philosophers, and educators from the time of Confucius to recent days,—a Hall of Fame in color schemes. Along with these there runs a series of shields or coats-of-arms of the American colleges. In Chicago also are the headquarters of the Elks, a national memorial of that order designed by the architect Egerton Swartwout of New York. For this imposing structure, limestone without, marble within, containing a hall like a Pantheon rising 96 feet from floor to dome, Paris & Wiley wrought a number of the windows. The building is of the Italian Renaissance order. The main reception rooms are paneled in English oak, above which there range 12 large openings, while for the first floor, equivalent to the *bel etage,* they designed several windows almost twice as large, choosing soft hues,—red, blue, orange,—against a silvery background which admits abundant light.

For a church at Evanston, by the architects Tallmadge & Watson of Chicago, they designed several windows for a chapel to be fitted with glass of deeper tones. Likewise for another church in Chicago, built by the architect H. J. Schlack, they planned a series of windows called "The Apostles" inspired in the spirit of Chartres, where they have maintained a studio and ateliers for several years. Another group by Paris & Wiley in which mosaic has been applied in harmony with color windows is shown in a church which was built by the architects, Coolidge & Hodgdon, of Chicago in Grand Rapids. Here the ceiling, a closed window and a baldachino have a mosaic investment, all coördinated and harmonized with the style of building. A simpler scheme is the decoration of the First Methodist Church, Jamaica, N. Y., built by Joseph Hudnut. It is carried out in *grisaille* for greater light.

One of the stumbling blocks met by architects is the lack of one-man control over the decoration of a building, not merely the material and tonality of the structure outside and inside, but the fenestration with its design, glass, mosaic or painted walls and ceilings, the paneling and furniture. Some of these may be assigned to artists who are unwilling to submit their taste or their ideas of color and form to a dictator. Ceilings, walls, floors too often turn out badly because they are not in key with the windows. One man should have the final say, and that man is not the rector, or the president of the club or bank,—not even the chairman of the art committee, but the architect! Cass Gilbert when he built the Detroit Public Library had control even down to minutiæ. Working under him, Mr. Paris felt inspired to write an attractive as well as informative book about this great building. He knows his subject well, for did not Paris & Wiley supply the grand array of glorious windows? The latter, some of which are illustrated here, exemplify the care taken by these "fenestrators,"—if to coin a word be forgivable,—to look at a window as one great section of a wall and yet give it distinction and vary it for close inspection. Observe what care they have taken to keep their function subordinate to the genius of the building itself.

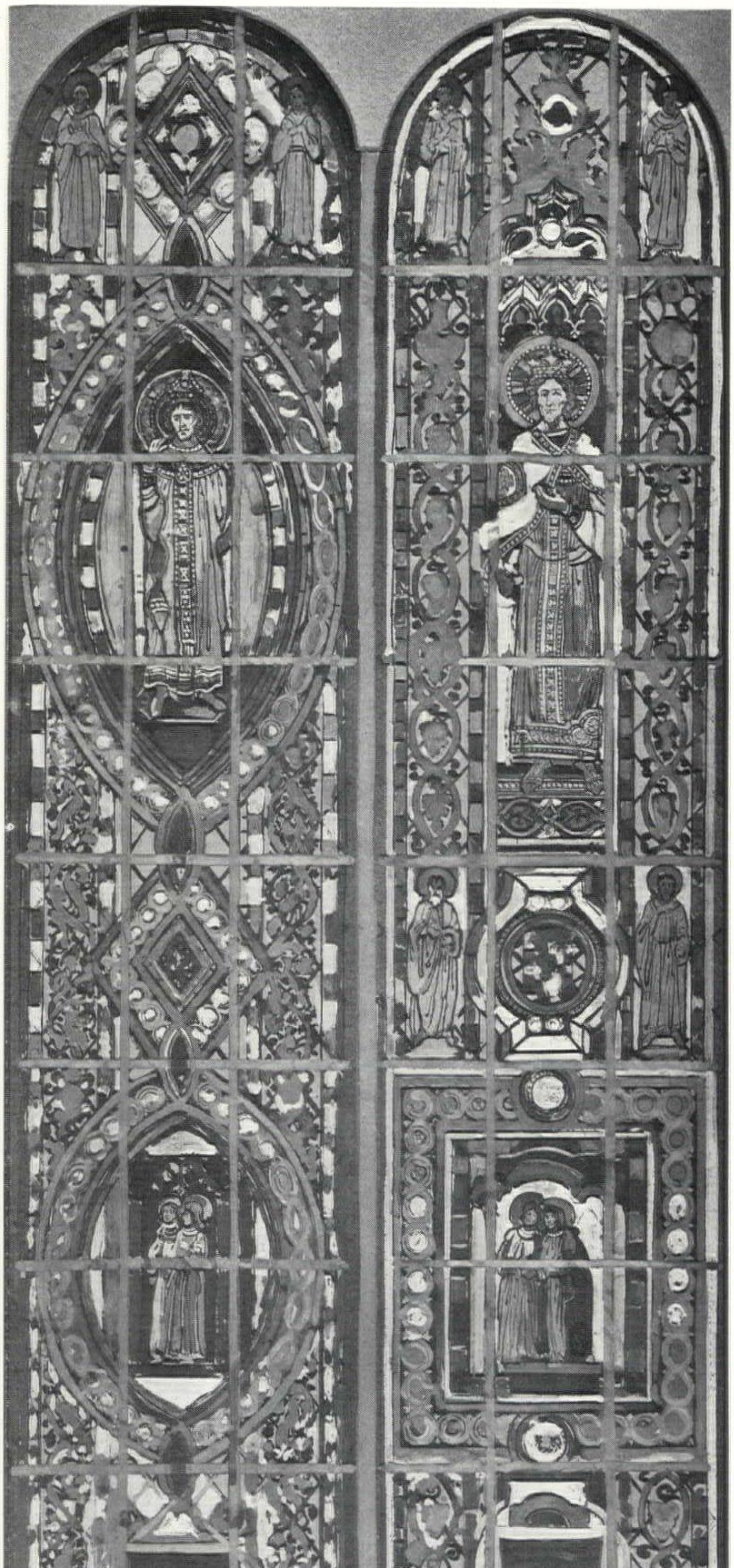
Unlike the mood of mystery and awe sought for by the Romantic or "Gothic" churches, so called, attained through narrow apertures, heavy mouldings and mullions, deep rich effects from bits of glass of slender size which were fused with colors in the pot, a library needs windows of wider span, more receptive of sunlight; for libraries are not places in which to pray but rather to read and write. The less artificial light, the better. In early Christian centuries naïve converts came to church in the kermess mood, a spirit of excitement and frolic so pronounced (and this we have from early letters) that beadles, proctors and priests found it hard to control the noise made by the happy crowds. Difficult enough it was to prevent eating and especially drinking in the sanctuary. It is possible that this is one of the reasons for the lines of separation drawn between the clerics and the laymen, out of which there grew the raised choir and the rood loft. Those semi-pagan barbarians would play! Solemn music and solemn shades helped subdue the "holy day" spirits of the mob, while the figures in the windows captured the eyes and reiterated the pious tales of the scriptures, old and new.

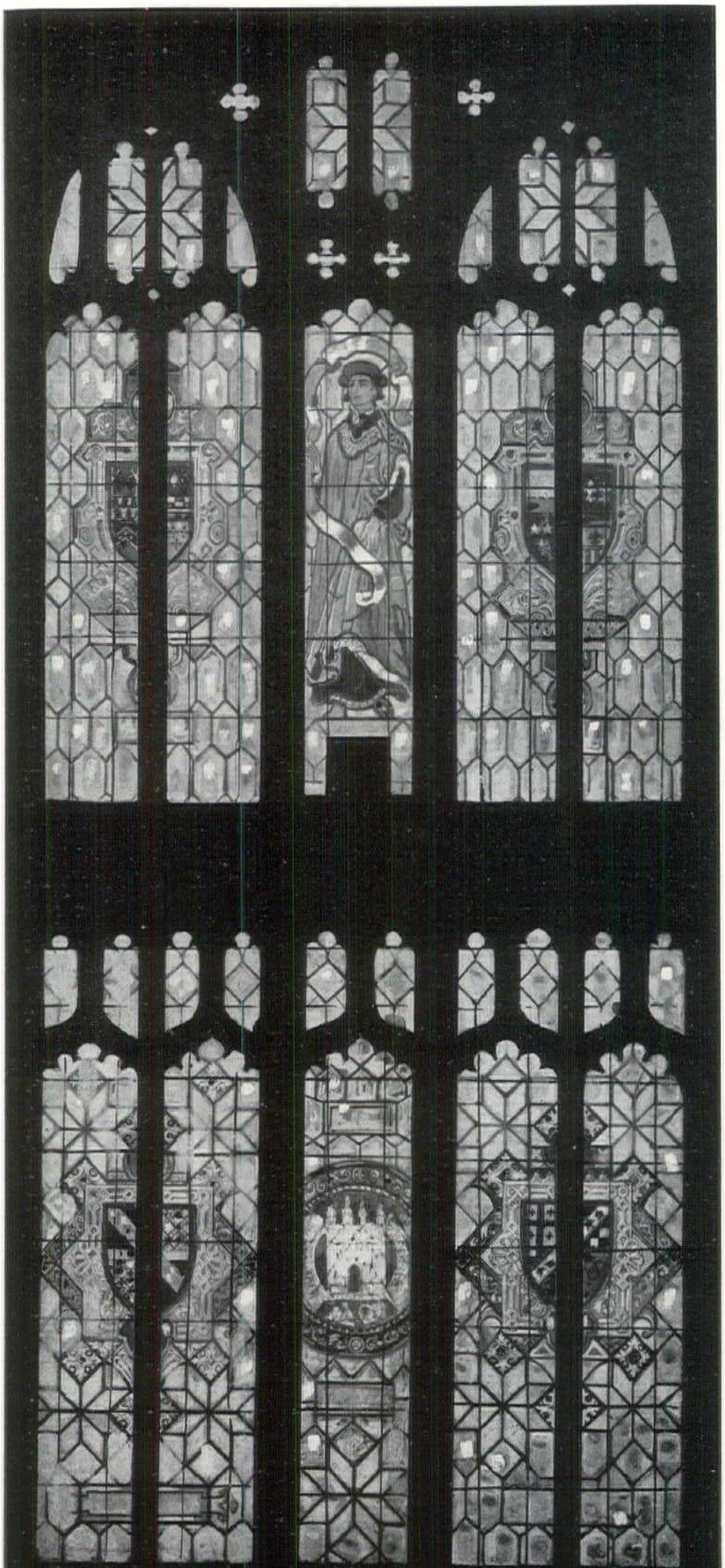
Very different is the case with a secular edifice, whether library or capitol, residence or club house. In Mr. Gilbert's public library the size of the windows necessitated a powerful armature to withstand the wind, and the need for light demanded large areas where daylight enters freely. The problem has been met by arrangements monumental in plan suited to the style of the interior,—noble, concentrated designs appealing to



A DESIGN FOR A WINDOW IN PROPOSED ROMANESQUE CHURCH. PARIS & WILEY, DECORATORS. COOLIDGE & HODGDON, ARCHITECTS

ALTERNATE WINDOW FOR PROPOSED ROMANESQUE CHURCH, PARIS & WILEY, DECORATORS. COOLIDGE & HODGDON, ARCHITECTS





SCHEME FOR ONE OF FOURTEEN WINDOWS, UNIVERSITY OF CHICAGO
PARIS & WILEY, DECORATORS
COOLIDGE & HODGDON, ARCHITECTS

GLASS WINDOW IN THE LIBRARY
OF THE UNIVERSITY OF CHICAGO
PARIS & WILEY, DECORATORS
COOLIDGE & HODGDON, ARCHITECTS

the eye, yet offering the least possible interference with daylight. Details in this library are carried out in a rich and yet formal fashion, the main masses making for architectural symmetry, but the minor features on examination proving ever varied. Thus notes of a different kind melt into a harmony with the surroundings. Observe in the illustrations how the central panels of these superb windows are rich with elements belonging to sculpture and suggestive of the Italian Renaissance. The mid-zone gives a chance for pictorial effects, figures or groups magnificently enframed, along with architectural fantasies such as we find in book plates and badges used by the old printers. In the field below there are shown the signs of the zodiac, two in each window, while the midmost figure of all is one of the muses. A quotation from a poet runs in bold, clear letters under the arch of the border above. The key window in the center of the west wall of the delivery room is richer than the others, and the center pieces repeat the colophon used by an Italian printer of the sixteenth century. There are nine of the windows for the muses; each is different in details of design; all are planned to admit considerable light.

Already in the fourteenth century portions of minster windows were often given over to lighter glass known as *grisaille*. In this library, where they could be introduced with advantage, there are richer and darker windows. Thus on the stair well colors are more lavishly employed for two tall narrow windows, with rich borders set with figured panels, to indicate Study, Art, Music and Painting for the one, and Meditation, Sculpture, Music and Geography for the other. The scheme for these is taken from a building in Florence, the cartoons for the windows having been made by Giovanni da Udine. In the Detroit Library the mosaics in the ceiling of the loggia, the Seven Ages of Man, deserve special study. They were designed by Frederick J. Wiley.

The greatest foe of stained or enameled glass is bad glass, garish, flat, cold; next come ill-placed, glass-like jewels, stupidly set. The best material will not utter truth so hampered! These prejudice people against the art. Another foe is glass of colors overdone, where quantity tries to make up for lack of quality. The old masters of pot-metal with their small but exquisite pieces escaped the danger of the over-much; their "purple patches" are due in some degree to the lack of technical perfection attained in later centuries. Thanks to modern appliances, it is comparatively easy to fill great wall openings with glass; also, there is no lack of glass men; but the difficulty is to find the artist among them. Those born and bred to the craft are few now; it is hard for a commander to pick the generals to carry out his campaigns. The great desideratum is the rare man who has for a natural gift a delicate yet passionate sense for color, and who has learned his art from the bottom up.

In this sketch of the multiple output of the Paris & Wiley ateliers one should not forget a historical scheme in glass, heroic in theme and proportions,—it is 25 feet wide,—which decorates the senate chamber in the capitol of Missouri, a building by Mr. Swartwout of New York. Here is shown, prancing on a great white horse, Don Hernando de Soto, the conquistador who, after a picturesque career in Peru, Cuba and the Caribbean, as the reader may recall, entered Florida and discovered the Mississippi, only to find therein his watery grave. This is an illustration from early American history treated in the romantic mood. The spirit that animates these decorators is to adapt their glass, mosaic, or tapestries to the architectural facts of the interiors they will decorate, striving for unity of color scheme and a close bond with the style set by the architect.

Note that in his book on the Detroit Library, the senior member of the firm makes a statement which no one will deny,—that "stained glass window is a poor, clumsy, misleading term for a work of art that displays a translucent material in varied forms, which is beautiful when manipulated by artists, whether the color be fused into the mass or applied in layers under the magic hand of the glass blower." He suggests the word "vitral," adapted from the word in use by the French. They were the first to raise colored glass windows into the high dignity of realm of art.

Photos. Samuel H. Gottscho

Hotel Governor Clinton, New York
Murgatroyd & Ogden, Architects
George B. Post & Sons, Consultants

ABOUT the middle of August, 1929, after a year of construction, the Hotel Governor Clinton opened its doors to the public, thereby supplying a long-felt demand for additional hotel accommodations in the Pennsylvania Station zone.

This new skyscraper hotel, towering 31 stories above and three floors below the street level, has a dignified three-story base of limestone above which rises the shaft of brick trimmed with terra cotta. The broad, flat piers of this shaft are accentuated by having the walls between studded with projecting brick headers. Arched windows in pavilions with angular corners cap these piers, between which, required by zoning ordinance, are setbacks used for roof gardens which make an interesting composition with a finial in the form of a low tower. The horizontal bands with their small arches and other decorative features are all executed in brick with a terra cotta coping. The exterior walls are faced with 4 inches of face brick backed up with hollow terra cotta block, which makes a good weatherproof and inexpensive wall.

Entering the hotel from either the Seventh Avenue or the 31st Street front, the main lobby is reached by short flights of stairs. This main lobby, two stories in height, has French limestone pillars supporting a gold and colored decorative paneled plaster ceiling, these panels being recalled in the terrazzo floor. Between these pillars on the north one views the arcade and on the south the shopping spaces, which are finished with dark wood walls which emphasize the strong stone piers of the lobby. Beyond this to the east we enter the elevator and office lobby, where the main desk in bronze and marble and elevator doors also in bronze make an interesting business center of the hotel. The floors of these rooms are of terrazzo over which are rugs. The lighting fixtures are specially designed in character with the architecture.

To the west of the main lobby, up a short flight of stairs, is the main dining room, executed in early Colonial style of the period when George Clinton was the first governor of the state of New York and after whom this room and hotel were named. The walls are painted in two-tone light gray with curtains of wine color in the arched openings, and the three beautiful crystal chandeliers and the carpeted floor make this room a formal and comfortable dining place. At the extreme east end of the building on the main lobby floor is the Florentine dining room, so called because of its design and decoration. The vaulted ceiling, and plain two-tone gray walls, the same color being carried out in lighter shades on the ceiling, make this room likewise comfortable and homelike.

The mechanical equipment is of the most modern type. Part of it is a vacuum vapor heating system fed by oil-burning boilers. A refrigerator system serves not only for refrigeration but for cooling the air supplying the main and Florentine dining rooms, the grill room, and the coffee shop. The building is served by six high-speed passenger elevators having floor leveling devices, and four freight service elevators, A completely equipped laundry in the sub-basement serves the building as well as the guests. At the top of the building are the carpentry, paint and upholstery shops.

HOTEL GOVERNOR CLINTON, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS
GEORGE B. POST & SONS, CONSULTANTS

SEVENTH AVENUE ENTRANCE

LOBBY

HOTEL GOVERNOR CLINTON, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS
GEORGE B. POST & SONS, CONSULTANTS

MAIN DINING ROOM

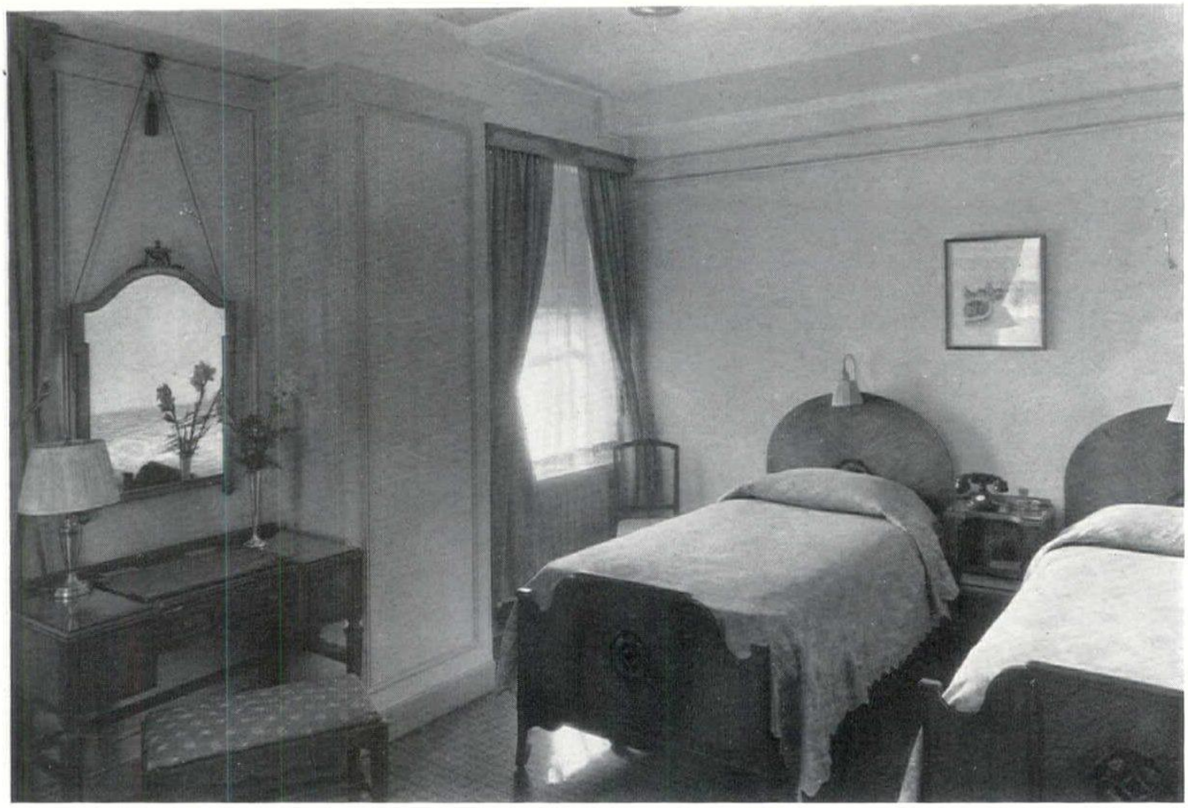
EAST DINING ROOM

HOTEL GOVERNOR CLINTON, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS
GEORGE B. POST & SONS, CONSULTANTS

COFFEE SHOP ALCOVE

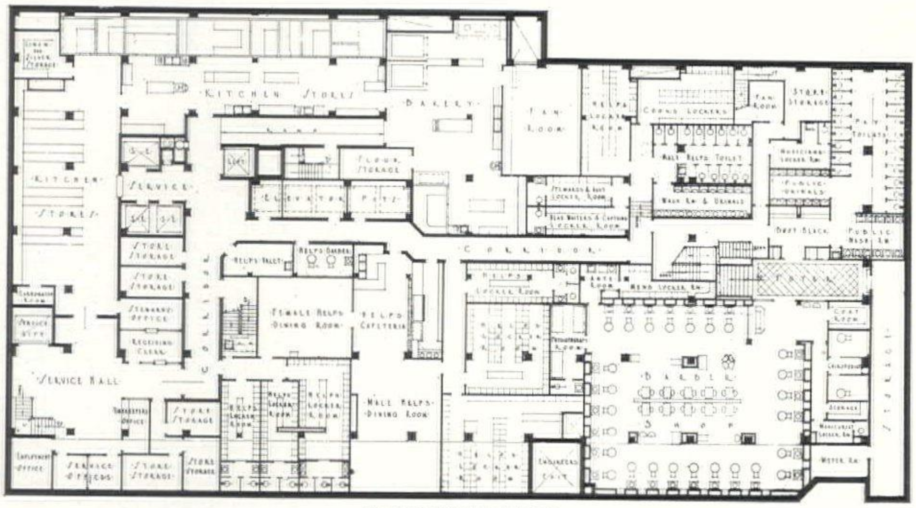
GRILL ROOM

HOTEL GOVERNOR CLINTON, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS
GEORGE B. POST & SONS, CONSULTANTS

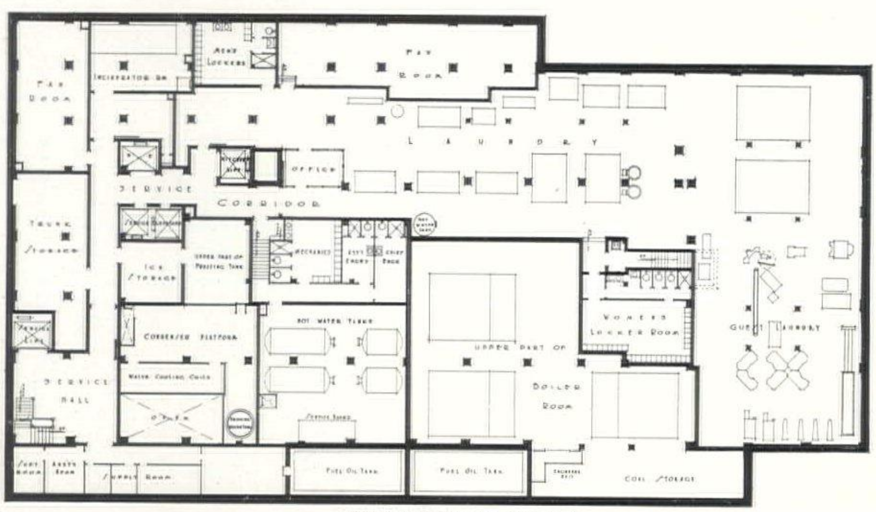


TYPICAL BEDROOMS

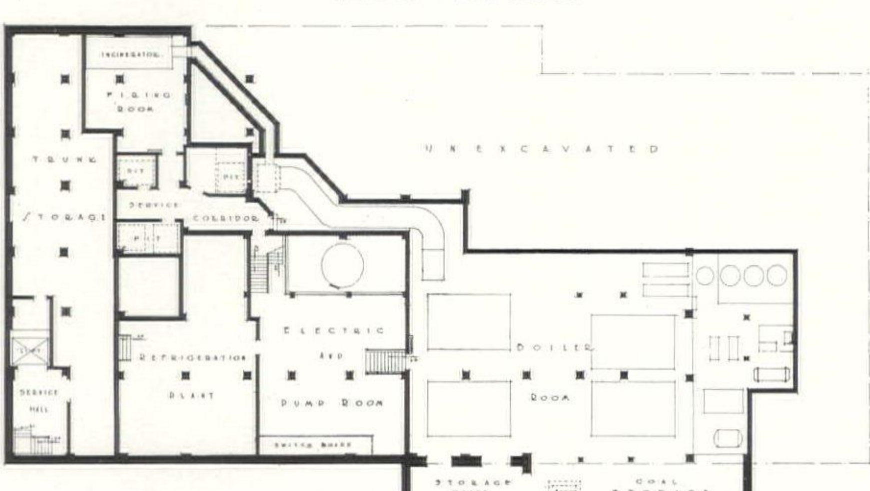
HOTEL GOVERNOR CLINTON, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS
GEORGE B. POST & SONS, CONSULTANTS



BASEMENT FLOOR

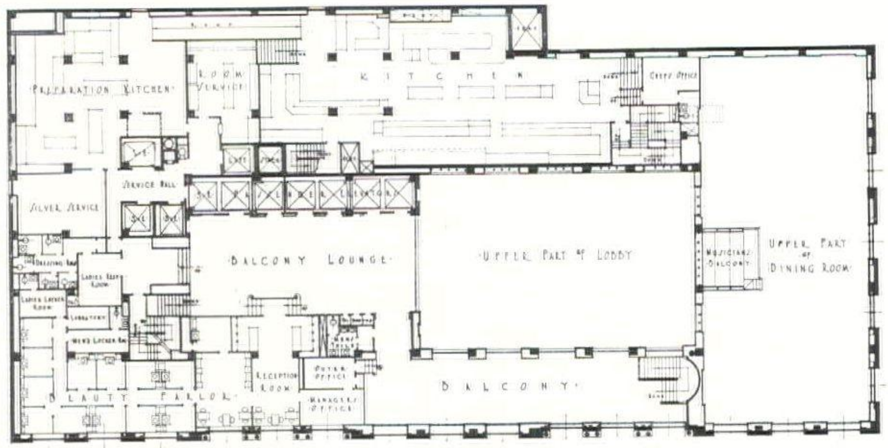


SUB-BASEMENT FLOOR

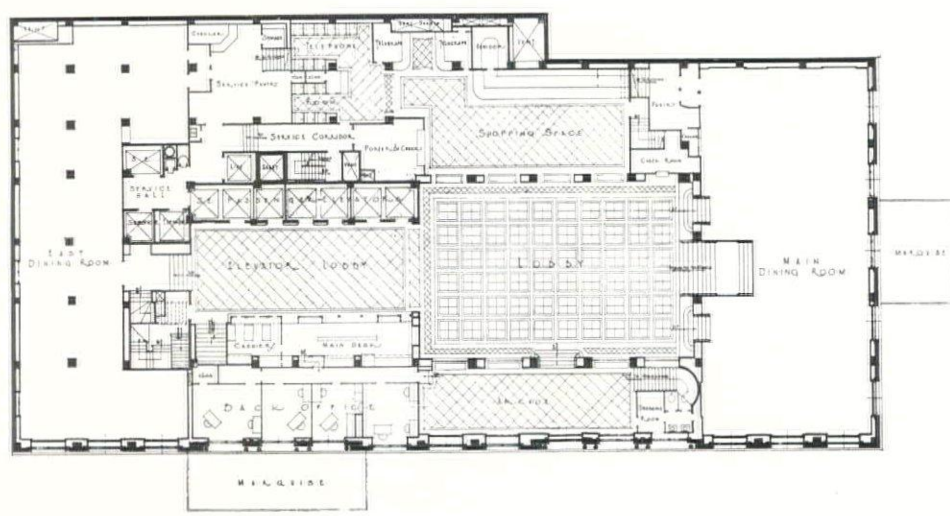


SECOND SUB-BASEMENT FLOOR

HOTEL GOVERNOR CLINTON, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS
GEORGE B. POST & SONS, CONSULTANTS



MEZZANINE FLOOR



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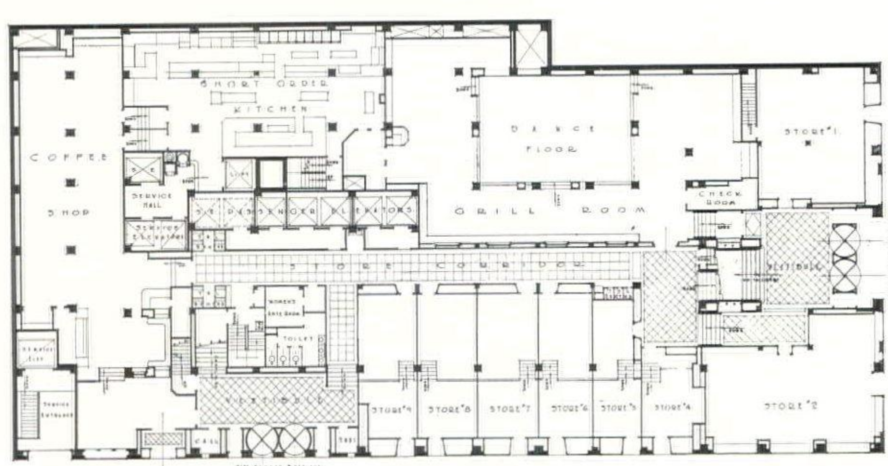
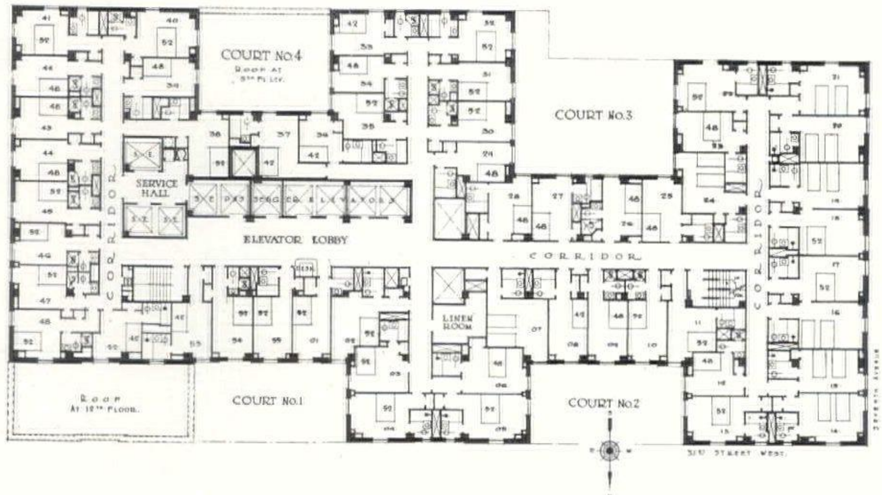
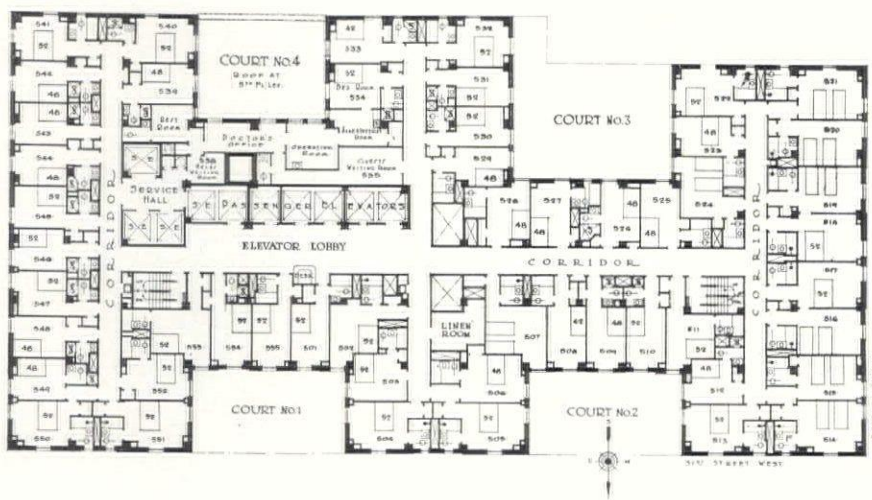


FIRST FLOOR

HOTEL GOVERNOR CLINTON, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS
GEORGE B. POST & SONS, CONSULTANTS



12TH TO 18TH FLOORS



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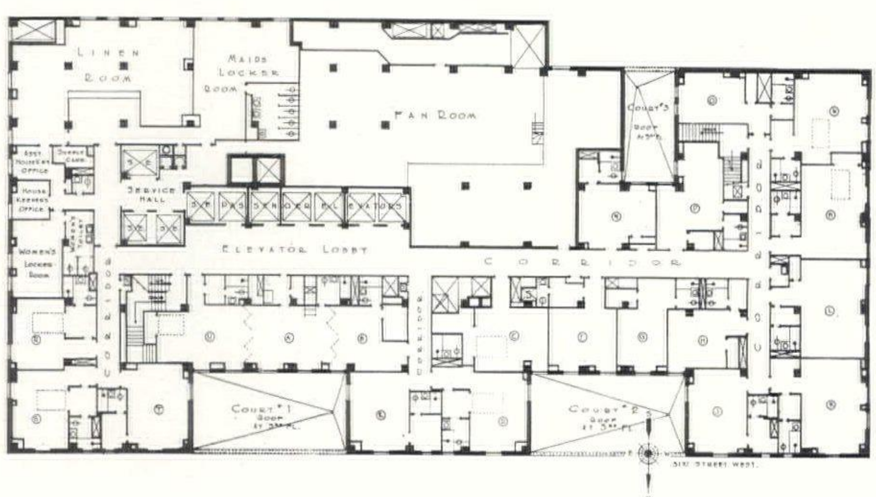
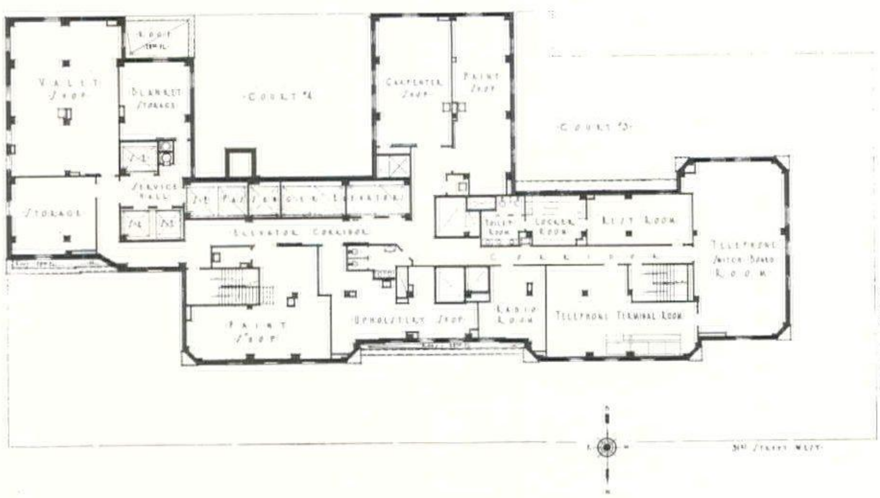
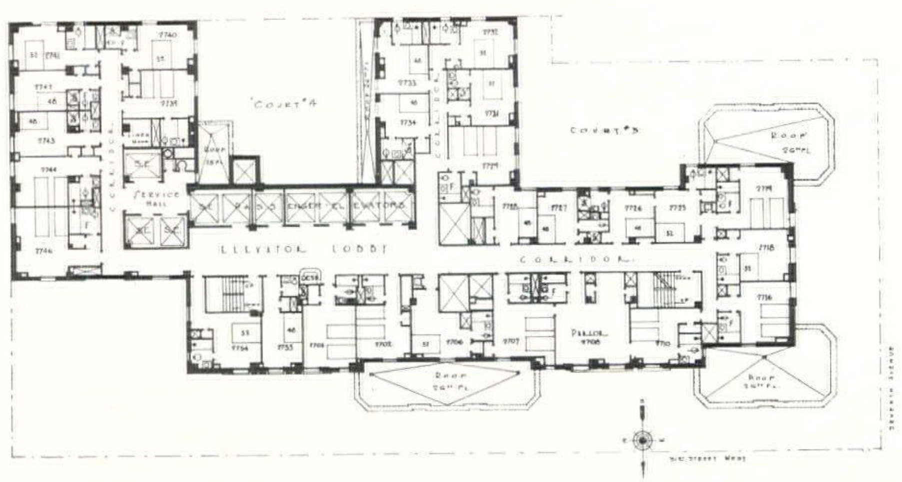


THIRD FLOOR

HOTEL GOVERNOR CLINTON, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS
GEORGE B. POST & SONS, CONSULTANTS



28TH FLOOR



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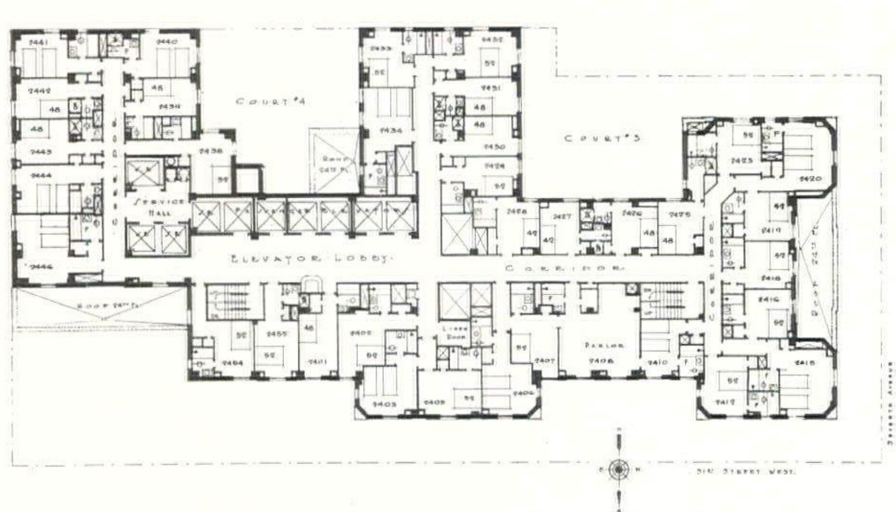


24TH FLOOR

HOTEL GOVERNOR CLINTON, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS
GEORGE B. POST & SONS, CONSULTANTS

EIGHTEEN GRAMERCY PARK
A NEW YORK RESIDENTIAL HOTEL FOR WOMEN

MURGATROYD & OGDEN, ARCHITECTS

THIS women's club residence, located on Gramercy Park South and Irving Place, is designed in the Greek Revival manner to harmonize with and retain the atmosphere of the old residences still surrounding Gramercy Park. Its 16 stories of brick, rising above the park, were completed, after one year of construction, in the fall of 1927. A two-story base of brick laid all in header courses is trimmed with limestone, and the projecting entrance porch forms a decorative feature of this base. The porch with its columns and cornice executed in cast iron projects beyond the building proper, being one of the few cases in downtown New York, where this has been done recently. A stone feature of pilasters and cornice at the top of the building finishes the plain shaft of brick, making an interesting composition with a pent house capping the mass of the structure.

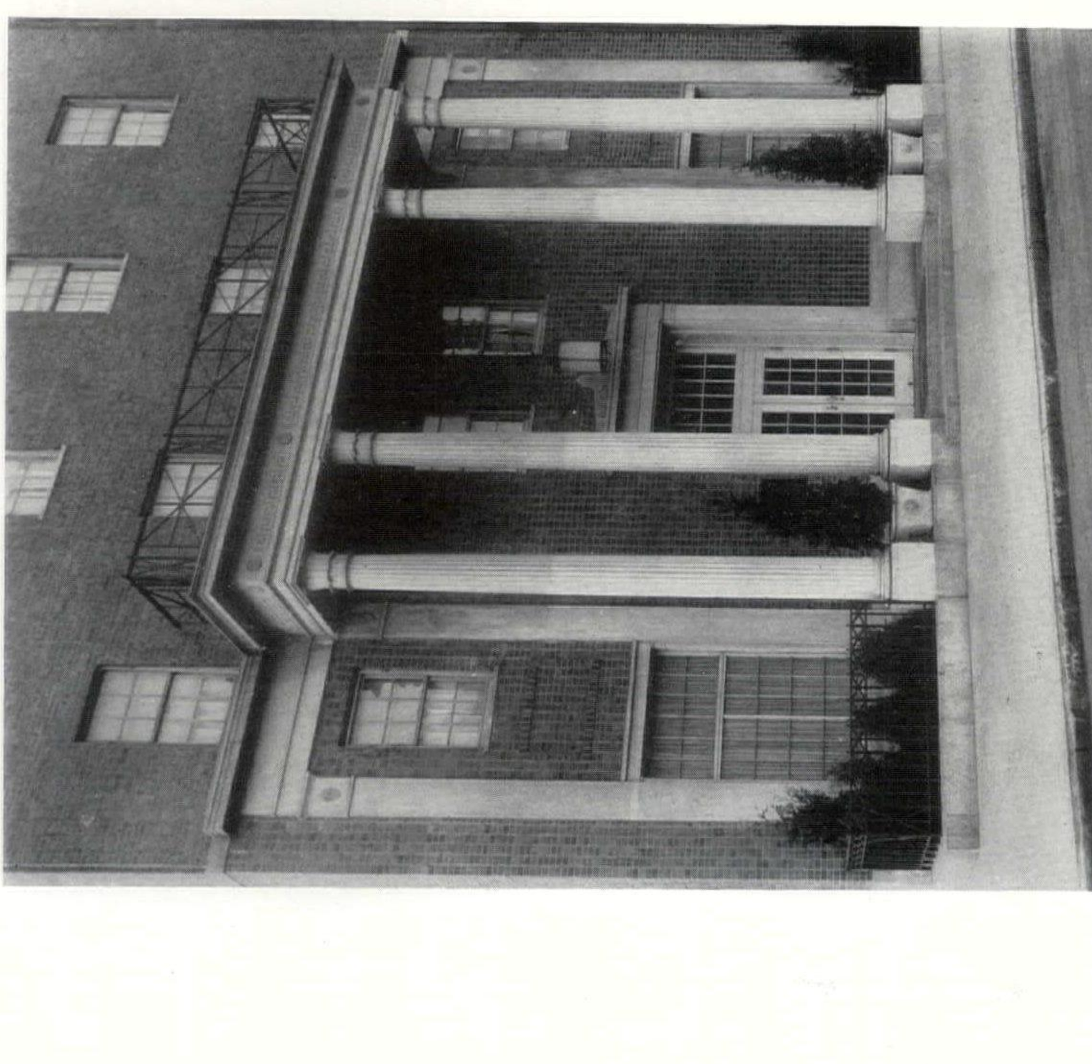
The main entrance on Gramercy Park and an entrance on Irving Place lead to the main lobby on the street level. Here also are parlors, writing, and reception rooms, and the main dining room. Here the architecture and decoration are carried out in the Colonial style. These rooms were executed with simple and inexpensive materials, having plaster painted walls with wood trim and terrazzo floors. The color scheme is harmonious throughout, being cream, gray and white with floors in black and white. To complete the effect, lighting fixtures were specially designed, and the draperies are in character with the rooms. A feature in the dining room is the radiator enclosure in the form of balconies coming under windows. The top floor of the building is also for the convenience of the guest, having a solarium.

The bedroom floors are so arranged that every room is an outside room facing the street, and they are all arranged as single rooms, some having private and others semi-private baths. Light buff colored walls and Colonial maple furniture together with appropriate draperies and rugs complete homelike rooms. Two electric elevators supply the building, which contains about 320 guest rooms. The structure is heated by vacuum vapor steam.

Photos. Samuel H. Gottscho

Alcove off Entrance Lobby

EIGHTEEN GRAMERCY PARK, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS

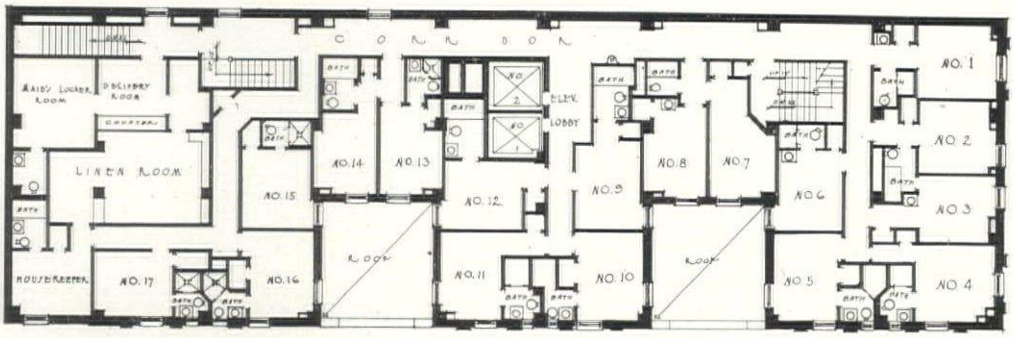


MAIN ENTRANCE — LOUNGE

EIGHTEEN GRAMERCY PARK, NEW YORK

MURGATROYD & OGDEN, ARCHITECTS

DINING ROOM
EIGHTEEN GRAMERCY PARK, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS



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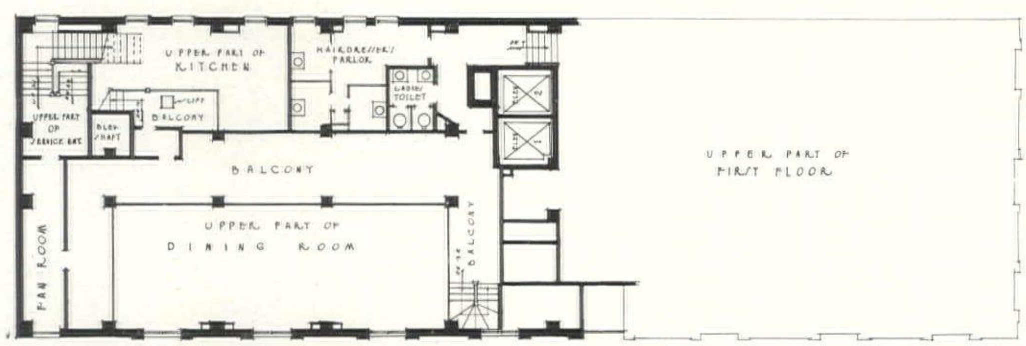
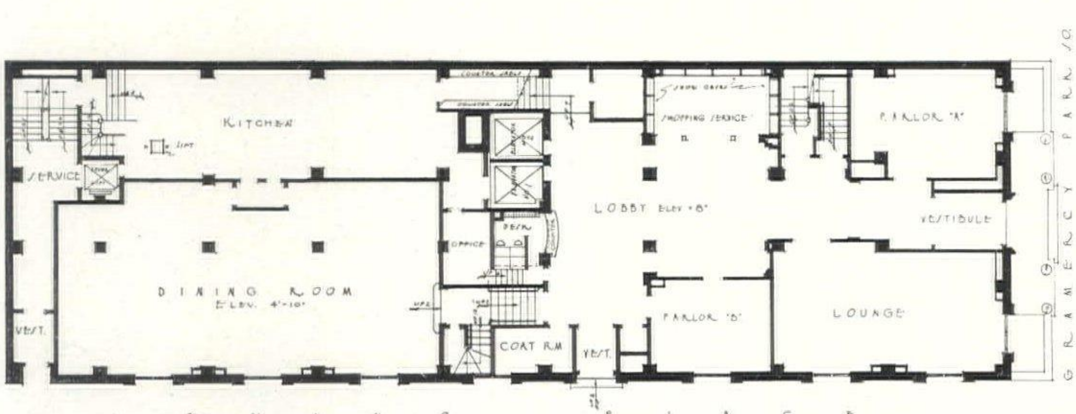
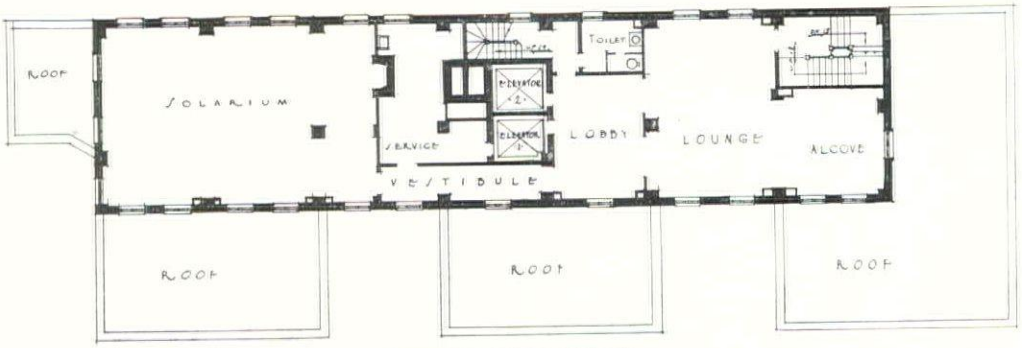


MEZZANINE FLOOR

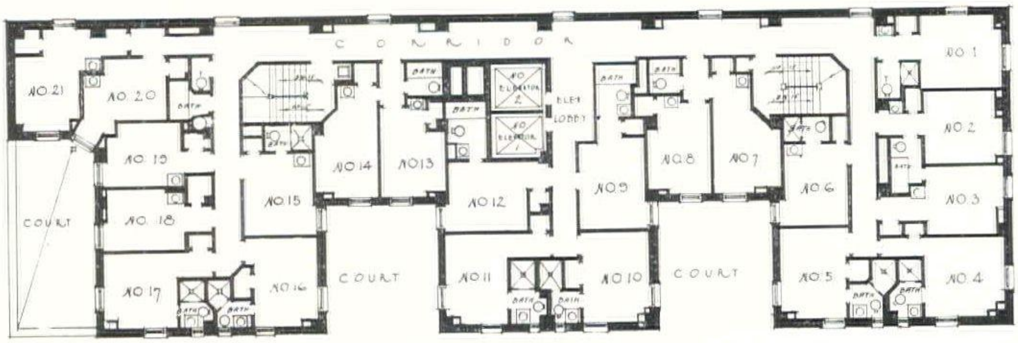


FIRST FLOOR

EIGHTEEN GRAMERCY PARK, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS



SEVENTEENTH FLOOR



SIXTEENTH FLOOR

EIGHTEEN GRAMERCY PARK, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS

LOBBY

BOOK DEPARTMENT

THE FUNDAMENTALS OF GOOD BANK BUILDING

A REVIEW BY

ROBERT STUYVESANT HOOKER

TO him who is beset with misgivings as to the financial stability of America, we have but to say: "Look about you at the buildings in which the workings of the financial system take place," and if he be a person of perception he cannot help being given a feeling of confidence and security. The financial system itself is a thing of amazing intricacy to most people. There is so much that is mysterious and incomprehensible about it that, were it not for the material manifestations as presented in steel, concrete, marble and granite skillfully combined in structures of architectural beauty and obvious solidity, the foundation of public confidence upon which the financial fabric rests might well be much less stable than is now the case. How often have we heard someone say: "Well, things cannot be going so badly in the old town, what with the First National putting up a new marble building, and all." Bankers themselves are by no means slow in realizing and taking advantage of the tremendous possibilities for high class advertising resulting from housing their institutions in buildings typifying solidity, prosperity and efficiency, for who can imagine a depositor so benighted as to prefer to entrust his funds to a bank occupying a dingy old structure, having the appearance of being about to collapse at any moment, while just around the corner there is a shining new building in whose interior all is brightness and order, and whose massive concrete and steel vaults are the very embodiment of security and protection?

No doubt it is the dream of practically every banker to be able some day to occupy a building or suite of rooms in which everything is perfectly planned for the purpose of permitting the smoothest possible operation of his system. Most bankers have very definite ideas as to some features of the ideal building, but on the remaining points they are likely to be a bit hazy. One may know exactly the sort of safe deposit department one wishes and just where it is to be located, but have failed to devote as much thought to some other equally impor-

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tant department. This condition points to the necessity of calling in a bank expert, who in most cases is, of course, an architect. But, it will be asked by some: "Why should the architect be an expert in planning banks? He probably has never worked in a bank, and in the ordinary course of events he can have no great familiarity with the workings of a financial institution." The answer to this of course is that the architect specializing in banks has the advantage of the experience of all his former clients to supplement his own knowledge.

For those architects who have not had the advantage of long experience in planning banks, there are works such as that which is the subject of the present review which sum up the results of the experience and thought of leaders in the field. These books, it is true, are also available to the bankers themselves, and by their use they may acquire a knowledge of the fundamentals of bank planning which will put them in a position to demand only the best. If the architect wishes to coöperate to the greatest extent with these men, he must be in a position to discuss their problems intelligently with them.

From a standpoint of experience, ability and knowledge, Alfred Hopkins is preëminently fitted to write a book on the fundamentals of good bank building. In his volume just published, which bears that title, he is offering the reader the results of long experience in the field of bank building. Few if any have had the advantage of coming in contact with as many prospective clients for bank buildings as has Mr. Hopkins, and in his endless conferences and discussions with the officers of banks in every part of the country he has acquired a fund of information covering the best practice in the planning of all types of banks. The work is addressed to the banking and not to the architectural profession, but as has already been pointed out there is no reason why architects should not take advantage of the information which it contains. All the varied phases of the problem of bank building are fully discussed, beginning with the purchase of the site, which as the author points out is of an importance seldom appreciated by the banker. So many times bankers by purchasing small or odd-shaped lots impose conditions on the architect which can be surmounted only at the expense of a great deal of time and money, usually resulting in a more or less unsatisfactory layout. Methods of utilizing such lots are pointed out, as well as a discussion of the advertising value of various sites and situations. The illustrations, plans and diagrams serve to emphasize the realization of the importance of selecting only the best possible sites for the erection of bank buildings. Having settled the question of lot areas and shapes, Mr. Hopkins proceeds to analyze the several plans prevalent in the laying out of banks, such as the "island plan" and the "U-plan," pointing out their advantages and disadvantages.

Often in a thorough discussion of the plan in general, each of the several departments is taken up separately. The increasing importance of safe deposit service in banks makes the location and layout of this section a matter of the greatest importance. The great vaults with their tremendous steel doors which form the nucleus for the safe deposit department offer great possibilities for effective treatment and are often located in conspicuous positions in the bank. Also every possible convenience must be afforded the customers in this department to insure them privacy and absolute security for their val-

uables. Data as to the layout, size and equipment of coupon booths are given. The vault itself is often said to be the heart of the institution, and great emphasis is placed upon it by many bankers who believe in the psychological effect of a sensational-appearing vault on the public mind. Some of these vaults are made much larger and stronger than is required for the minimum insurance rate solely for the purpose of making an impression on the banks' clientele. Many variations of vaults and their doors have been developed, and their construction is not only of great general interest but is of prime importance to both bankers and architects. The space where the actual work of the bank is carried on should be convenient and well lighted and ventilated with plenty of space allowed for future expansion and equipment.

Many other aspects of the bank planning problem are considered, including the approach through the vestibule, the important considerations of light and ventilation, the type of floors to be used, and the furnishings. The screen which serves to separate the bank employes from the public offers great possibilities from the design standpoint, and many improvements and refinements are being made in the design of these screens. The cumbersome, high screen of old has given way in most cases to a lower, simpler screen which does not seem to have the effect of shutting out the customer as did the old style screen. The interior features of a bank are no less important than the exterior aspect, and special emphasis is placed on the appearance of the building as seen from the street. The bank building should express as nearly as possible the character of the institution it houses.

A great majority of the banks in this country have been built along classical lines, especially in the Roman style. An attempt should be made to convey an impression of solidity and permanence, but at the same time there is a decided recent tendency not to make them so funereal and forbidding in aspect as to seem to discourage the entrance of clients. Many attempts have been made to break away from the conventional type of bank building, and although many have been very successful in this attempt, it often leads to building structures whose exteriors have no suggestion of bank character, and a great deal of their effectiveness as an advertising medium is thus sacrificed for the sake of originality. In the larger cities the construction of tall buildings has become so prevalent that a one- or two-story bank building is likely to be dwarfed by its neighbors, and therefore it loses the dominating quality which is so important to the success of a bank building. It has therefore become customary to combine banking quarters with office areas in the skyscraper type of building. The financial advantage of erecting this type of building is so obvious as to need no explanation, so that in the large cities this type of structure has now become quite the usual thing for banks. This type naturally introduces a great many new features into the planning of bank buildings. The structure is really two separate units, but as the bank is the part that requires advertising, this part must be emphasized. The rest of the structure really falls under the heading of "office buildings," and is treated much like other office structures.

THE FUNDAMENTALS OF GOOD BANK BUILDING. By Alfred Hopkins, 142 pp. 6½ x 9½ ins. Price $7.50. Bankers Publishing Co., 71 Murray Street, New York.

VOLUME LII

THE
ARCHITECTURAL
FORUM

NUMBER TWO

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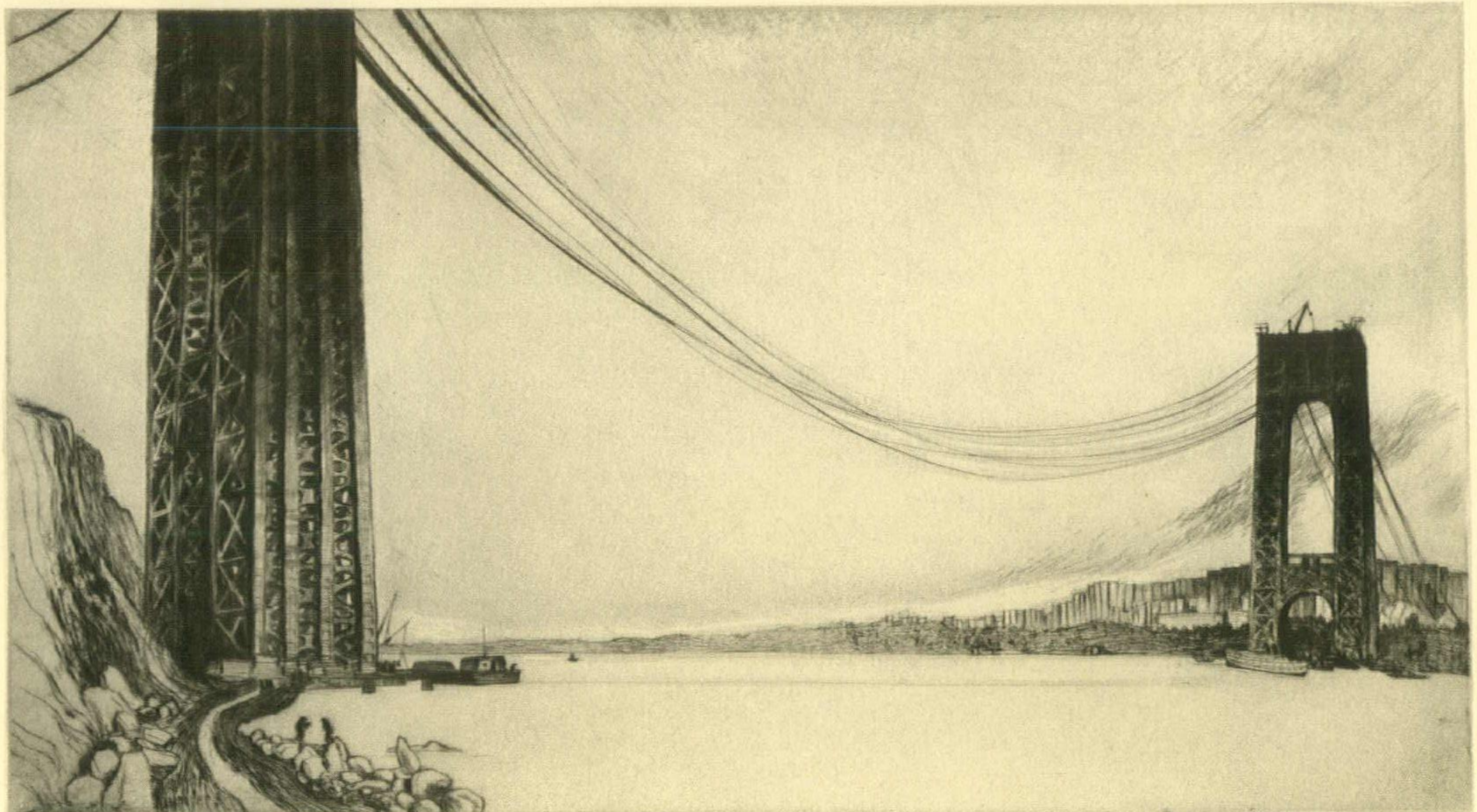
THE ARCHITECTURAL FORUM is published monthly by Building Division, National Trade Journals, Inc., 521 Fifth Avenue, New York.

H. J. Redfield, Chairman of the Board and Treasurer; Howard Myers, President and General Manager; John Thomas Wilson, Vice-President; James A. Rice, Vice-President; C. Stanley Taylor, Vice-President; Henry J. Brown, Jr., Secretary.

Yearly Subscription, Payable in Advance, U. S. A., Insular Possessions and Cuba, $7.00. Canada, $8.00. Foreign Countries in the Postal Union, $9.00. Single Copies: Quarterly Reference Numbers, $3.00; Regular Issues, $1.00. All Copies Mailed Flat. Trade Supplied by American News Company and its Branches.



SPANNING THE HUDSON

From an Etching by Margaret Lowengrund

THE
ARCHITECTURAL
FORUM

VOLUME LII NUMBER TWO

FEBRUARY 1930

THE HEATING AND VENTILATING SYSTEMS OF THE TEMPLE EMANU-EL*

BY

KENNETH KINGSLEY STOWELL

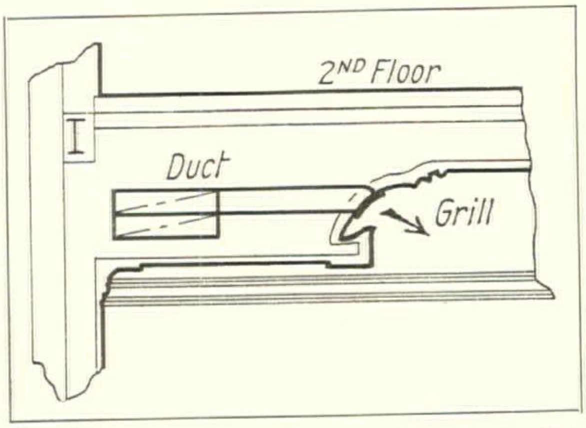
THE problem of providing comfortable atmosphere in houses of worship is one that may be solved in several different ways. In the case of Temple Emanu-El, an ingenious split system was devised, and each portion of the building was provided with heat and with fresh air in the most convenient and effective way for the particular portion under consideration.

The building is divided into several main portions from the point of view of heating and ventilating. There are four assembly or meeting places, each with its particular problems because of size, ceiling height, location, or function. There is, first, the main auditorium or the Temple proper; second, the large banquet hall, with its kitchen, entirely underground; third, adjoining the Temple proper to the north, is the Chapel; and, fourth, the community hall to the east of the main auditorium. Each of these areas has its own individual ventilating system. In addition to these large spaces, there is the Community House, which contains the library, classrooms, committee rooms, etc.

The heating is naturally from a central plant, which is located under the Community House. The boiler room is located in the basement of the community portion of the building, and is provided with ample coal storage space on the street side. There are three brick-set, fire-tube boilers with special grates and electrically-driven forced draft blowers for burning anthracite screenings. A vacuum return line pump delivers directly into the boilers, and there are all the usual accessories for such a boiler plant. In general, the piping of the Community House is arranged with separate steam supply and return mains. In the Temple and the Chapel all steam lines are dripped through individual traps into the return mains. In the Community House there is provided an independent system of water-sealed "relief" mains which pick up all the drips from the steam mains or risers of this portion of the building. The boiler plant supplies all the heating,—direct, indirect, and for the tempering coils.

THE TEMPLE. In describing the heating and the ventilating, we may well take up each of the main portions of the building in natural sequence, discussing the various features of both the heating and ventilating equipment. The heating of the Temple is accomplished by re-circulating gravity indirect stacks which are entirely independent of the mechanical ventilation. There are two separate heating zones in the Temple,—one, the space on the main floor level; the other, the space on the balcony level. The ceiling and roof have been eliminated from the heating problem by installing large coils so placed in the space between the ceiling and the roof as to bring this air to the required temperature in order that no cold from this source might interfere with the heating in the zones occupied by people. Typically, each bay of the Temple on each level has its own independent heating stack, flues and grilles, so as to secure the best possible heat regulation in all parts of the Temple during cold weather. Each bay has its own individual thermostatic control, so that each will be supplying the required amount

* *See also "The Structural Frame of the New Temple Emanu-El Building," by Eugene W. Stern, consulting structural engineer, published in* THE ARCHITECTURAL FORUM, *July, 1928.*

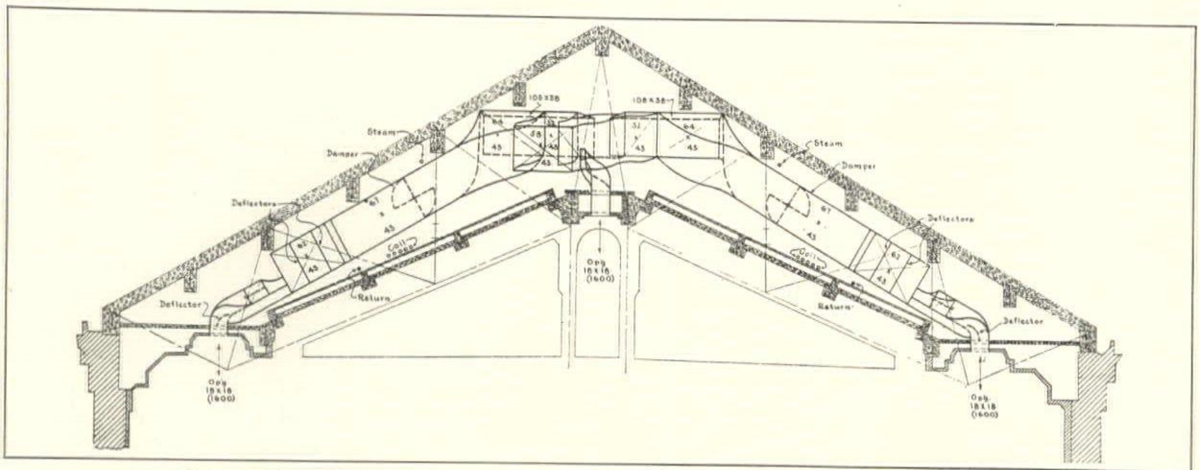


Duct and Grille in Cove of Ceiling of Community Hall

of heat for its own particular location, thereby insuring a uniform temperature wherever one may be in the auditorium. In one case only (the rear of the large balcony at the west end) indirect heating stacks are located in the construction of the balcony itself. In all other cases they are located in various pipe spaces and passages in the basement, and are connected by galvanized iron ducts and flues with the re-circulating and hot air grilles in the Temple. The supply grille for a bay is usually located on an adjacent column, and the heated air is delivered under the outside window or door, as the case may be.

The fan room for ventilating the Temple proper is above the sanctuary, just below the roof level; i. e., located on the seventh floor of the Community House adjacent to the roof space of the Temple. The system is so arranged that it may be operated either as an upward system or a downward system of ventilation. This is accomplished without employing two fans or a multiplicity of ducts by the use of a large reversing damper of the drum type (a large damper is mounted in the drum on roller bearings, is lined with felt along the edges, and provided with a handle and suitable locking devices). By operating one handle, the entire operation of the ventilating duct system may be controlled so as to provide either ceiling supply and floor exhaust, or floor supply and ceiling exhaust, at will. The fresh air for the Temple system proper is brought down from the roof through an intake shaft, then passed through air filters employing oil as a cleansing medium, then through tempering stacks of standard type, from which it is brought to the inlet of the blower. The re-circulated air is brought back through a duct to the blower inlet connection, where automatically-controlled pneumatic mixing dampers vary the proportion of all fresh and re-circulated air to suit the weather and the number of people in the Temple. This latter equipment is so adjusted as to supply at least 1/3 fresh air and a maximum of 2/3 fresh air when required. The capacity of the blower is based upon moving 30 cubic feet of air per minute per person, the number of persons being based on the maximum seating capacity of the Temple proper. From the blower, the air goes to the large drum type reversing damper just mentioned. From the reversing damper the ducts for the upper system run out directly through the roof space and connect to three rows of registers blowing directly downward (one on the center line of the Temple, the others near the sides). These registers are designed for a velocity of about 600 feet per minute because of their great height above the floor of the Temple. This height varies from 90 to 100 feet. From the reversing drum, also, the main ducts for the lower system turn down into shafts which are located at the sides of the sanctuary of the Temple. They carry down to the basement and there connect with distributing ducts which run over the sides of the banquet hall. These distributing ducts connect to a series of plenum spaces underneath the floor construction of the Temple; each plenum space serves a group of mushroom ventilators located under the pews above. Branches from these distributing ducts also are carried up to the floor of the rear balcony, where similar plenum spaces are formed serving similar mushrooms. The mushrooms are usually 10 inches in diameter and are so placed that there is nearly one mushroom for every two persons, thus giving low enough velocities to avoid objectionable drafts on the occupants when the reversing damper is set for upward ventilation. These mushrooms supply air at 65 cubic feet per minute and number 1,020 on the first floor of the Temple.

It is intended that the system to be used should be an upward ventilating system, with the air entering through the mushrooms and being exhausted through the roof, during the greater part of the year. During the three or four coldest months, when the dryness of the indoor air might result in a slightly chilly sensation due to its motion if the air were introduced around the feet, the system will be reversed so as to run as a downward ventilating system. During these colder months this operation as a downward system will also improve the heating of the Temple, and will tend to save fuel by resisting instead of aiding the natural tendency of the hot air to rise to the roof. When the system is operated as a downward ventilating system, the excess of the air blown in over that drawn back by the fan is expected to find its way out through doors, windows, connecting passageways, and so forth, which will incidentally maintain a moderate pressure (probably in the neighborhood of ¼-inch water gauge). This pressure will assist in the heating results by preventing infiltration and

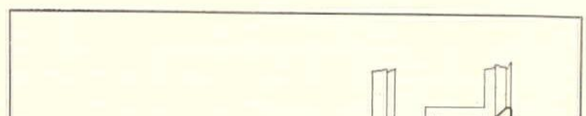


Ducts and Grilles in Space Above Main Ceiling. Temple Emanu-El, New York
Kohn, Butler & Stein, Architects
Jaros & Baum, Heating and Ventilating Engineers

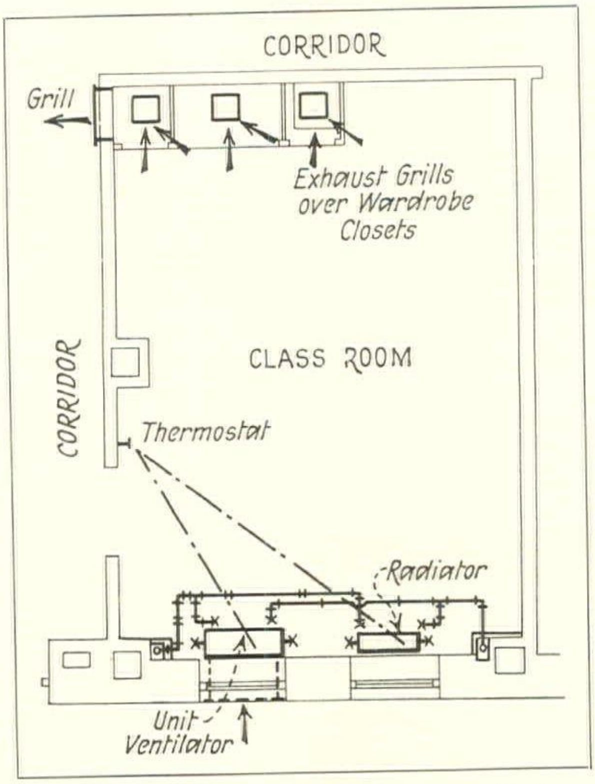
drafts at the various doors and windows. During warmer weather, and the greater portion of the year, when the equipment is run as an upward ventilating system, means are provided for eliminating part of the surplus air, if necessary, through auxiliary outlets provided in the Temple roof. These outlet ducts connect to two of the three main ducts in the roof space, and are provided with two sets of louvered dampers, one operating in conjunction with the automatic mixing dampers, and the other operating by pneumatic push buttons, and intended to remain tightly closed at all times when the system is run for downward ventilation.

CHAPEL. The system planned for the Chapel is similar to that for the main auditorium in general scheme, the principal difference being that the Chapel system is not provided with any air outlet duct similar to that just described, inasmuch as the Chapel is small in comparison with the Temple, and because it connects with the Temple through such large archways as to make this unnecessary. The fan room for the Chapel is located in the basement, the fresh air being brought down to the ventilating apparatus from a convenient opening in the upper part of the rear wall of the Chapel. The ducts enter the Chapel ceiling in two places only (the tops of the vaults) instead of in three rows as in the case of the auditorium. The lower duct system supplies the plenum space, under the Chapel floor, which is in the hung ceiling above the storeroom. This plenum chamber supplies 158 ten-inch mushroom diffusers under the seats of the Chapel, each diffuser supplying 64 cubic feet of air per minute.

BANQUET HALL. This hall occupies the area under the auditorium of the Temple and is entirely below the grade. Because of its location, it requires a minimum of heating. The ventilation for the banquet hall is provided by a typical system of mechanical fresh air supply and exhaust. A slightly unusual feature of this system is that the supply and exhaust fans are mounted on a common extended base, and a single motor is mounted between them, thus operating both fans by means of its shaft which extends to each. In this way the two fans are always run at the same speed (the speed of the motor), and as the apparatus has been chosen with the proper characteristics to do this, the fresh air supply and exhaust



Diagrammatic Section Showing the Heating System and the Ventilating System



Plan Diagram Showing Typical Classroom Heating and Ventilating

from this room are always kept in the proper proportion to each other. The fan room,—with its fresh air chamber, self-cleaning oil-type filters and tempering coils for the banquet hall,—is located under the east end of the Chapel. The fresh air supply is brought into the banquet hall through numerous registers located at both sides of the room, with a few individual registers on the end walls. These supply registers are located about 7 feet from the floor, as shown in the sectional diagram. The exhaust is removed from the room by registers located at the break in the ceiling on the line of the inner columns, which makes the raised central part of the ceiling act in effect as an exhaust hood for the room. The kitchen at the end of the banquet hall is provided with adequate exhaust ventilation. The openings for the kitchen exhaust ducts are so placed as to remove heated air and air which might have considerable odor, directly from the places of origin,—that is, over the ranges, etc. Having exhaust only, the air will be taken from the banquet hall rather than escaping into the hall. There are independent exhaust systems also for toilet rooms. Naturally, these rooms have exhaust only in order that the air travel may not be from these locations toward the other rooms.

THE COMMUNITY HALL. The community hall is provided with a ventilating system similar to that of the Temple and that of the Chapel. The fan room for this system is to the northeast of the boiler room directly under the stage of the community hall. This system is provided with a reversing damper of the same type as that of the Temple. The seats in this community hall are fixed so that the ducts supply plenum chambers under the floor, which in turn supply the 10-inch mushrooms located under the seats. These mushrooms each supply 6 cubic feet of air per minute. The ducts in the ceiling of the community hall are connected to grilles that open in the coved soffit just above the light trough which supplies indirect lighting. Being thus located, on a coved surface, the air is directed toward the center and downward, when the damper is set for downward ventilation. Grilles also are located above the proscenium arch of the community hall.

THE COMMUNITY HOUSE. As this portion of the building is devoted to the library, classrooms, committee rooms, trustees' rooms, offices, and such purposes, there is no central system for these rooms. They are heated by an ordinary two-pipe, vacuum heating system with exposed radiation. The classrooms are each provided with a unit ventilator of the usual school type, as will be seen in the diagram, in addition to the ordinary exposed radiation. The air (750 cubic feet per minute) finds its way out through grilles in the wardrobe closets or cabinets of the room, which in turn empty into the corridor, and eventually finds its way out through the exhaust systems of the toilet rooms, through the windows of the corridors, or through the elevator and stair shafts. The heat of each individual room is regulated by a thermostat in the room, as shown on the diagram. Unit ventilators are provided in the library for both the stacks and the library itself.

This brief description of the heating and ventilating schemes of the various portions of Temple Emanu-El shows that the problems of each portion of the building were studied and solved as separate problems by the consulting engineers, Jaros & Baum. One of the most interesting features of this installation is that the systems were carried out almost in their entirety as shown on the drawings, which is somewhat unusual. This was brought about by the close coöperation existing between the architects and the heating engineers. The architects provided the necessary space for the heating and ventilating systems, and it is evident that they considered each element of the mechanical plant when designing the structure, instead of, as is too often the case, designing the structure first and leaving the mechanical provisions to be worked out as best they might be under the conditions imposed by the structure. It is only through proper coördination that the most efficient building can be produced.

TEMPLE EMANU-EL ELECTRIC LIGHTING

BY

A. T. NORTH

TEMPLE EMANU-EL, New York, is distinguished by several unusual features, among which are the artificial illumination and the public speaker system, both of them included in the electrical plans and specifications. The architects had a very definite concept of the results to be attained in the interior of the Temple, a concept which controlled the design of the structural parts, the appearance of the walls, ceiling, windows, and the sanctuary. Artificial illumination as an integrant element of the scheme was of the utmost importance, and it involved some unusual problems. The requirements were successfully met through the sympathetic understanding and coöperation of their consulting engineers, Eadie, Freund & Campbell.

The scheme was to secure the illumination of the Temple without the light sources being visible to distract the attention of the congregation from the services and from their contemplation of the focal point of the Temple,—the Ark. In other words, the light was to make objects visible, with its sources invisible. From invisible sources, the artificial illumination was apparently to be of increasing intensity until it reached its maximum on the reading plane of the congregation. To attain this result, the walls of the Temple are finished with large acoustical tiles of a decreasing brightness from the floor upward, until the ceiling is involved in a mystical dimness. The happy and balanced coördination of these integrant elements of structure, surface finish and illumination induces that perfect harmony of physical and spiritual elements that should inhere in places of religious worship.

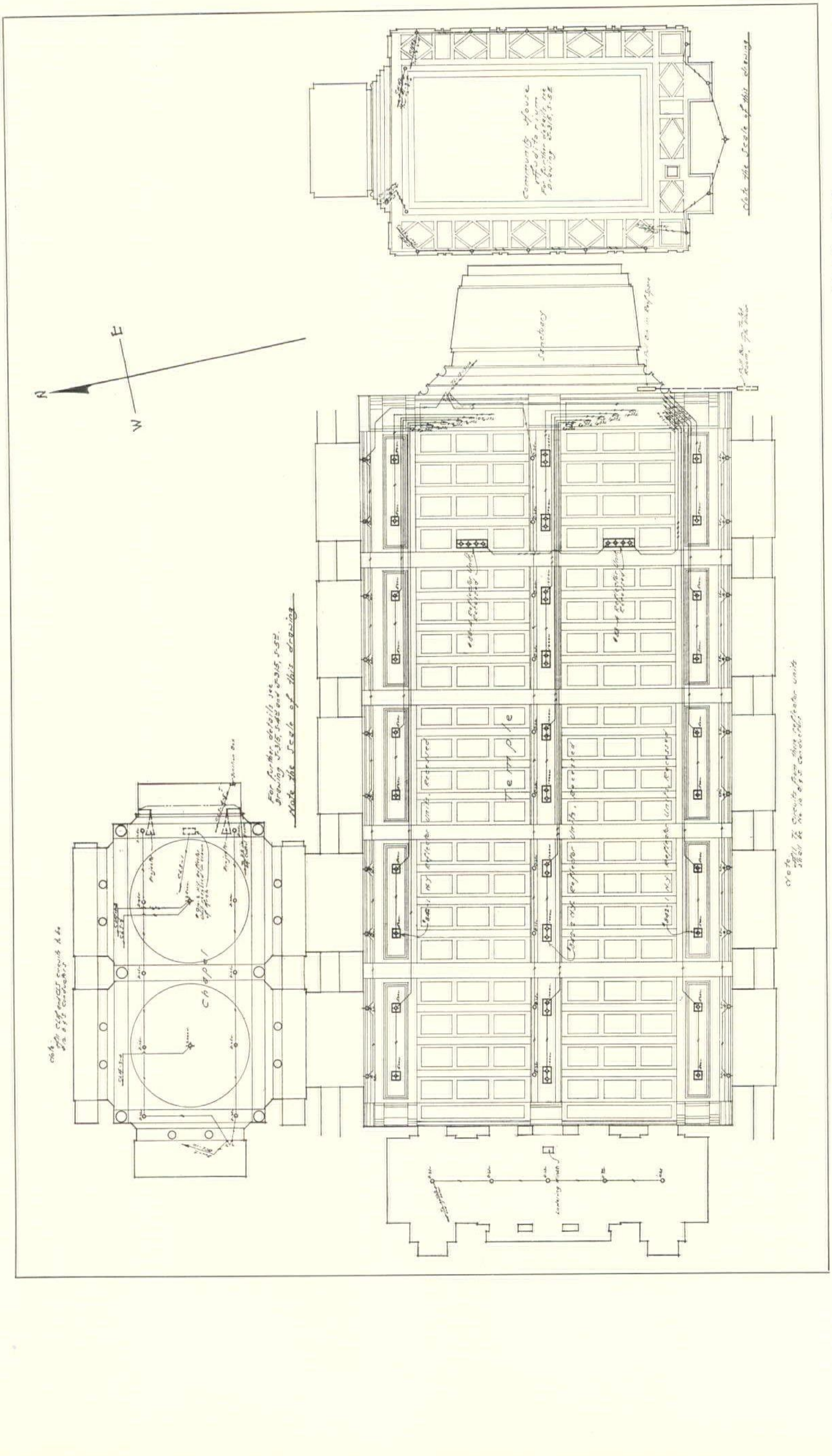
Obviously, visible light sources or the usual indirect lighting would not produce the required results, and it was necessary to resort to use of a system of concealed direct illumination. The system adopted was to place the light sources in the ceiling, enclosed in recessed receptacles. The lamps are provided with reflectors, and below them are placed a series of concentric louvers made of enameled metal. The louvers are intended to conceal the lamps except when observed from the objective point of their inclination and projection. The usual glass covering of the receptacle is omitted as a possible interference with the light distribution. Three rows of lighting units are placed in the ceiling,—one row along each side wall having 10 units, or 20 in both rows, and one row in the center along the ceiling ridge. The side units contain one lamp each, designed for 500 watts and with 300 watts actually installed. The center row units contain two lamps designed for 500 watts, 300 watts used. These units illuminate the seating area of the Temple. The sanctuary is illuminated by two four-lamp units placed close to and in front of the upper chord of the truss nearest the sanctuary.

Photo. The Metal Arts

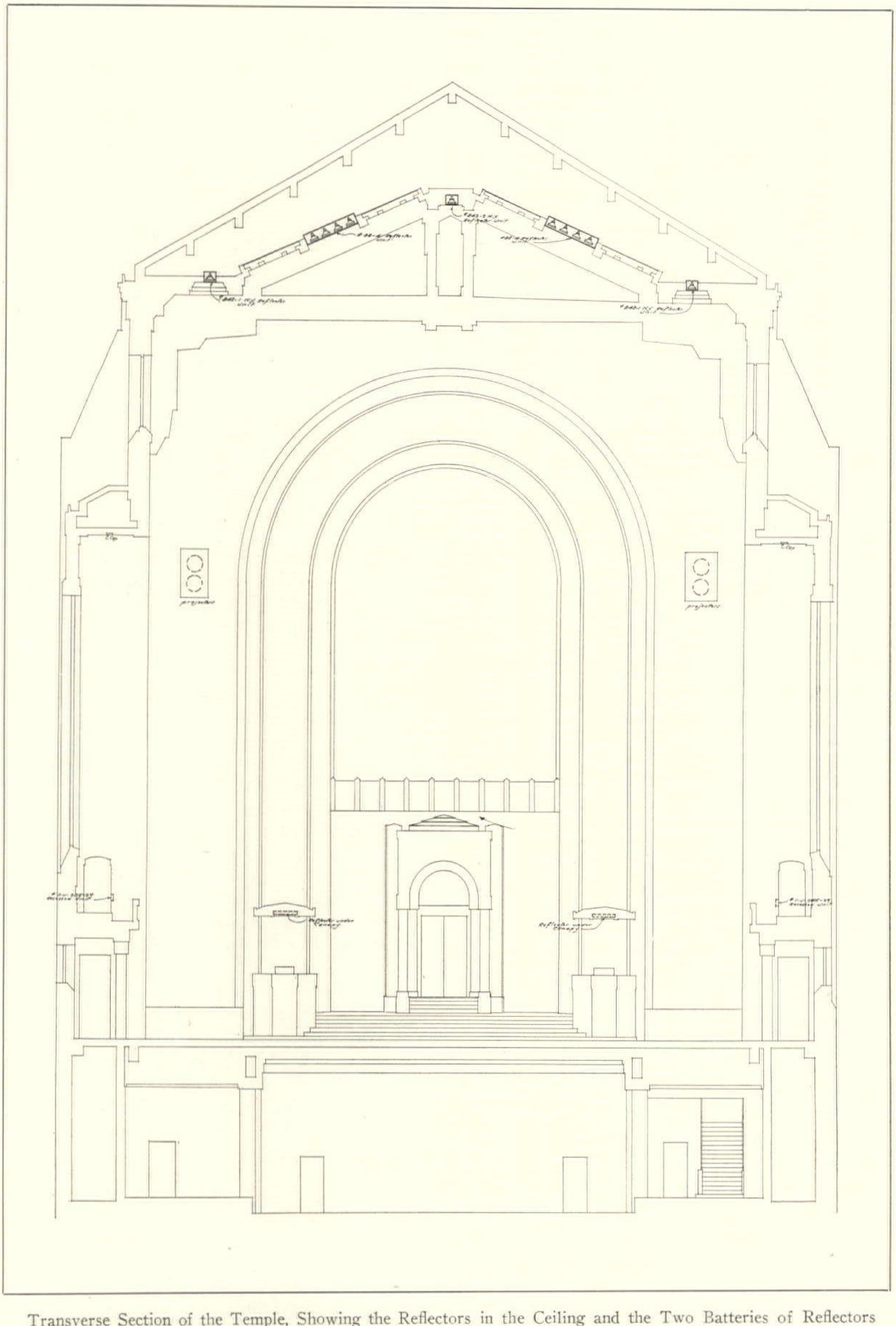
The Chapel. Luminaires for General Lighting and Recessed Reflectors to Illuminate the Sanctuary

It was found that by inclining the lamps in the side units in the transverse direction of the room, there was had a uniformly distributed illumination of between 5 and 6 foot candles on the plane without using the center row of lights. The light sources are more than 100 feet distant from the congregation reading plane. Contrary to expectation, the pews in the side galleries are being used, and to properly illuminate their reading plane it was necessary to change the inclination of the side rows of lights. Removing this amount of light from the center of the floor, it is necessary to use the center row of lights to secure uniform light distribution. This illustrates the flexibility of the installation. The sanctuary lights brilliantly illuminate this focal point of the Temple and develop the magnificence of the wealth of color and exquisite details of the Ark.

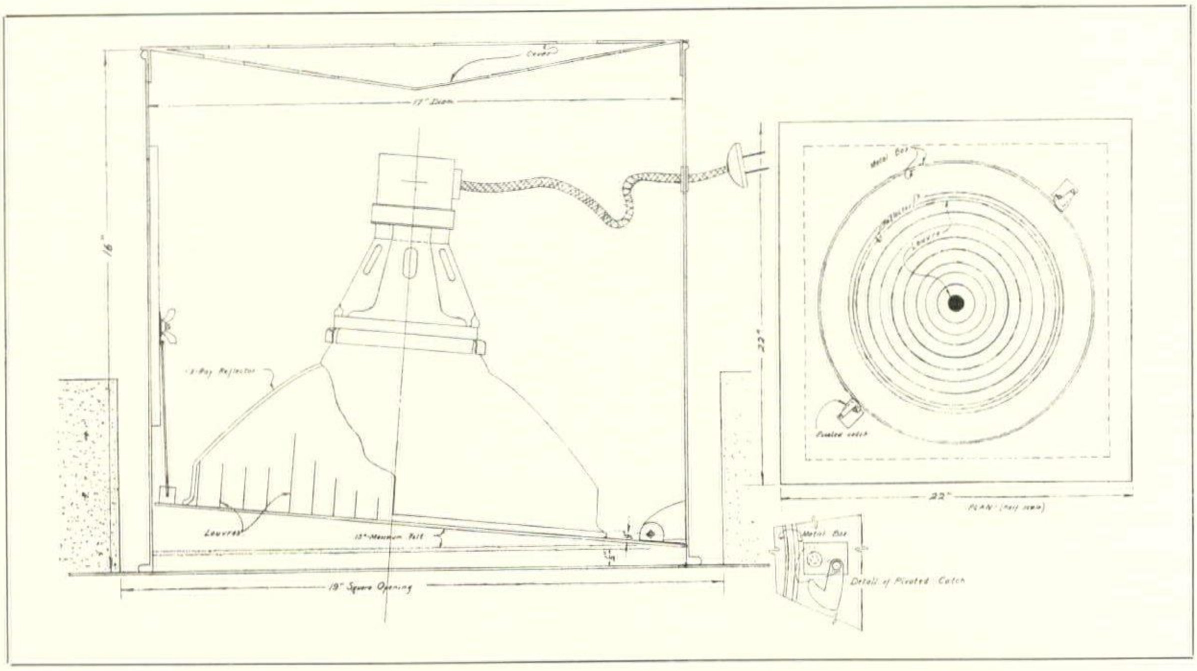
The side rows and the center row of the ceiling



Ceiling Plans of the Temple, Chapel and Community House Auditorium, Showing the Locations of the Lighting Units



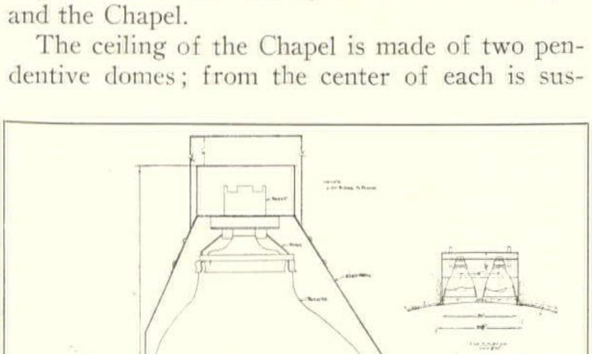
Transverse Section of the Temple, Showing the Reflectors in the Ceiling and the Two Batteries of Reflectors That Illuminate the Sanctuary, and also the Public Speaker System in Front of the Sanctuary



Plan and Section of a Reflector Unit in the Ceiling of the Temple

lights are separately controlled, and of them the three ceiling bays adjacent to the sanctuary and the remaining two bays are on separate circuits. This permits a partial illumination of the Temple when desired. The concealed lights about the Ark are not used. Concealed lights are placed in the canopy over each of the two pulpits. The aisles of the galleries are lighted by recessed wall lights, and the aisles on the main floor by small wall lights. These lights are placed on the backs of the large masonry piers and are unseen by the congregation. The west gallery is lighted by a 12-light louvered border light. Adequate lighting is provided in the choir galleries of the Temple and the Chapel.

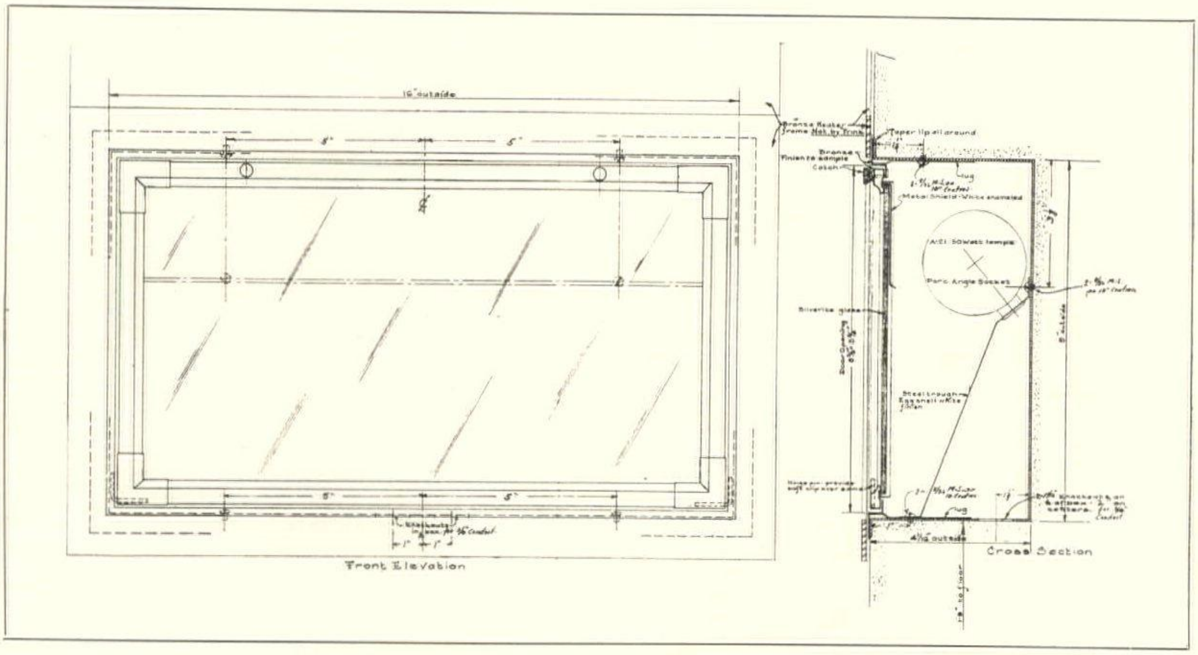
The ceiling of the Chapel is made of two pendentive domes; from the center of each is suspended a luminaire, and a recessed, louvered reflector unit placed in the soffit of the arch illuminates the sanctuary. The Wise Memorial Hall in the basement has a small stage equipped with disappearing footlights, three border lights, and the usual dimmers. The general lighting of the hall is from ceiling and wall luminaires. These are on three circuits which can be controlled from the stage. By cutting out the circuits, a dimmer effect is secured without the use of dimmers.



Section of Lighting Unit with Asymmetrical Reflector for the Chapel Sanctuary

Indirect ceiling lighting is used in the Community House auditorium. Except for a comparatively narrow border, the ceiling is recessed by shallow, concentric offsets, behind the faces of which there are concealed, on the longer east and west sides, rows of lights which brilliantly illuminate the large ceiling panel. From this source sufficient light is reflected to provide adequate intensity of illumination on the reading plane of the seated area. Urns for indirect lighting units are placed on the side walls, but they are not used. The small stage is equipped with disappearing footlights, two border lights, and dimmer apparatus.

The Community House library bookstacks are lighted by partially recessed reflectors and diffusing panels installed in the ceiling of the aisles between the stacks. These lights are controlled by flush wall switches. The rest of the lighting system is of the usual type for the various uses. The switchboards are so designed that great flexibility is provided for controlling the illumination of the larger and more important areas. The Temple has an unbroken floor 77 feet wide and 150 feet long, exclusive of the sanctuary. The ridge

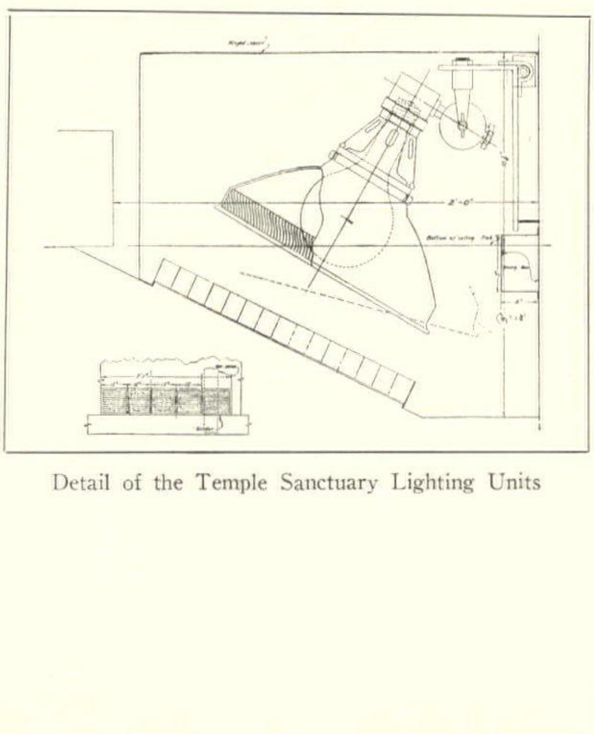


Recessed Lighting Units in Walls of the Side Balconies of the Temple

of the ceiling is 103 feet above the floor. The effect of spaciousness is greatly heightened because the eye is not distracted by the customary large suspended and side wall luminaires. It is a vast space of imposing dimensions, colorful, dignified and filled with diffused light.

A very comprehensive public address system is provided for the local reinforcement of speech from the pulpits and the Arks, and for the music of the choirs and organs of the Temple and the Chapel; from the stage and speakers' tables on either side of the banquet hall; and from the stage of the Community House auditorium. Reproduction is made of speech, and the music of choir and organs to the Temple (2,000 seats), to the Chapel (350 seats), to Community House auditorium (750 seats), and banquet hall (1,600 seats),—in all to 4,700 auditors. The public address units in the Temple are placed high above the pulpits in the wall on both sides and in front of the sanctuary. These units are so deflected that the sound is uniformly distributed over the seated area. The distribution of sound is controlled from a station located in a small room at one side of the west gallery of the Temple, from which the operator can observe the progress of the services. The operator controls the connections between the various transmitters and the public address reproduction units throughout the building. The flexibility of the system was demonstrated by the reproduction in the Temple of the choir and organ music of the Chapel during the funeral services of the late Louis Marshall, before the Temple organ was completed.

The illumination of ecclesiastical buildings has not kept pace with the development of the sources of artificial light. This is due largely to the influence of traditions having their origin in times when the torch and the candle were the only sources of artificial light. These necessarily were placed within easy access and consequently were always visible. The same conditions existed with the use of illuminating gas. Largely through the influence of tradition and custom, the same placement of light sources was retained for electrical illumination. Electrical illumination makes it possible to fill a space with light of pre-determined direction, diffusion, intensity and color. The art of illumination is such that it is possible for architects and illuminating engineers to design a structure and system of illumination that will be in complete accord. The coöperation of both is essential.



Detail of the Temple Sanctuary Lighting Units

A QUESTIONNAIRE FOR CLIENTS

USED BY REGINALD D. JOHNSON, ARCHITECT

ONE of the many difficulties encountered by the architect is that of obtaining prompt decisions from the client.

Reginald D. Johnson, of California, has had no little success in persuading clients to make prompt decisions by using a questionnaire that covers many of the items that the owner is likely to forget. It is very easy for the owner to read the item, consider the architect's suggestion, and merely put his O.K. in the column "Owner's Decisions." The architect then has a definite, written record of the owner's desires and can proceed accordingly. Should misunderstandings arise, the architect has the written record that saves what might be an unpleasant situation.

In THE ARCHITECTURAL FORUM for September, 1928, a check list was published that covered the major items which should be considered by the architect and the client in consultation when considering country houses. The editors of THE ARCHITECTURAL FORUM would be glad to receive check lists that have been developed and used successfully by other architects.

Mr. Johnson's questionnaire includes many items of special equipment not listed in that previously published. The full list of items included in Mr. Johnson's questionnaire runs,—

1. Public phone locations.
2. Inter-communicating phones (combination with public phone or independent?).
3. Push-button and annunciator system (give locations of annunciators).
4. Burglar lights on master switch (exterior at eaves and in main first floor rooms).
5. Refrigerator—type and make.
6. Plate warmer.
7. Dishwasher.
8. Electric range—present—future.
9. Electric heaters in baths (state which bathrooms).
10. Floor covering in kitchens and pantry (linoleum, linotile or rubber tile).
11. Floor and wainscot in baths (tile, marble, terrazzo).
12. Flooring—broad and narrow oak; V-joints, plain joints; width—random, plugged.
13. Room finishes—wood; texture plaster or to be papered.
14. Cedar closets.
15. Jewel safe.
16. Fur safe.
17. Drain boards—tile or mahogany?
18. Countertops—tile or mahogany?
19. Special mantels, to be selected by architect and owner.
20. Mirror doors in bedrooms.
21. Clothes chute.
22. Incinerator—in house or outside house.
23. Laundry equipment.
24. Plumbing fixtures (colored).
25. Plumbing fittings (finish).
26. Showers over bathtubs (state which tubs).
27. Sound deadening.
28. Type of heating.
29. Fire protection (hose racks).
30. Type of sash adjusters, windows opening out.

RESIDENCE FOR MR. ....

REGINALD D. JOHNSON, ARCHITECT
LOS ANGELES, CALIFORNIA

QUESTIONNAIRE FOR OWNER

In developing the working drawings for your house, it will be necessary for us to have your decision on the following items.

Would you kindly fill out the Questionnaire as far as possible, and we will take up at our next conference the items upon which you have not made your decision.

	ITEM	ARCHITECT'S SUGGESTIONS	OWNER'S DECISIONS
1	Public phone locations		
2	Intercommunicating phones (combination with public phone or independent?)		
3	Push button & annunciator system (give location of annunciators)		

Fac-simile of a Portion of the Questionnaire used by Reginald D. Johnson. The Original is 8½ x 11 Inches

FIRE INSURANCE AND THE ARCHITECT

BY

HARRY B. KUSCH

ONE popular way of increasing profits from a building is to reduce operating expenses. Curtailing the efficiency of a building's service, however, makes it difficult to rent space and to retain tenants in a building, and this, of course, is poor economy. Therefore, every item of expense must be carefully scrutinized to determine those features which may with safety be eliminated.

The cost of fire insurance, while distinctly an item of considerable expense, bears no tangible relationship to the matter of building service, yet, too often the charge for fire insurance is regarded in the light of a fixed charge, on which time would be wasted if any serious effort were expended in obtaining a reduction. Modern building practice dictates, however, that such matters be analyzed with scientific scrutiny, and experience proves that it pays to do so. For instance, a low rate for fire insurance provides a good sales argument for renting space or selling property. On the other hand, it is known that good deals have been lost on account of high insurance rates. By giving serious attention to this subject, owners may profit directly every year through the saving effected, and indirectly, securing a low rate for fire insurance may be a means of attracting new tenants, keeping present tenants, or making a profitable sale of the building by the owner.

New York Life Insurance Building, New York. Cass Gilbert, Architect

A surprising percentage of existing buildings have, from a fire insurance rating point of view, deficiencies in construction for which they are being annually penalized. In most cases such deficiencies may be remedied, but as the cost of the remedy often far exceeds the amount of reduction to be secured, expenditures for the purpose are not as a rule advisable. New construction, however, presents distinct possibilities in this respect, if proper precaution is taken at the right time. Common errors can be avoided at little or no additional cost during the planning stages, and thus the owner may be assured of a minimum rate when the building is completed. It is evident from the charges applying to many existing buildings that little, if any, attention was given to the fire insurance rate feature during their construction periods. Consequently, owners now keep paying for somebody's carelessness or oversight in the past.

With the tendency today toward building larger and higher structures, a great number of which involve many millions of dollars each, it has become increasingly important to secure the lowest rate obtainable for fire insurance, because a difference of a few cents per hundred for such necessary protection may amount to many thousands of dollars every year. There are already many buildings in New York whose cost has exceeded $10,000,000. The proposed 80-story skyscraper to take the place of the old Waldorf-Astoria Hotel at Fifth Avenue and 34th Street is expected to cost $40,000,000. A saving of $.01 per hundred for fire insurance in this instance, would amount to $4,000 for each year of the building's existence.

A recently built structure in the midtown section of New York may be cited as a striking example as to just how much money can be needlessly wasted in this direction. The building in question, when completed, was confronted with a rate of $.417-1% per hundred per year for fire insurance protection. This rate is about five times the minimum charge that could have been obtained by proper compliance with the rules and regulations governing construction of this type. Approximately $8,000,000 of fire insurance is involved, and over a 20-year period the excess cost is more than a half million dollars. This figure does not include the excess cost of insuring the contents, which is also affected. It will even yet be a paying proposition to comply with some of the recommendations of the Fire Insurance Rating Bureau, and steps are now being taken to reduce this charge. Before the last mechanic engaged in the erection of this magnificent structure has left the premises, it becomes necessary to make changes from basement to tower, at a cost far greater than would have been the original cost of incorporating these features in process of erection.

On the other hand, the New York Life Insurance Company received a rate of $.053-1% per hundred for their new building on Madison Avenue, between 26th and 27th Streets, New York. Such a rate is within $.006 of the lowest rate obtainable for an office building in New York, and it indicates what may be accomplished by coöperation and careful planning. The New York Life Building is one of the few structures of its size, completed in recent years, that enjoys the distinction of having been granted almost the lowest possible rate. In discussing this accomplishment, one of the New York Life Insurance Company's officials, who served on the building committee, said: "We put in a great deal of time and effort with our insurance experts, going over the numerous details of construction, to determine the advantages of complying with the requirements for a low fire insurance rate, and in every instance we found that any additional cost was more than offset by the savings to be made. Aside from the monetary consideration, we concluded that these features were highly desirable in making our building as safe as possible for the thousands of New York Life employes and the other occupants of the building."

No two buildings are alike, and therefore, every new project constitutes a rating problem in itself. Detailed advice and analysis of plans require an intimate knowledge and experience in such work. To obtain the best results, the sponsors of a new building should secure the coöperation of a fire insurance rating specialist just as they would naturally enlist the services of an architect, builder, consulting engineer, and building manager for the other phases involved in the erection of a well built structure that is to be financially successful.

The class of occupancy is also a factor in maintaining a low fire insurance rate. For instance, the Fire Insurance Rating Bureau permits certain classes of mercantile tenants, under stipulated limitations, to be introduced in a building rated as "pure office occupancy," without an increase in rate. In addition to "pure office occupancy" there are also four grades of "partial office occupancy ratings." Before considering the application of a prospective tenant, the matter of the business to be conducted should be investigated, and the rate specialist consulted to determine what effect, if any, such occupancy might have on the present fire insurance rate. It does not necessarily follow that the applicant must be refused space in the building if the occupancy should cause an increase, for it may be possible to adjust the difference by an increased rental, or the prospect may offer to pay the additional cost for the insurance on the building.

Then again, from time to time, it becomes necessary to make structural changes to provide extraordinary accommodations to meet the requirements of some tenants, such as private stairways between floors, private elevators, the breaking of a fire wall to open an entrance into additional space, or the segregation of something constituting a special hazard. In all cases of this nature, the fire insurance specialist should coöperate with the architect in making the changes, as it is possible to secure these alterations without increasing the cost of fire insurance, provided that the work is done in a standard and approved manner.

Thus it is apparent that from the time the preliminary plans are drawn, and throughout the life of a building, fire insurance rating is a factor of consequence, and an owner who expects to produce the best financial results cannot afford to treat lightly such an important matter as securing the lowest possible fire insurance rate. Securing a low rate for fire insurance is within the reach of every owner planning the erection of a building, and it may still be open to owners of some existing structures. The architect should profit by obtaining expert advice that will enable him to so plan the building and specify the materials that will give the owner the benefit of a low insurance rate for his building.

EDITOR'S NOTE: *The insurance rates are based on so many factors of construction, equipment, plan and location of a building that it is obviously impossible to prepare an article that will tell definitely how to construct and equip a building to obtain the lowest insurance rate. Mr. Kusch, of Cushman & Wakefield, Inc., has indicated in this article the necessity of considering fire insurance and the benefits to be derived.*

TALL BUILDING EGRESS

BY

A. T. NORTH

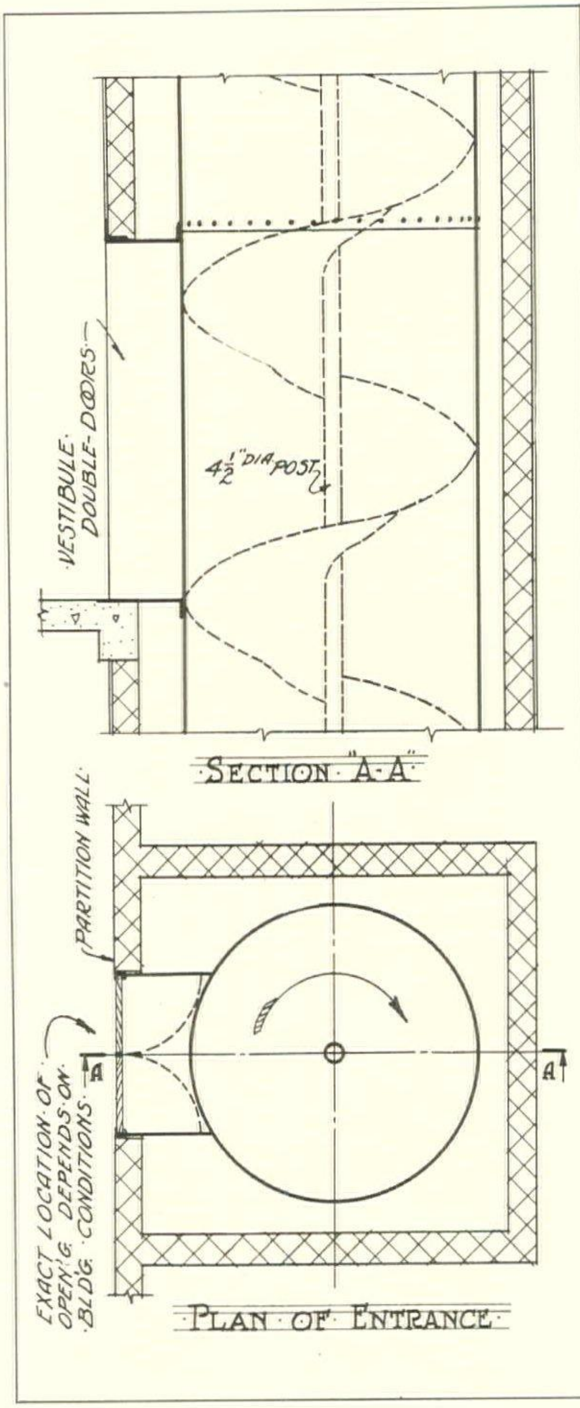
WHAT are safe means of egress from a 50- or a 100-story building? Such building heights have necessitated radical changes in the means of heating, plumbing, fire protection and elevatoring which have proved to be satisfactory. Egress, however, appears to be limited to the use of the elevator, stairways and fire escapes in the opinion of many. Others frankly say that "the consensus of opinion seems to be that it will not be practicable to even attempt to evacuate completely a large building of 50 stories or more in case of fire emergency. . . . There are of course conceivable emergencies in which an entire building might be involved, even a building of the best modern type of construction. There is not very much that can be done to cover such a case. However, the probability of any such emergency arising is doubtless remote, and as a practical matter safety can usually be assured by providing some means of escape for the occupants from the immediate area of the fire. We do not expect that in case of fire everyone will rush to the stairway and descend to the street. What is much more likely to happen is that people will use the stairs to reach a point, say two stories below the point of origin of the fire, where they will be safe at least for the time being and may then leave the building in a more leisurely manner. It is on this account that the horizontal and vertical subdivisions of a building are of primary importance in the case of very high structures."

This statement seems to be an avoidance based on a rationalization. Undoubtedly it is impracticable "to evacuate completely a large building of 50 stories or more in case of a fire emergency" because the means of egress in common use are either inadequate or of doubtful effectiveness. The stairway is inadequate because of the physical inability of the great majority of human beings to negotiate the descent of that number of stories, —or one half that number in fact,—even under normal conditions. A recent test was made by three men in descending from the 50th floor of the Woolworth Building by stairway under normal conditions. The descent was made in 6 minutes; 6 minutes, 10 seconds; and 8 minutes, 25 seconds. The time consumed in descending was not the important factor,—it was, rather, the physical effect upon the three men. Very noticeable distress was experienced by all of them after descending from 20 to 25 stories. Movement became of a reflex nature entirely, and it was continued painfully by means of mental concentration. They arrived at the ground floor in a distressful state of vertigo and muscular exhaustion and were practically incapable of further movement. Two of these men are expert tennis players, and the third is a man of athletic habits. It was intended to have a group of 40 selected persons make a similar trip, but it was decided to be inadvisable to assume the risks of fatality. The impracticability of using stairways as a means of egress from tall buildings, especially under panic conditions, is acknowledged quite generally.

The effectiveness of the elevator as a means of egress under panic conditions is questioned and, perhaps, due credit is withheld. The effective performance of the elevator operator is subject to what is termed the "personal factor." Press reports, however, frequently record the performance of elevator operators who remove persons from fire zones in perfect safety,—the record is commendable. The power and motive parts of the equipment can be adequately protected from fire for a reasonable period of time. The shafts and cabs can be made practically smoke-proof. By the time the elevator guides became distorted by heat, all of the occupants would be out or dead; elevator guides could be distorted by earthquake shocks of severe intensity and outside electric current could be discontinued. In any event, a severe earthquake shock would cause panic conditions. The exterior fire escape is by common consent considered useless as a means of egress from even moderately tall buildings.

The recent fire in the 11-story Hotel Marguery, New York, was confined to the storage rooms in the basement and sub-basement. The firemen shut off the electrical supply, throwing the building into darkness and stopping the elevators. The building was filled with smoke from the elevator shafts, and the car operator was suffocated. One guest suffered a fatal heart attack induced by descending ten flights of stairs. The actual fire was confined to the basement. A separate electrical supply to the elevators would have permitted their operation with the other electrical services cut out. The use of the elevator shafts by firemen to free basements from smoke precludes the use of elevators as means of egress unless the elevator shafts are made smoke-proof and separate ventilating shafts provided. With a differently arranged elevator plant and ventilating shafts, the occupants in this case could have escaped safely and comfortably and two needless fatalities could have been avoided.

The avoidance of definitely providing an ac-



Details of a Typical Spiral Slide Escape

ceptable and safe means of egress is justified by a rationalization based on an assumption that is questioned by many. It is assumed that the occupants of tall structures are sufficiently intelligent to understand the inherent qualities of fire-resistive buildings to the extent that they will be panic-proof when confronted with fire, smoke and gas, or earthquake shock. Is it a reasonable assumption that "people will use the stairs to reach a point below the point of origin of the fire, where they will be safe at least for the time being and may then leave the building in a more leisurely manner?" Suppose a fire originates on the 25th floor,—will the occupants of the 50th floor remain calmly in their places until the fire is extinguished, or will they attempt to leave the building at once? If they do attempt to leave at once, what would be their physical and mental condition when they had descended by the stairs to the place of origin of the fire and still have 25 stories more to go?

The users of subway trains in New York should be sufficiently intelligent to know that the cars are made of incombustible steel except the cane covering of the seats. Recently, a subway train was stopped a short distance from the entrance to the tunnel under the East River for the motorman to report the burning of the insulation of an electrical connection on the opposite track. There was no danger whatever, and yet the passengers became panic-stricken when the acrid smoke of the burning insulation entered the cars. Several scores of casualties resulted. Fortunately, the performance of the occupants of high buildings under fire conditions is not known. The disastrous results of inadequate or obstructed stairway exits in comparatively low buildings are known. The inevitable physical collapse of a few persons on a stairway would be an effective obstruction, and fatalities would result from trampling if not from asphyxiation.

A logical and effective solution of the problem might be found by developing a means of egress based on the principle that the most economical, easiest and quickest means of transportation from an upper to a lower level is secured by utilizing the force of gravity. If this force can be employed with safety and without physical effort by the person, an ideal situation results. The force of gravity has been utilized in gravity slides used to transport materials and merchandise from upper to lower levels. The most delicate and fragile articles, properly packed, are transported in this manner without damage. The distance of vertical travel does not complicate the problem.

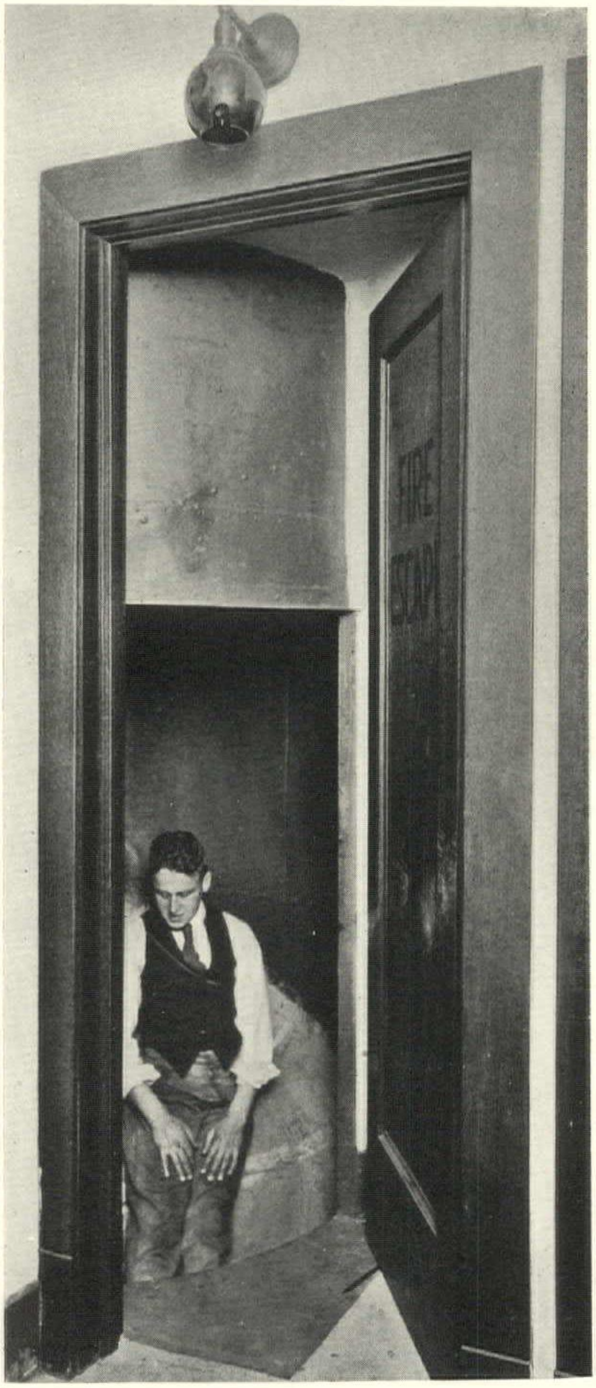
A means of transporting human beings vertically from upper to lower levels by gravity has been in successful use for several years, principally in the central states. The apparatus, known as spiral slide escapes, consists of a spiral surface placed in a cylindrical enclosure 5 feet in diameter. The spiral surface is so dished that the body of the passenger remains in an upright position when seated and does not come in contact with the wall of the enclosure. The spiral slide is entered through a narrow door at each floor level, the passenger assuming a seated position. The gradient of the spiral is designed as a function of the frictional resistance of the movement of the person, so that descent is made without undue acceleration. At the bottom the speed is retarded so that a person emerges easily at chair height from the floor. Placed in a fire tower, the slide should be free from smoke and gas. The passengers move at a uniform rate of speed, and there is no possibility of obstruction or interference one with the others.

An investigation of the practicability of this means of egress has been made. The inquiries were directed either to the architects or managers of the buildings. A prominent architect reports on an installation in an 18-story office building that he has "made personal use of spiral slide escapes and am confident in case of fire I would fight my way to the one spiral chute even if the building were equipped with outside fire escapes and stairways. I would know that in several minutes or thereabouts I would be safe on the ground or in a fireproof passage leading direct to safety. The height of the building would have no bearing on my decision. I would use the chute whether the building were five or 50 stories high."

The building manager of a 20-story office building, designed by one of the largest architectural organizations in this country, says that "the spiral escape is cleaned periodically by sending down bags of sand and by porters riding on mats. They have never complained of dizziness; in fact, they seem to enjoy the experience. The descent from the 20th to the first floor in one stretch by stairways would be a rather trying experience for the majority of our tenants. It gives us a feeling of safety to know that in an emergency we can put our people into the spiral slide, whether they go voluntarily or involuntarily, and get them to the street." The architect of a ten-story apartment building installed three stairways and one spiral escape. He reports that "the only objection we have found to the spiral escape is that it is a great temptation to boys, as it is great fun for the youngsters to go down the slide."

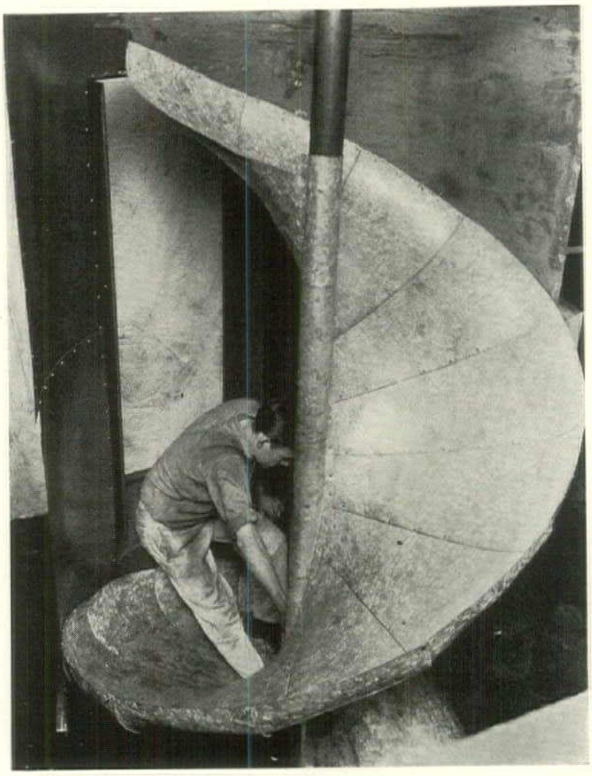
The builder and designer of a large grain elevator installed a spiral escape about 190 feet high. He says that no objection has been raised to its use and that he went down the escape shortly after it was installed and noted no particular effects, and that there was very little acceleration. The manager of an orthopedic sanitarium reports that two spiral slides were installed in 1893. They have periodical fire drills, and the patients who cannot walk when they come to be treated will crawl on their hands and knees to the escape and slide down without being affected by vertigo or dizziness.

Spiral merchandise chutes in New York loft buildings are built for speed. Persons who ride down these chutes from as high as the 37th story suffer no ill effects. It is reasonable to assume that the specially designed lower speed passenger spiral will afford egress from much greater heights without discomfort. There are installed in hospitals special spirals of sufficient width to accommodate bed-ridden patients who ride down on mattresses in safety and comfort.



Position of Man Descending a Spiral Slide Escape

With stories of ordinary office building height, an intermediate spiral can be introduced and double the capacity of the apparatus. The distance between the spirals is one half the story height and allows sufficient headroom for entrance. For an 80-story building one cylinder can



Mechanic Erecting a Spiral Slide Escape

extend up to the top floor. Entrances can be made from the 61st to the 80th floors inclusive,—20 stories,—and with no more access doors down to the first floor. On the opposite side of the cylinder provide entrances from the 41st to the 60th floor inclusive,—20 stories,—and no more access doors down to the first floor. Another cylinder can be erected up to the 40th floor, serving the 21st to the 40th floor inclusive, and the intermediate spiral serving the second to the 20th floor inclusive. By this arrangement, each zone of the building height would have its exclusive means of egress with no possibility of congestion. The two cylinders can be installed in the space that is ordinarily occupied by one stairway, and still leave ample room in the corners for utility pipes. The cylinders can be supported at each floor level and made of light weight metal.

Opposition to the use of gravity slide conveyors as a means of egress appears to be confined to those who have never seen or used one. A well known student of the egress problem is quoted: "It may be, that, taking into account the well known fact that people in fire-resistive buildings do not get panicky about a fire which has broken out below, it might be safe to increase this number of per capita per stair unit appreciably, and that of course would be a solution of the problem of not having too many stairs. Regarding spiral chutes, I am of the opinion that it would be very undesirable to consider installing a 30- or 40- or 50-story spiral chute, no matter what the character of the material may be. I doubt whether people would want to take a chance on them, and I also wonder whether the friction would not actually cause serious burns if continued over a preceptible length of time. I am clearly of the opinion that spiral chutes ought not to be used in very high buildings, and that there is even a doubt as to whether they are of general value. For institutional buildings of certain types and for schools, they may be satisfactory, but I doubt whether we could get a miscellaneous occupancy of an office building to dive head first into such chutes in the hope of reaching the ground in safety."

It has not been found in this investigation that "it is a well known fact that people in fire-resistive buildings do not get panicky about any fire which has broken out below." The performance of office building or hotel occupants under such conditions is practically unknown, and it might be disastrous to plan according to such an assumption. Frictional burns are not experienced in spiral slides approximately 200 feet high, and with the comparatively slow motion of the passenger there is little probability of injury in higher slides. To anyone who has used these slides, it is hard to believe that a person could or would "dive head first" into one, even if panic-stricken.

Among the factors involved in the problem of a safe means of egress are:

1. Effectiveness of the exterior fire escape.
2. Effectiveness of the interior stairway.
3. Effectiveness of the elevator.
4. Effectiveness of the gravity slide.

The exterior fire escape and the interior stairway are admitted to be practically useless in high buildings because of the physical and mental incapacity of human beings to use them. The elevator as now constructed is undependable. The gravity spiral is in successful use up to considerable heights. The factor of fire panic is unknown, but the reasonable presumption is that panic is an inevitable result of the presence of fire and smoke, regardless of the construction of buildings. The vast majority of people are not construction conscious.

New York and Chicago are both revising their antiquated building codes, and it is to be hoped that they will not, in the matter of safe egress, set the example of avoidance and rationalization based upon theoretical assumptions. The problem can be solved only with an open mind free from prejudice, fear and ignorance. It does challenge the best abilities, and it is unthinkable that it should remain in its present inadequate condition.

FINANCING THE LARGE BUILDING PROJECT

PART II

BY

ALTON L. WELLS

THE financing of a building project has this in common with the building operation itself, —if the foundation is solid, there need be little concern about erecting the superstructure. The facts and figures which appear in the set-up of a building enterprise constitute its financial foundation. If this indicates a solid business basis for the undertaking, there should be little difficulty in erecting thereon a safe financial structure. But buildings are not erected haphazardly, even on solid foundations. And so it is with financing. Before seeking the banker and his money, a definite financial plan must be formulated. What this plan shall be depends upon the particular project under consideration. There is no hard and fast rule capable of general application. A careful analysis of the specific enterprise will reveal its financial needs. Then the plan must be built to care for them.

PLANNING THE FINANCING

To devise a general plan for financing is a comparatively simple matter, but to refine that plan through the addition of carefully thought out details and to adapt it to the requirements of a particular project is not so easy. A glance at the chart on page 286 will show that all building financing falls into three general divisions: Primary Financing, Secondary Financing, and Equity Investment Financing. The methods employed for obtaining these various types of financing differ, interest rates vary, and financing costs in the several divisions fluctuate widely. An institutional first mortgage may be obtainable at a cost of 2 per cent, while equity funds may cost from 15 to 20 per cent, or even more. Primary financing may be had with comparative ease, while equity funds may be secured, possibly, only after long and persistent effort. The generally accepted limits of the amounts obtainable in these divisions of building financing are: first mortgage financing, from 50 to 66 2/3 per cent of the total cost of the project, according to whether an institutional first mortgage or a bond issue loan is used; secondary financing, together with the money raised on first mortgage, usually provides funds totaling from 75 to 85 per cent of the cost, while equity investment takes care of the remainder of from 15 to 25 per cent.

To quickly ascertain just what funds will be needed, write down the amount of the total cost of the proposed building operation, including cost of land and building, financing charges, carrying costs during construction, and other essential items. Underneath this figure draw three columns marked "Primary Financing," "Secondary Financing," and "Equity Investment." Jot down in these columns whatever amounts have been definitely arranged for. Then estimate the balance that will be needed to cover 100 per cent of the cost, and place in each column the proportionate amount of the balance that sound judgment indicates should be raised in that division.

To illustrate this method of procedure, as well as some other factors that enter into the making of a financial plan, take the concrete example of a building operation whose cost is estimated at $2,400,000. The principal, a substantial business man, has $400,000 in cash. The bond market is readily absorbing first mortgage bond issues. What financial plan shall be devised? Because of the favorable condition of the bond market it is decided that a first mortgage bond issue of 66 2/3 per cent can be obtained. The figures in the columns then show $400,000 under Equity Investment and $1,600,000 under Primary Financing. Because of the large size of the first mortgage loan, and due to the fact that this loan carries a fairly heavy amortization schedule, it is determined not to seek an excessive amount of secondary financing. The figure finally placed in this column is $320,000 which, with the Primary Financing constitutes 80 per cent of the total cost of the enterprise. There is still a shortage of $80,000, which upon consideration the principal is asked to raise in order to make the proposal to the banker as attractive as possible. This the principal accomplishes by arranging with the owner of the building site to re-invest $80,000 of his purchase price funds in the new enterprise on a share-in-the-profits basis.

Or again, assume the same amount of total cost, or $2,400,000, but somewhat different circumstances. The project is one of merit, but the principal has but $150,000 in cash, and the bond market is stagnant. What plan now? Investigation shows that an institutional loan for 50 per cent of the cost probably can be secured, without amortization payments, with low interest charges, and for a comparatively small financing cost. Granting that this loan can be obtained, the figures in the columns will show $150,000 under Equity Investment, and $1,200,000 under Primary Financing. Because the first mortgage represents but 50 per cent of the cost of the project and because its terms impose no amortization payments, it is judged that a straight second mortgage for $600,000 can be obtained, inasmuch as a liberal amortization schedule can be promised without imposing hardship on the project in the way of heavy fixed charges. Accordingly $600,000 is placed in the Secondary Financing column. However, there is still lacking $450,000 of Equity Investment money. How shall this be raised? The project is so sound and the proposed financing plan so favorable that decision is made to form a syndicate whose members will provide the remainder of the equity funds. Three other men join the original principal, each subscribing $150,000 to the equity funds.

From these simple examples it is apparent that many important features must be considered in the making of the financial plan besides the elementary arithmetic which appears in the columns of our general estimate. For instance, attention must be given to such matters as the condition of the money market; the amount of money required by the principal; the type of building to be financed; whether the property is to be built for sale or held for investment, *et cetera*. If the money market is such that interest rates are high but indications are that lower interest charges will prevail at a later date, short-term financing will probably be sought in the expectation of effecting a substantial saving in fixed charges by re-financing under more favorable conditions. If the owner is able to provide the cost of the undertaking above an amount that can be obtained on a conservative first mortgage, an institutional loan will be decided upon in preference to the more expensive method of a bond issue. Obviously, different plans of financing will be formulated for an office building, a theater, or an industrial plant. If an owner is building for sale, he will want a method of financing that calls for low enough fixed charges to make the net income from the property attractive to a prospective purchaser. If the same building were to be erected for his personal investment, the owner would probably be willing that larger amortization payments be provided for on the assumption that such payments would reduce the amount of his loan more quickly and thereby decrease his interest costs. A speculator would probably desire to borrow as large a sum as he could in order to conserve his working capital. An investor, on the contrary, would no doubt wish to borrow as little as possible in order to reduce his interest payments.

In addition to these matters, which vary somewhat with the circumstances surrounding the particular project to be financed, there are certain other points that should be carefully considered in the laying out of every financial plan. Among the more important of these are:

1. The Cost of Obtaining Funds. In his anxiety to consummate a deal, a principal may consent to loan charges or discounts on bond issues that will make the cost of his money a lasting burden on his enterprise. Beyond a certain point it is wiser to abandon a project than to pay excessive fees.

2. High Interest Charges on Long-term Loans. Loans are often negotiated for a long period of years at a time when interest rates are abnormally high. Care should be taken to see that such loans may be called for payment, prior to maturity, and that the penalty charge involved is not too high.

3. Construction Loans and Short-term Financing. Funds which must be repaid in a short time should not be accepted without some definite assurance that permanent financing can be secured, for a similar or greater amount, prior to the maturity of the temporary loans. Short-term financing also involves considerable added cost in the way of renewal or re-financing charges.

4. Adequate Net Income. Before accepting any financial plan, a borrower should be *certain* that the net income from his project is ample to cover every obligation that such financing will impose upon him. It is much easier to rearrange a financing plan to conform to net income at the time the funds are obtained than it is to attempt to increase net income to meet the requirements of over-burdensome financing after it is once placed.

5. Too Early Amortization Payments. Most properties require considerable time to attain their full earning capacity. Making too early amortization payments should be carefully avoided. Often loan terms provide that no amortization shall take place until three years after the date of the loan. Sometimes a graduated schedule of amortization payments is used.

A sound financial plan, once formulated, gives the prospective borrower some evident advantages when he starts out to raise his money. He knows the exact amount of money to be raised, and about how much of the total amount must be secured in each of the three divisions of financing just enumerated. Furthermore, when he approaches a banker for funds, his financial plan provides a definite basis for negotiation. This not only impresses the banker with the fact that the borrower knows what he is talking about but it helps the banker to render a speedier decision.

LOCATING FUNDS

Instances are rare where a borrower gets his funds from the first banker with whom he talks. Money must be found, and that implies searching for it. Loans for large building projects are much more difficult to obtain than loans for small operations, because sources which can handle a loan of a million dollars, or perhaps several millions, are much fewer than financial concerns or individuals who can lend a few thousands. Success in finding financial help, as in other lines of difficult endeavor, is greatly facilitated by organized effort and preparation. An experienced financial agent, in search of funds, could probably secure as much information about loan sources in a few hours with his files and records and with the telephone as a novice would be able to gather in weeks.

Card Index Records. There is no reason, however, why any architect cannot install a simple system in his office that will provide the information needed to speed up the work of financing large building enterprises. A 4 x 6 card index and a drawer in a filing cabinet, for clippings, correspondence, and circular material are the only equipment needed. Each card in the index should contain the name of a loan source, and on the card should be recorded such information as the name of the lender, his address and telephone number and, if the lender is a company, the name of the official with whom loan business is usually transacted. Other pertinent facts to be noted are the types of buildings on which loans are made (whether office buildings, apartment houses, theaters, etc.); brief data regarding actual loans, indicating when and to whom made, interest rates, and maturity dates; and any needed references to advertising matter or correspondence that may have been placed in the "Loan Source" file.

Card records should be kept up to date, and they should be classified and filed according to the type of financing that the lender is in the habit of handling. For this purpose such guide cards should be used as "First Mortgage Loans," "First Mortgage Loans, Institutional," "First Mortgage Loans, Bond Issues," "First Mortgage Loans, Office Buildings Only," "Secondary Financing," "Prospects for Syndicates," *et cetera*. The list of titles given is by way of suggestion only. A much more complete index may be used. Cross indexing is often resorted to in order to make the records more detailed and helpful.

Preparation of the card index and the filing system is not nearly so difficult as the problem of gathering information that will make the system of real value. This takes time and much painstaking effort, and some suggestions may prove helpful. In the first place, practically all large first mortgage loans come from one of these sources; insurance companies (principally life insurance companies); mortgage companies; investment banking houses; banks and trust companies. Secondary financing in large amounts is confined pretty much to investment banking houses, mortgage companies, and finance companies. Occasionally trust companies and sometimes large building organizations make this type of loans. Equity financing is done mostly by individuals, syndicates, real estate corporations, and large real estate operating companies. Search for data concerning large loan sources may, therefore, be confined largely to these fields.

Obtaining Data. Much helpful information can be obtained from books and directories. A very complete list of investment banking houses is published in New York. Likewise, a directory of insurance companies, published annually, shows what companies invest largely in mortgages. In compiling data regarding insurance companies, care should be taken to ascertain whether the company takes large mortgages, inasmuch as many insurance companies confine their loans to small amounts. Mortgage companies of a size sufficiently large to provide funds in the amounts desired are located chiefly in the larger cities of the country. By consulting the classified sections of the telephone directories of such cities, lists may be obtained. Inquiry, by letter or telephone, will reveal what companies make loans of large amounts. Banks and trust companies confine their lending operations, in nearly all instances, to the territory immediately surrounding the cities in which they are located. The bankers' directory will show the financial resources of the various financial institutions. Only banks and trust companies with large assets are in a position to make loans of any great size.

Other methods of collecting data are: (1) An examination of the financial pages of the large metropolitan daily newspapers of such financial centers as New York, Chicago, and Philadelphia. Advertisements of financial institutions making large loans are appearing constantly in such papers. Then, too, practically all of the large real estate issues put out by investment banking houses are advertised in the financial columns of these journals. These advertisements should be clipped and put in the "Loan Source" file, and the information contained therein briefly noted on the index cards. (2) Personal investigation. It is surprising how much information can be obtained in a day of intensive work in a city like New York, Philadelphia or Chicago. A call on the secretary of the local real estate board; visits to the offices of large builders; and interviews with well informed bankers and other persons familiar with the building and real estate fields, will yield an astonishing amount of first hand, valuable information as to possible loan sources. A large personal acquaintance among people of this type is a distinct asset.

An examination of the index and file system, after it is well under way, will show that nearly every loan source has certain decided preferences. Many investment banking houses never handle real estate issues. Time spent with them is wasted. Other houses handle only first mortgage issues, while still others handle both primary and secondary financing. Often, too, a loan source will have taken all the loans that it can handle for the time being, but will indicate that it will be in the market at a later date. All these facts still further emphasize the value of possessing an adequate knowledge of loan sources before starting out on a search for funds.

Probably no information system has yet been devised that is entirely satisfactory when it comes to locating sources of equity money. Securing this money is the most difficult problem to solve in building financing. If the principal has not sufficient equity money himself, the most logical prospects are friends of his who may be willing to join him in the enterprise. Other possible sources of financial aid are the owner of the site of the proposed building, the contractor who is to construct the building, and sometimes the architect. If these sources fail, then resort may be had to a blind search among local capitalists. Or some local security house may be willing to undertake the sale of an issue of ownership stock. In nine cases out of ten, a large portion of the equity money must be raised in the city in which the building is to be located.

It should be remembered, when seeking financial aid, that success in locating funds is very largely a matter of tenacity of purpose. If the project to be financed has real merit, there is nearly always somebody, somewhere, who will be attracted by it. This source of funds can be found usually if sufficient energy is applied and a diligent search made.

LOAN NEGOTIATIONS

The first thing in negotiating a loan is to determine with whom negotiations shall be started. It is, of course, desirable to try and locate the correct source as speedily as possible. There are two reasons for this,—first the saving in time, and secondly, if a loan is presented in too many places, it quickly gets the name of being "peddled," which makes succeeding negotiations increasingly difficult because few financial houses desire to consider a loan that other responsible houses have rejected When a loan is to be obtained, a careful search of the office index and file will probably result in the listing of a number of sources that are likely prospects for the type of loan being sought. These prospects should be noted in the order in which it is estimated there is the best chance of successful negotiations resulting. Only one prospect should be approached at a time. News travels very quickly in financial circles, and if it is discovered by a financial house that other firms have been approached simultaneously for the same financing, the result is likely to be that all of the sources involved will refuse to consider the loan.

The process of negotiation may be expedited considerably, however, in another manner, and that without danger of "peddling" a loan. In nearly every large financial house there is one man who has charge of considering the new loans in which his company may be interested. Such men are very familiar with the condition and policies of their concerns, and they can tell almost instantly whether a certain type of loan will be considered. Inquiry may be made by telephone, or if this is impractical, by means of a short letter, as to whether the house in question would consider, for example, "a first mortgage bond issue loan on a new office building in Blank City, in an amount of about $1,500,000." Further identifying details may usually be omitted. Generally an inquiry of this sort will elicit an immediate "Yes" or "No" answer, as to the possible interest of the house. Starting with the most likely source on the list, one can speedily query the prospects to the point where some house says "Yes." Here there is a "live" prospect, and further general inquiry should stop until one has submitted the details contained in the set-up and financial plan, and received an offer or refusal of the funds sought. This method may be continued until the loan is finally secured.

In conducting the actual negotiations with the bankers, these suggestions may prove helpful:

1. Written Authorization. Before undertaking to obtain a loan for a principal, secure in writing a specific authorization to do so. Disregard of this important detail has resulted in some acute embarrassments and, in some instances, in severe financial losses. To have a principal "back out" of a deal when his agent is well along with the financial negotiations creates a situation for such an agent which is far from enviable. Then, too, the interested financial house may have gone to considerable expense in investigating the loan, and it may ask, and quite rightly so, that it be reimbursed for such expense.

2. Treat the Banker as a Friend. If the banker makes the loan desired, he in fact becomes a partner in the enterprise. Be frank and honest.

3. Call on the Banker Personally. When one has found a "live" prospect, if possible, he should be called upon personally. Explain the salient features of the loan and leave with him, to be examined at his leisure, the set-up and financial plan which has been brought. Try and get a definite appointment for a second interview, at which time the matter may be discussed at more length, due to the fact that the banker has then had an opportunity to thoroughly familiarize himself with the details of the proposal.

4. Start negotiations early, well in advance of the time when the funds will be needed. At best it will probably take 30 days before a commitment for a loan can be obtained, and at least another month will be consumed in attending to the many details incident to closing. Do not let negotiations "drag." Bankers are busy people, and new proposals are coming before them all the time. Negotiations over too long a period tend to wear out the initial attractiveness of the loan. With the use of a little tact, the matter can be urged along.

5. Don't "dicker." Ask for a reasonable loan and insist on getting the amount asked for. Many borrowers make the mistake of asking for more than they really expect to get and depend on doing a certain amount of trading before the final sum is decided upon. Responsible banking houses resent this method of dealing. It is true that certain terms of the loan are open to negotiation, but there is a wide difference between making these adjustments, and "dickering."

6. Use Caution in Accepting Partial Commitments. It is often necessary to negotiate simultaneously for different classes of financing in order to raise the required amount of funds. For instance, it may be necessary to arrange for equity funds as well as first mortgage and secondary financing. Equity funds should be secured first. Bankers quickly lose interest in a loan when they learn that the principals have not already provided their share of the financing. Caution should be observed in taking a definite commitment for one portion of the financing before the rest of the funds have been arranged for. This applies particularly to first mortgage and secondary financing. The negotiator would find himself in an uncomfortable position, for instance, if he were to obligate his principal to take first mortgage financing and then find later that it was impossible to secure secondary money. When negotiating a first mortgage loan, especially if the lender is an investment banking house, it is often possible to get a commitment for both first mortgage and secondary financing from the same source. In fact the placement of the first mortgage financing is often conditioned upon the willingness of the house to take or arrange for the secondary financing.

7. Investigation of the Loan by the Banker. Offer the banker every facility for investigating the loan. Supply needed information. When a representative of the banker visits the property, especially if the property is located in a city different from that in which the banker's office is located, do not attempt to dominate the investigations. Representatives of this type usually prefer to employ their own methods of securing information, unhampered by the attentions of a too-zealous borrower. The chief concern of the borrower should be to see that the investigator does not, in his ignorance of local conditions, secure information from unreliable sources.

8. Present Attractive Set-up Material. If it is necessary to present the same proposal to several financial sources before securing an acceptance of it, the set-up material used usually becomes soiled or torn. In this event prepare a new lot of material. When an untidy set-up is presented, bankers are quick to sense that the loan desired is a "hard seller," and that it has been offered elsewhere several times before reaching them. Typed material should be the original sheets.

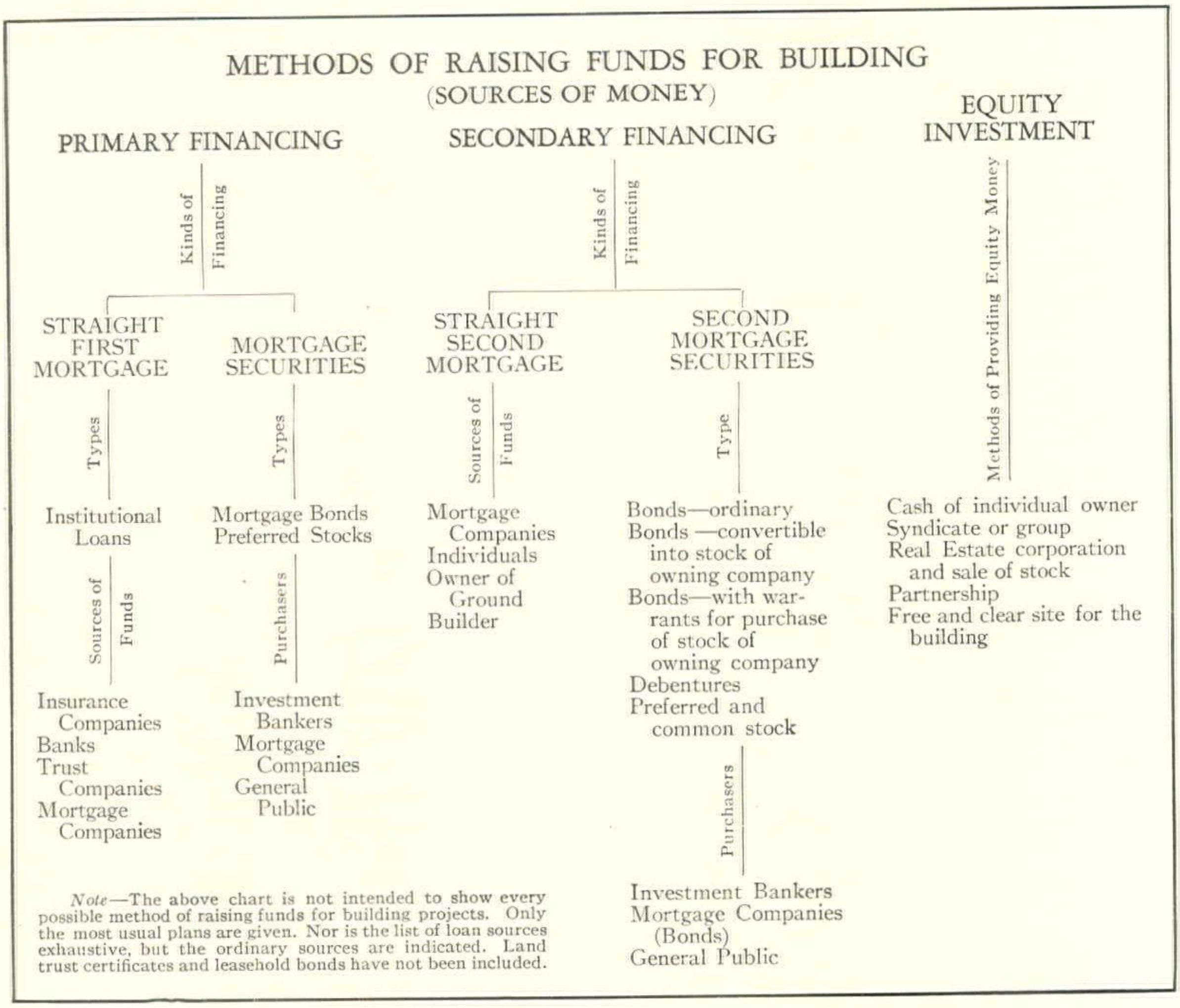
9. Bringing the Builder Into the Negotiations. When loan negotiations have progressed to some extent, it is often helpful to have the builder who is to do the construction work call on the banker also. He is an expert in certain phases of the transaction, and his favorable comment will impress the banker. Then, too, weight is added to the proposal by the fact that a well known builder is a party to the undertaking, especially if the builder is participating in the financing junior to the loan being considered by the banker. Very seldom is it advisable to introduce the principal into the negotiations until the loan arrangement is practically concluded. Many promising deals have been lost in this way. An agent can negotiate much more skillfully for his principal when the principal is not present.

10. Get the Commitment in Writing. When the conferences have been successfully concluded and a promise given that the loan will be made, it is advisable, if possible, to get the commitment in writing. Mortgage companies, insurance companies and banks and trust companies will probably comply with this request. It is difficult, however, to get a written commitment from an investment banking house. Their case is somewhat different. Investment bankers buy loan securities for re-sale to the public, and they depend upon the condition of the investment market for the selection of a time for marketing such issues. For this reason they are not inclined to bind themselves in writing to take delivery on any certain date. When the right time for marketing arrives, however, they usually conclude the transaction with dispatch.

CLOSING THE LOAN

Once the commitment for funds is obtained, the conclusion of the financing transaction is largely a matter of careful attention to the details incident to closing the loan. Many of these details are of a highly technical nature, and they should be cared for by attorneys experienced in real estate and financing practice. Both banker and borrower will be represented by their respective legal advisers. Closing a straight mortgage loan is a simpler transaction than the preparation of a bond issue. In the former, the essential items to be cared for are the examination of the title to the ground, the drawing and signing of the mortgage papers, and the filing of them. Fire insurance and generally title insurance must be provided. In the case of a bond issue, many additional matters must receive attention, as for instance, the selection of a trustee, the drawing of a financial contract between the borrower and the banker, the securing of appraisals of the property, the printing or engraving of the bonds, and often, too, the opinions of experts as to the probable income to be derived from the building when erected. In all loans made on buildings to be erected an agreement is made between the borrower and the lender in which it is stipulated when and to whom payments are to be made as the building progresses. It is not unusual for the lender to have his own architect, whose function is to check the plans and to inspect the building operations from time to time.

The expenses of securing a loan vary with the type of loan, a bond issue being much more costly than a straight mortgage. The items of expense should be carefully discussed by the borrower and the lender, and the amounts thereof determined as definitely as is possible. Loans should be closed promptly. To accomplish this, much tactful and patient urging usually must be done.



Note—The above chart is not intended to show every possible method of raising funds for building projects. Only the most usual plans are given. Nor is the list of loan sources exhaustive, but the ordinary sources are indicated. Land trust certificates and leasehold bonds have not been included.

POLICY AND OPINION

EIGHT ESSENTIALS, AND EDUCATION

THE position of the architect in the building industry is not as dependent on what he feels this position should be as upon his capabilities for establishing and maintaining such a position. We can take it for granted that practically every architect assumes that he is the individual who should be in complete and responsible control of the building operation. To hold this position, he should:

1. Formulate and analyze the owner's building requirements and problems.
2. Advise in regard to the financing and the economics of the project, making research and analysis.
3. Solve the plan and design problems so that the building will function efficiently and be æsthetically satisfying.
4. Solve the structural and mechanical problems of the building in collaboration with the engineers and specialists of his choice, coördinating and supervising the work of these collaborators.
5. Select the materials and equipment best suited to their purposes, and establish the proper methods and procedure of construction.
6. Select the builder or general contractor, and be an authority in all contractual relations.
7. Supervise and expedite the actual construction.
8. Serve as the administrator and business executive of the work, maintaining accounts and records.

The architect will be judged, and his position in the building industry determined, by his ability to function in each of these eight capacities. If he fails to function in any one, the duties involved will be assumed by others, thus circumscribing and limiting the architect's position, authority and power. For this reason, it is well for architects, and especially the younger members of the profession, to consider ways and means of fitting themselves to establish and maintain the position that thus involves a knowledge of architectural design and plan, of materials and equipment, of structural problems, of costs, of financing, and of executive methods and procedure. This is necessary if the architect is to be "in complete and responsible control of the building operation."

It is obvious that from the very beginning of the architect's education he should be made to realize that these eight factors are involved. This is not always the case at present. It is obvious, also, that the curricula of the architectural schools should take full cognizance of the fact that the student should receive instruction and training in each function, the amount of time devoted to each to be determined, naturally, by its relative importance. At the outset of his training, however, the young architect should be informed that all of these functions are vital to the profession and to his own successful practice, otherwise he will probably find himself an architectural designer or draftsman, perhaps in the employ of an executive architect or firm or of a building corporation. *K. K. S.*

THE QUICK OR THE DEAD?

THE quick or the dead professional organization has the same characteristics as the quick or the dead person. All organizations are of either the one class or the other,—it depends upon their personnel and purposes. Public appraisal is based on the results of organized efforts, and when public appraisal is favorable, there must be some compelling reason.

THE ARCHITECTURAL FORUM is concerned with architects and architecture,—the former primarily as exponents of the latter. It is as necessary for architects to organize as it is for the other professions, and a lively interest should be manifested in such organizations. Every professional organization declares its several purposes and includes among them the intention of rendering "an ever-increasing service to society." This is a laudable intention, but no intention can become effective unless supported by other intents and purposes. Men are united in organizations because experience demonstrates that their members enjoy certain economic advantages over unorganized individuals and also that *power* is an attribute that is essential to the realization of their purposes. Power, then, is the essential attribute of an organization, and when power is had, then and only then can the organization render "an ever-increasing service to society."

A survey of the local, state and national architectural organizations discloses the only sources of organization power. In New York state there are many local architectural organizations formed as a direct result of the registration law. Brooklyn, Binghamton, Rochester, Buffalo, New York, and other cities, and Westchester, Nassau, Suffolk and other counties, have their local organizations. Membership is open to every registered architect within their jurisdictions. Upon registration, every architect is invited immediately to join an organization. Practically all of these organizations include every registered architect in their membership. This is the basis of power.

The conditions of architectural practice have been lamentably bad. These vigorous organizations, whose frequent meetings are attended by practically their entire membership, hold out a promise and the beginnings of realization. Their members will profit by better laws to regulate building construction, more power and influence, better consideration by building officials and other authorities, better compensation for their services, and all of the other contributions to organized *power*. The united voice of a completely organized profession is not only heard,—it is respected. Conditions will inevitably compel these local organizations to unite into state units where they are not already formed, and when architecture becomes an important function of the federal government, a national organization will be formed which represents every registered architect in America. Then architecture will come into its own as a result of the work of the quick rather than of that of the dead. *A. T. N.*

DECORATIVE COLOR LIGHTING

BY

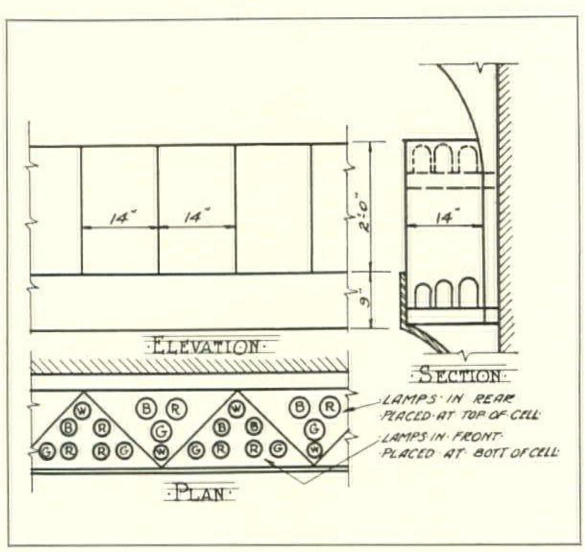
A. T. NORTH

A NEW method of decorative color lighting was demonstrated recently in the new ballroom at the St. George Hotel, Brooklyn. The device consists substantially of a flat-bottomed trough with a vertical face equipped with reflecting surfaces and colored lights. In the trough is placed a continuous series of vertical triangular cells, the backs of which are in contact with a metal back or with the wall. The depth of the cells is equal to the width of the trough. These parts are made of sheet metal and painted white to produce a surface having the maximum coefficient of reflection. The walls and ceiling of the room are also finished in a dull white.

In the cells are placed green, red, blue and clear electric lamps, and in front of the cells and behind the vertical face of the trough, lamps of the same color are installed. The electrical control is such that any one or any combination of lamps, either behind or in front of the cells, can be lighted. Dimmers are connected to each circuit. The control is so comprehensive that an unlimited number of color combinations are possible with variable intensities of illumination. The top edges of the cells confine the projected rays of light to certain fields or sections of the wall, ceiling or cornice. The projected rays of two or more lamps in the same cell will overlap on the reflecting surface, and the mingling and overlapping of these colored rays produce new colors and angular patterns of infinite variety.

The transformation of color and pattern is made so gradually that it is scarcely distinguishable and does not partake of the distressing activity and crudity of the ordinary illuminated sign. This refinement of colored illumination makes the method especially suitable for places of public assembly. The installation illustrated here demonstrates the beauty and flexibility of the illumination. Unfortunately, it is not entirely satisfactory because of certain incongruities in the architectural design of the ballroom which interfere noticeably with the continuity and repose of the illumination. To attain the finest effects, the room should be designed in a suitable manner, and the architect must study the theory and the practice of the method before he can secure the best effects. This method of illumination will be the principal feature of the place in which it is used, and a desirable degree of perfection can be obtained only by a proper adjustment with the architectural design. It is evidently a coöperative activity for both the architect and the illuminating engineer. The possibilities and the best manner of installing this form of decorative color lighting are not easily decided. It is so novel and unusual that further developmental experiment and study of its application to different shapes of rooms may be necessary. It is a problem, however, that challenges the best abilities and ingenuity of the engineer and the architect. Its future extensive use seems to be assured. This system of lighting was developed by F. J. Cadenas, illuminating engineer, National Lamp Works.

Illumination of Grand Ballroom, St. George Hotel, Brooklyn



Detail of Lighting System Showing Arrangement of Lamps

UNITING TWO BUILDINGS AND TWO BANKS

BY

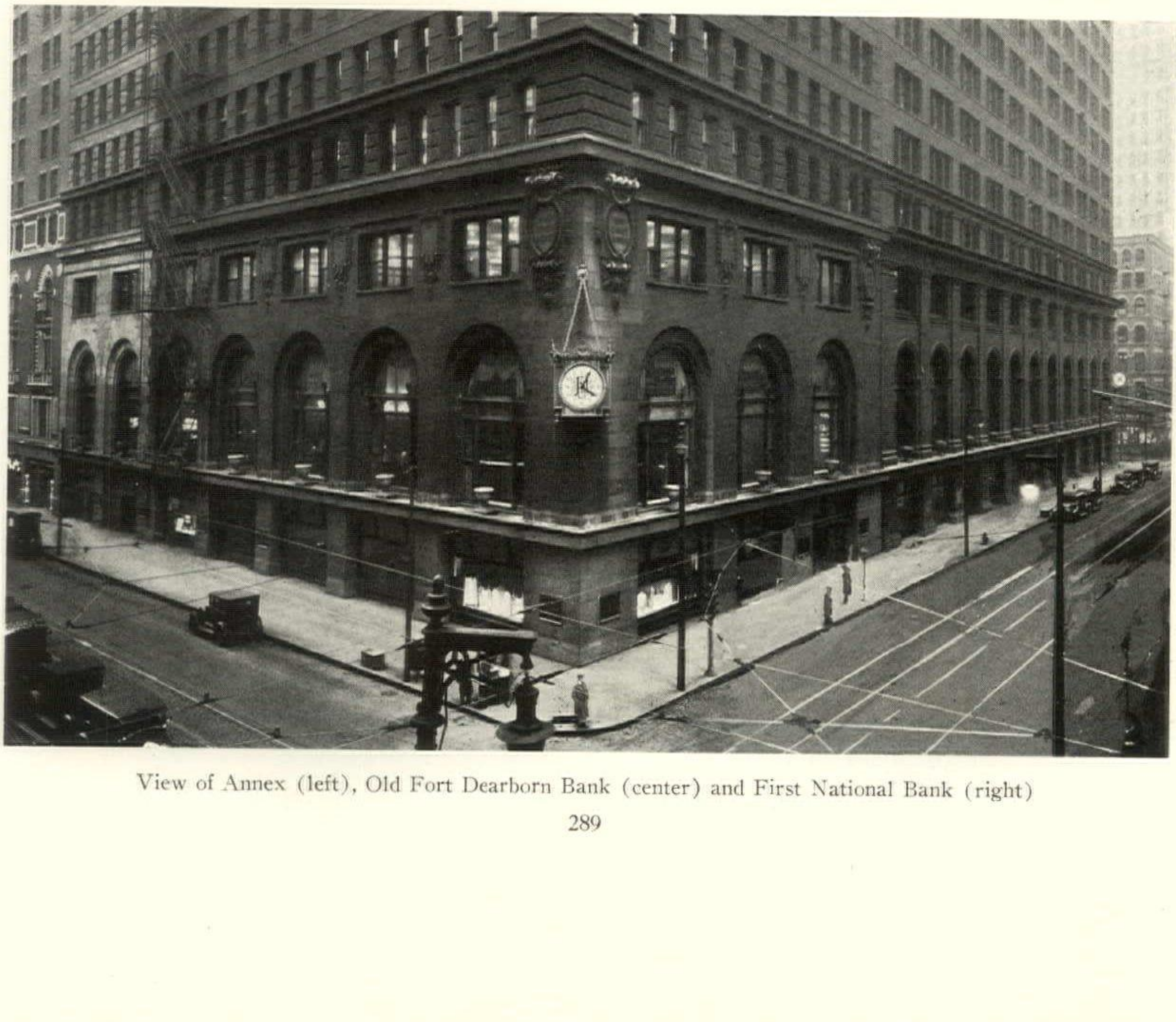
CHARLES FRANCIS KEIFE

EDITOR'S NOTE. *There is an appreciable difference between designing the construction of a new building, however complicated it may be, and designing the alteration of an existing structure. In the first instance the load-supporting members ascend from the foundations in an orderly manner,—the support is always ready to assume its loads. In the second instance the structure exists complete, and important supports are removed and the loads transmitted through new supports and often to new foundations.*

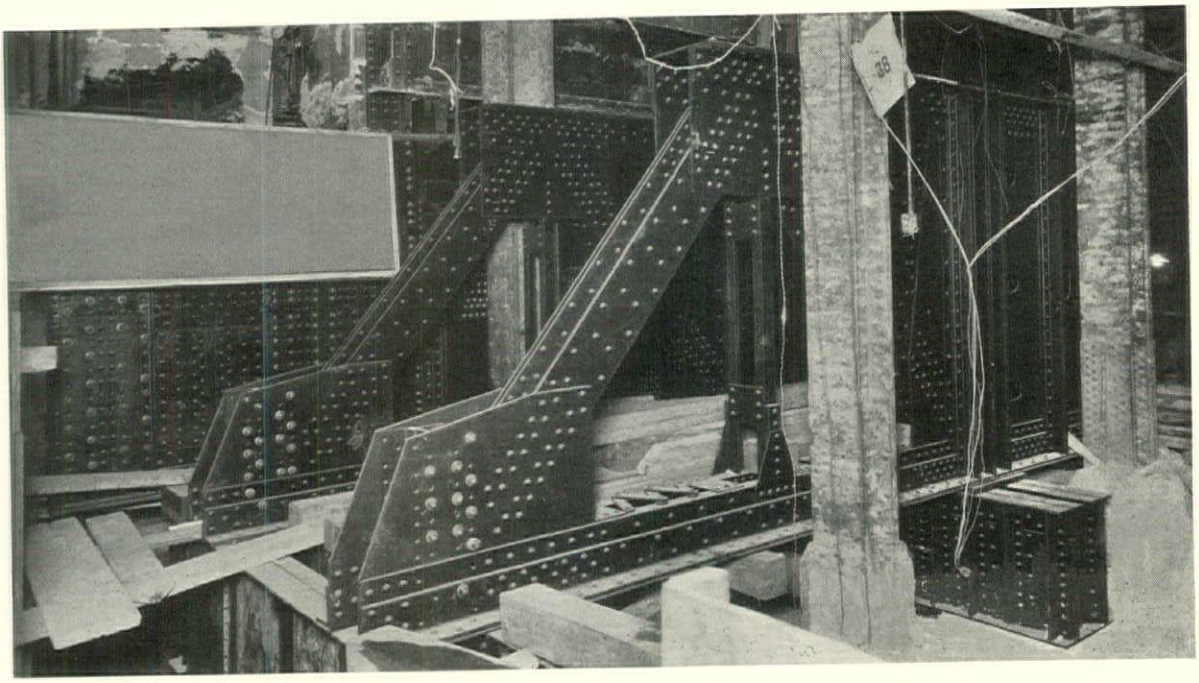
The readers of Mr. Keife's description of the transformation of the existing banking quarters of The First National Bank of Chicago will have an understanding of how the structural engineer resorts to various expedients to attain the stated objectives,—how tremendous loads are picked up, shuttled back and forth and up and down through trusses, columns and cantilever girders to the foundations. Such readers will also have an understanding of how the contractor uses every precaution to forestall the obvious hazards of the undertaking, the accurate adjustments of the new parts to the old with hydraulic jacks and wedges, and the removal of old parts and the final closing up of all adjustable parts, tight and secure. Withal, the reader can see the invisible stresses traverse their courses with certainty and security.

BUILDING value, when threatened by obsolescence, is maintained usually by a construction program of some kind. The construction may be of a simple or of an intricate character which may challenge the skill and ingenuity of the architect and the engineer. There is a wide range of possibilities in the art, if one pleases, of building obsolescence prevention. Such an undertaking is initiated as an economic necessity, and the program of construction work as an investment must be justified by a judgment of future probabilities. The causes of building obsolescence are many, one or more of which may affect the value of a building. It is but reasonable to first make a diagnosis and determine the cause or causes, and then prescribe a suitable remedy.

One common cause of obsolescence is the expansion of the business housed in the building, and two remedies are then possible,—enlarging or remodeling the structure, or else demolishing it and rebuilding to meet the new demands. It was the necessity for securing larger banking quarters that caused The First National Bank of Chicago to acquire the contiguous Fort Dearborn National Bank property. The First National Bank Building was constructed in 1902 (D. H. Burnham & Company, architects), and the Fort Dearborn National Bank Building was constructed in 1905 (originally as The American Trust and Savings Bank Building, Jarvis Hunt, architect). Both of these structures were exceedingly well planned,



View of Annex (left), Old Fort Dearborn Bank (center) and First National Bank (right)



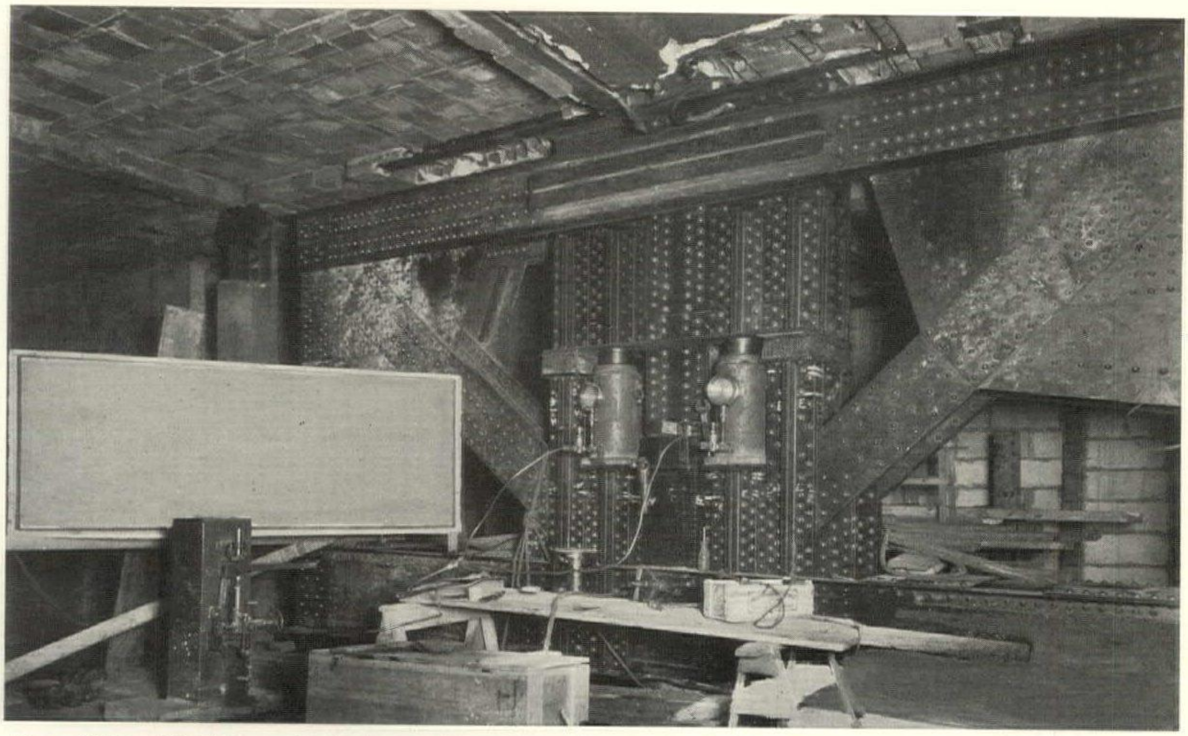
View Showing Ends of Basement Trusses T1, T2 and Girder G4

constructed and maintained. Notwithstanding their age, as office buildings they were not affected by obsolescence because of their size, fine construction, good management and location in the center of the loop district. They were obsolete only insofar as the owner's business occupancy of the lower floors was concerned,—the need for more and unified banking space.

The problem was studied in all of its aspects, and the procedure proposed by the Leonard Construction Company was adopted by the owner, this company acting as architect, engineer and contractor. This close coöperaion of the essential contributing factors was deemed desirable because of the great care and safeguards necessary in some of the intricate construction work included in the scheme. A second property was acquired adjoining the Fort Dearborn National Bank Building. The sizes of these properties and their relation to each other are shown on the plan, and for convenience they are designated as the East and West Buildings and the Annex. All of these buildings are 18 stories high, and of steel frame and hollow tile fireproof construction.

The adopted scheme included:

1. Erection of Annex, which contains new elevators and stairways to replace those removed later in the East and West Buildings and to provide a suitable entrance on Clark Street.
2. Construction of a sub-basement under the East and West Buildings.
3. Construction of new trunk, record and miscellaneous vaults in sub-basement.
4. Construction of new safety deposit department in the basement, with new safety deposit vault, cash vault and security rooms.
5. Removal of safety deposit vault from first floor and record vaults from first and second floors, all requiring reframing of steel work because of changes in the loading of floors.
6. Changing first floor framing for two large stairways from first floor to basement.
7. Removal of elevators and stairways in the west end of the East Building and in the east side of the West Building to make this space available for the connected and unified banking rooms in the basement and on the first to fourth floors inclusive and also the connecting corridor on the upper floors.
8. Raising interior panels of the first floor of the West Building 2 feet.
9. Mezzanine floors to be removed and second floor reframed for the continuation of the banking space from Dearborn Street to Clark Street.
10. Removal of lot line walls between the two buildings (East and West).
11. Installation of four new caissons to rock below the sub-basement floor and new trusses and girders in the sub-basement and basement and in the third story to transmit the loads from old to new columns and foundations.
12. Installation of eight new columns, reinforcing of one old column, and removal of five old columns extending from sub-basement or basement to the third floor.
13. Complete remodeling of the fourth floor for larger quarters for the Trust Department.

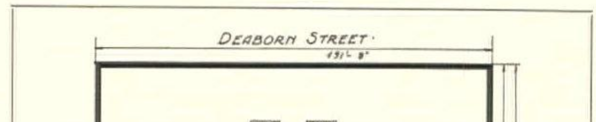


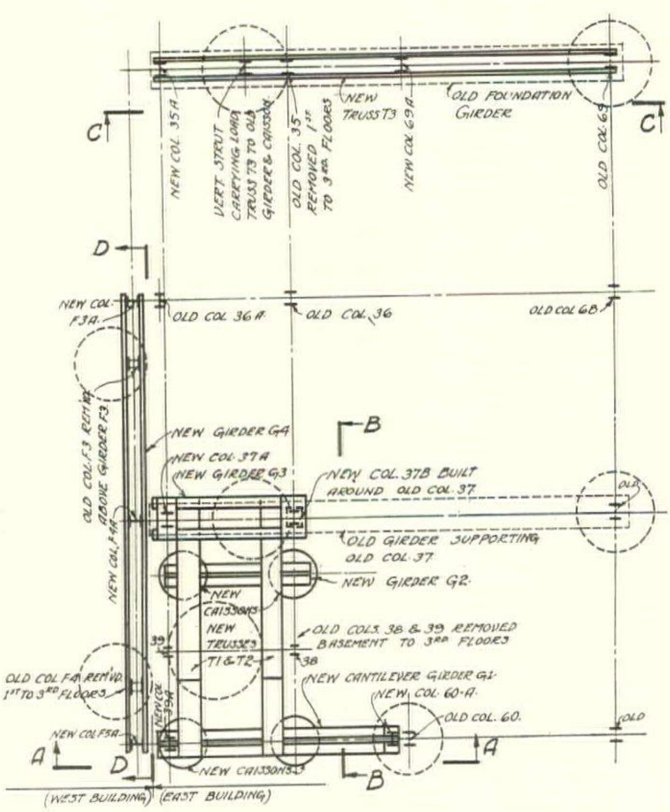
Truss T4 in Third Story with Jacks and Steel Wedges Supporting Jacking Bracket Riveted to Old Column 35. Hydraulic Pump at Left

14. Remodeling 18th floor from an attic to provide lounge room, dining rooms, kitchen and gymnasium, with new skylights and windows.
15. Reframing steel work in the Dearborn Street elevator shafts for additional loads from new penthouse and overhead electric machinery for electrically-operated elevators to replace hydraulic apparatus, and new cabs, pneumatically-operated doors, and marble elevator fronts replacing iron grilles.

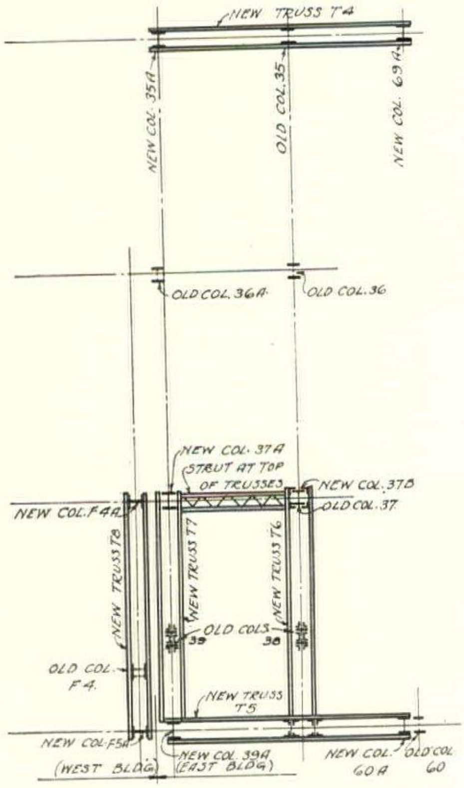
The operation of the bank and buildings and the occupancy of the tenants were carried on without interruption. Of this extensive program Items 2, 11 and 12 are unusual in several respects. The other items are such as usually appertain to the construction and remodeling of buildings of this class except for the precautions taken not to interrupt the orderly procedure of the occupants and the maintenance of the mechanical facilities such as plumbing, heating, ventilating, lighting and elevators. The sub-basement (Item 2) was constructed by first installing a switch under and into the building from the Illinois Tunnel Company's tracks in Monroe Street, which are about 45 feet below street grade. Over the end of this switch a panel of the basement floor was barricaded in the usual manner. A portion of the basement floor was removed, and a shaft was sunk to the switch through which the excavated material was loaded into cars and removed.

When excavated sufficiently, the new steel framing for the new basement floor was installed from which was suspended the underground work for sewerage, water supply and other utilities. New underground work was installed when the

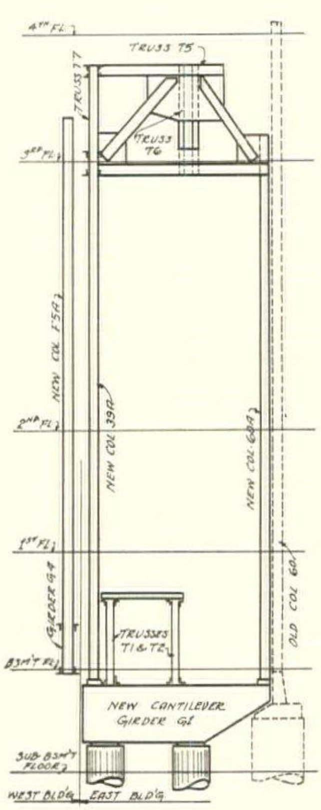




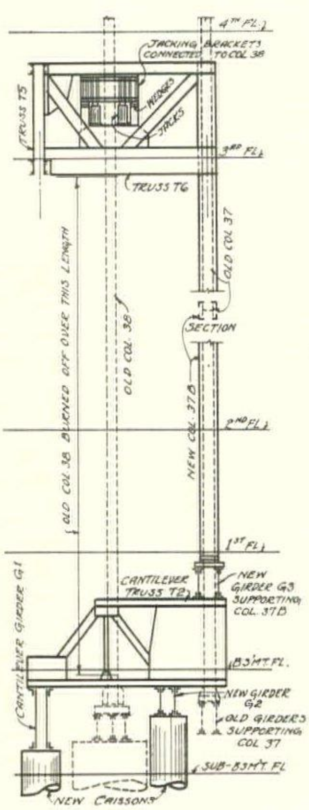
Plan at Basement Floor



Plan at Third Floor



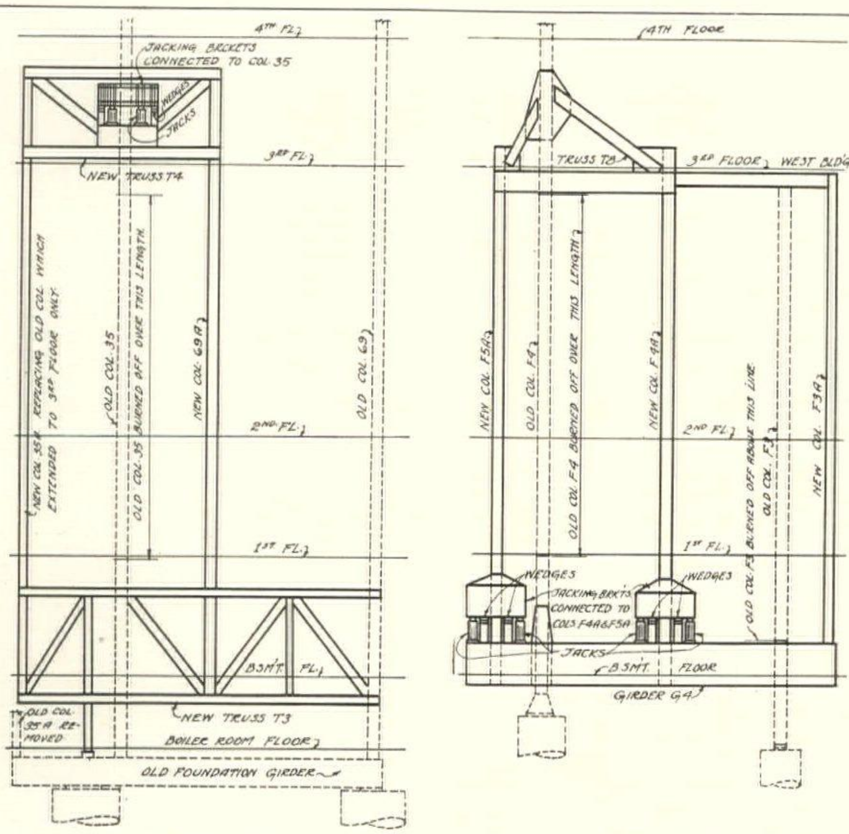
Section AA



Section BB

Section Lines are Shown on Basement Plan. In Sections AA and BB Old Columns 38 and 39 Removed and Loads Transmitted by Trusses T6 and T7 to New Truss T5 and New Columns 37A, 37B, 39A and 60A, to New Girders G3, G2, New Cantilever Trusses T1 and T2 and Cantilever Girder G1, to four new Caisson Foundations

Section CC, Old Column 35 Removed, Load to Truss T4, to New Columns 35A and 69A, to New Truss T3 in basement



Section CC Section DD

Section DD, Old Columns F4 and F3 removed, Loads to Truss T8, to New Columns F3A, F4A and F5A to New Girder G4

excavation was made to the proper depth for the sub-basement floor.

This procedure was followed until the entire sub-basement was excavated and the new basement story completed. The new underground work was then connected to the old supplies and wastes, and the old underground work suspended from the new basement floor was then removed. The sub-basement floor was then constructed along with the new vaults and other facilities placed therein. The most difficult phase of the work (Items 11 and 12) was the removal of certain columns extending from the basement to the fourth floor and the substitution of new and differently located columns therefor. These old columns were in or near the contiguous lot line walls of the East and West Buildings and interfered seriously with the plan of the united banking rooms on the first and second floors. The work divides itself into two major sections,—the supporting members in the sub-basement and basement and the supporting load-transmitting members in the third story. The old and new columns do not involve complicated calculations.

This work is divided into three groups,—two in the East and one in the West Building,—as shown on the diagram. The West Building group is included in Section DD and part of Section AA. The old caissons F3 and F4 are used as foundations. A new two-web girder G4 is placed on both sides of and riveted to the lower portion of old columns F3 and F4. G4 is cantilevered to support the new columns F3A and F5A at its ends and supports new column F4A at its center. In the third story, truss T8 supports the load of old column F4 (800,000 pounds) and transmits it to new columns F4A and F5A. A supplementary beam extends from truss T8 to new column F3A. In this group the old columns F3 and F4 were removed in the first and second stories. The adjustments for load deflections and compressions in the new columns, girder and truss were made with hydraulic jacks and wedges in connection with girder G4 located in the basement.

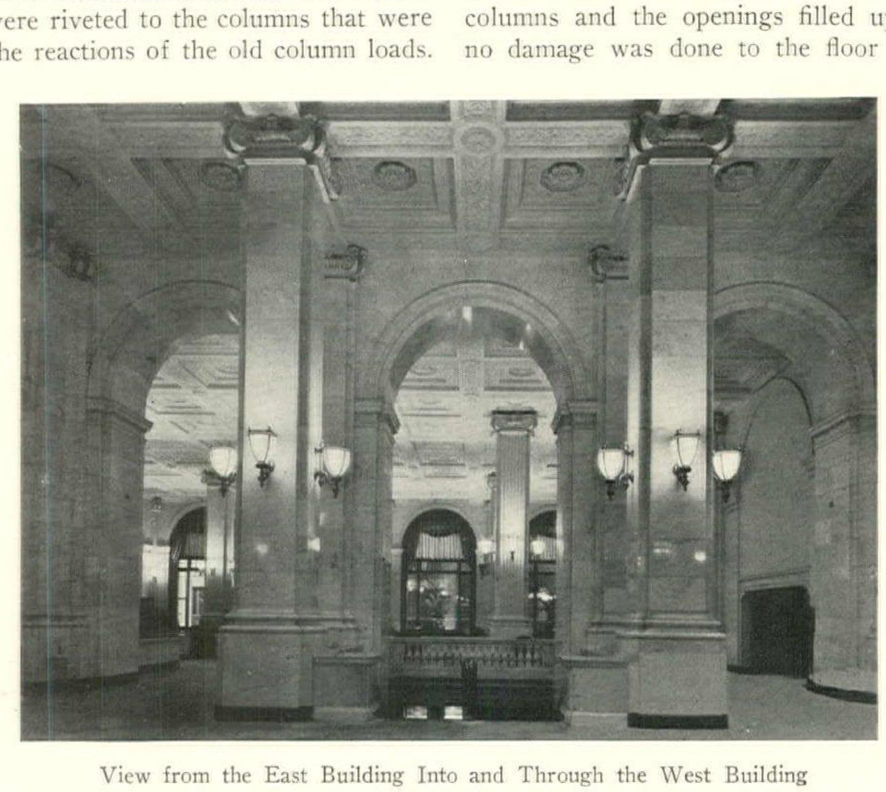
Four new caissons were constructed in the East Building group included in Sections AA and BB. Two of these caissons support new cantilever girder G1, and the other two caissons support new girder G2. Cantilever girder G1 supports new columns 39A and 60A and the ends of new cantilever trusses T1 and T2 for which new girder G2 serves as the fulcrum. The cantilever ends of trusses T1 and T2 support new double-cantilever girder G3, which in turn supports new columns 37A and 37B. The opposite ends of trusses T1 and T2 are attached to girder G1, which with its loads from new columns 39A and 60A counterbalances the uplift from girder G3 and its loads. New column 37B is unusual, as it is built around and free from old column 37, which is unchanged in loading and foundation.

In the third story, the load of 1,500,000 pounds from old column 39 is transmitted by new truss T7 to new columns 37A and 39A, and the load of 925,000 pounds from old column 38 is transmitted by new truss T6 to new column 37B and through new truss T5 to new columns 39A and 60A. Old columns 38 and 39 were removed in the basement, first and second stories. The adjustments for deflections and compressions were made with hydraulic jacks and wedges placed in new trusses T6 and T7. The second group in the East Building is included in Section CC. Truss T3 in the basement supports new columns 35A and 69A, which in turn support new truss T4 in the third story. Truss T4 transmits to new columns 39A and 69A the load of old column 35, the lower part of which was removed in the first and second stories. The hydraulic jacks and wedges were placed in truss T4.

It was necessary to exercise great care in transmitting the loads from the old columns to the new structure with certain safety and without settlement, cracking of plaster or annoyance to tenants. Hydraulic jacks of 250 tons capacity each were placed on diaphragms connected to the supporting trusses or girders, beside which were placed diaphragms for steel wedges. Jacking brackets were riveted to the old columns whose loads were to be transmitted, and the new trusses or girders were riveted to the columns that were to support the reactions of the old column loads. The jacking operation served to gradually transmit the loads and to compensate for the deflection and compression in the new construction.

When the pressure gauges indicated that about one half of the load had been transmitted, a joint was opened below the jacks in the old column which was to be removed, to prevent any possibility of producing tension in it. The jacking was continued until the gauges indicated that the entire load was transmitted to the new construction. A careful inspection was made to discover any upward movement of the structure above the third floor. It was found that an actual upward movement of 1/16 inch had taken place, which at no time opened up the splice in the old column. In order to ascertain if the entire load was actually transmitted to the new structure, a ¼-inch horizontal cut was made in the old column splice. When there was no further deflection in the new construction, the trusses and girders were riveted to the columns that had been jacked and the wedges left in place, forming a double connection. The old columns were then burned off as indicated in Sections AA, BB, CC and DD.

Another interesting feature of the work was that included in Item 8. The interior floor panels of the first floor of the West Building were raised 2 feet. This was done by making small openings in the floor around the columns and detaching the steel floor beams and girders therefrom. The floor panels were then jacked up to the new level and the beams and girders re-attached to the columns and the openings filled up,—otherwise no damage was done to the floor construction.



View from the East Building Into and Through the West Building

BATTLEDECK FLOOR

BY

A. T. NORTH

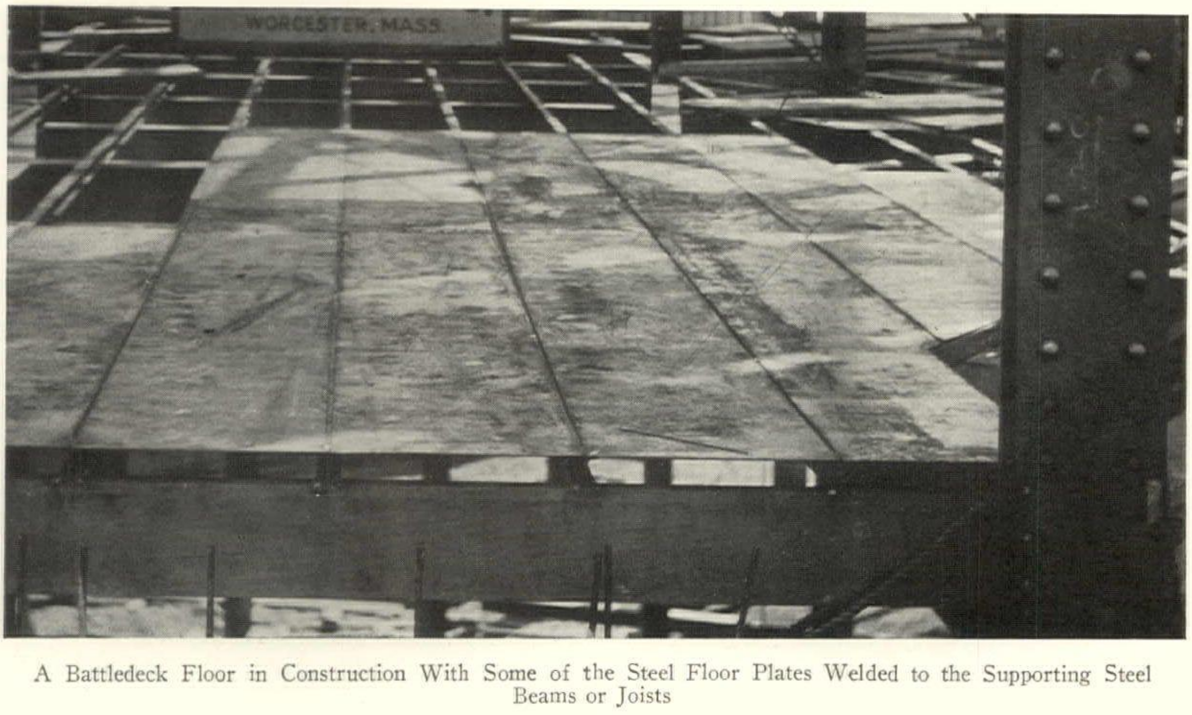
THE constant effort to reduce the cost of fire-resistive floor construction has developed several distinctive types, of which the contributing factors are weight and the cost of labor and material. They must comply with the fixed standard requirements of strength and fire resistance.

Fire-resistive floor constructions are designed for use in combination with steel or reinforced concrete structural frames. The materials in most common use consist of hollow burned clay tile, concrete and gypsum. Closely spaced joists of rolled or built-up steel and concrete are used in combination with thin concrete or gypsum slabs and metal lath and plaster ceilings. Many of these types of construction are patented or are constructed with the use of patented forms or accessories. Adequate strength and fire resistance have been secured in all types with variable costs. Some of these variations in cost result from the local material or labor conditions. The factor of weight may not affect the cost of the floor slab itself, but it has an important effect on the cost of the supporting structural frame and the foundations.

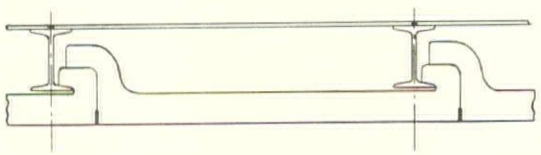
The maximum reduction of construction weight is attained by using the material which possesses the greatest strength per pound of its weight. This is the basic principle on which was developed the new battledeck floor construction, in which all of the structural parts are made of steel. The related features are fire-resistive protection and soundproofing. The construction is made of small I-beam joists, 3, 4, 5 and 6 inches deep, placed 24 inches on centers for ordinary live loads, and using 10- and 12-inch beams for heavy live loads. The top flange of the I-beams supports long steel plates longitudinal with the beams. A space or joint is left between the edges of the plates, in which is made a weld that joins the plates to each other and to the top flange of the I-beam. The rigid joining of the plates and beam causes the combined construction to act as a T-beam section with its neutral axis close to the top of the beam.

The compressive stress in the plates is approximately one fifth of the tensile stress in the bottom flange. The range of the weight and strength of the steel construction are given in these tables: For 3-inch, 5.7-pound I-beams and 24 by 3/16-inch plate, the weight of steel per square foot is 10.5 pounds and the coefficient of strength is 25,000; for the 12-inch, 35-pound I-beam and 20 by ½-inch plate, the weight of steel per square foot is 41.4 pounds and the coefficient of strength is 560,100.

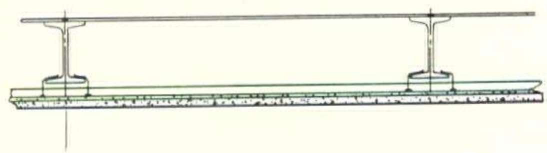
The economical use of structural material is evidenced by comparing the weight of floor construction per unit of strength. This is found



A Battledeck Floor in Construction With Some of the Steel Floor Plates Welded to the Supporting Steel Beams or Joists



Pre-cast Gypsum Ceiling Tile



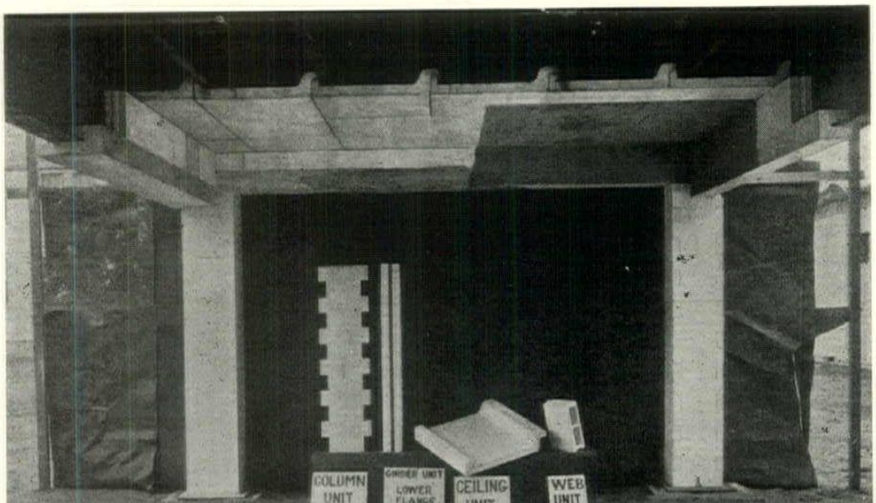
Metal Lath and Plaster Ceiling

to be unusually favorable in this type of floor. The several buildings that have been constructed with this type of floor are comparatively small and were erected by the owners for their own use. Although quite experimental in regard to labor cost, load tests have demonstrated the correctness of the calculated strength and deflection.

From the labor cost data available at this time indications are that it will contribute materially to the economy of this type of construction. Welding in building construction is comparatively new. The interest aroused in this type of floor construction has been sufficient to cause the development of an automatic electric arc welding machine which promises to materially reduce the cost of welding. In a recent demonstration made at the annual convention of the American Institute of Steel Construction at Biloxi, Miss., this machine made a satisfactory weld at the rate of 9½ inches per minute.

There are some practical difficulties of construction caused by the natural irregularities or buckles in the surfaces of large steel plates. The buckles are sufficient to cause irregularities in the surface which would be readily apparent to the eye or to those walking over it. These irregularities can be corrected by applying slight but sufficient thicknesses of mastic compound to level the surface to a true plane and form a perfect foundation for the floor finish, such as linoleum, cork or rubber tile. Several of the largest steel plate manufacturers are preparing to produce plates from which the buckles are eliminated, and cut to size with close tolerances.

Fire protection is confined principally to the ceiling, practically the only vulnerable part of a floor construction. Protection can be provided by the ordinary metal lath and plaster ceiling attached to the bottom flanges of the steel I-beam floor joists. Fire-resistive ceiling tiles of gypsum are made which are laid in on the bottom flanges of the beams. These tiles are 2 feet wide, 2 feet long, and 2 inches thick, and weigh from 50 to 52 pounds each, or about 13 pounds per square foot. The pre-cast gypsum girder covering consists of two pieces of flange covering which support the vertical web-covering units. The web covering extends up to and supports one end of the ceiling tiles. This construction is similar to that used in hollow clay tile girder covering. The columns are covered with long slabs which have dovetailed edges which interlock with the adjoin-



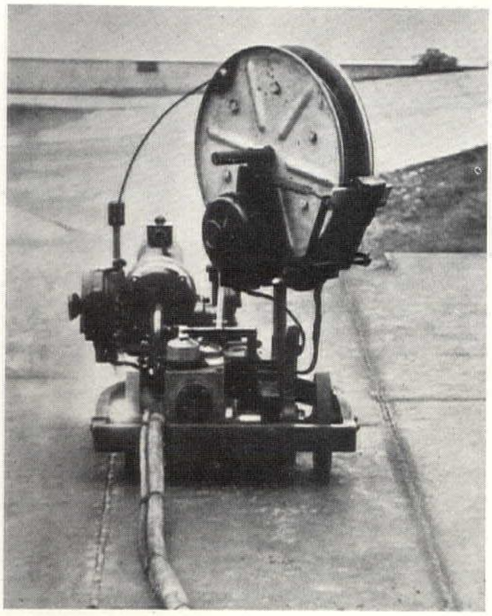
Sample Installation of Pre-cast Gypsum Ceiling Tiles, Column and Girder Fire Proofing

ing slabs. When placed, the slabs are nailed together at the corners.

This type of construction, as now developed, does materially decrease the weight of fire-resistive floor construction and the girder and column covering. It is probable that other fire-resistive materials will be adapted to forms suitable for this type of floor. Tests have never been made to determine the effects of fire on top of any kind of fire-resistive floor construction. Obviously, the hazard is limited because of the tendency of heat to ascend rather than to descend. The performance of steel plate floors about furnaces and cupolas, notwithstanding their severe exposure, has been satisfactory.

Sound transmission through this type of floor is an important matter. The rigidity and continuity of the construction in association with the thick gypsum ceiling tiles and a floor finish of linoleum, cork or rubber tiles, indicate a quiet floor. The limited experience has been satisfactory.

Arrangements are being made to have authoritative and acceptable load tests made to determine the strength, deflections and induced stresses. The effect of fire upon the ceiling will be made according to the established methods, and also the effect of fire on top of the floor will be investigated. Sound transmission will also be measured. These data will determine the characteristics of this type of floor construction which is now being very generally discussed. The indications are that a very unusual, important and economical type of floor construction is in process of development. The engineering features are entirely acceptable, and the remaining problems pertain to methods of construction, and they will undoubtedly be solved quickly.



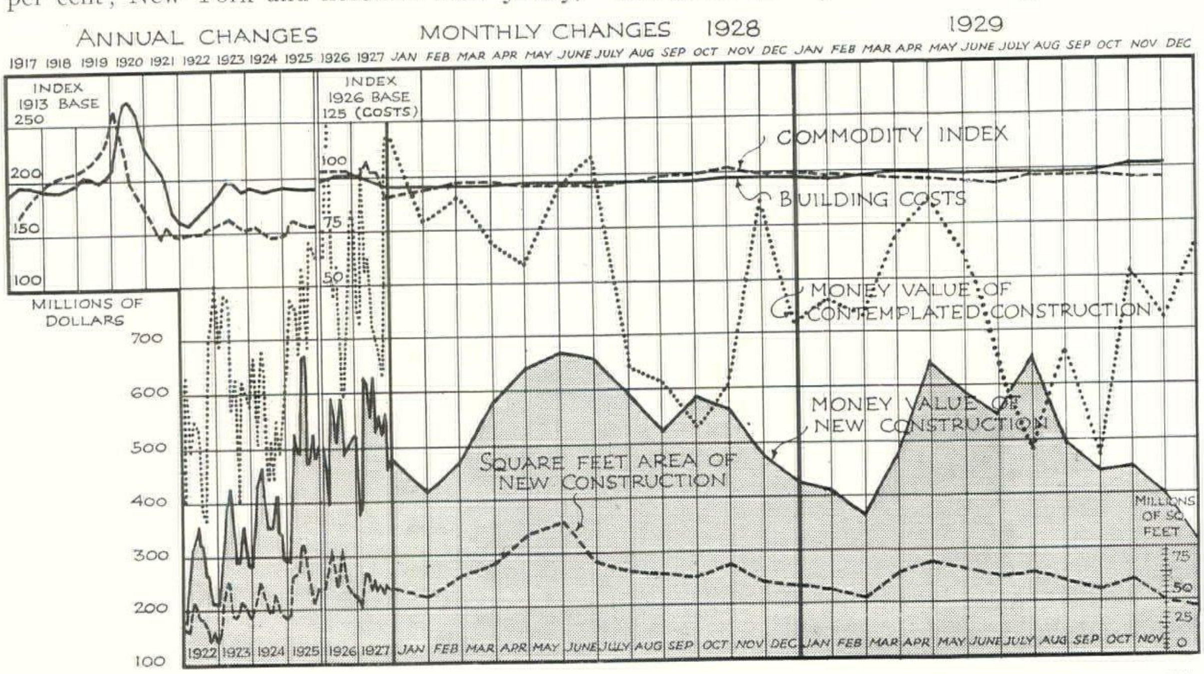
Automatic Welder for Battledeck Floors

THE BUILDING SITUATION

A MONTHLY REVIEW OF COSTS AND CONDITIONS

DURING the year 1929 contracts awarded for new construction work in the 37 states east of the Rocky Mountains reached a total of $5,754,290,500, according to the F. W. Dodge Corporation. This figure represents a decline of 13 per cent from the total for 1928. Residential construction showed a marked falling off, with 1929 expenditures 31 per cent below those of 1928. Non-residential work, on the other hand, reached a new high level during 1929 with an increase of 3½ per cent over 1928. All of the districts included in this survey with the exception of the northwest showed a decided slump in December as compared with December, 1928, ranging from 17 per cent for New York and northern New Jersey to 59 per cent for the middle Atlantic states. In the northwest an improvement of 79 per cent was shown this past December as compared with December, 1928. Comparing December contracts with those of November, the Pittsburgh district showed a slight improvement of approximately 2 per cent, while the central west showed a more marked improvement of 13 per cent. All other districts showed decreases,—middle Atlantic, 49 per cent; New England, 34 per cent; New York and northern New Jersey, 31 per cent; northwest, 31 per cent; southeast, 9 per cent; and Texas, 7 per cent.

Following the stock market break in October, it was expected that construction activity, which throughout the year had remained considerably below that of the previous year, would take a turn for the better, and this belief is still commonly held. The marked construction decline during the month of November and again during the month of December seems to indicate, however, that some time is being required for the financial situation to become stabilized. In the meantime, contemplated construction reported has shown a strong trend upward beginning with October 1 and continuing through December. The contemplated work reported during the month of December, for the 37 eastern states, amounted to $864,220,600. This is 19 per cent above the amount reported during December, 1928, and 20 per cent more than that reported during November, 1929, and is the greatest volume of contemplated construction reported during any one month of this year, with the exception of March and April. This seems to indicate that we are going into 1930 with a very favorable construction demand, likely to affect building of all classes.



THESE various important factors of change in the building situation are recorded in the chart given here: (1) *Building Costs.* This includes the cost of labor and materials; the index point is a composite of all available reports in basic materials and labor costs under national averages. (2) *Commodity Index.* Index figure determined by the United States Department of Labor. (3) *Money Value of Contemplated Construction.* Values of building for which plans have been filed based on reports of the United States Chamber of Commerce, F. W. Dodge Corp. and *Engineering News-Record.* (4) *Money Value of New Construction.* Total valuation of all contracts actually let. The dollar scale is at the left of the chart in millions. (5) *Square Foot Area of New Construction.* The measured volume of new buildings. The square foot measure is at the right of the chart. The variation of distances between the value and volume lines represents a square foot cost which is determined, first by the trend of building costs, and second by the quality of construction.

THE SUPERVISION OF CONSTRUCTION OPERATIONS

BY

WILFRED W. BEACH

CHAPTER 14

JOB PROGRESS

WHEN our school house construction, which is being studied in these articles, was fairly under way, in April, the architect at the time of his third visit took occasion to confer with his superintendent and the general contractor on the subject of a schedule of procedure. This is a feature too often neglected, which leaves the superintendent without a definite guide as to whether proper progress is being made, when certain materials should put in their appearance, and whether or not expediting should be resorted to. The schedule fixed upon these definite dates:

April 30. Basement walls completed and basement steel in place.

May 1. Corner stone laying ceremony.

May 15. First floor slab poured.

May 30. Walls and floor construction completed to second floor level.

June 15. Walls and floor construction completed to third floor level; basement forms wrecked; underground piping completed.

June 30. Third story walls completed and roof framed; first story forms wrecked; basement floor slab laid.

July 15. Roof and cornice completed; second story forms wrecked; partitions and ducts in place in first story; plaster started in basement.

July 30. Suspended ceilings completed in third story and assembly hall; plastering in basement completed; tile work and floors in basement completed; all roughing-in of piping, conduit and duct work completed.

August 15. Plastering in first story completed; boiler set, steam mains in basement under way.

August 30. Plastering in second story completed; first story corridor floors completed.

September 15. All plastering completed; second story corridor floors completed; glazing one-third done; exterior painting and pointing done; premises cleaned.

September 30. Third story corridor floors and all stairs completed; plaster dry; all piping completed and temporary radiation in place; glazing two-thirds done; yard work 50 per cent completed.

October 15. Basement finish in place; glazing completed; yard improvements, including walks and paving, completed.

October 27. (Roosevelt Day.) Flag raising.

October 30. First story wood trim and floors in place; basement and gymnasium completed.

November 15. Second story wood trim and floors in place; first story work completed.

November 30. All wood trim and wood floors in place; second story work completed; first story furniture in place.

December 15. All contracts completed; all furniture in place; building ready for acceptance.

By referring to such a schedule, each contractor knows exactly what is expected of him in the matter of getting his materials on the site, coördinating his work with that of others, and having his contract completed on time. Copies of the schedule were sent to the heating, plumbing and electric contractors and their concurrence secured; and the general contractor was advised to do likewise with his subcontractors. The first scheduled date to be met was April 30, when basement walls were to be completed and the steel for first floor construction was to be in place. It was obvious that the first floor form work must follow the setters of basement steel very closely if this first date and the second were to be met. The foreman showed the superintendent how easily his crew, working six days a week, could meet the schedule; whereupon the superintendent pointed out that this made no allowance for time out for inclement weather, and hence it would be much safer to figure on a basis of four good days a week, and the crew was increased accordingly. It thus appeared a simple matter to meet the first two or three dates, at least.

In these early stages of the work, the usual number of volunteer observers congregated on the adjoining walks, day by day, enjoying the spectacle of the industry of others. Many of these were friends of local contractors and were eager for opportunity to find fault with what was being done and to gossip about it. Some appeared particularly concerned anent the ultimate destination of a steadily growing pile of stones, culled from the gravel because too large to be run through the concrete mixer. When a foreman delegated a laborer to drench these and distribute them in the basement wall forms by dropping them in at intervals, immediately after concrete was poured, these "sidewalk inspectors" were agog, never before having seen stone utilized in this manner and, of course, being unaware that the specifications permitted such action.

Before the day was over, each member of the board of education who could be reached had been confidentially advised that the foreman and superintendent were evidently conspiring in making improper concrete by using a grade of gravel coarser than any that a local builder would think of putting in high class work. The superintendent of schools consulted his copy of the specifications but missed the pertinent clause. He called upon a local architect of his acquaintance who had never used large stone in concrete and who "didn't think it helped it any." The chairman of the board was out of town, so the chairman of the building committee advised the school superintendent to talk to the architect over the long distance telephone and warn him that there was "dirty work afoot" and that he had best make a trip over "on the quiet" and investigate. Instead, the architect telephoned his superintendent and inquired what it was all about. At first, no one appeared to know, but he presently traced the complaint to the lumber dealer, who handled broken stone and was responsible for most of the criticism of the use of pit-run gravel. The superintendent showed the school man the specification clause bearing upon the subject, and the latter had again to explain himself out of an embarrassing situation. If a superintendent on a public work could be sure that he is the only individual acting in such a capacity, his duties would frequently be less onerous.

It developed early in the proceedings that conducting a slump test (see page 560, in the October issue of THE FORUM) twice a day was an excellent idea, not only as a check on the mix, but as an object lesson to all observers proving that operations were being carefully watched by means of some scientific process new to the locality, but well understood by those in charge. The man assigned by the foreman to watch the forms just ahead of pouring was also employed to make these tests and quickly mastered the task. Being an experienced concrete worker, he was easily inducted likewise into the mysteries of the water-cement ratio, and hence little difficulty was experienced in that direction. He was not, of course, to be depended upon to relieve the superintendent of any of the responsibilities of supervision. The latter continued to give close attention to every phase of concrete construction. In this, he was fortunately favored by a good going organization under the right kind of foremanship; but, nevertheless, there were several things to which he was compelled to make objection from time to time. For instance, some of the buggymen considered it to be their duty to their employers to shovel droppings of flux into the buggies or forms as opportunity offered. Then, the "straw bosses" or sub-foremen were not always diligent in bulkheading the end of a "run" in the middle of a day, but would, if not prevented, return to it at their convenience, to treat it in all respects as freshly poured flux. This was in no case permitted, after the deposit had lain untouched for more than one and one half hours. (See pages 562 and 563 in the October, 1929, issue of THE ARCHITECTURAL FORUM.

At the end of the first day's run with the large mixer, the superintendent observed the buggy-squad in the act of running the washwater from the mixer into their buggies to dump into the forms. When stopped from doing this, the concrete foreman insisted that such had always been local practice,—that it appeared to benefit the flux by making easier the manipulation and leveling of the top material in the forms. This the superintendent admitted might be true of ordinary concrete construction, but he called attention to the close adherence on this project to the water-cement ratio, by virtue of which the correct amount of water had already been incorporated, and hence no more was needed until for curing.

The most onerous item of inspection in connection with the concrete work was seeing that *all* reinforcing members were placed exactly where they belonged. (This subject is discussed more fully in Chapter 10, "Concrete Reinforcement and Other Built-in Members"; see page 565 in the October, 1929, issue of THE ARCHITECTURAL FORUM.) Nothing in connection with the production of reinforced concrete is of more importance than this, and yet a superintendent has continually to cope with crass carelessness in this particular. After stopping the entire work for half-hour intervals on two occasions, the general and concrete foremen got together and henceforth coöperated to give better attention to the placing and securing of rods and mesh, and much of this source of trouble was thereafter eliminated.

Those who have followed this work may recall that the contract, as originally awarded for a semi-fireproof building, was changed, early in the proceedings, to that for a much better grade of structure by the substitution of fireproof partitions for the studding and wood lath that had originally been called for. These changes were taken care by the issuance of Change Order No. 2, which deducted $8,035 for the saving in wood lath and studding and allowed an extra of $25,735 leaving a net extra of $17,700 to be added to the contract price. This covered the cost of hollow tile or gypsum blocks for all partitions above the basement, except a few that were to be of solid plaster, 2 inches thick, on metal lath and small channel studding. The extra also provided compensation (amounting to $1,200) for the increase in the steel columns and girders necessary to carry the additional weight throughout the building. The change made urgent the prompt revision and re-submission of shop drawings for steel and for the reinforcement of certain concrete beams (for which $420 had been included in the extra), and hence the superintendent kept persistently at the expediting of these, as well as that of the reinforcement for first floor slab, these two items constituting the first causes of possible delays.

This subject of expediting is receiving much more attention in present-day construction operations than was formerly the case. Part of the carrying charge against any commerical building enterprise is the item of ground rental, which, on an expensive site, may amount to many thousands of dollars monthly. The architect is counted upon to assist in conserving this as much as possible. Days slip by rapidly on such work, and the architect and superintendent must keep all factors constantly alive to the need of closest attention to proper sequence in the arrival of materials and men for every purpose. For this reason, there is now appearing in the specifications of some architects and structural engineers a particular clause on the subject, such as:

"When, in the opinion of the architect, it may be necessary, in order to avoid delay or a continuance of delay in any part of the work, he is privileged to provide personal tracing or expediting of the cause of delay and to assess the expense incidental thereto (not in excess of $100 per week in connection with any single item) against the contractor responsible for such delay; or, in case no such responsibility can be established, against the owner. Each party to this contract hereby agrees to pay the cost of such tracing or expediting, respectively, as so assessed."

With the approach of May 1, the superintendent was particularly concerned in two items focusing on that date. One was the issuance of first monthly certificates to contractors; the other, the timely arrival of the cornerstone, for the laying of which formal ceremonies had been planned to take place on May Day. It was ascertained that the stoneyard (located in the architect's home town) which had the subcontract for the cut stone could not possibly have its first car loaded in time for delivery by April 30, and hence provision was made for delivery of the cornerstone by truck. After two or three telephone promises from the subcontractor for sheet metal work, on the subject of the copper box for the cornerstone deposits, the superintendent called at the shop on April 30, found that nothing had been done about it, and hence personally supervised its construction and carried it to his office. He had once suffered the embarrassment of participating in a cornerstone laying ceremonial where the copper box was missing, and had likewise been concerned in another ceremonial which had to be postponed because of the non-arrival of the particularly necessary stone. He was determined that neither of these accidents should occur in this instance. Frequently, a superintendent is forced to a conclusion that he is the only individual to concern himself about the existence of these two important items in such a program. All others appear to think that both stone and box arrive of their own accord. He had made sure that the box was so constructed as to be readily hermetically sealed. The hole in the stone had been cut in the bottom bed, so that the weight of the stone would safeguard its contents until such time as ample wall was built around it. Cornerstone boxes have been stolen by miscreants under the impression that they might contain articles of commercial value. For that reason, if the hole is not in the under side, it should be effectually walled in on the day the stone is laid. The former provision is simpler.

As concerned the certificates to be issued, the superintendent's records showed the condition of the general contract account as of April 30:

	Extras	Deductions	
Original Contract			
Change Order No. 1*	$ 467	$1,917	$716,437
Change Order No. 2	25,735	8,035	
Change Order No. 3	115		
Change Order No. 4	420		
Total extras	$26,737	$9,952	
Total deductions	9,952		
Net extras	$16,785		16,785
Total amount of contract, as of April 30			$733,222

In order to ascertain the amount that would be due on account to the general contractor on May 1, he and the superintendent jointly compiled an itemized statement comprising the various major items (these embracing the lesser) of the work, and allowances were made accordingly for labor and material incorporated in the structure and for other material on the site, as stipulated.

GENERAL CONTRACT ESTIMATE

Divisions	Contract	Extras	Deduct's	Net Contract	First Allowed	Balance
Overhead	$17,500	$115		$17,615	$11,615	$6,000
Excavating	8,180		$1,917	6,263	5,500	763
Concret	110,205	800		111,005	5,260	105,745
Masonry	127,750	200		127,950	4,250	123,700
Cut stone	25,000			25,000	250	24,750
Str'l tile	8,030	13,620		21,650		21,650
Steel	16,220	1,200		17,420	6,600	10,820
Miscel. metal	14,450			14,450		14,450
Roofing	21,560			21,560		21,560
Sheet metal	23,140			23,140		23,140
Carpentry	115,050	267	2,500	112,817		112,817
Plastering	74,820	10,535	5,535	79,820		79,820
Marble, etc.	56,670			56,670		56,670
Paint & glaz.	54,512			54,512		54,512
Linoleum, etc.	21,500			21,500		21,500
Furniture	21,850			21,850		21,850
	$716,437	$26,737	$9,952	$733,602	$33,475	$700,127
Deductions		9,952				
Net extras		16,785				
Original contract		716,437	First allowance			33,475
Contract, April 30,		$733,602		$733,602		$733,602

As is customary, the contract stipulated that but 85 per cent of the architect's estimate of the value of material and labor would be due and payable each month, and hence it was necessary that 15 per cent be deducted from the allowance of $33,475 thus the first certificate read:

Job No. 28017 Certificate No. 1

Date, May 1, 1928

To J. U. Petty, Clerk, Board of Education, East Millville, P.M. This certifies that, J. Q. Brown, Contractor for the General Construction

* See page 788 in the May, 1929, issue of THE ARCHITECTURAL FORUM for details of Change Order No. 1, and page 129 in the July, 1929, issue for details of Change Orders Nos. 3 and 4.

for your Consolidated District School building at East Millville, is entitled to a first payment on account under his contract to the amount of twenty-eight thousand, four hundred fifty-four and 00/100 dollars ($28,454).

(Signed) John Smith Jones, Architect.*

The statement of account, filled in on the margin of the certificate, read:

Contract price	$716,437
Extras	26,737
Deductions	9,952
Total contract	733,602
Previously allowed	0
This certificate	28,454
Allowed to date	28,454
Balance	$700,127

These records are given thus in detail, not for their intrinsic value, or because they are essentially the business of a hired superintendent, but for the purpose of impressing upon the young practitioner the extreme importance of keeping his accounts in perfect "shipshape," ready to be audited at any time, on short notice. Nothing is more exasperating to an owner than to find that the man on the work, be he architect or superintendent, has gotten his records "balled up,"—cannot be depended upon to keep them straight. Such a superintendent is quite likely to be replaced without due formality. The appended statement on the certificate form, as received at monthly intervals by the contractor, is all that is needed for comparison with his own books. It constitutes the authentic record of the account, rather than does that gotten out by the contractor himself each month and sent to the architect, intended to be used as a basis upon which the architect is supposed to prepare the regular estimate and certificate. Such statements are frequently subject to revision and must, in any event, bear the customary 10 to 15 per cent deduction for retention.

Notwithstanding the fact that, by virtue of an ample surety bond, an owner may consider himself adequately protected against any financial defection on the part of a contractor, it is incumbent upon the architect to have positive knowledge, either that such contractor is promptly paying his bills or that his subcontractors, supply concerns and those laborers who are directly employed have no intention of having recourse to the owner for any portion of their reimbursement. The mechanics' lien laws, as they appear in various forms on the statutes of all our states, were devised to prevent either an owner or his builders from depriving any of those who had supplied either labor or material for his building of their just recompense therefor. Thus its direct object was the elimination of the "shyster" contractor, to the advantage of his competitor who secured a sufficient contract price to enable him to pay his bills, and who was accustomed so to do. Theoretically, a contractor may be supposed to pay his bills in full each month, secure receipts therefor, then requisition the owner for 85 per cent of the funds so expended, and carry the remaining 15 per cent (most of which is assumed to be profit) until the final payment is received. In actual practice, this is scarcely recognized, even as a theory. Competition between supply houses is generally so keen (except, perhaps, in the matter of prices) that they will go to considerable lengths in the sacrifice of their supposed benefits from lien laws, in order to assist those builders whose continued patronage seems attractive. This is frequently carried to a point of actual financial backing. All of this has led to their assistance in the conniving of architect and owner to defeat the very law that was invented for the supply concerns' protection. Naturally, then, the architect is driven to accept so-called "waivers of liens" as evidence of the owner's protection, in lieu of receipts representing actual cash payments, if the supply concern or subcontractor is willing to take this chance. Out of this practice has grown the assumption that few, if any, contractors finance their operations further than is needed for meeting their payrolls, transportation charges, and other incidental costs that must be met in full and with cash. Obligations to his regular sources of supply and to his "subs" are met by the average contractor after he receives his monthly payments. Some of these creditors are willing to accept but 85 per cent, as the contractor himself does, waiting for the remainder until he receives his final payment.

The effect of this credit structure upon the architect is not to lessen in any degree his responsibility to his client. He understands that part of the service supposed to be rendered is that of keeping the owner out of trouble with the contractor, his subordinates, his sureties, or the courts. He fortifies himself, so far as the possibility of liens is concerned, by demanding the deposit of either receipts or waivers as a prerequisite to the issuance of each monthly certificate. In the case of directly-employed labor, he may insist upon seeing either payroll signatures or canceled checks, though neither of these can be deemed positively determinate.

The burden upon the architect incidental to the foregoing is frequently shifted to the shoulders of the superintendent, especially if the latter be an experienced man or employed away from the

(*See form of certificate on page 301 in the February, 1929, issue of THE ARCHITECTURAL FORUM. Similar certificates, about the size of bank drafts, bound into books, may be had of architectural supply houses. Referring to the same page, 301, it will be noted that the "General Contract Estimate" comprises seven of the 12 columns described on that page as being properly explanatory in a superintendent's record of accounts on a construction operation.)

home office.* If such a one be not diligent in watching this end of the proceedings, his carelessness may result in annoyance or undue expense to the owner and an allegation of lack of acumen on the part of the architect.** Our superintendent was supplied with the necessary waiver blanks by his home office and had no difficulty in getting them promptly returned, properly filled out, and signed by those factors of the general contractor who had so far functioned on the work. The other contracts awarded to date were:

Heating and ventilating	$75,700
Plumbing and drainage	54,000
Electrical work	63,050

No work was done on any of these except the plumbing contract, prior to May 1, and hence this was the only contract, in addition to the general contract, for which a certificate was to be issued. The superintendent estimated that the work done and the piping already laid or delivered were worth about $1250, on which amount the plumber was entitled to a payment of $1062.50. To the surprise of the superintendent, the contractor's bondsman, the hardware dealer, called and presented his waiver of lien and an assignment of the plumber's claim to the payment. A little investigation disclosed the fact that the former had, as yet, supplied nothing to the plumber for the school work, but expected to credit the amount of the certificate on a note due him from the plumber. This was frustrated by the architect's insistence upon receipts or waivers from the two concerns that had supplied the tile and cast iron pipe and from the man who had taken a contract for laying the tiling. Evidently the hardware man assisted the contractor in procuring these, as he eventually secured the payment.

On this subject of partial payments to contractors, it is the custom with many architects to rely largely upon the temporary suspension of the final payment as a means of holding a contractor to his financial obligations. Such payment ordinarily constitutes from 15 to 25 per cent of the amount of the contract and should be ample for the purpose, especially on public work, immune as such operations are to the process of mechanics' liens. But a clever rascal, incorporated, and intent upon "making a clean-up" on several contracts, just prior to bankruptcy, has many tricks "up his sleeve" and it is up to the architect and his superintendent to outwit him, if possible.

One simple precaution that should always be observed is to re-check one's total estimate at the time the work is about two thirds complete. In this connection, it is well to bear in mind that the costs entering into the particular structure are not necessarily *market prices* at any stages of the work. In compiling his monthly estimate, a superintendent is interested in current prices only as they supply a general guide. The actual cost of the building (or other contract) is the contract price at which it was sold to the owner. If this price turns out to be too low, the loss, insofar as the architect is concerned, is distributed over the entire project, not confined to a particular item which might have been accidentally omitted from the bid figure. Therefore, when an architect expresses his opinion of "the value of labor and material supplied," he should be most careful to compile it as applied to *his particular contract*, regardless of what the contractor is actually paying, or claims to be paying. The latter may even be resorting to the old dodge of having supply houses pad his bills, or pay him substantial "drawbacks" when the contract is complete. Verily, the business side of architecture is no simple matter. Thus, if an architect finds that his allowances of current prices for early work, such as excavating and concreting, are evidently leaving an insufficient balance for hardware and finishing, it is fortunate if he discovers the discrepancy in time to revise his estimate and trim his remaining certificates accordingly,—and quite regardless of the contractor's protests. The latter, if faced with a loss, will likely try to take it out of his subs, may even resort to devious methods, such as forging waivers and receipts or having them signed by unauthorized individuals, all of which demands the utmost watchfulness on the part of both superintendent and architect. Obviously, they should not depend too much upon the protection supposedly afforded by holding up the final certificate. They must "play safe" at all times.

(*Forms of waivers of lien can be had of stationers in cities and are worded somewhat in this form:
"To Whom It May Concern:—Whereas the undersigned ....has been employed by........... ....to provide.....................for a........... building located at................Street in the City of ...., State of...........and owned by..................................,
Now, therefore, be it known that the undersigned, for and in consideration of the sum of.................... dollars, the receipt of which is hereby acknowledged, does hereby waive and release any and all claim or rights of lien against the above described building or the premises on which said building is located, under the statutes of the State of......................, relating to mechanics' liens on account of labor or materials which have been or may be supplied to said.................... for said building or premises.
Signed, ...
Dated at ...., ..., 19....."
After "dollars" may be inserted "and other valuable considerations.")

(**A young architect, engaged upon a public building, discovered too late that the general contractor was remiss in his payments to subcontractors and material men. When the issue was forced, it developed in connection with the contractor's financial failure, that, of the $28,000 he had received to date, less than $5,000 had been expended on that particular work, for local labor, incidentals and one payment on the steel contract. The remainder had been diverted into the contractor's own pockets or used on other projects. It was with difficulty that the architect convinced the attorneys for the bonding company that there had been no collusion with the contractor.)

THE SUPERVISION OF CONSTRUCTION OPERATIONS

(Continued)

CHAPTER 15. MASONRY

INASMUCH as masonry materials are among the first to appear at the site of a proposed new building, these were discussed to some extent in Chapter 7, "Foundations and Masonry Materials," in THE FORUM for July, particularly common brick, structural tile and materials for concrete and mortar. Receipt of these materials for the school building we are considering was followed, early in May, by the arrival of face brick and the cut stone for window sills, belt courses and other trim.

Face brick is ordinarily specified to be selected by the architect, owner or building committee, and the contractor is allowed a certain arbitrary price per thousand at which they are to be purchased, such price to be actual cost to the contractor for the required number of brick, delivered at the site or free on board ("f.o.b.") cars at the local station or building siding, as the case may be. It is further provided that, if the brick determined upon vary in price from that stipulated, the difference in cost to the contractor is to be duly compensated for. In our case, the specified price was $40 per thousand, "f.o.b. cars at East Millville," but the brick selected were priced to the board of education at $38. Knowing that a contractor frequently purchases such material at a lower price than that publicly quoted, the architect ordered the brick to be bought, but purposely delayed issuing the order for the deduction to which the district was entitled until a careful estimate of the required quantity could be made and the superintendent could inform himself as to the price at which they were being billed to the contractor. Some architects purposely ignore these special discounts to contractors in connection with the cash allowances named in the specifications, but others, more exacting, insist upon observance of the letter of the contract, even though the builder may be most recalcitrant in acceding to the deduction.

Since the work of a superintendent brings him in closer touch than that of anyone else in an architect's organization with conditions as they actually exist, both in connection with construction itself and in the building material market, he is frequently called upon to prepare or check estimates and to supply information as to prevailing prices for both material and labor. All experienced superintendents are fully capable of exercising this function, and hence it is well for the novice to educate himself by taking bills of materials off of drawings and preparing estimates based thereon. If he can make himself dependable in such performance, he has materially increased his value to his employer. Various methods of estimating quantities of masonry materials, plastering, etc., are in vogue in different parts of the country, and these change from time to time. One must, therefore, keep up to date, both in method of arriving at quantities and in application of prices thereto. The brick selected for facing for the school measured 8 x 2¼ inches on the side and were to be laid with ⅜-inch joints, and hence it was computed that they would run 6⅝ brick per superficial foot of exposed wall. For more detail in the estimating of brick and brickwork, the reader is referred to "The Building Estimator's Reference Book" by Frank R. Walker, and other works on the subject, wherein each phase of building construction estimating is treated more or less exhaustively. The obsolete custom of allowing 7½ brick per square foot, doubling corners and deducting nothing for openings, was ignored by both contractor and superintendent, who were concerned only in the actual quantity to be purchased. After deducting the saving in openings and in the space occupied by stone belt courses, it was agreed that 298,000 face brick would be needed; and the contractor admitted that he was getting them at $1 a thousand less than the price quoted to the board by the brick company's representative. Change Order No. 5 was therefore issued calling for a deduction of $3 per M on 298 M brick, a total of $894. It was assumed that the estimate was sufficiently exact, but it was understood that, if it later developed to be materially at fault, a suitable correction would be made.

These brick began to arrive shortly thereafter, and, as is not unusual, were found to vary somewhat from the samples to which they were supposed to conform. Being a finished material, perpetually exposed, face brick must not only equal the requirements for common brick of the best quality, but should be superior thereto in both composition and density, in order that they may weather permanently. This applies equally to pressed brick and to common or paving brick used for facing. It is assumed that the approved samples meet these requirements. All that are delivered which do not equal the samples should therefore be rejected. These may be too soft, ill-shaped, off color, chipped or otherwise defective. In order to simplify such rejection, without loss to the contractor or delay in the work, it is customary with some architects to stipulate that such culls from the face brick as are not unduly soft shall be used for the interior facing of parapet walls above the roof flashing, such facing to be completed, if the quantity of such culls is insufficient, with the necessary quantity of the regular run of face brick. In the case under discussion, it was estimated that there would be about 20,000 brick required for the inside of parapet walls, and that there would be less than that number of culls, if the first shipment was a fair criterion of what was to be expected. The brick company was therefore warned that the brick were being culled in lieu of absolute rejection, and that future shipments *must* be up to samples or rejection might be expected. (See page 127 in July, 1929, issue of THE ARCHITECTURAL FORUM.)

The two other kinds of face brick,—glazed for certain wainscoting and enameled for the side walls of the swimming pool,—were definitely specified to conform to approved samples. These arrived later and were inspected with the same care that was exercised with other face brick.

In addition to the flat-tile arches used in first floor construction, two other kinds of structural terra cotta (commonly known as "hollow tile") were called for in this school work,—"load-bearing" for backing of outside walls above basement (except in certain localities where a good grade of common brick was required), and "non-load-bearing" for basement partitions, for backing of brick wainscoting, and behind plumbing fixtures and as a first course under the gypsum blocks of all other partitions. Thus there were three kinds and grades of hollow tile brought to the building, and the superintendent was again supplied with approved samples with which to make comparison. The floor and load-bearing tile were shipped by a concern of good repute, and no trouble was experienced with them. But the tile for partitions were of a make new in the field and, as had been the case with the first common brick received, were shipped "kiln-run," regardless of the fact that the samples submitted had been carefully selected. Defective tile may be softer (more porous and less burned) than the grade demands, mis-shapen, unduly chipped, checked or cracked, or too light in weight. This last deficiency implies shells thinner than specified and is to be noted when samples are inspected for approval. The first carload of these tile was rejected *in toto* because of a large percentage of all shortcomings (except that they were heavy enough); and because less than half were scored for plastering. Thereafter, the partition tile were culled before shipment, and little further trouble was had with this material. Since the chief fault with such title is breaking in handling, which renders the units unfit for laying or subsequent plastering, the contractor is likely to be as particular as the architect's inspector regarding their acceptance,—but not *too* particular, because, if these tile are too hard, they are not easily cut after being built in; and one must unfortunately, count upon considerable cutting of such partitions in any building. On the other hand, the load-bearing tile and those for floor arches must be free from flaws,—except the most trivial.

Mortar for masonry consists of a mixture of sand with lime or cement, or both, tempered with the correct amount of clean water. It is generally conceded that the sand need not be sharp, but it must be clean and hard and evenly graded from fine to coarse, though some tests have shown that a mixture of coarse and fine, with few intermediate-sized aggregate, will produce the strongest mortar. "Coarse" sand consists of pebbles ranging from 1/20 to ¼ inch in diameter. When containing a very small proportion of finer material, such sand is known as "torpedo" in some localities, presumably to distinguish it from the sharp sand required for plastering. "Fine" sand will pass a 20-mesh screen, but not more than 30 per cent should pass a 50-mesh screen. Fine clean sand encountered in a building excavation, while too fine for concrete, may be suitable for mortar or plaster, or both, but this requires careful discrimination. It may be found that such sand, though in common use in the locality, is, nevertheless, not regarded as proper material for use in first class work, but is simply another of those materials that are misrepresented to a superintendent in the hope that he doesn't know his business. It may be too uniformly fine or soft or contain too much foreign substance, not discernible except by proper testing.

The sand for mortar is mixed with the cement or lime in the proportion of 3 to 4 parts of sand to 1 of either the lime or cement (by bulk) or of an equivalent combination of the two materials. Thus, a "cement mortar" is one consisting of 1 part of cement to 3 of sand; or, to improve its workability and add slightly to its waterproofness, not to exceed 15 per cent of the bulk of the cement may be displaced by an equal quantity of lime. The cement may be Portland, of any approved brand (such as will pass the specified tests) or may be white Portland or waterproof Portland, as may be required for special purposes. In localities where natural cement is still offered in competition with Portland, it may be used to produce a mortar somewhat stronger than a simple lime mortar. "Lime mortar" consists of 1 part of lime to 3 or 4 parts of sand, and is sometimes improved by the addition of from 10 to 25 per cent of Portland cement, replacing an equivalent quantity of the lime. "Cement-lime mortar" is produced by mixing 1 part of lime and

1 of cement with 6 parts of sand. The kind of mortar to be used in each part of the work is stipulated in the specifications, frequently fixed by local ordinance, and seldom left to the discretion of the superintendent. His function is to see that proper materials are used in correct proportions, that they are mixed in the right manner, and placed in the work as required.

As to lime, the contractor is usually given his choice in the use of lump lime (delivered unslaked and usually in bulk), or ready-slaked lime, called "hydrated," delivered in barrels in the form of powder. Lump lime, unslaked, must be "fresh," that is, it must be water-slaked before it has been exposed to the air long enough after leaving the kiln to become "air-slaked." Air-slaking causes the lumps to disintegrate and continues, more or less rapidly, depending upon the amount of moisture in the atmosphere. Thus, lump lime, on account of its friability, is accompanied by two kinds of powder or dust, that due to attrition and that resulting from the slaking process. In order to avoid receiving the latter, one is justified in insisting upon the lime's being handled by forks, rather than by shovels, unless it can be proved that no air-slaking has begun. An expert can judge this by feeling the lumps. If they are covered with scant dry dust of the same color as the inside of the lump, they may be considered fresh; but, if the dust coat is heavy, dark or moist, the lime has begun to deteriorate and should be rejected. Its usefulness lies in its ability to unite with water to form a lime paste, which air-slaked lime will not do. Proper slaking takes a week or more in the process, and since the paste is unfit for use in mortar until slaking is finished, it must be allowed its full time. This is frequently most inconvenient, and hence the increased use of hydrated lime, which, though more expensive, possesses the advantage of being ready for use as soon as it is mixed with water.

In general, lime mortar is used for interior masonry, or cement mortar or cement-lime mortar for exterior work and for piers carrying heavy loads, where quick-setting and minimum compressibility are sought; though, in some sections, notably in the Chicago district, lime mortar, straight or tempered, is used for outside as well as inside walls. Having made sure of the suitability of the lime, sand and water, one pays little further attention to the preparation of straight lime mortar. The ingredients for this are seldom measured, there being no gain in cheating such a mix, in fact any possible advantage is outweighed by the need of producing mortar of maximum workability, which involves the use of between 3 and 4 parts of sand to 1 of lime, as is ordinarily demanded. An experienced mortar-mixer knows, by the feel of the paste under his hoe, just when he has enough sand to make good mortar. But with cement mortar, we have a different condition. Whereas, a 1:3 mix is considered correct for general use, a workable cement mortar can be made as lean as 1:6 at a considerable saving. Hence these ingredients must be measured as accurately as for concrete.

Then, too, the use of cement in mortar places a further burden on the inspector by requiring him to know that each batch is entirely used before the cement has begun to set. Perhaps the chief objection to the use of this material lies in there being too little attention paid to this phase of the subject. If this be true, as is the contention of the vendors of proprietary brands of ready-prepared mortar materials, then much Portland cement is being wasted in the production of mortar that is little, if any, better than the lime product. Obviously, this is simply a matter of writing the kind of specification that is expected to be carried out, and then enforcing it. If not more than 10 or 15 per cent of cement is called for, this can be added to small batches after the lime has been worked. But the superintendent on our school construction found that his specification called for a cement mortar, tempered with 15 per cent of lime, for all exterior walls. Having "been through the mill" before with this requirement and knowing the custom of foremen to prepare plenty of mortar in advance and then to see that it is all used, regardless of deterioration, he took time to discuss the subject before the brickwork was started and had it distinctly understood that no cement mortar should stand longer than 30 minutes after the water had come into contact with the cement, and that there should be no "re-tempering" under any condition. Having established these rules of conduct, the superintendent still found that it was difficult to secure the kind of coöperation that would guarantee that all hands would live up to the letter of the stipulation. He could not object to the mixing of water into a batch that was too stiff, but after timing several of these, he had some of them dumped and had less of this trouble thereafter.

Of more trouble, however, was the proviso that all brick and tile "must be drenched, in warm or dry weather, just before being placed in the wall." These materials are more or less absorbent, and hence, if dry, will draw moisture out of the mortar and leave it granular, with insufficient water for the crystallization that is absolutely essential in the formation of such a cementing compound. But wet brick and tile are cold and slippery, and less convenient and pleasant to handle than when dry; nor do they hold their position in a green wall as readily.

Chapter 15 will be continued in the April issue of THE ARCHITECTURAL FORUM.