

# THE ARCHITECTURAL RECORD

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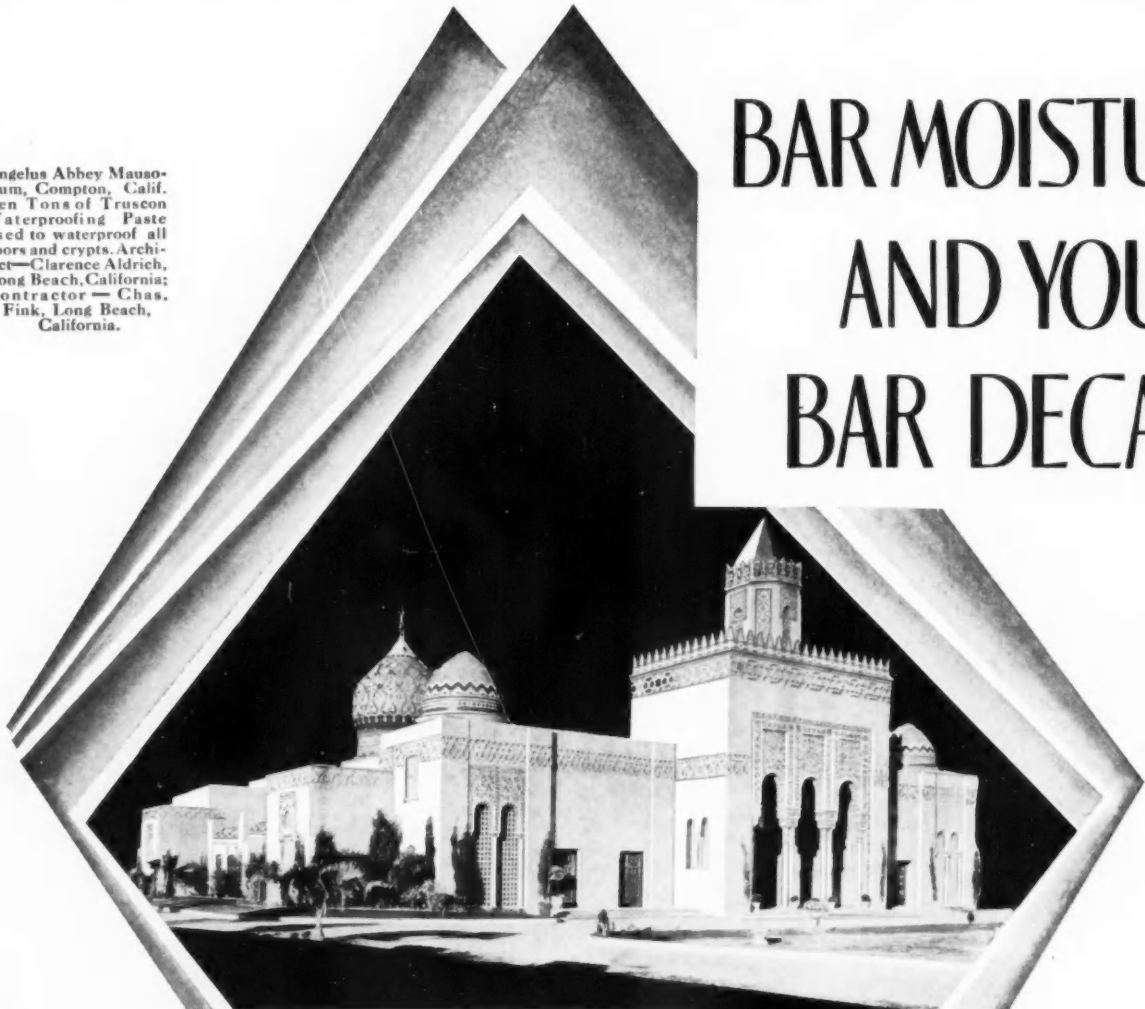
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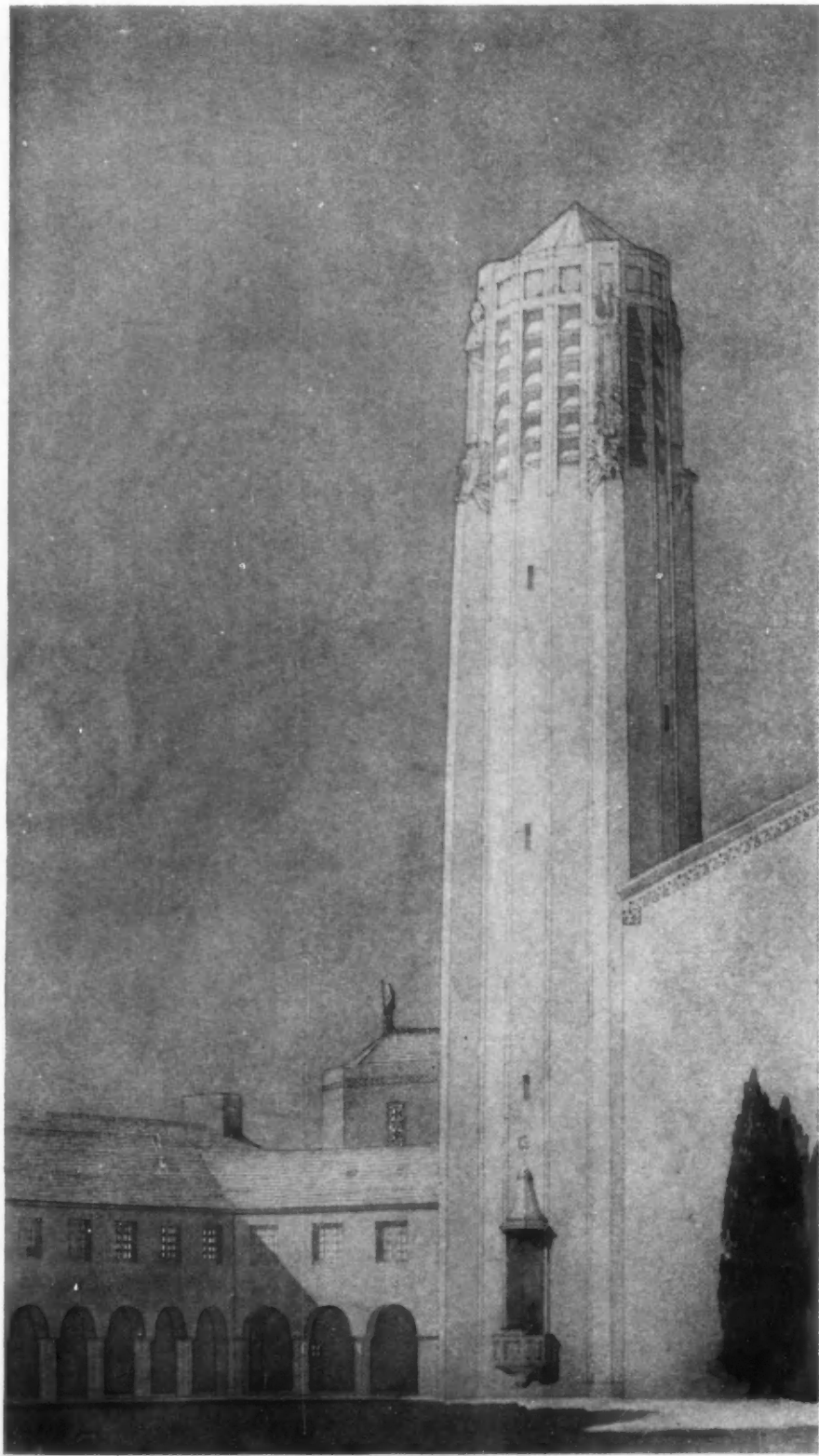
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**W A T E R P R O O F I N G S**

Preliminary Study, First Plymouth Con-  
gregational Church, Lincoln, Nebraska.

A rendering in water color washes  
by H. Van Buren Magonigle over a  
drawing in toned ink by Robert W.  
McLaughlin, Jr.



STUDY, FIRST PLYMOUTH CONGREGATIONAL CHURCH, LINCOLN, NEBRASKA  
H. VAN BUREN MAGONIGLE, ROBERT W. McLAUGHLIN, JR., ARCHITECTS ASSOCIATED

# THE ARCHITECTURAL RECORD

AN ILLUSTRATED MONTHLY MAGAZINE OF  
ARCHITECTURE & THE ALLIED  
ARTS & CRAFTS



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VOLUME 65

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## FIRST PLYMOUTH CONGREGATIONAL CHURCH

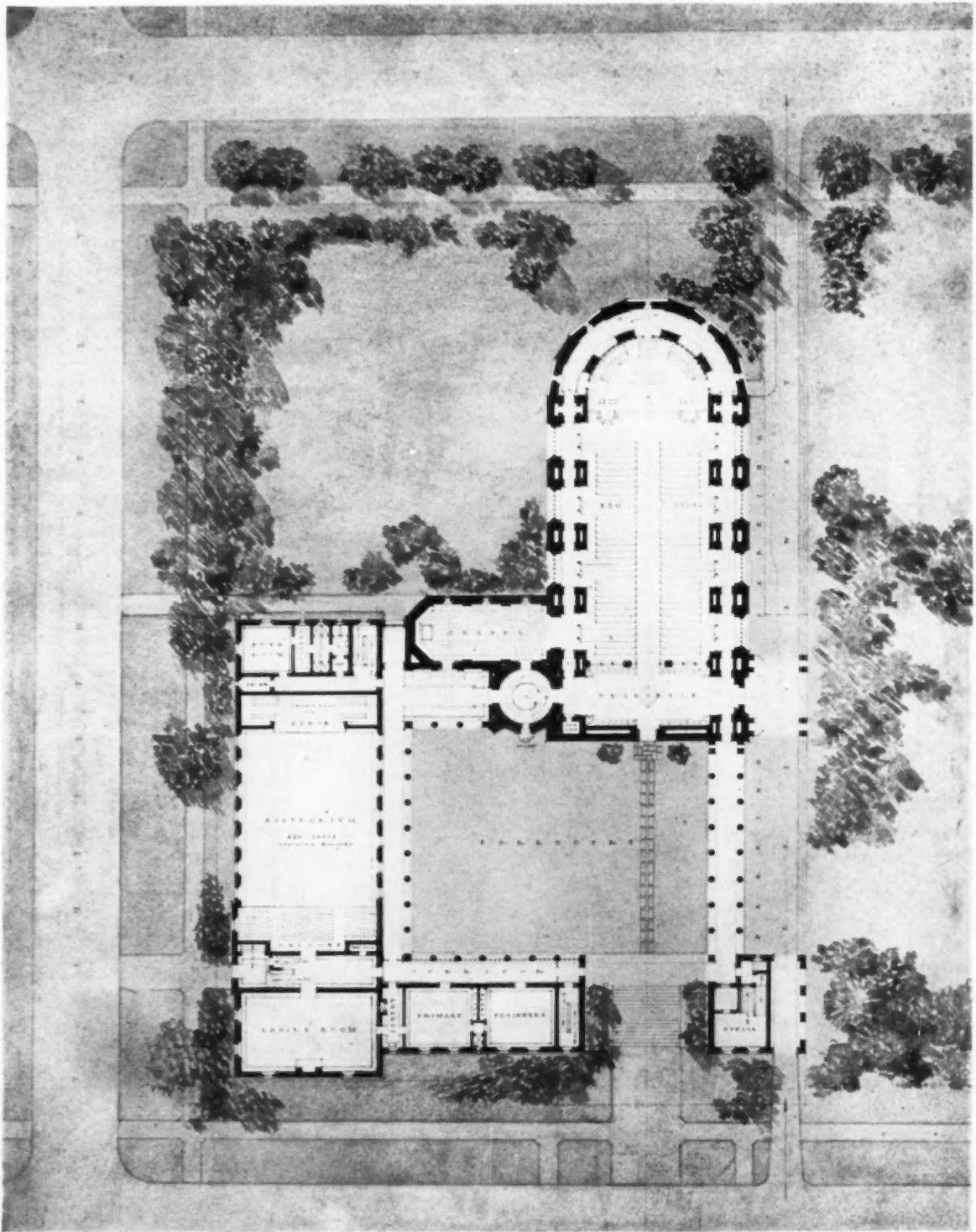
LINCOLN, NEBRASKA

H. VAN BUREN MAGONIGLE AND ROBERT W. McLAUGHLIN, JR.,  
ARCHITECTS ASSOCIATED

THE design of a Congregational Church on the Nebraska prairies offered an architectural problem which was not solved by the easy adaptation of one of the historic styles. The natural surroundings of Lincoln are at once a stimulating as well as a governing factor in the design of a church to be located there. Dr. Hartley Burr Alexander, who was Mr. Goodhue's counsellor in working out the details of the State Capitol at Lincoln, describes the prairie country as "a region where the undulating hills are beginning to die away into the level lands of the plateau. Naturally it is a region of open prairie, broken by no eminence in any direction; the trees which invade the hollows and rise upon the slopes are of the orderly planting of man—groves and orchards, not forest. Every site, in such a country, is foursquare with the horizon; every suggestion is of freedom and space; there are no challenging pinnacles, no inevitable approaches constraining the sense of form. The whole setting has the character of pure geometry, offering a simplicity of contour which is perhaps most effectively

indicated by the words of an old Pawnee Indian, native of the state: 'If you go on a high hill and look around, you will see the sky touching the earth on every side, and within this circular enclosure the people dwell.' A further feature of this central portion of the Missouri Valley is that it is a land of immense and almost constant sunlight. Physiographically the region is perhaps more akin to Central Asia than to any other portion of the world that possesses an architectural tradition. . . . Here in the prairie country of our Middle West, an architectural tradition is all to make."

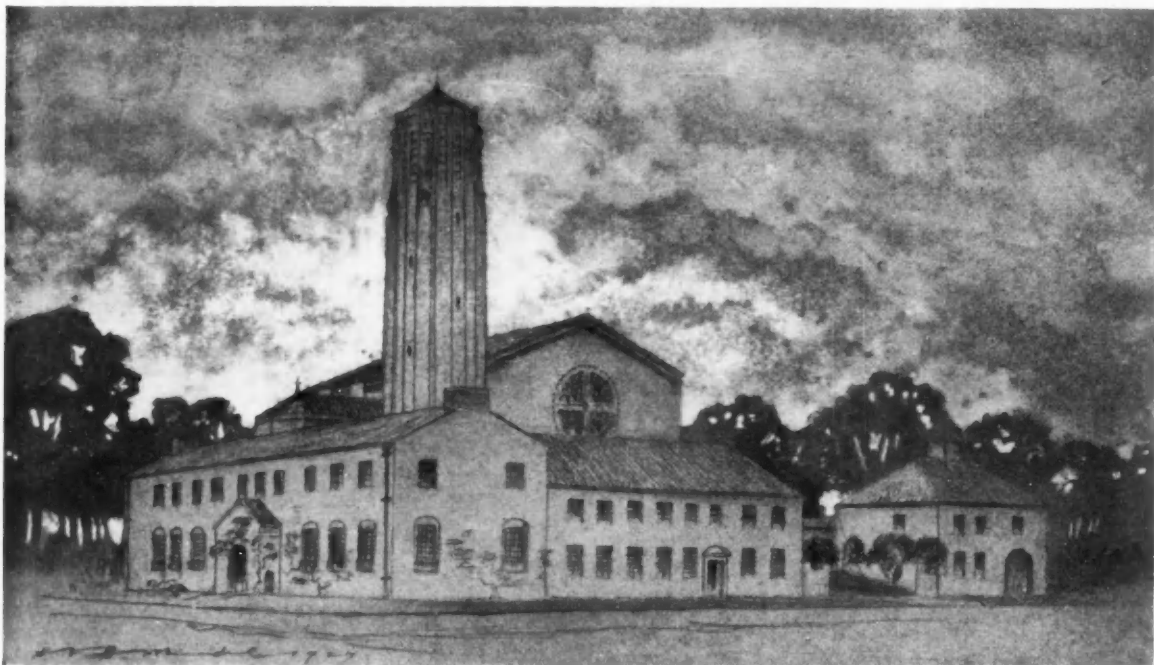
The scale of the prairies is tremendous and is hardly appropriate as a setting to the historic style of the Congregational Church which is New England Colonial. A Colonial spire which nestles so engagingly on a Massachusetts hillside or charmingly dominates the life of a village green is dwarfed into insignificance on the broad sweep of the prairies and Gothic architecture at best can be only an unsatisfactory compromise when used to house a preaching service. The challenge of the open country-



PLAN AT COURT LEVEL  
FIRST PLYMOUTH CONGREGATIONAL CHURCH, LINCOLN, NEBRASKA  
H. VAN BUREN MAGONIGLE, ROBERT W. McLAUGHLIN, JR., ARCHITECTS ASSOCIATED



PRELIMINARY STUDY, ACCEPTED AS THE BASIS FOR THE DESIGN OF THE CHURCH



PRELIMINARY STUDY, ACCEPTED AS THE BASIS FOR THE DESIGN OF THE CHURCH  
FIRST PLYMOUTH CONGREGATIONAL CHURCH, LINCOLN, NEBRASKA  
H. VAN BUREN MAGONIGLE, ROBERT W. McLAUGHLIN, JR., ARCHITECTS ASSOCIATED

side and the character of a people little removed from pioneer days are a tremendous stimulus to architectural design.

The minister of the First Plymouth Congregational Church, the Rev. Ben F. Wyland, characterizes Lincoln as a University city which is dominated by its educational institutions. "It is not an industrial community and never will be one. Our agricultural interests will always be important. The spirit of the people is that of a friendly people with a very large conception of liberty. It is a pioneer state with the characteristics of the pioneer evident everywhere. The marks of the wagon trains over the famous Oregon Trail can still be seen on the soil of our state. It would seem to me, knowing the bright, friendly and free character of this people that a church with a dark gloomy interior would be two opposites that would not fit together."

The site for the church, which is bounded by three streets and ends a fourth, suggested the placing of the building so as to center on this fourth street. It seemed desirable, in a region where one is so aware of the limitless expanse of space, to enter an enclosed portion of the out-of-doors, before entering the church proper; therefore the transition from a busy world into the sanctuary was made through a forecourt formed by the parish house and cloister.

The parish house, planned for the religious education of the children and for those activities of the church that are somewhat secular, is distinctly separate from the sanctuary. This relation of parish house and church is a variation from the usual plan of letting the parish house straggle along behind or beside the church. The general effect is one of low mass in front with church and tower rising beyond.

The tower was designed primarily to hold a carillon, for the gentle undulations

around Lincoln suggested a country which, like Belgium, would be beautifully receptive to the music of bells. The plan of the tower is sixteen sided, with salient buttresses on four sides. Figures of the four evangelists surmount the buttresses, with their symbols at their feet—the lion, the bull, the eagle, and the man. An outdoor pulpit is to be placed at the base of the tower so that the forecourt can be used for open air services.

Aside from its aesthetic effect, the forecourt will possess practical advantages of great value to the church. Such an open space, measuring about eighty by one hundred feet gives privacy from the noise and traffic of the outside world, and is a desirable element in the church life. The group is compact and yet there is a suggestion of the campus or close in the arrangement. The approach to the church on foot is up the steps to the forecourt and either across the court or around through the cloister; for motors there is a drive along the side of the property with entrance by a side door to the vestibule of the church.

The interior of a Congregational church, if it is to express the qualities of the religion it houses, should possess clarity and spaciousness, rather than the dim mystery associated with liturgical churches. The plan of the interior is basilical in its simplicity, and an abundance of light is secured without glare by setting the windows in deep reveals through which low side aisles are cut. There is no attempt to mark a definite architectural separation between the chancel and the congregation for to do so would be out of character with the traditions of this church. The material of the church group is brick used with full recognition of its monumental possibilities and not as a substitute for a more costly material.



# A NEW TYPE OF BUILDING FOR RELIGIOUS EDUCATION

BY MOUZON WILLIAM BRABHAM

THE NEW type of building being erected for religious education is characterized by an appreciation of the necessity for meeting the requirements of educational work. The contrast is striking when such a building is viewed alongside of the well-known "Akron Type" which dates back to 1867. Instead of provision being made for a maximum of mass assembly, the building today provides for age grouping as the fundamental basis of operation. Instead of class rooms of all imaginable shapes and irregular features, the rooms are well proportioned, with unbroken wall lines, and with standard allowances for window space, ceiling heights, blackboards, and entrances.

The most approved type of educational building today is one following to a great degree the "corridor arrangement" of class rooms as related to the assembly rooms. This plan makes possible outside light and ventilation in every room and at the same time gets away from the "built-in" class room idea which has been prevalent for more than three decades. In other words, just as the departmental idea grew up and displaced the Akron plan arrangement, so the corridor type is displacing the departmental room characterized by a multitudinous number of "stalls" enclosing the assembly space. The new arrangement makes possible assembly rooms that are practical and, at the same time, attractive.

A brief description of each of the accompanying illustrations will serve to make clear the important characteristics of the educational building of today, in so far as the rooms for assembly and class work are concerned. This treatment does not include other features which will be found in a complete building, such as the gymnasium, play rooms, administration offices, kitchen,

serving room, storage rooms, toilet facilities, and general social hall.

*Nursery, Cradle Roll, and Mothers' Rooms.* It should be noted that the Nursery room provides a minimum of fifteen square feet for each person to be accommodated; the room is intended for children one and two years of age; there is a dado on which pictures may be pinned or hung, and a cabinet provides space for keeping any supplies required. This room should be equipped with cribs and cradles. In the Cradle Roll room, which is for children three years old, the general arrangements are the same as for the nursery but the equipment should include blocks, toys, balls, and other simple play things that are easily cleaned. The Mothers' Room is near-by but does not open into either of the other rooms. All walls are studded and plastered, and should be tinted.

*Beginner Room or Rooms.* For children four and five years of age, there should be one room for approximately every thirty to forty pupils attending. These rooms must be well proportioned so that a seating circle may be formed without undue waste of space. A square room or with proportions about as three is to four is desirable. Seventeen square feet of floor space must be allowed as a minimum for each pupil. The entrances and cabinets should be placed where they will be least noticeable while the program is in progress; walls should be constructed so as to be as nearly sound-proof as practicable. In schools of twelve hundred members an enrollment of approximately ninety-six pupils of four and five years of age or eight per cent of the total, may be expected.

*Primary Group.* It is when the Primary group is reached that class rooms as such first appear in the educational building.

Children of this division are six, seven, and eight years of age; they have started to public school and school conditions must be kept in mind. The drawing shows the corridor arrangement of class rooms as related to the assembly room. The assembly is well lighted from one side, giving the uni-lateral lighting used in approved public schools; the entrances are at the rear of the leader's position so that late comers will not interfere with the program. In the assembly room seven square feet of floor space is allowed for each pupil; in the class rooms a minimum of eight square feet per pupil is provided. The assembly room accommodates one hundred and twenty pupils and the ten class rooms provide for the same number. In a school of twelve hundred, a membership of one hundred and twenty pupils may be expected, which means that ten per cent of the total enrolment will be found to be six, seven and eight years of age. This same proportion is used as a basis regardless of whether the enrolment is larger or smaller.

*Junior Group.* Practically all that has been said of the foregoing group applies to children who are nine, ten, and eleven years of age, known as Juniors. The proportion of membership to the whole is the same, namely ten per cent; however it will be observed that the class rooms vary in size instead of being identically the same as in the Primary division. This is because the Juniors are being accustomed more and more to school procedure and larger units may be made. Each room is provided with hinged doors, studded walls and one or more windows.

*Intermediate Group.* Except for the difference in the size of class rooms, the general arrangement for "Intermediates" (12-13-14 years of age) is the same as for Juniors.

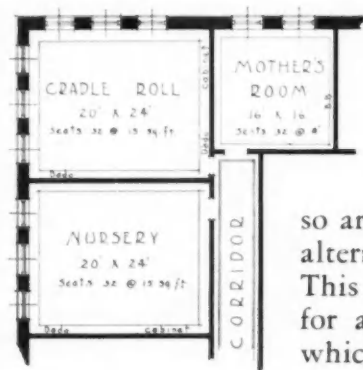
Class groups in this department may vary from twelve to twenty members.

*Senior Group.* The Seniors, in the middle period of adolescence, are fifteen, sixteen, and seventeen years of age. They require the same amount of floor space for each pupil as indicated for younger groups, namely, a total of fifteen square feet per person, but the size of the class rooms should be increased to accommodate, in some cases, as many as twenty-five pupils.

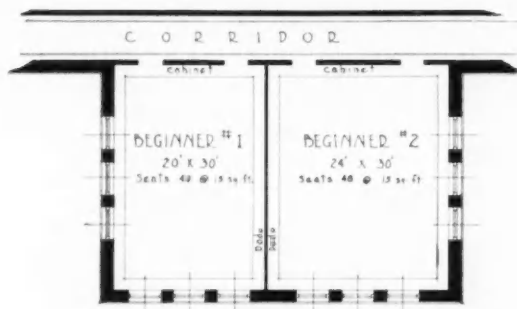
The drawing on page 426 shows a combination use of rooms for Intermediates and Seniors. Instead of each of these groups having a separate assembly, one room is made to serve both groups for worship, and corresponding space is devoted to a hall for recreation, fellowship and social gatherings. The class rooms are so arranged that they may be used alternately by these two age groups. This kind of plan naturally calls for an administrative arrangement which may be at times a bit difficult to adjust, but has been successfully carried out.

*Young People's Group.* Young People are from eighteen to twenty-four years of age. They usually constitute about twenty per cent of the total enrolment, although in college communities the percentage will run higher than this. The class rooms should vary in size, seating from twenty to fifty with an allowance of eight square feet for each person. The classes need not directly adjoin the assembly room, but they should not be far removed. It frequently happens that the Young People's assembly room is also made to serve as the social hall for the church as a whole. In such a case there should be provision for a kitchen and serving room.

*Adult Department.* The Adult Department is composed of members above twenty-four



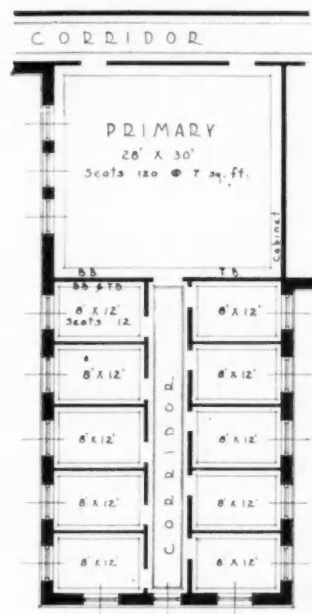
SUGGESTIVE ARRANGEMENT FOR NURSERY, CRADLE ROLL & MOTHERS' ROOM IN ORGANIZATION OF 1200



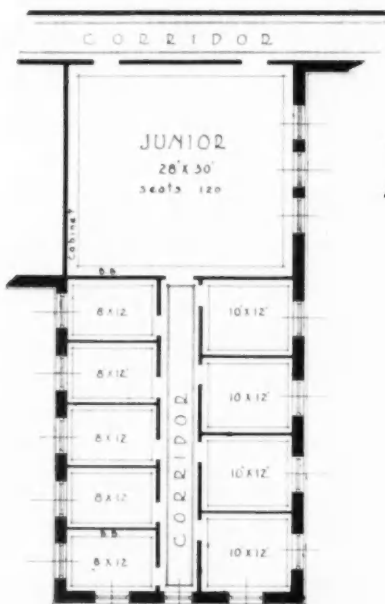
ARRANGEMENT FOR BEGINNER GROUPS IN ORGANIZATION OF 1200 MEMBERS



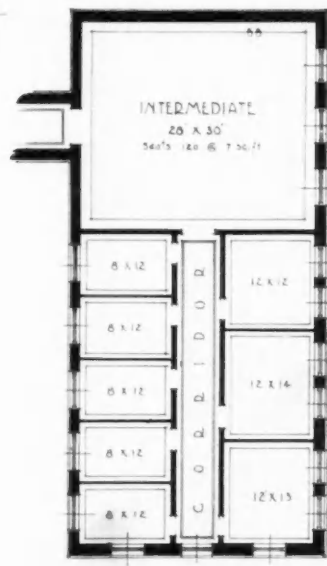
ARRANGEMENT FOR BEGINNER GROUP IN ORGANIZATION OF 250 MEMBERS



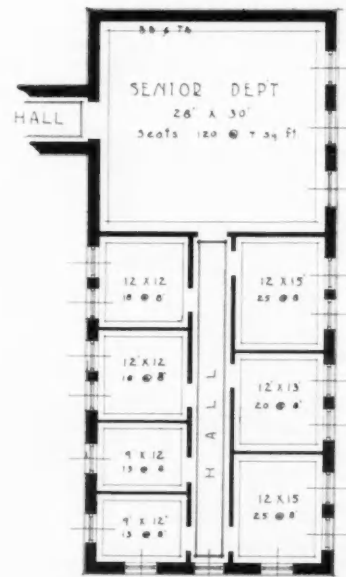
SUGGESTED ARRANGEMENT FOR PRIMARY AGE GROUP IN CHURCH ORGANIZATION OF 1200 MEMBER



SUGGESTED PLAN JUNIOR AGE GROUP IN ORGANIZATION OF 1200 MEMBERS



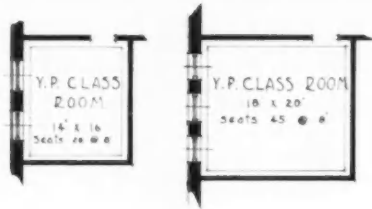
SUGGESTED FLOOR PLAN INTERMEDIATE AGE GROUP IN CHURCH ORGANIZATION OF 1200 MEMBERS



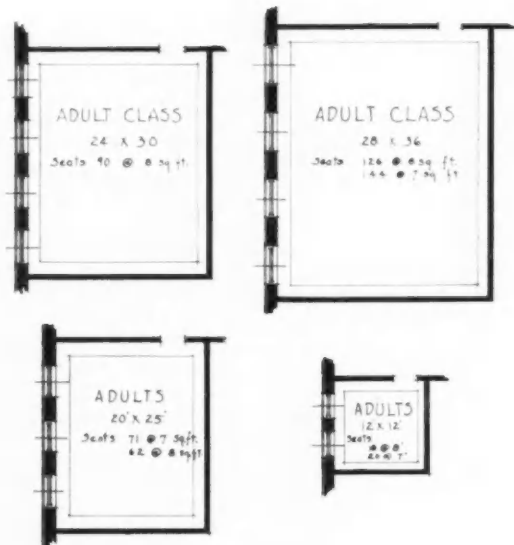
SUGGESTED FLOOR PLAN SENIOR AGE GROUP IN CHURCH ORGANIZATION OF 1200 MEMBERS

PLANS SHOWING NEW TYPE OF BUILDING FOR RELIGIOUS EDUCATION

DESIGNED BY MOUZON WILLIAM BRABHAM



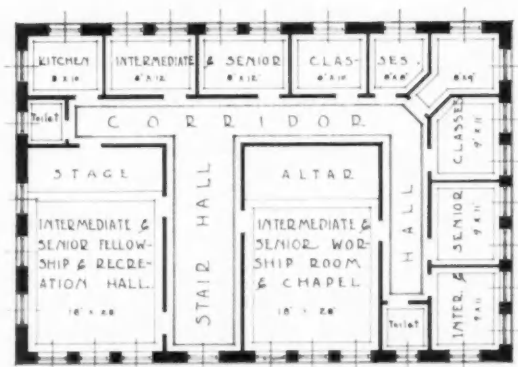
TYPICAL YOUNG PEOPLES ROOMS IN  
CHURCH ORGANIZATION OF 1200  
MEMBERS



TYPICAL ADULT CLASS ROOMS  
UNILATERAL LIGHTING

PLANS SHOWING NEW TYPE OF BUILDING FOR  
RELIGIOUS EDUCATION

DESIGNED BY MOUZON WILLIAM BRABHAM



SUGGESTED ARRANGEMENT FOR INTERMEDIATE  
& SENIOR CHAPEL, RECREATION & CLASS ROOMS

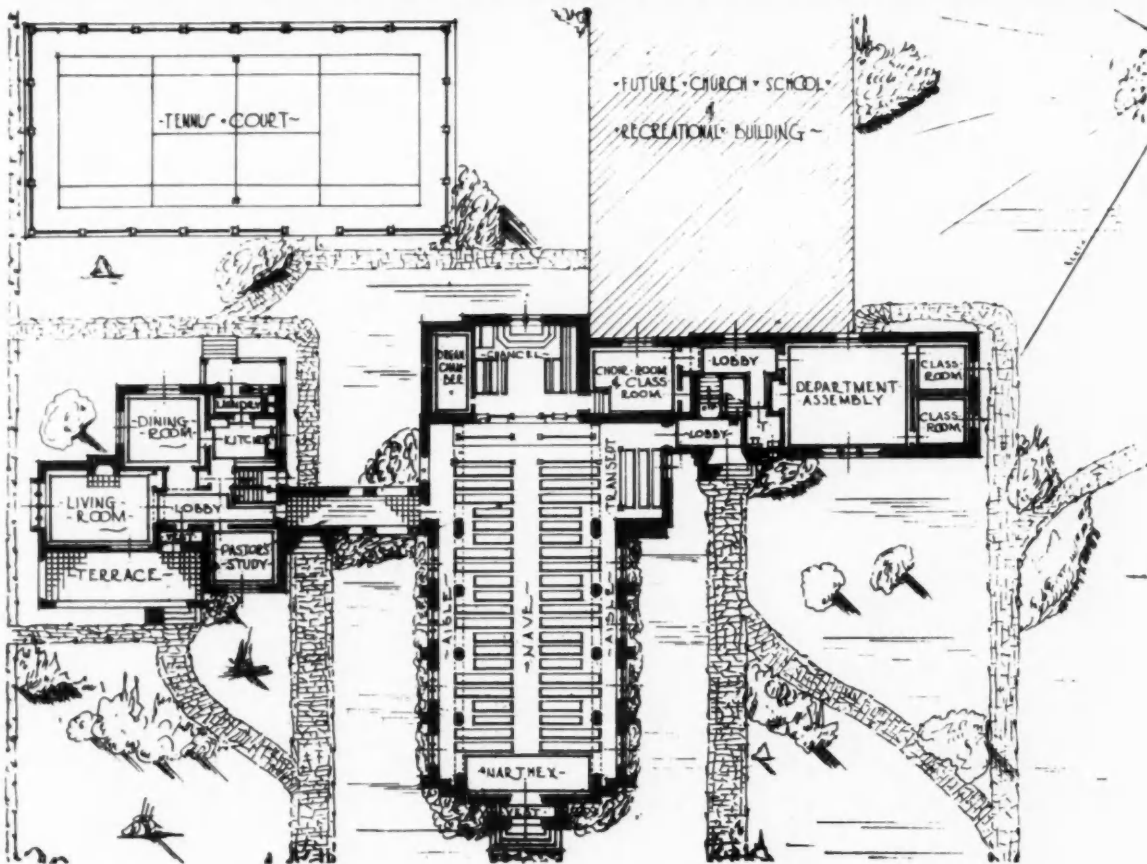
DESIGNED BY MOUZON WILLIAM BRABHAM

years of age. It is generally considered that the percentage of adults enrolled is twenty-seven per cent of the total. The class rooms should vary more in size than in other departments, and local conditions will need to be considered most carefully in determining the minimum and maximum sizes. Many of these adult classes exceed four hundred active attendants. Usually the main auditorium of the church will be used as the adult assembly space.

*A Schedule of Capacities.* Regardless of the total accommodation, the following schedule of capacities will be found a safe basis to follow; naturally local conditions will at times affect these percentages, but taken over a period of twenty-five years or longer, certainly for the life of the building, the percentages will prove to be satisfactory:

Cradle Roll and

Nursery	5% (1-2-3 years)
Beginners	8% (4-5 years)
Primary	10% (6-7-8 years)
Junior	10% (9-10-11 years)
Intermediate	10% (12-13-14 years)
Senior	10% (15-16-17 years)
Young People	20% (18-24 years)
Adult	27% (24 years and above)



METHODIST EPISCOPAL CHURCH, TRAINER, PENNSYLVANIA

THORALS M. SUNDT AND BRUCE C. WENNER, ARCHITECTS

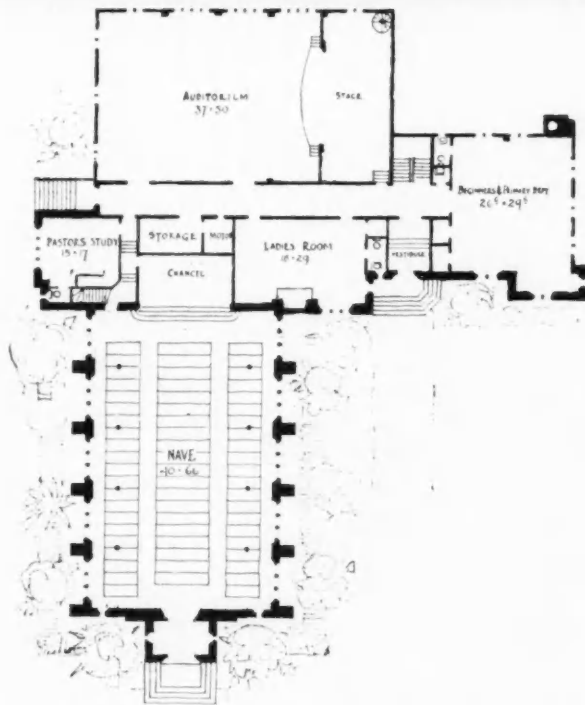
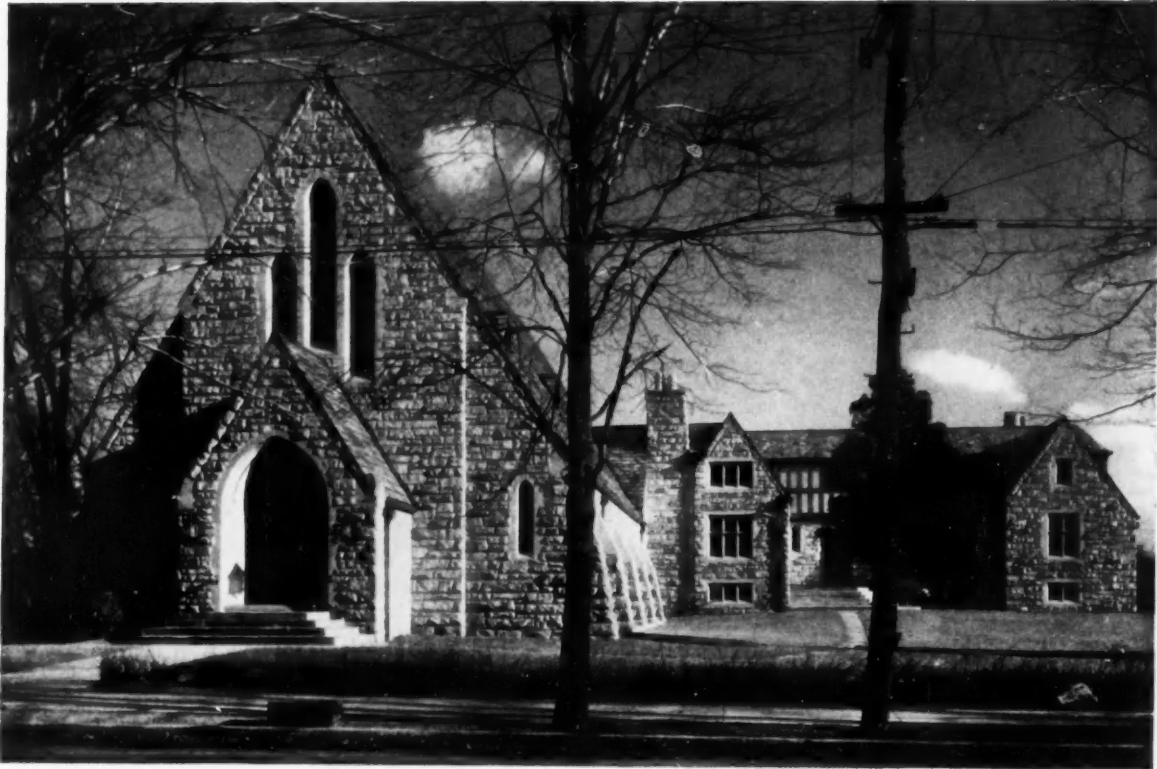
(Awarded First Prize in Christian Herald's Church Building Competition)



FIRST BAPTIST CHURCH, PLAINFIELD, N. J.

HOBART UPJOHN, ARCHITECT

*(Awarded Second Prize in Christian Herald's Church Building Competition)*



WESTSIDE PRESBYTERIAN CHURCH, ENGLEWOOD, N. J.  
HOBART UP JOHN, ARCHITECT  
(Awarded First Mention in Christian Herald's Church Building Competition)



A CHURCH IN AARHUS, DENMARK  
KAY GOTLOB, ARCHITECT



## ✓ AMERICAN ARCHITECTURE

CORRESPONDENCE OF WALTER PACH, PAUL CRET, FRANK LLOYD WRIGHT AND ERICH MENDELSON WITH FISKE KIMBALL

THE PUBLICATION, first in *The Architectural Record* and other periodicals and now in book form,\* of Fiske Kimball's studies in American architecture of today, evoked an interchange of letters with some of the leading figures in the world of architecture and of art criticism in America and in Europe. It constitutes a veritable symposium on the neo-classic and progressive trends in modern architecture, and on their great protagonists in the last generation such as Joseph Morrill Wells, McKim and Louis Sullivan. Through the kind consent of the writers we are privileged to present this correspondence to our readers.

—EDITOR.

PHILADELPHIA, May 6, 1925

DEAR KIMBALL:

I had hoped to see you in New York and possibly to have a stimulating discussion of your paper on Louis Sullivan. All you write is of interest to me, even though I do not share your views entirely.

To me, Sullivan has the merit of being a pioneer who struggled to open a trail to a barren country. As I do not judge of the value of an effort by its success alone, I have great respect for him. His effort, however, was against the trend of the American architecture of his time with the consequence that he lived to survive his own influence. His main claims to fame are his theory of design of the skyscraper and his system of ornament. The former rests on a conception of steel construction which assumes that in a system of a girder resting on two posts, the posts have a metaphysical nobility which entitles them to a special magnification. His system of ornamentation is, of course, a matter of taste, and we

\**American Architecture* (Bobbs Merrill Company), 1928.

have to admit that its popularity was short lived. In both there was a good deal of "literature," and literary architecture is not worth much more than literary painting.

Sincerely,

PAUL P. CRET

HUNTINGTON, L. I., May 8, 1925

DEAR CRET:

. . . I wonder just a little if you have caught exactly my own view of Sullivan. I do not think for a moment that his work is the last word in American architecture. That was what I meant by calling him an "old master" in the title. I meant he was a great master of a school which is now a thing of the past. The nub of the article was really in the last few paragraphs where I say that his effort to express the steel is now a dead issue and suggest that the vital and really "modern" movement in American architecture is the effort to organize form irrespective of structure. That is what seems to me significant in the work of McKim, Mead & White, beginning in the 1880's, in which to me the superficial following of classical details is a secondary matter.

It seems also immaterial to me whether this organization of form, which is the artistic element in architecture, is embodied in the spirit of calm uniformity of this neo-classic or the dynamic and dramatic energy of opposite movements as in the Baroque, which we both admire.

On the other hand, it seems to me that as the essence of art is creative originality, any great creative effort, even if contrary to our own ideas, is valid, for its author and for its day, and thus Sullivan is entitled to a sympathetic interpretation on the basis of his own canons of thought, and to admiration even if not imitation. To impose a

single universal canon in the hope that it will permanently prevail is to stifle art in its creative essence. Art will continue to change from generation to generation as it has in the past. Happily it is now ceasing to follow the gods of the nineteenth century of whom Sullivan was a worshipper, and is turning to the new (and old) god of beauty of form. . . .

Sincerely yours,  
FISKE KIMBALL

NEW YORK, May 6, 1925

DEAR KIMBALL:

Thanks very much for The Architectural Record with your article on Sullivan. I read it with pleasure and with interest. And though I am going to renew, at least in part, my old objection, I am glad to say I think we are not as far apart as may at first appear.

For I do believe in formalism, if I use the word accurately; at all events in an abstract harmony of proportion. And to attempt to make the evidence of the system of construction replace that, is, in my opinion, to abdicate all title to artistry. That does not mean, however, that the proportions of a Greek building will hold good for a Gothic, a Renaissance or a modern building. Even where the systems of construction are sufficiently similar, there will be difference in the periods that will give any valid work a difference of aspect from those of the earlier time. And where a difference of construction occurs, as with the steel skeleton, there must be difference of aspect. I do not see it, in any essential degree, in the work of Wells and his school.

That may be my insensitiveness. But where I feel sure of my objection is in respect to your comparison with the painters. Monet is, in reality, only at the slightest of removes from his immediate predecessors. His color analysis is a very slight disguise—only the academic simpletons of the '80s and '90s could have failed to see that, and we know what nonentities they were. Sul-

livan and the steel frame men, on the other hand, made a real break with the past. As the immediate past was mostly bad, I believe their relative position as regards it is different from that of Monet as regards the Corots, Rousseaus, and Daubignys of his youth. The latter were most admirable men, and so Monet could proceed in harmony with their principles, as the architects could not—as regards *their* predecessors.

But what I fall foul of entirely is calling Wells the Cézanne of architecture. Leaving out the question of their greatness (and I cannot believe myself *so* insensitive as to fail to see something of the grandeur of Cézanne in Wells—if he has it) Cézanne simply carries classical balance and proportion into the vision of the Impressionists (his own in his early days). If something more than an Impressionist in his later period, his last work in no way contradicts his first. Matisse said to me once that Cézanne added nothing to his earlier work, but merely developed what he had at the start. In contradistinction to this, Wells *et al.* seem to me a revulsion from Sullivan, attempting return to forms once vital but no longer so in their handling of them. But I repeat that I am in accord with the idea of art that they are trying to keep alive. . . .

Yours cordially,  
WALTER PACH

HUNTINGTON, L. I., May 8, 1925

DEAR PACH:

I am delighted to have a good long letter from you, in the same mail as one from Paul Cret, most intelligent of architects. It is amusing to see how different Cret's point of view is still. I do not think we are really very far apart. Of course, just as you say that Monet was only slightly removed from his immediate predecessors, I would emphasize that the same was true of Sullivan. All the long historical part of my article at the beginning was designed to point this out, by emphasizing his continuity with the thought of Ruskin, Semper

and Viollet-le-Duc. When I spoke of Wells as the Cézanne, I myself left aside the question of their "greatness." What I wish to emphasize is that it was Wells who first reacted against the prevailing realistic or scientific theory that the merit of architecture is to be found in truth to structure, as Cézanne was the first to react against the realistic theory that the merit of painting was to be found in "truth to nature."

I would quite agree that "there will be a difference of genius in the periods that will give any valid work a difference of aspect from those of the earlier time." I think this is true of the work of Bramante as compared with the work of the Romans, and I think it is true of the work of Wells and McKim as compared with the work of Rome and of the Renaissance. But I think this difference comes from the inevitable difference of requirements, rather than from a conscious effort to invent a new alphabet of forms. Naturally it will appear most where the requirements are most different, and thus the most notable work of today is in the steel-frame buildings where the essential problem of the moment is the composition of mass. As I recently saw it expressed by a Dutch critic, their merit lies "nicht so viel in ihren Wahrheit, als in ihren Klarheit," but this clarity of organization of form could never have been attained without the reaffirmation of the principle by Wells in buildings of traditional type.

When you write "Where a difference of construction occurs, as with the steel skeleton, there must be a difference of aspect," I think that (so far as this difference of construction does not itself bring new types of mass and space), you are still unconsciously tinged with the old nineteenth century scientific theory of functionalism. We are all together on what Harvey Corbett said to me the other day: "I have only one God, beauty of form."

Faithfully yours,  
FISKE KIMBALL

PHILADELPHIA, December 19, 1927

DEAR KIMBALL:

I have just been reading your "Critical Estimate of Goodhue." If you remember this definition given by an old gentleman, "Mon fils, un journal bien pensant est un journal qui pense comme celui qui le lit," you will understand why I think you are writing the most penetrating criticism.

I have had, and I have, a high regard for Goodhue's talent. I feel, however, that the recent hero-worship has been somewhat far fetched. As a creator of modern forms, he did not go beyond the stage of attempting to conciliate contraries, with the usual result. Starting from Gothic Romanticism, he was attracted to Classicism by that element of the picturesque found in minor works, such as Spanish Colonial architecture, and did not live long enough to come to understand the real greatness of classical forms. Classicism is a discipline which requires a certain humility, the abandonment of too much personality of the modern exasperated "self expression."

So he remained half way on the road, and his later work is, after all, quite similar to his early productions, if one looks below mere external forms. All this you have admirably shown and you are doing much more for Goodhue's memory by showing his achievements and failures than well meaning but misleading eulogists.

Sincerely,  
PAUL P. CRET

BERLIN, April 11, 1928

MY DEAR MR. KIMBALL:

. . . I find your conception of American architecture dual—and therefore rightly seen from the side, as you yourself say, of abstract form and from that of technique. Just such a method distinguishes the historian from the artist: with the historian objectivity is present from the beginning, while the subjectivity of the artist's creative processes can only objectify itself in the completed work. Especially I have read

with the greatest pleasure your account of the now-historic struggles which are today clearly to be recognized as far as Wright; struggles to whose effects the supremacy of space over decoration and the purifying of details (even the zoning law, I believe) are to be traced back. I believe also that my "dithyramb" on Wright\* may stand: that the Old gradually unclothes itself to nakedness, while the New is born naked—naturally not without mutual influence.

I am happy, too, that you have embodied in your book the impression of Einstein about the Einstein Tower. Einstein's word of praise, "organic," I would interpret as deeply as could be at all possible, for fundamentally one cannot say better of any work of art. I am convinced that Einstein himself meant more by this word than any merely physical significance. . . .

With cordial greetings,

ERICH MENDELSON

PHOENIX, ARIZONA, April 30, 1928

DEAR FISKE KIMBALL:

A copy of your attractive new book came to hand, forwarded to me here in the Desert yesterday.

I have been reading my obituaries to a considerable extent the past year or two, and think, with Mark Twain, the reports of my death greatly exaggerated.

You were very kind to me though you used me to point your moral and adorn your tale, and left me in exile. Yours was no donkey's kick at a "dying lion". Nor am I a lion, nor dying, nor am I in exile.

Sometime let someone come far enough away from Manhattan to mark what the thought-built houses they called the "New School of the Middle West" have done (consciously or unconsciously) to three out of five buildings from Buffalo to Los Angeles, quietening the skyline, broadening and strengthening the mass, ordering the openings, reducing the "fancy-features," marrying all of them to the ground

\*Wasmuth's Monatshefte, 1926, Heft 7, p. 308.

to some extent, and be convinced of the potency in America of those ideas. Those ideas are more potent today than ever before, though their origin is growing obscure in the flood of pseudo-classic. This to offset inevitable abuse.

"A lost cause"? "The Triumph of the Classic"?—Dear man!—The cornice has gone! The Larkin Building, about which you write so well, struck it first.

No cornice, no classic! and Life goes on!

From your honorable niche in the museum in conservative Old Philadelphia, does that ancient dream "The Classic" still possess and obsess you? Or are you merely comforting the abstraction that was lost at the Columbian exposition thirty-two years ago—lost—because it was only again reborn to be commercialized to death. Trying to make it open its lips—eyes it never had—and seem to speak?

. . . I intend . . . to enlist your pen in behalf of the nature of the thing—as *architecture*—whereas the nature of the thing as *practised* is what you have been talking about—and how!

Meantime my best to you, faithfully. You are a friendly enemy. They make ultimately the best friends.

FRANK LLOYD WRIGHT

PHILADELPHIA, May 25, 1928

DEAR FRANK LLOYD WRIGHT:

I am just back from Europe and find your very kind letter to a "friendly enemy." I would not even say an enemy at all. The chapter on "The Triumph of the Classic" deals with a past event which I think really did take place, but in the chapter "The Present" you will see, I believe, the feet of the conqueror are crumbling.

Mendelsohn has written me an interesting letter in which he sees the ultimate unity of present trends, by the stripping naked of the old to accord with the new, born naked.

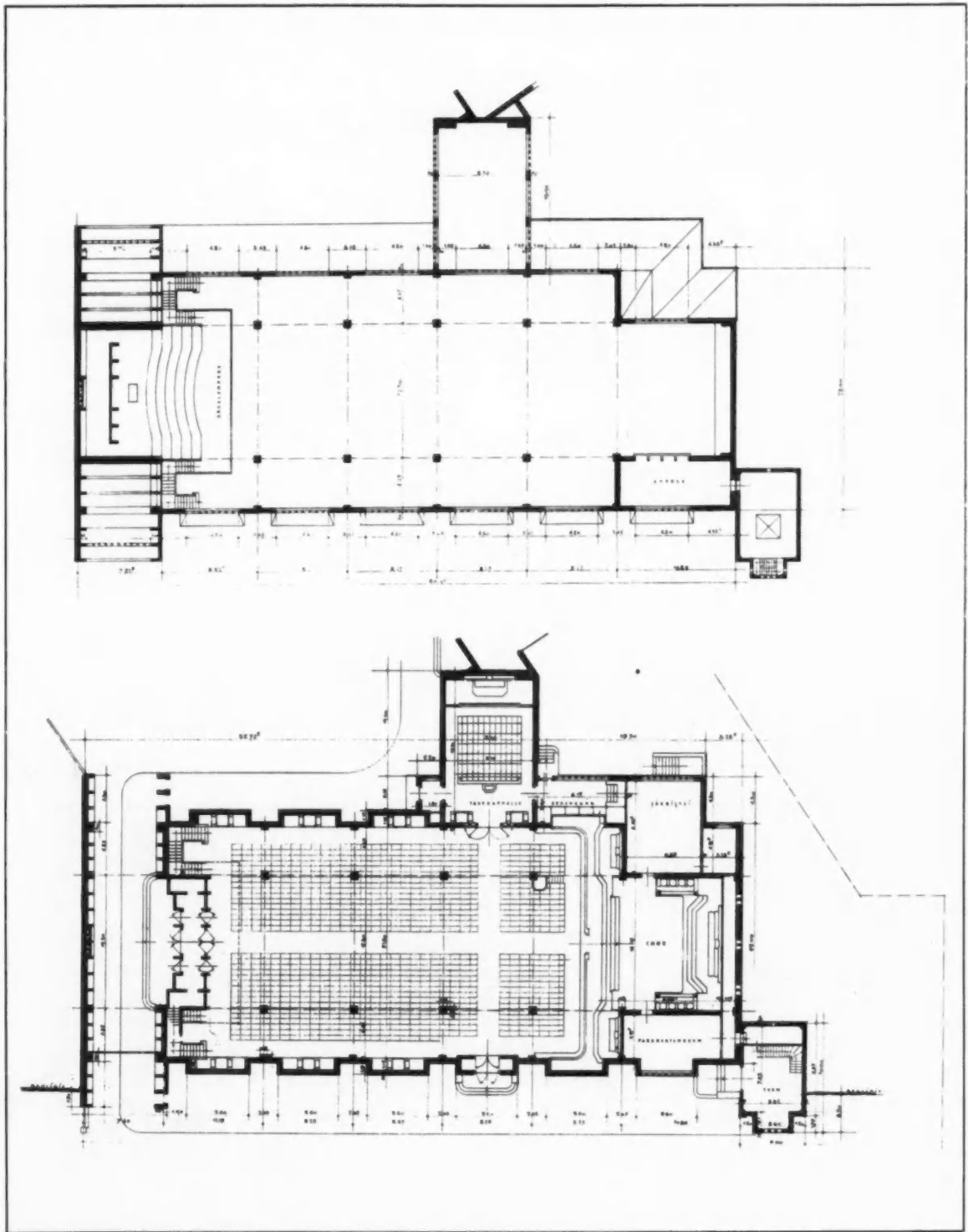
Faithfully yours,

FISKE KIMBALL

PORTFOLIO  
OF  
CURRENT ARCHITECTURE



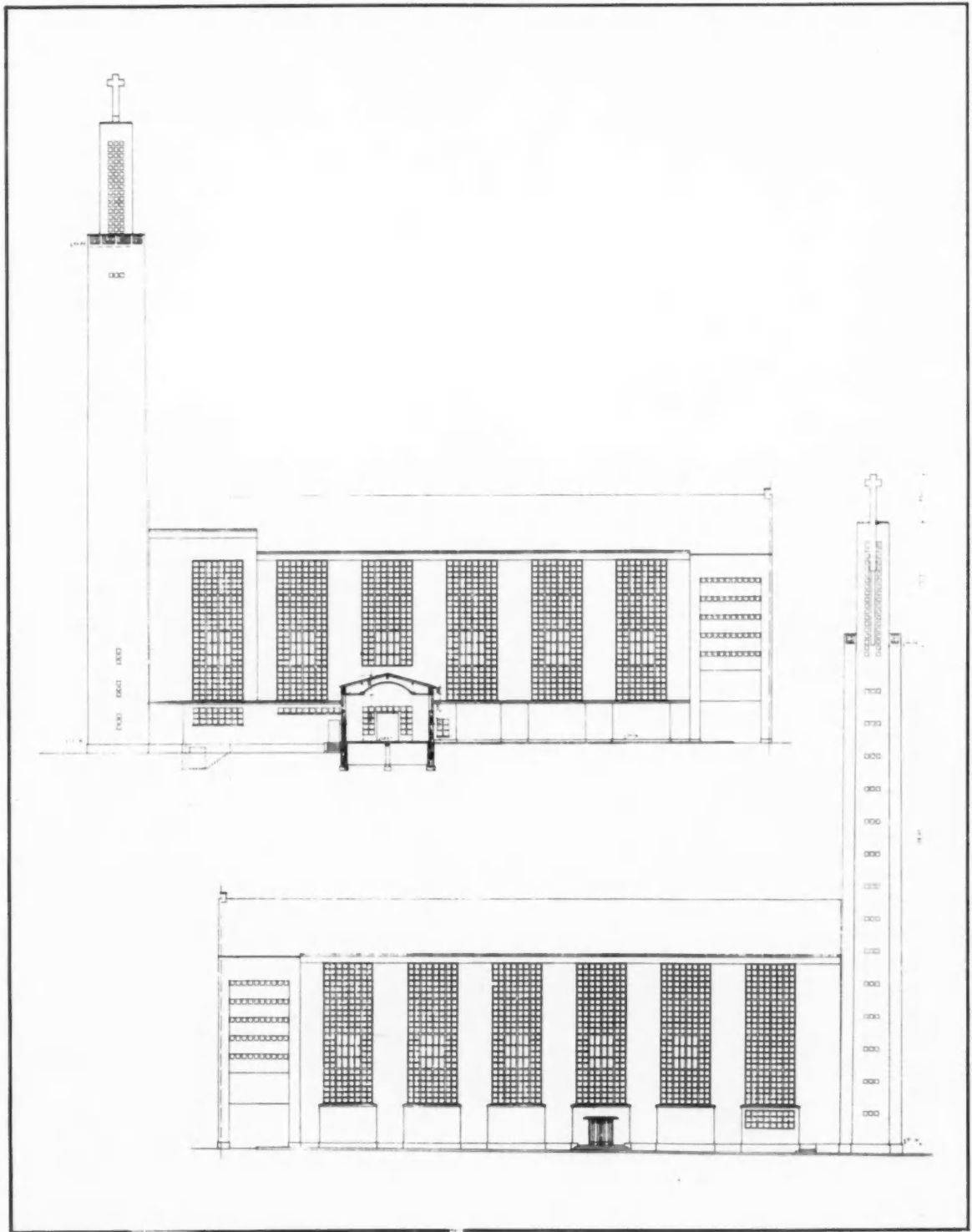
Side View of Church  
Church of St. Anthony, Basle, Switzerland  
KARL MOSER, ARCHITECT



Ground Floor Plan  
Church of St. Anthony, Basle, Switzerland  
KARL MOSER, ARCHITECT

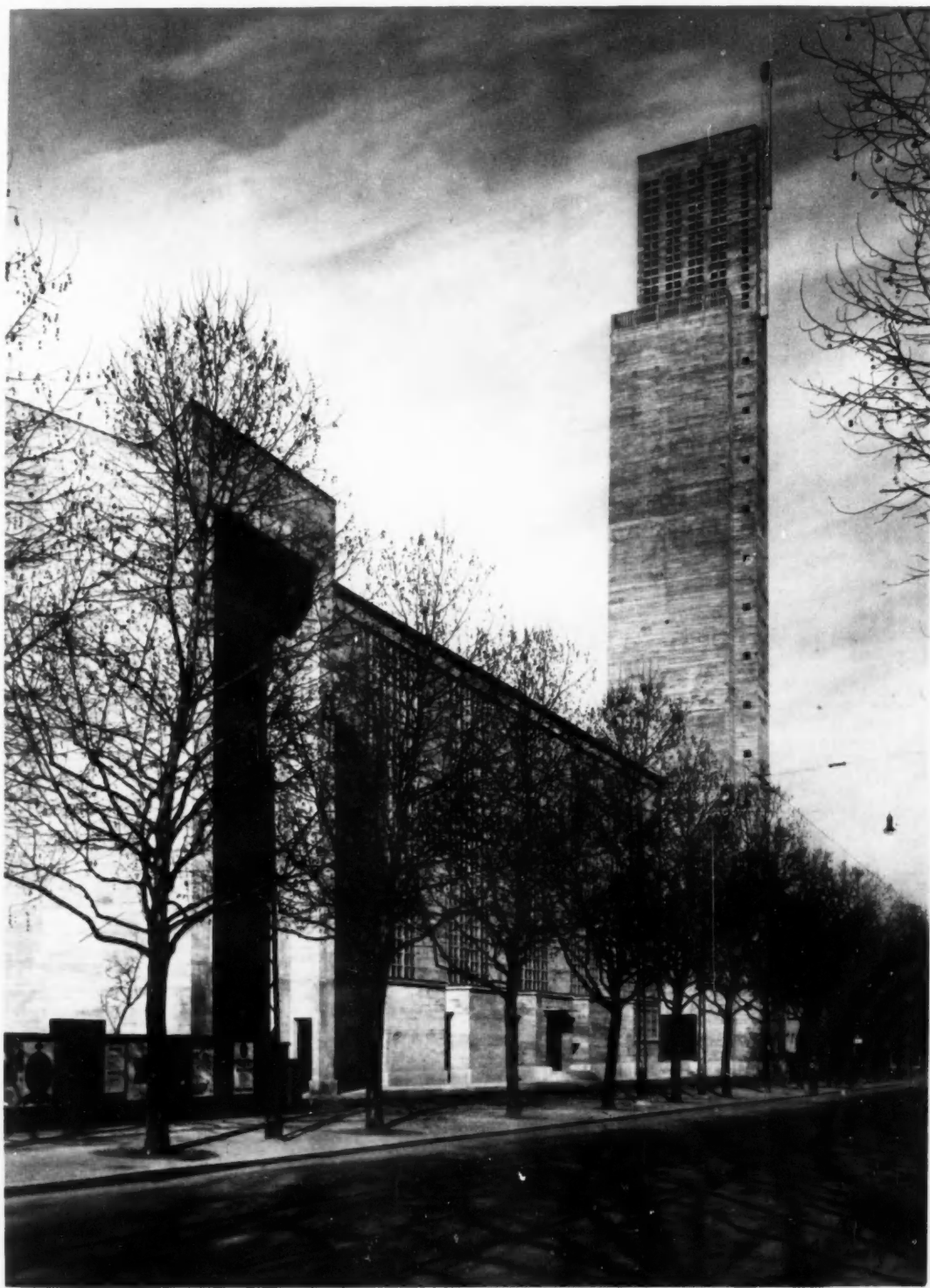


View of Tower  
Church of St. Anthony, Basle, Switzerland  
KARL MOSER, ARCHITECT



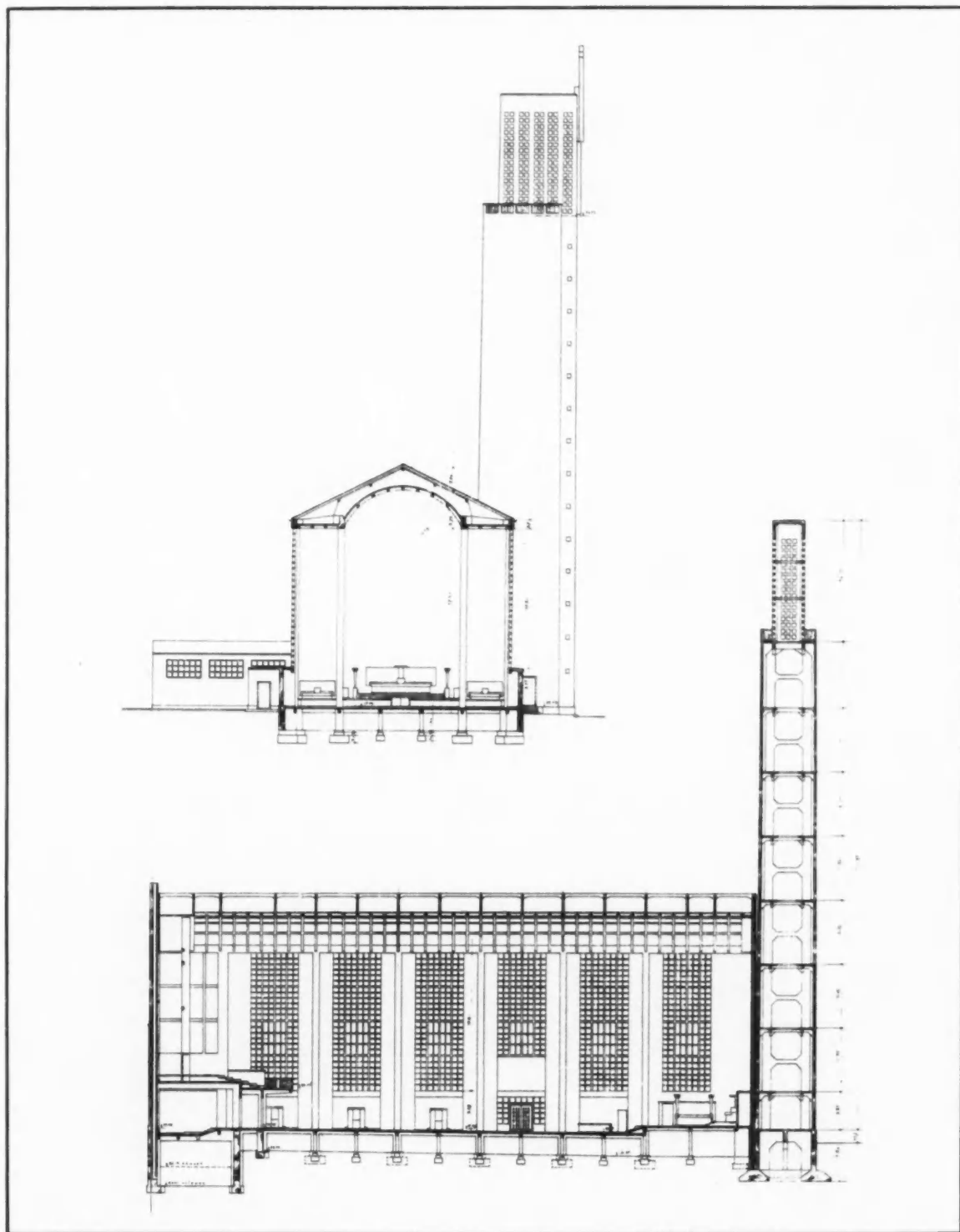
Side Elevations  
Church of St. Anthony, Basle, Switzerland  
KARL MOSER, ARCHITECT





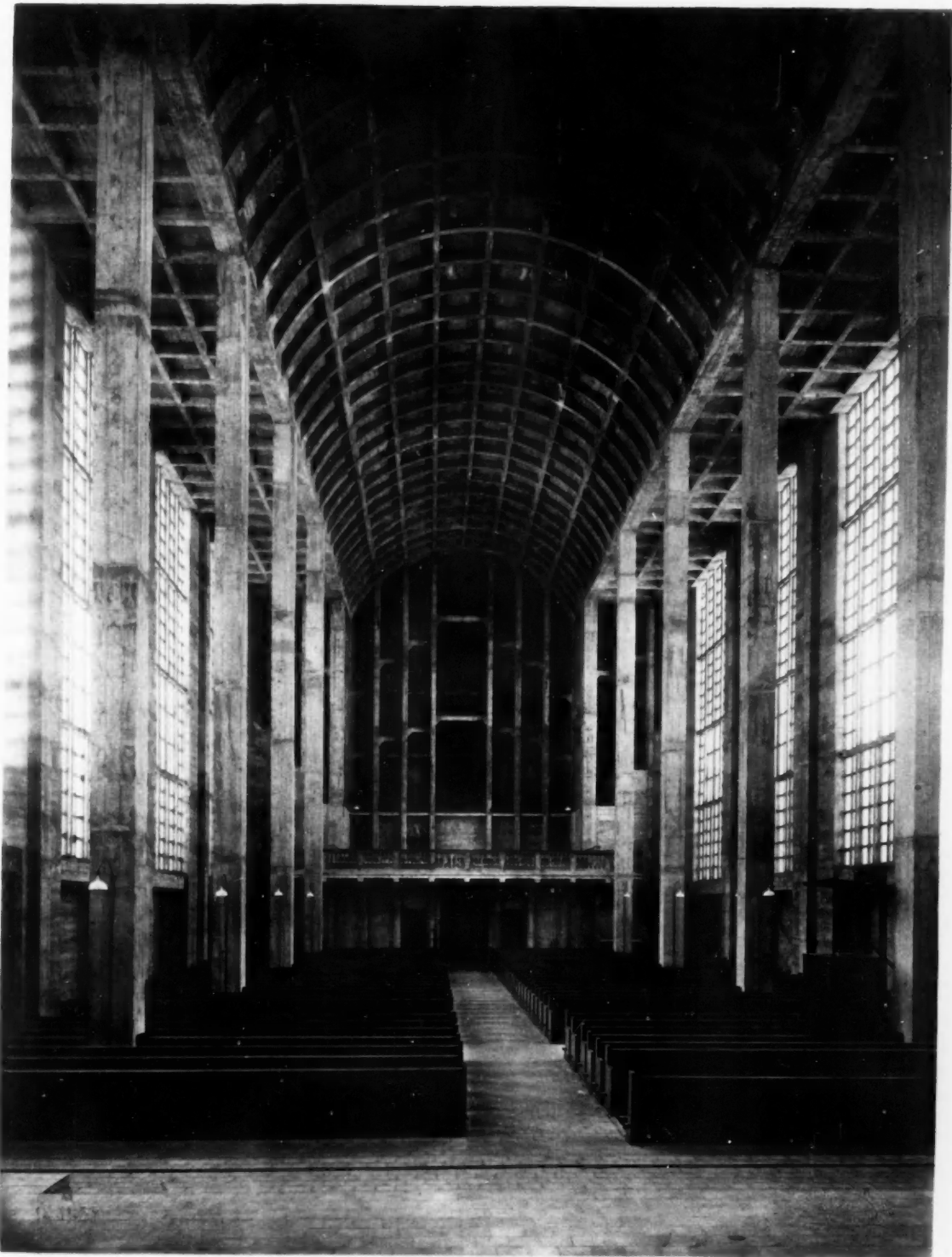
Street Elevation  
Church of St. Anthony, Basle, Switzerland  
KARL MOSER, ARCHITECT



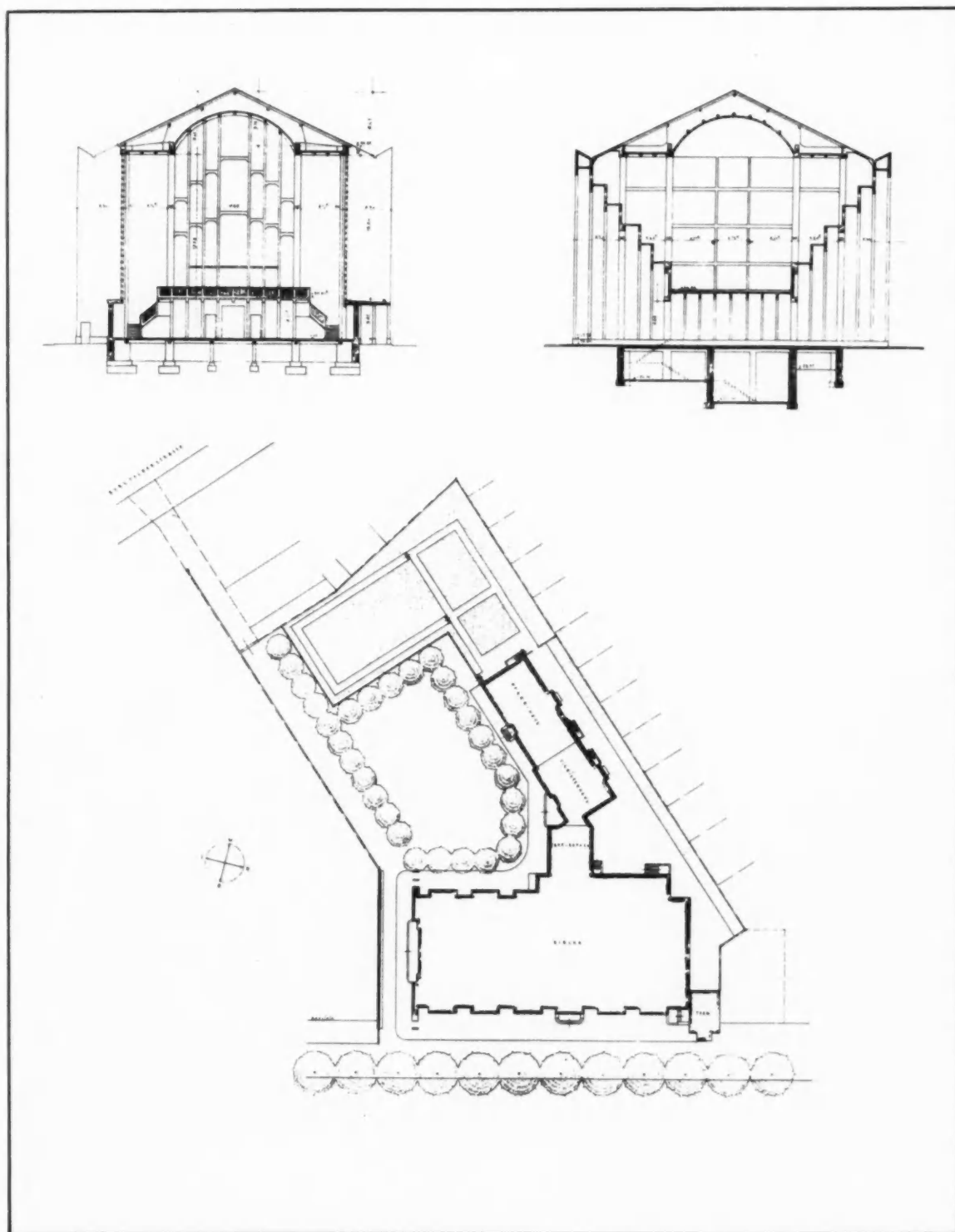


Drawings Showing Cross Section of Church and Choir Arrangement  
Church of St. Anthony, Basle, Switzerland

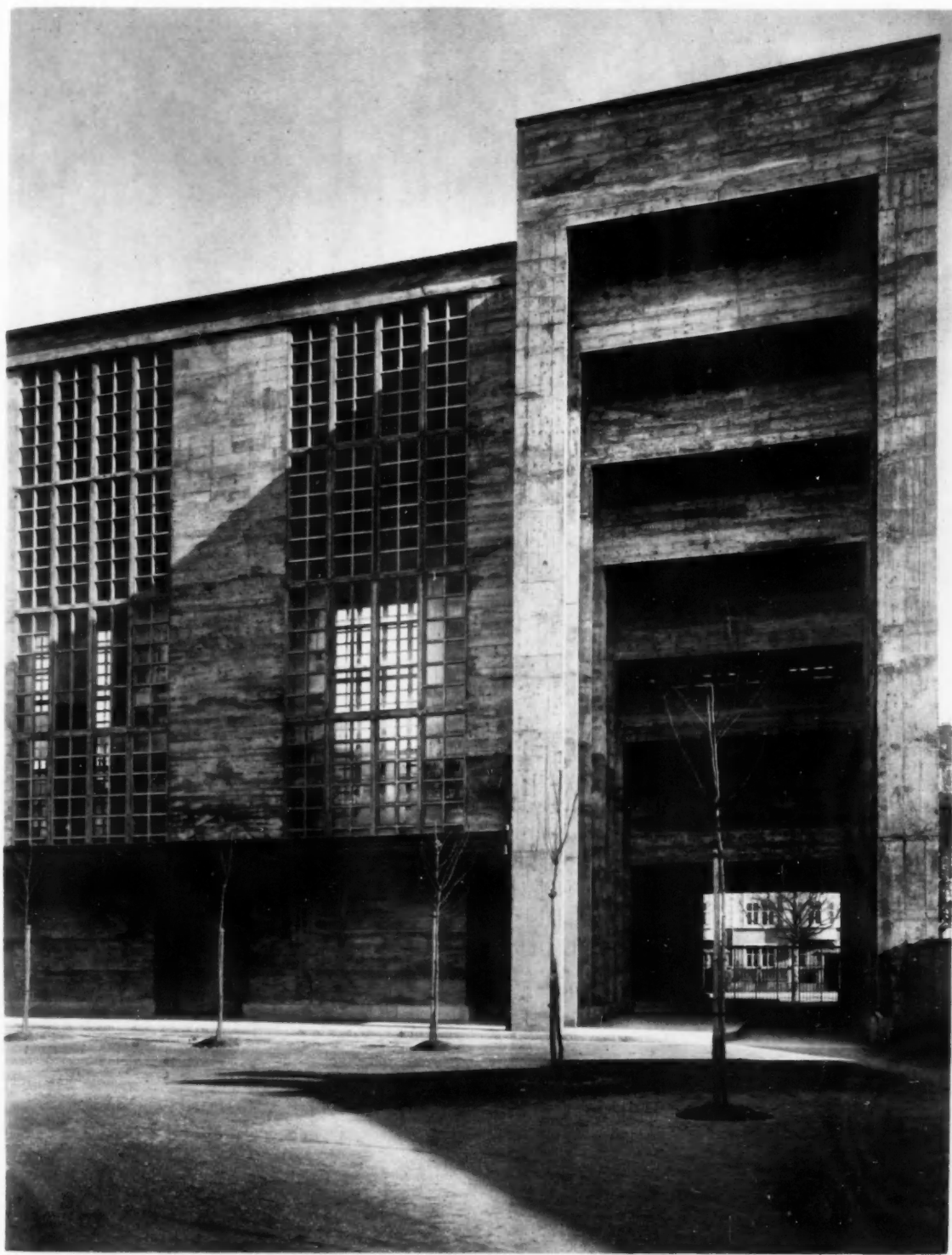
KARL MOSER, ARCHITECT



Nave of Church  
Church of St. Anthony, Basle, Switzerland  
KARL MOSER, ARCHITECT

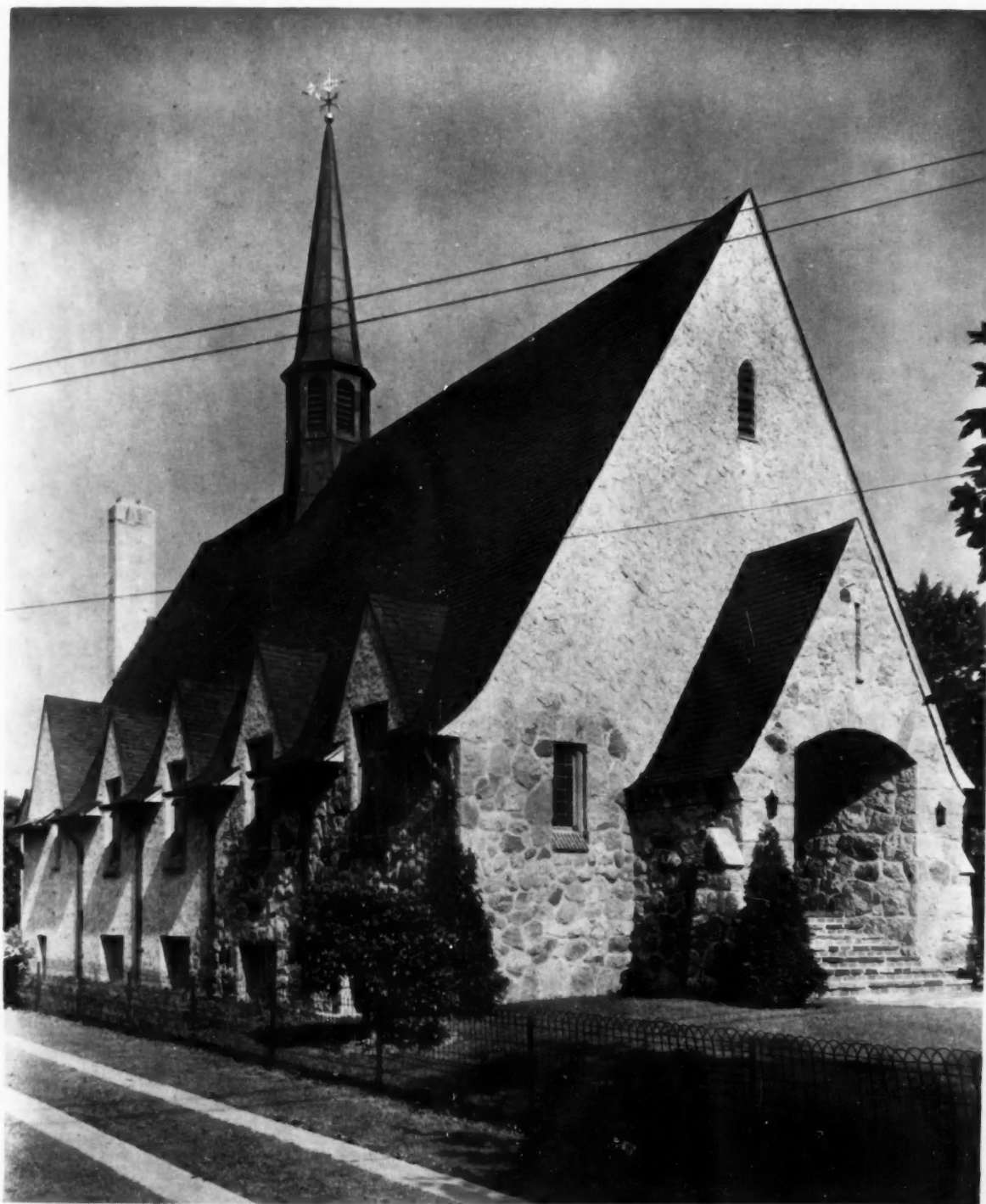


Plot Plan and Section Details  
Church of St. Anthony, Basle, Switzerland  
KARL MOSER, ARCHITECT



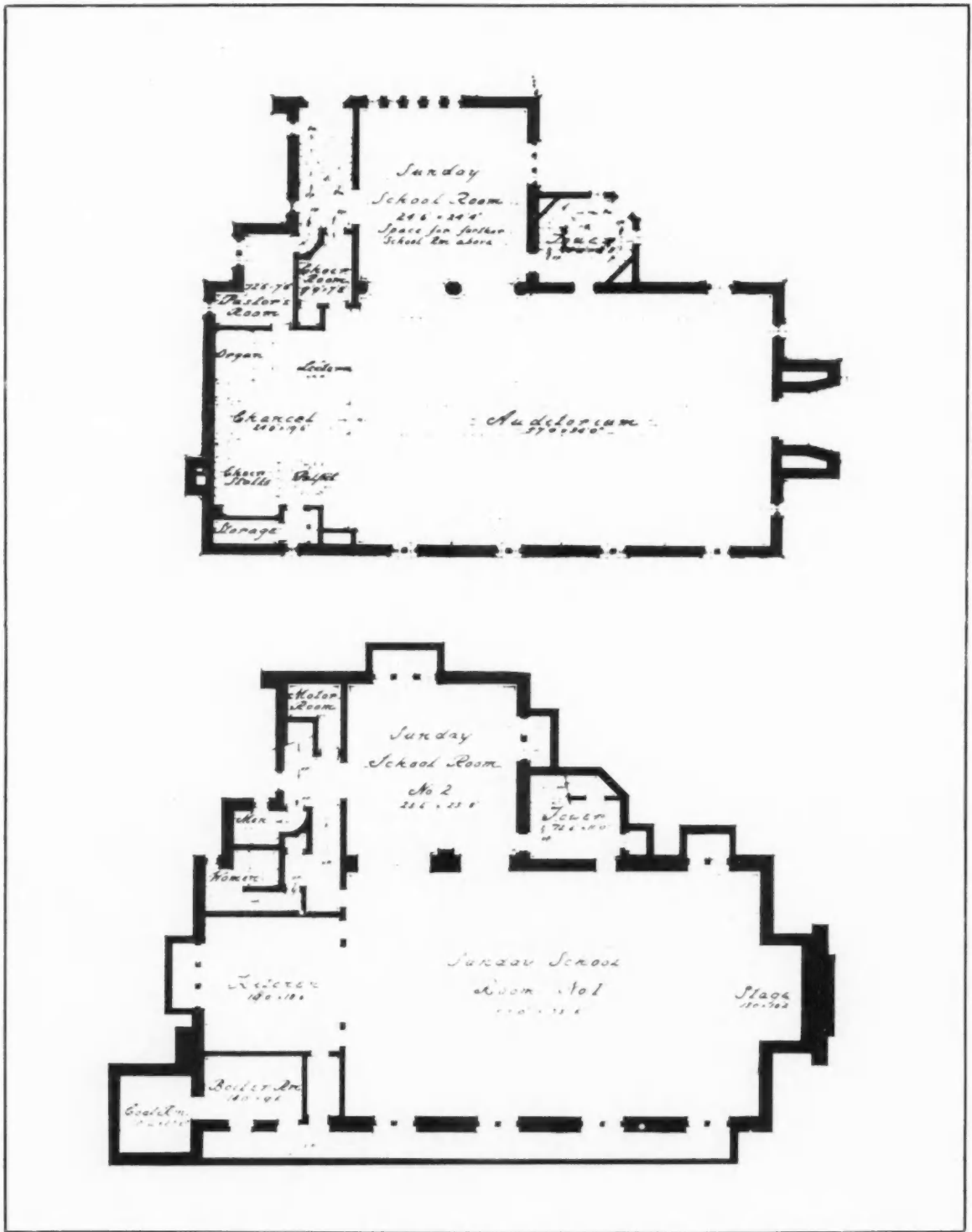
Entrance Detail  
Church of St. Anthony, Basle, Switzerland  
KARL MOSER, ARCHITECT





*Photo. Gottscho*

Entrance Facade  
Methodist Episcopal Church, Farmingdale, L. I.  
JULIUS GREGORY, ARCHITECT



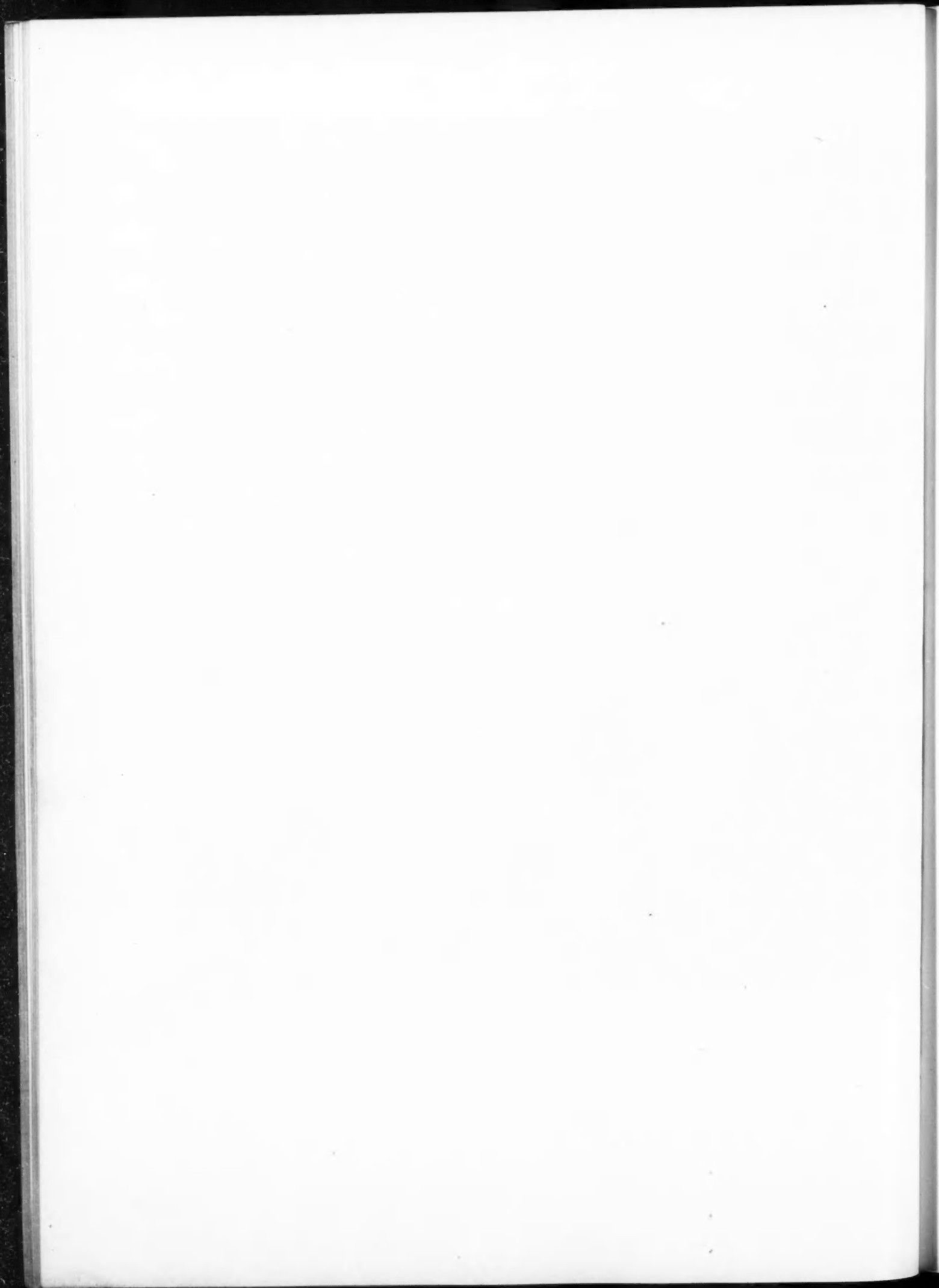
Floor Plans  
 Methodist Episcopal Church, Farmingdale, L. I.  
 JULIUS GREGORY, ARCHITECT

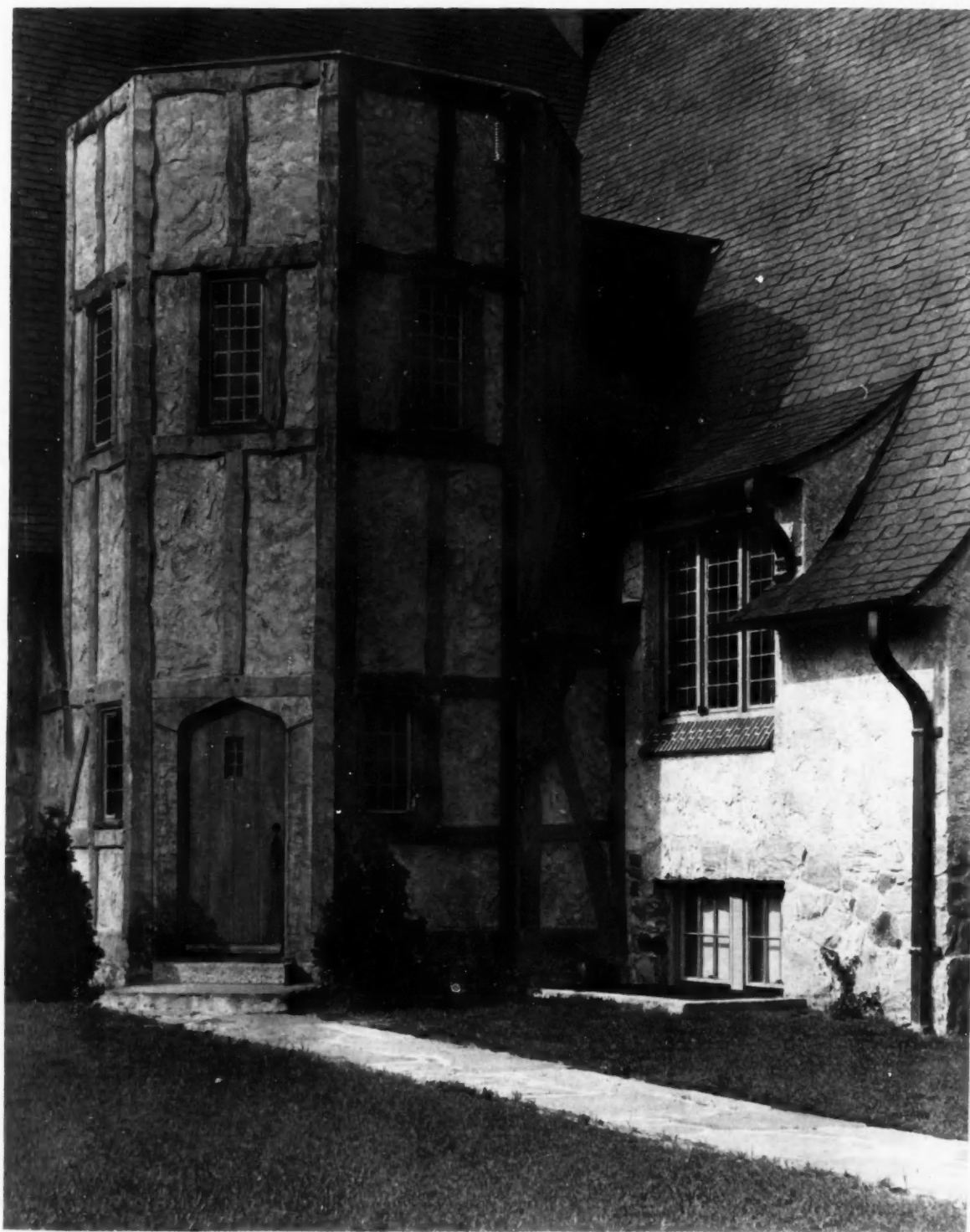




*Photo. Gottcha*

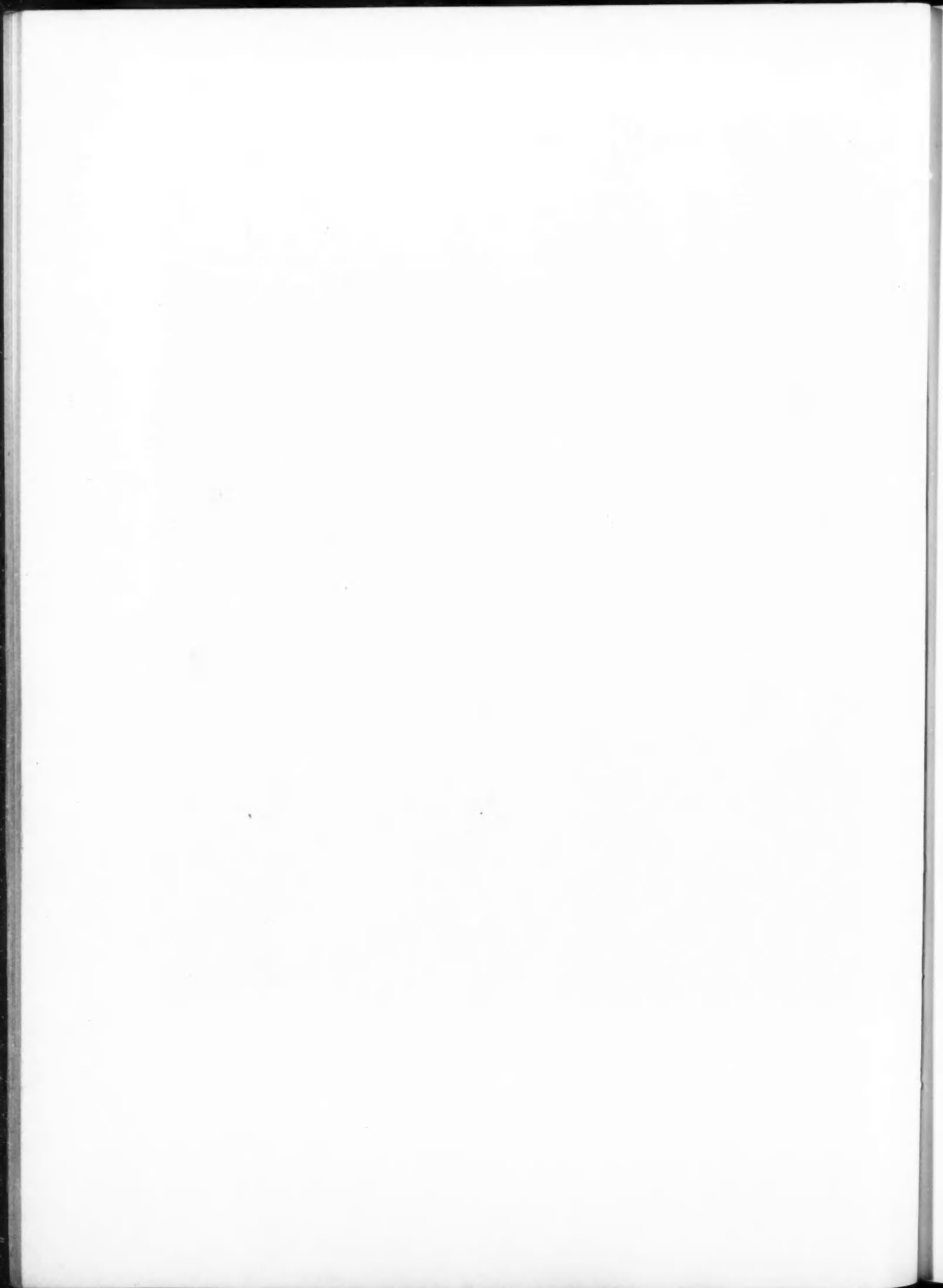
Main Entrance  
Methodist Episcopal Church, Farmingdale, L. I.  
JULIUS GREGORY, ARCHITECT

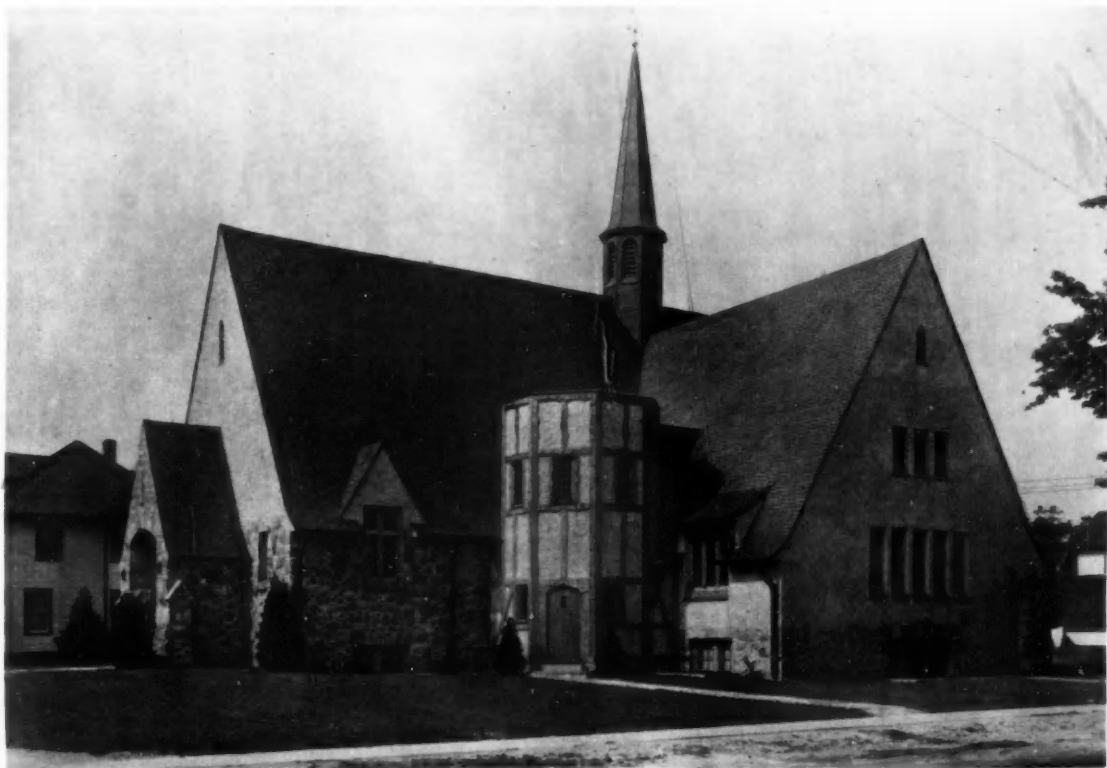




*Photo. Gottsch*

Side Entrance Detail  
Methodist Episcopal Church, Farmingdale, L. I.  
JULIUS GREGORY, ARCHITECT



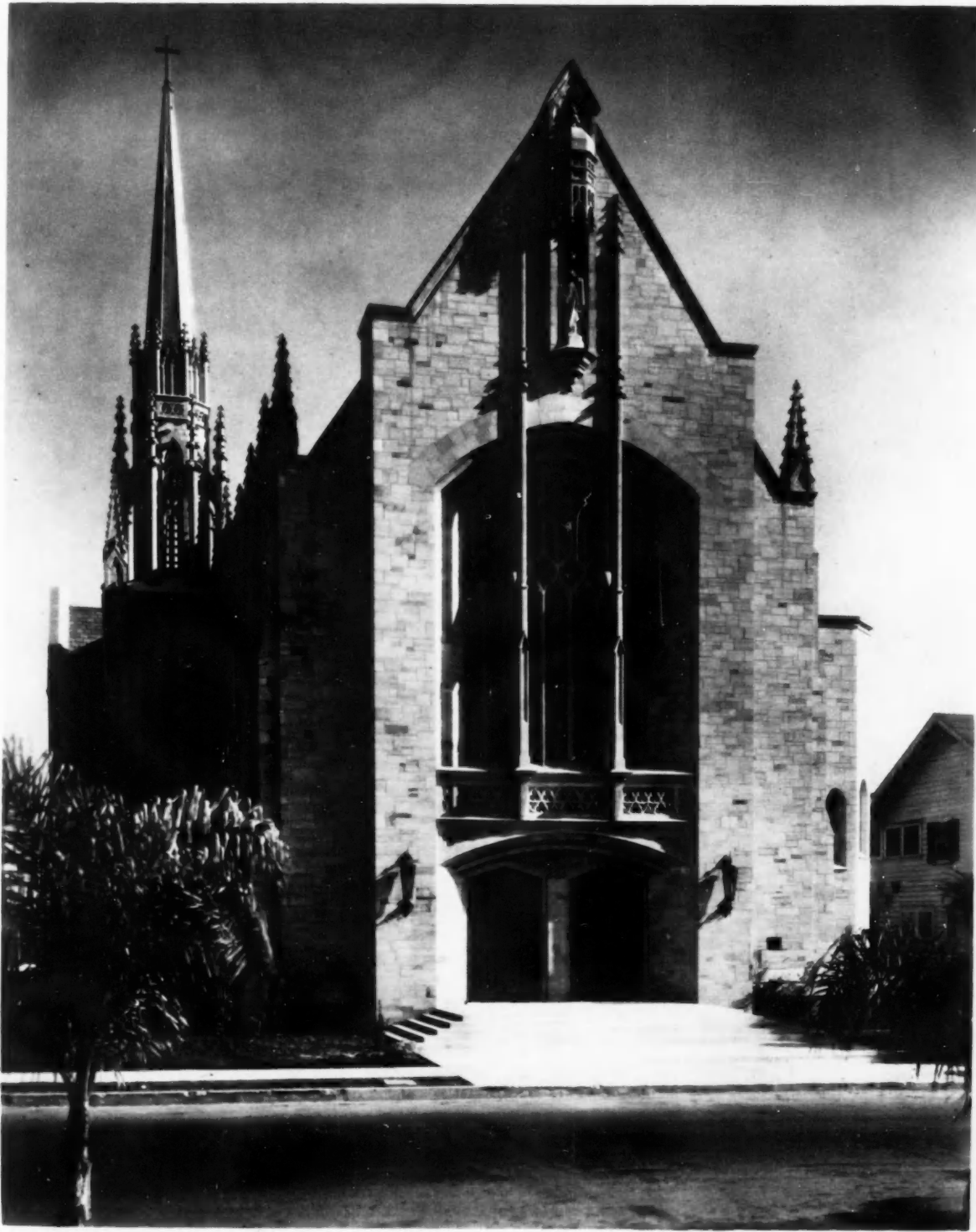


*Photo. Gattscha*

General View (Above) and Nave of Church  
Methodist Episcopal Church, Farmingdale, L. I.  
JULIUS GREGORY, ARCHITECT



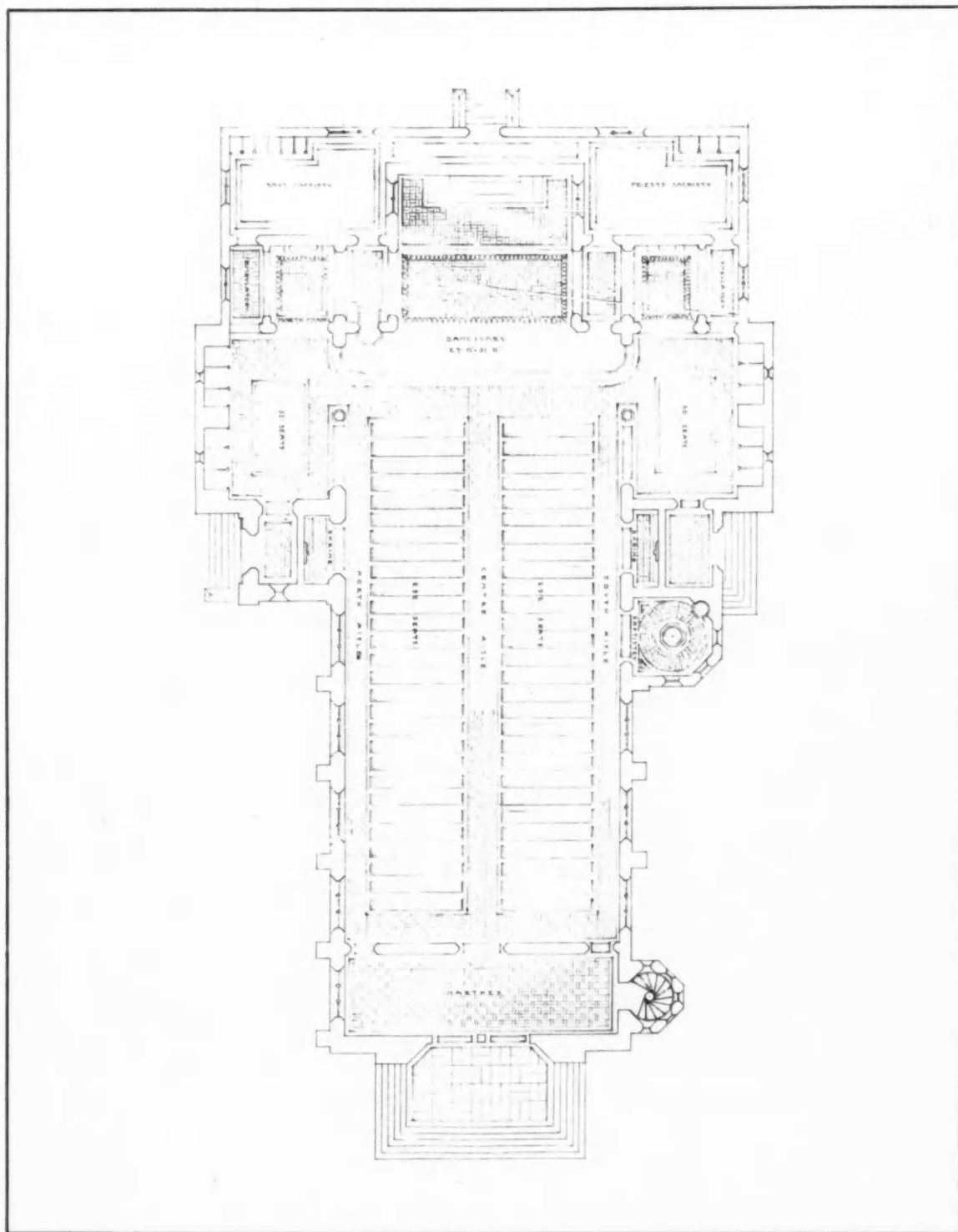




*Photo. Padilla Co.*

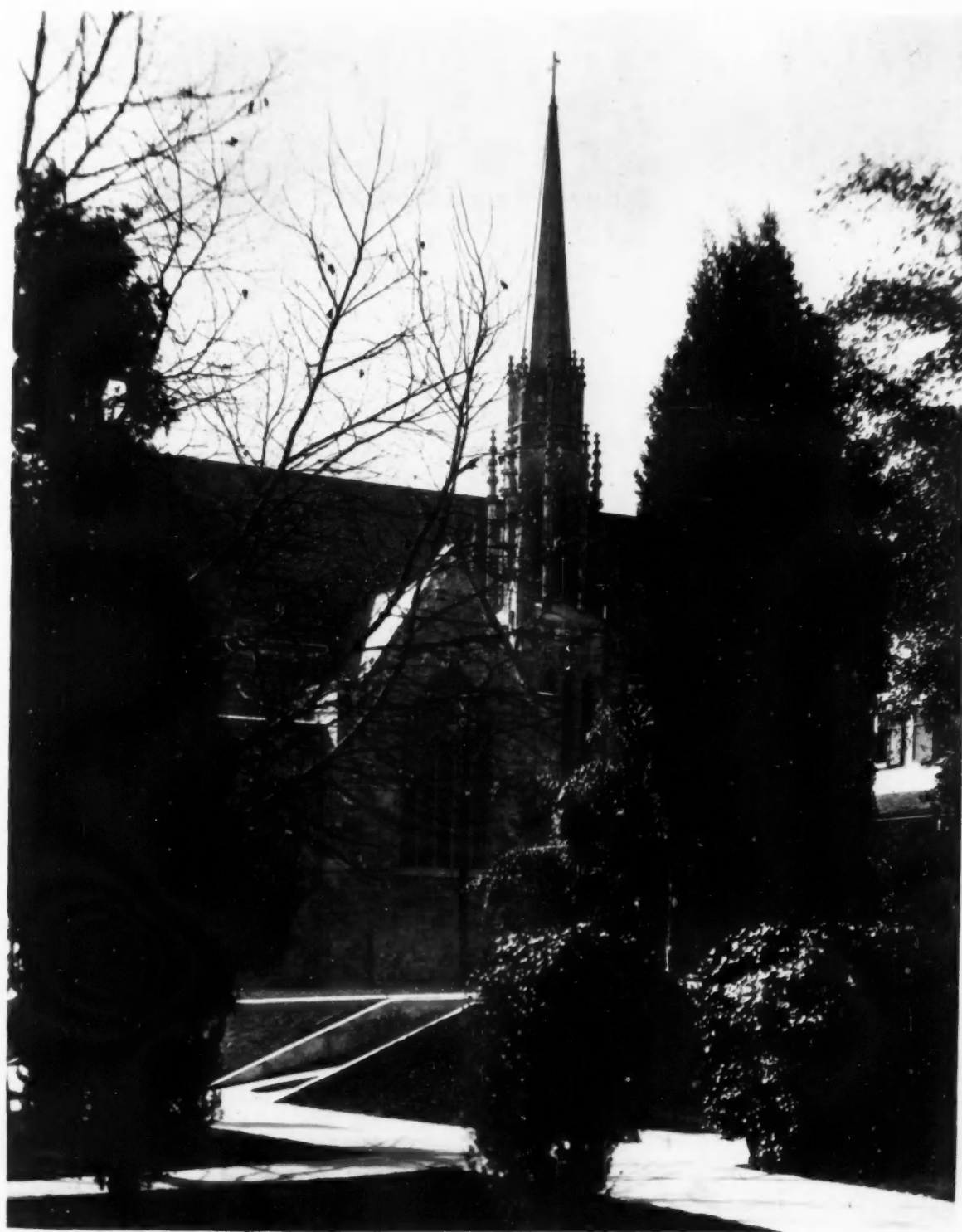
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Main Entrance  
St. Brendan's Church, Los Angeles, California  
EMMET G. MARTIN, ARCHITECT





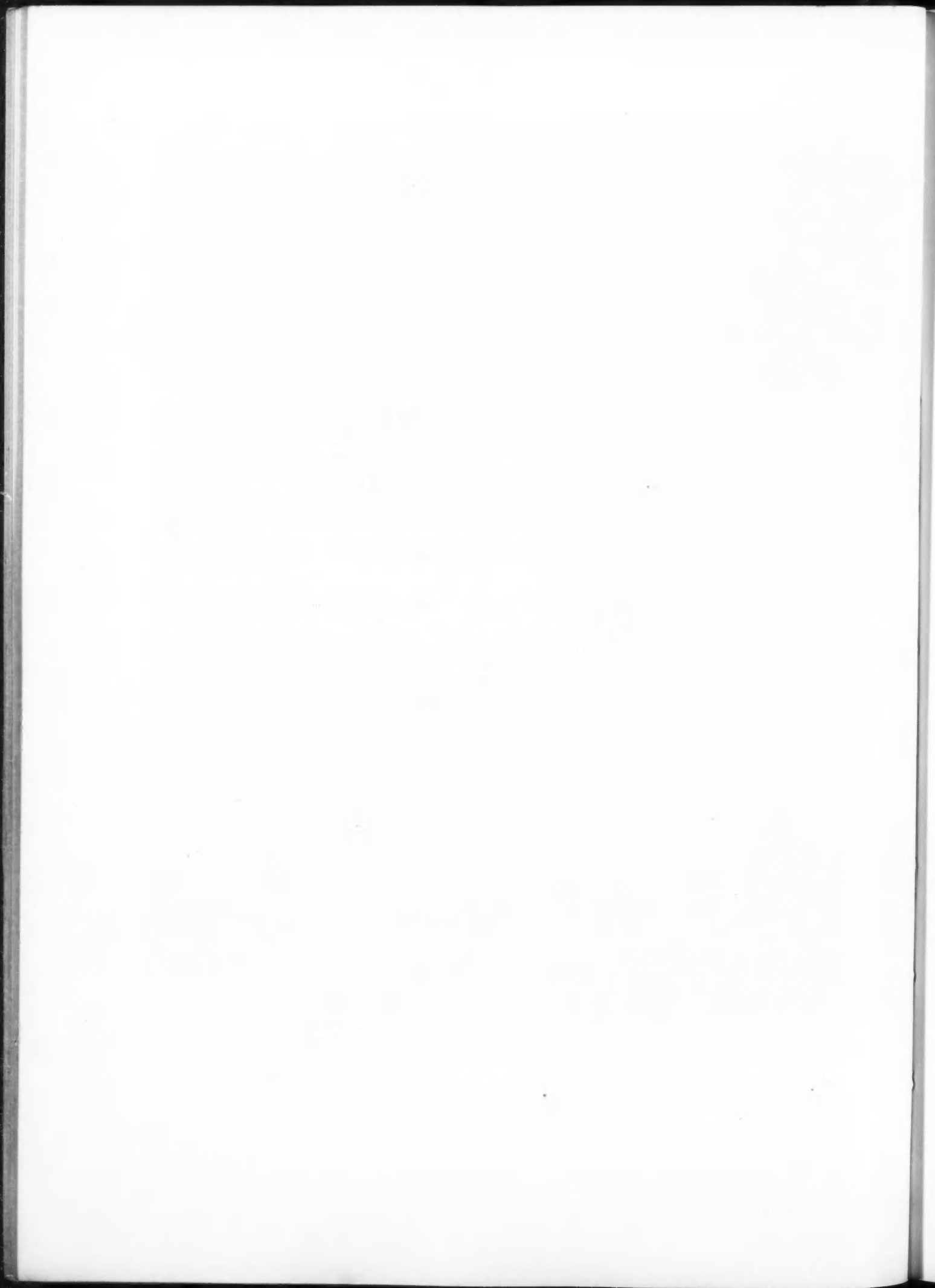
Floor Plan  
 St. Brendan's Church, Los Angeles, California  
 EMMET G. MARTIN, ARCHITECT





*Photo. Padilla Co.*

North Transept  
St. Brendan's Church, Los Angeles, California  
EMMET G. MARTIN, ARCHITECT



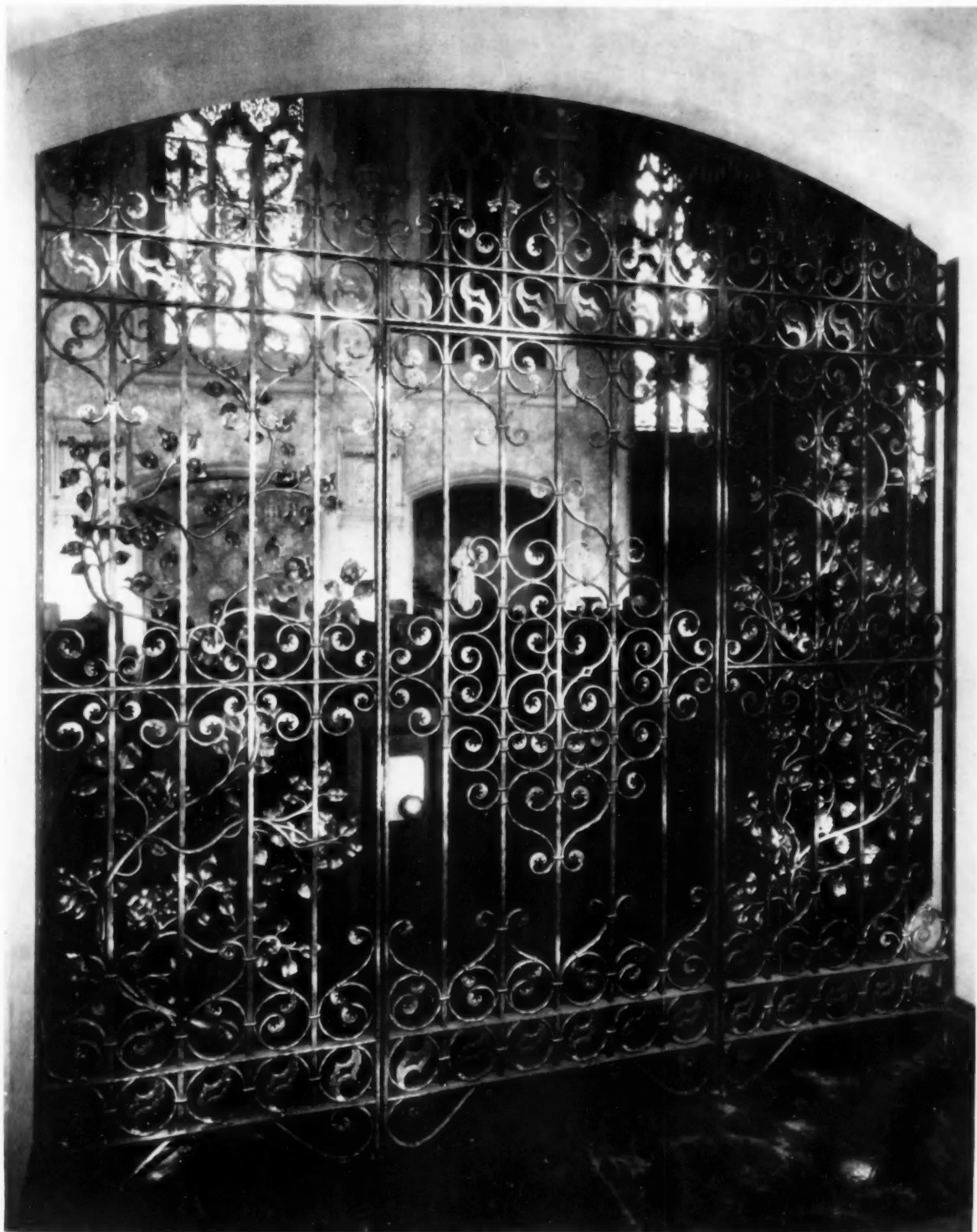


*Photo. Padilla Co.*

View of Interior  
St. Brendan's Church, Los Angeles, California  
EMMET G. MARTIN, ARCHITECT



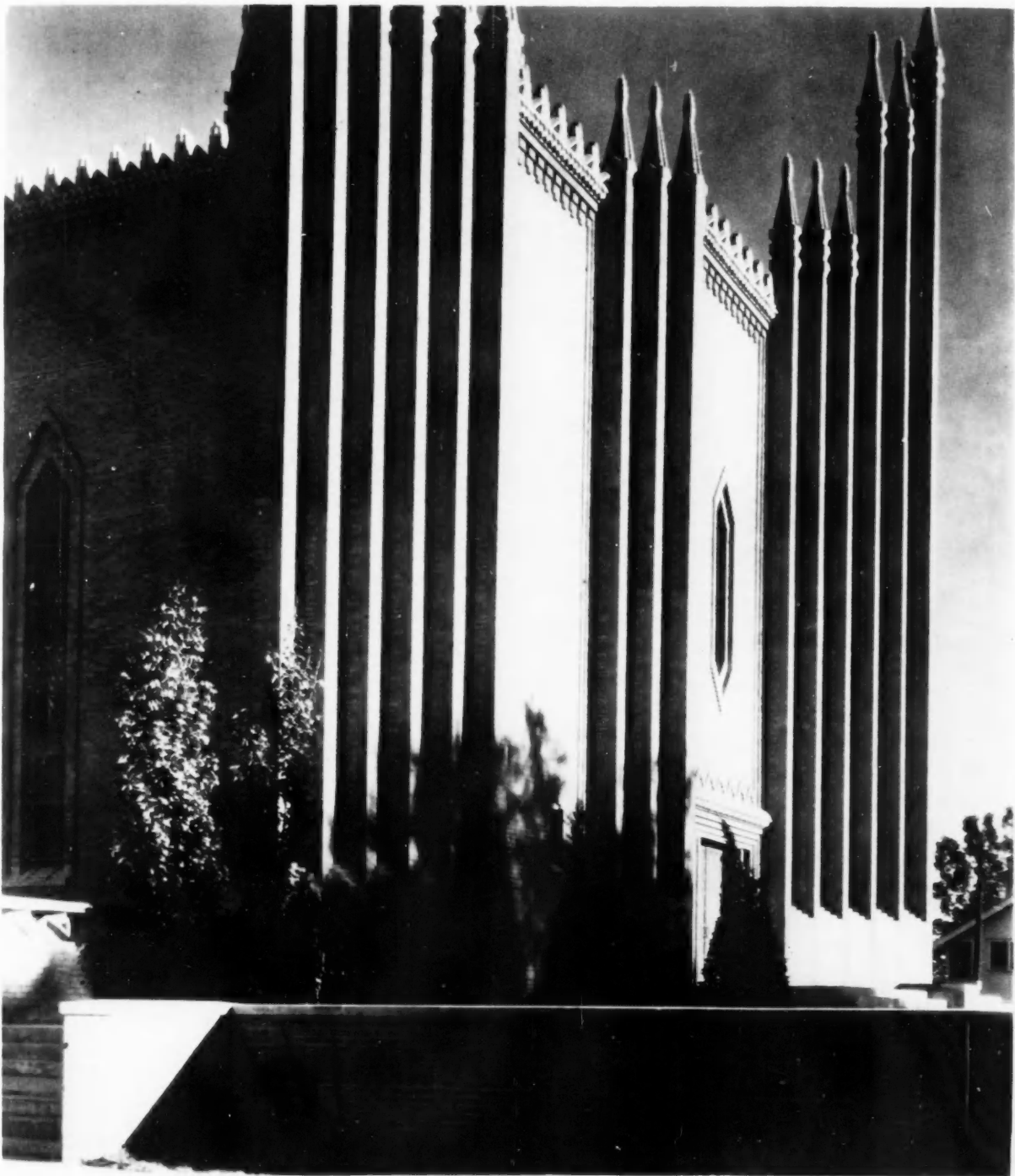




*Photo. Padilla Co.*

Grille between Baptistry and Nave  
St. Brendan's Church, Los Angeles, California  
EMMET G. MARTIN, ARCHITECT





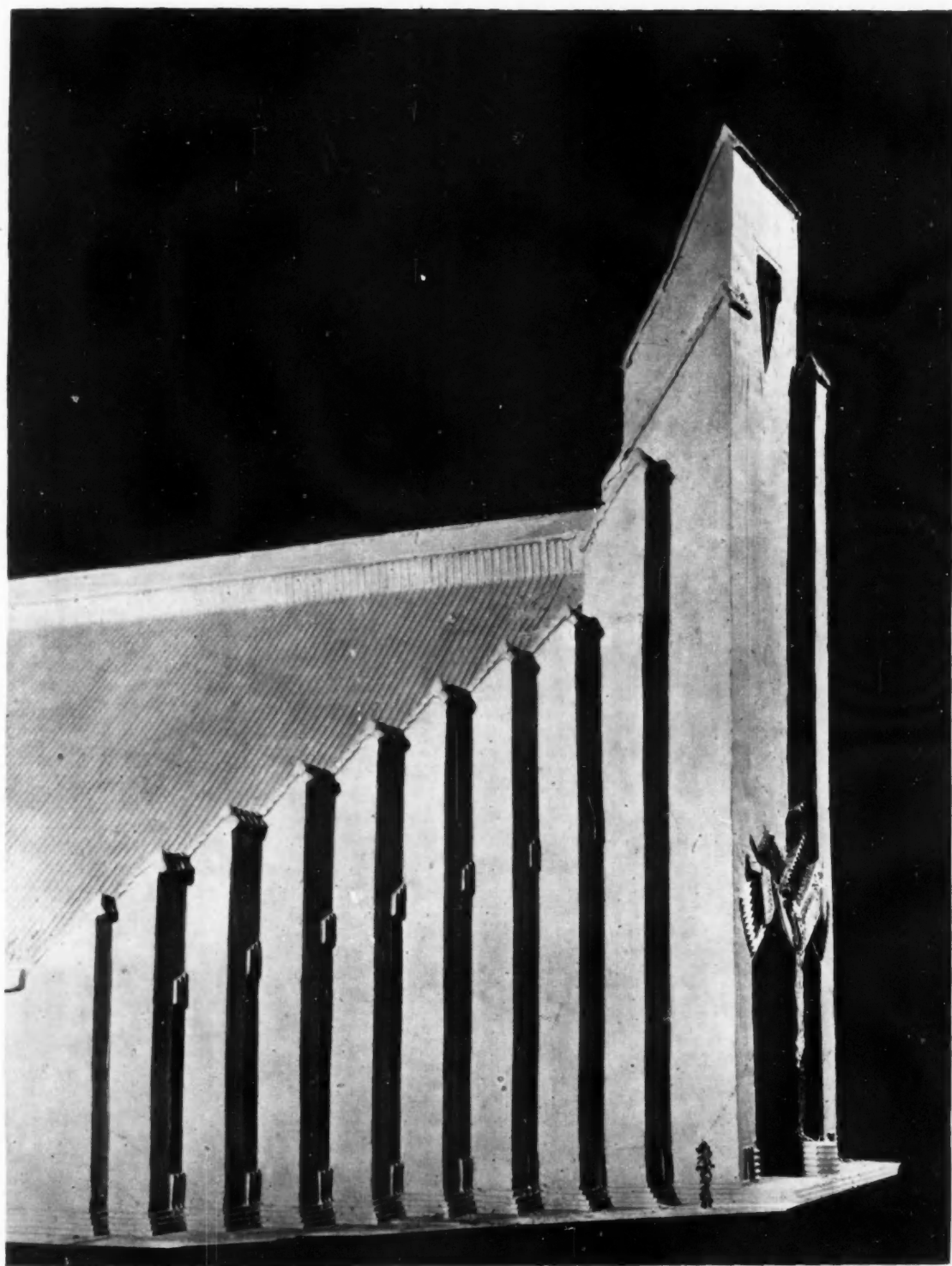
4 Church of Christ King, Tulsa, Oklahoma  
BARRY BYRNE, ARCHITECT  
ALFANSO IANNELLI, SCULPTOR



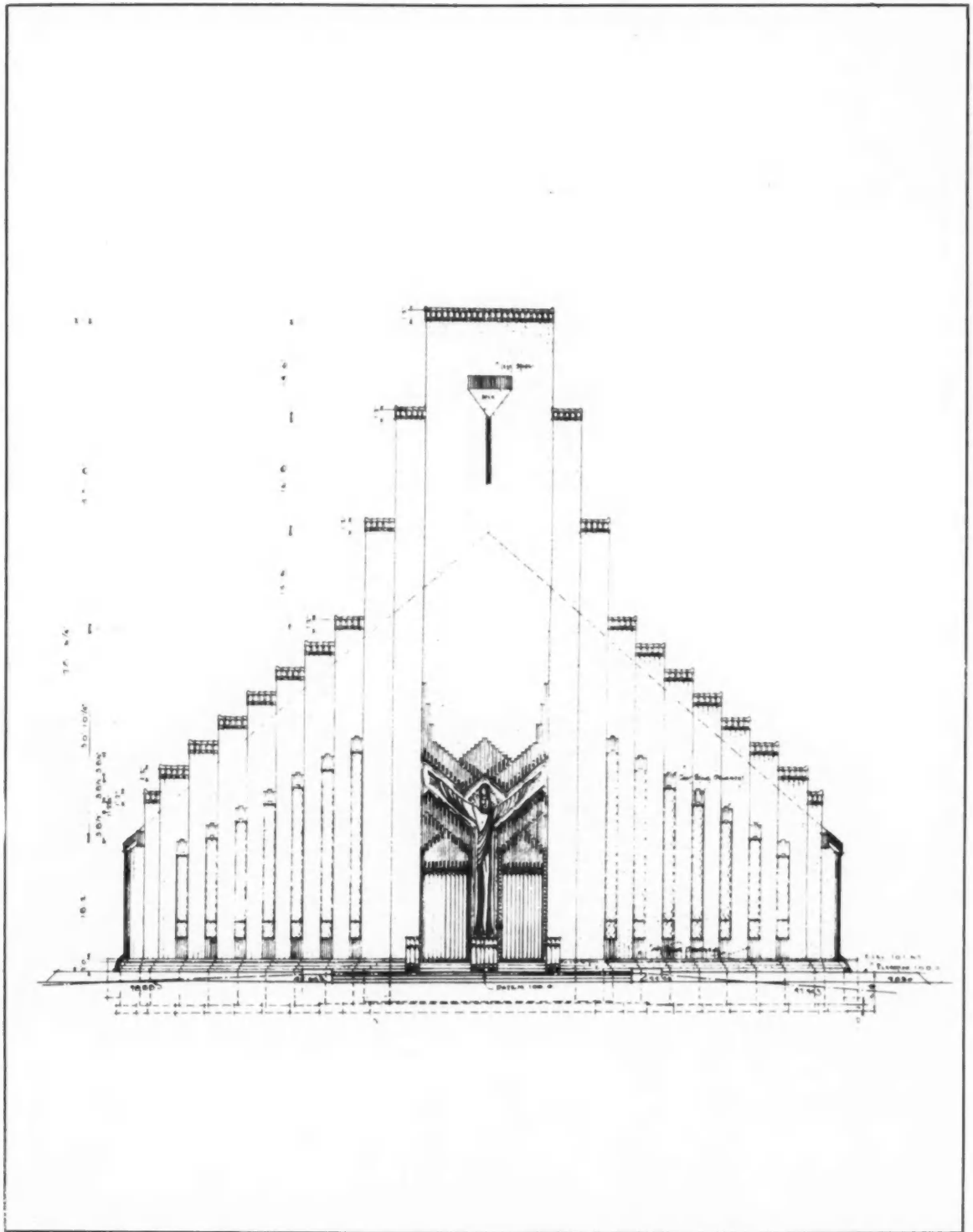
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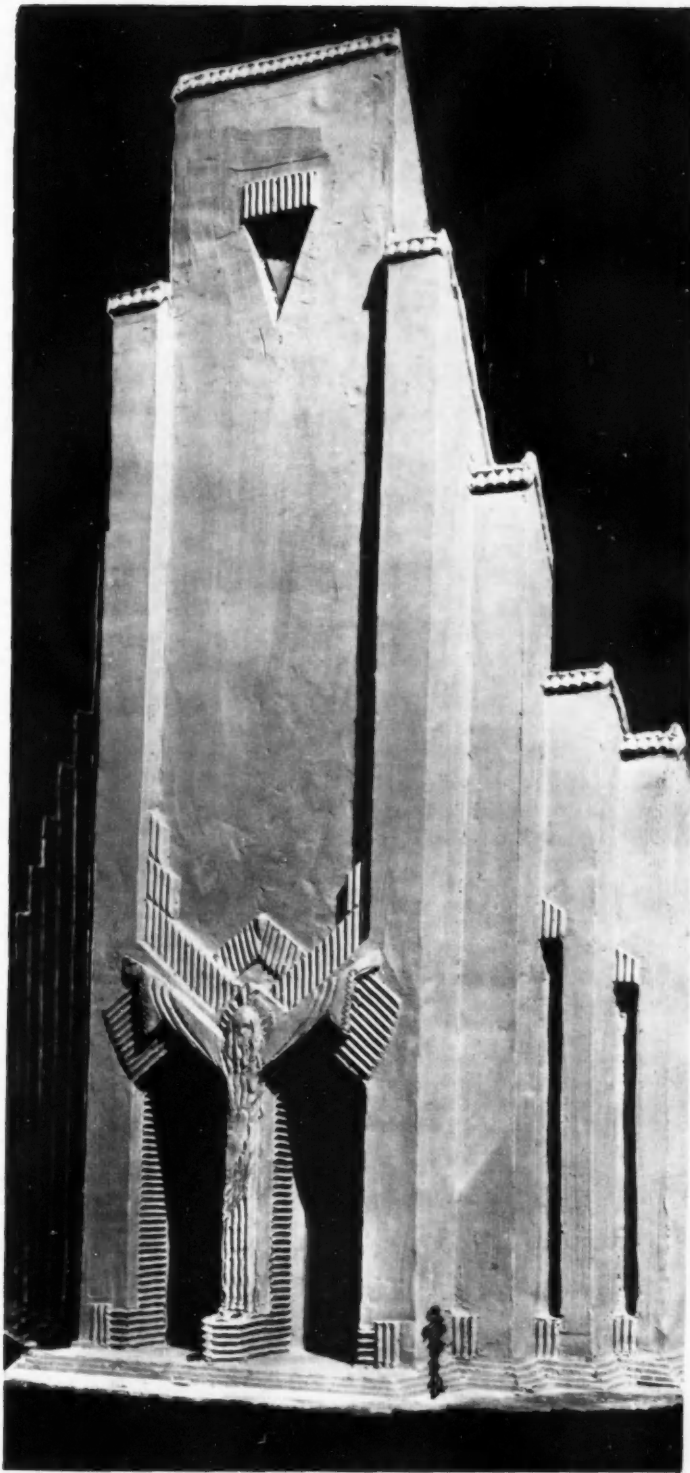




Model of Church  
Church of Christ King, Cork, Ireland  
BARRY BYRNE, ARCHITECT

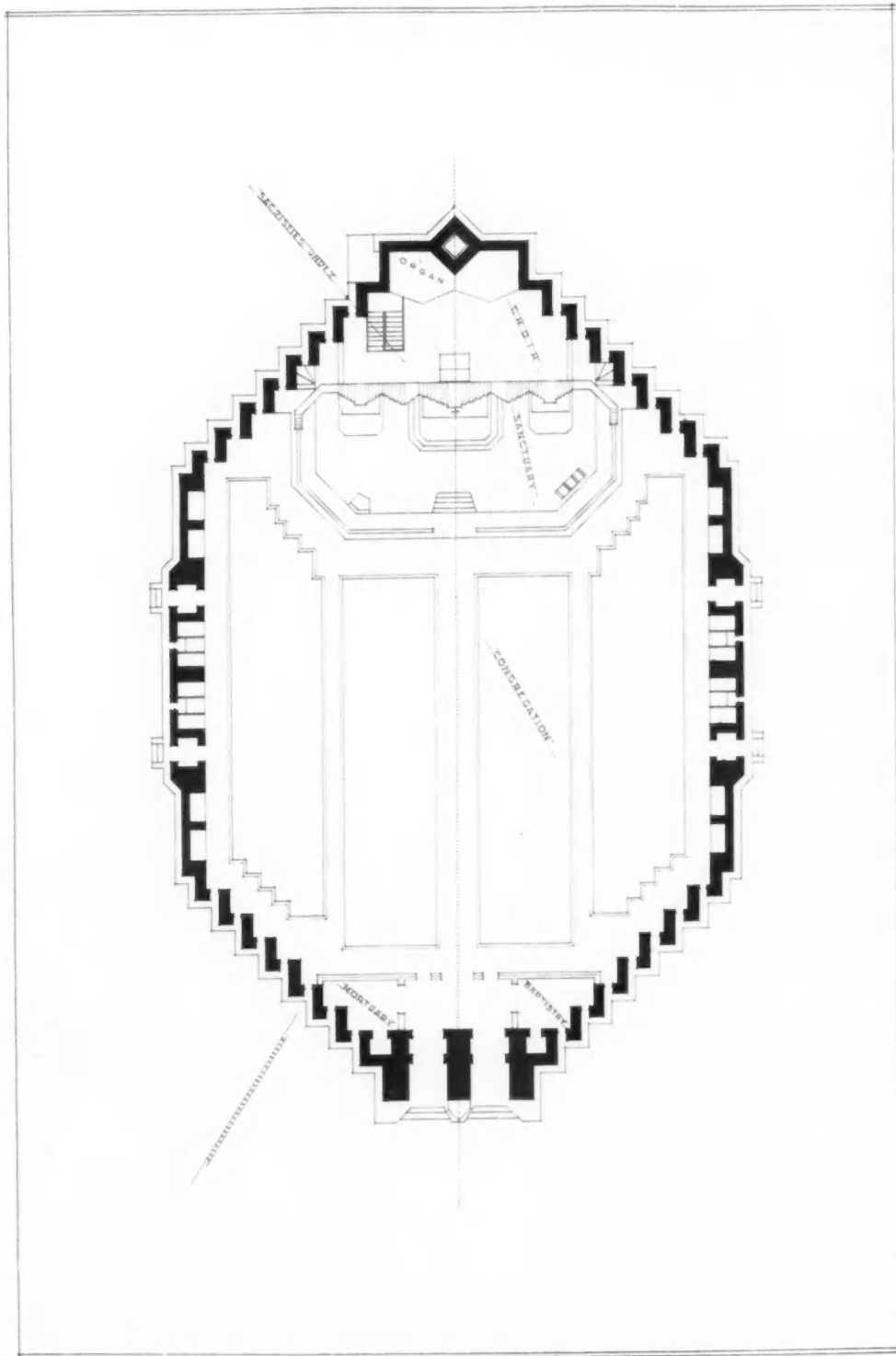


Front Elevation  
Church of Christ King, Cork, Ireland  
BARRY BYRNE, ARCHITECT



Entrance Detail  
Model of Church of Christ King, Cork, Ireland  
BARRY BYRNE, ARCHITECT



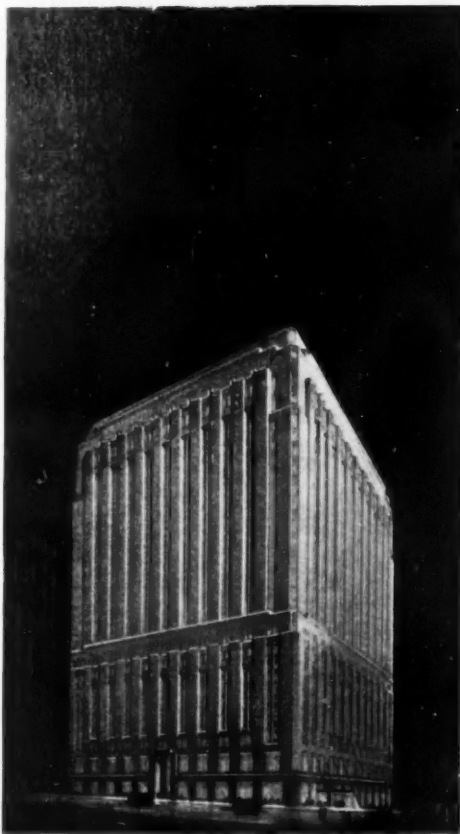


Floor Plan  
Church of Christ King, Cork, Ireland  
BARRY BYRNE, ARCHITECT

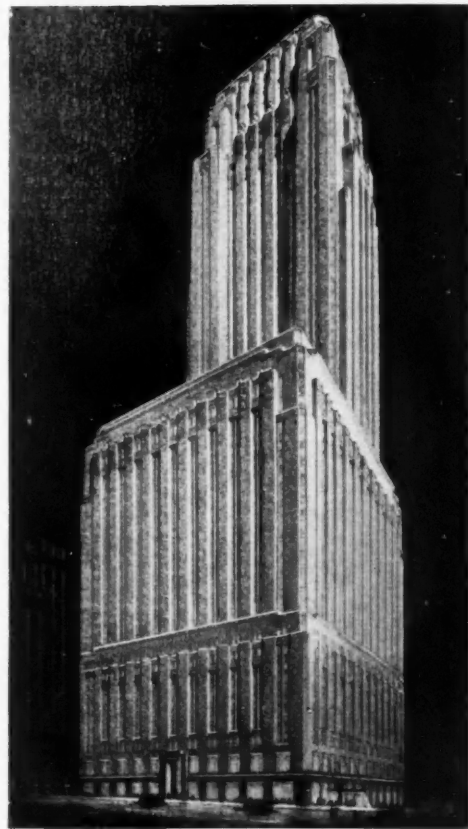


*Gilbert Hall, del.*

SCHEME 1



SCHEME 2



SCHEME 3

PROPOSED BUILDING, CORNER OF MICHIGAN BOULEVARD AND OHIO STREET, CHICAGO  
HOLABIRD & ROOT, ARCHITECTS

Scheme 1 shows present proposed building, and Schemes 2 and 3 possible future additions

# A RAILWAY PASSENGER STATION AT ERIE, PA.

FELLHEIMER & WAGNER, ARCHITECTS

**T**HE RAILWAY station has assumed one of two fundamental forms—the way station and the terminal station. Both require protection to tracks and have adjoining waiting rooms, specialized conveniences, offices and baggage, mail and express facilities. In way stations, such as the Erie Station, the main building is placed at one side of a multiplication of tracks.

The Station for the New York Central Railroad at Erie, Pennsylvania, was built

or in contact with, a railroad station plot. In such cases the problem of arranging the station and traffic facilities is simplified. The plot at Erie presented two principal street frontages by means of which passengers could approach and leave the station. To meet this condition an arrangement was adopted with two main entrances leading directly to a central rotunda or lobby. The principal facilities used by passengers are conveniently grouped around



Perspective showing proposed new park, street and post office site

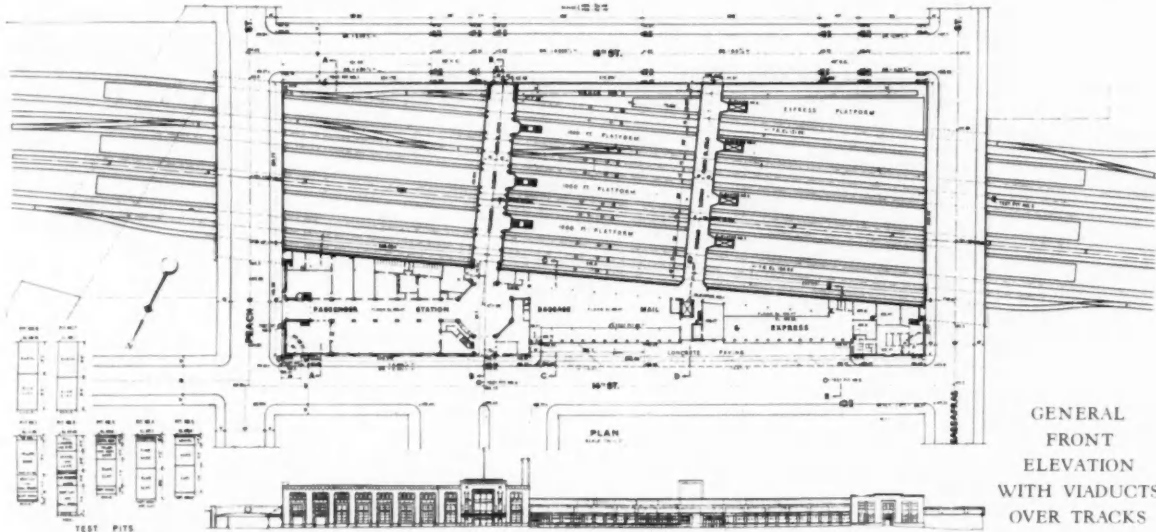
to supplant an earlier building which had outlived its usefulness. The rapid growth of the city from 50,000 to 110,000 inhabitants since 1900 had so congested street traffic that it necessitated the raising of the railroad track and roadbed through the city.

*Site.* The plot determined upon as suitable for the station layout is on the north or lake side of the tracks and is bordered on the other three sides by streets. The city coöperated in the project by providing a parked plaza on the north with a wide street approach.

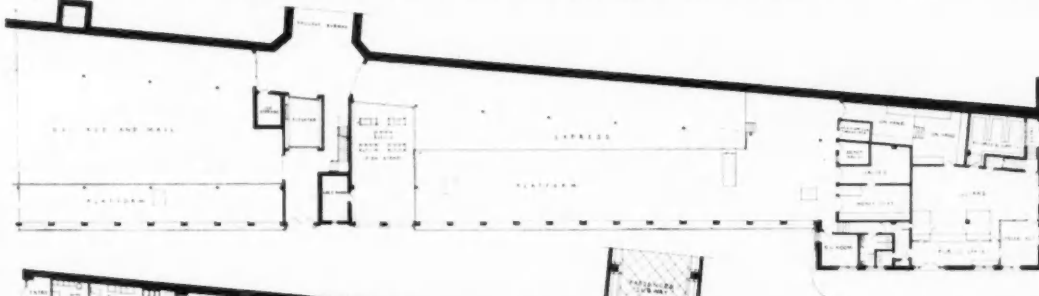
*Ground Floor Arrangements.* Frequently there is only one main avenue of approach to,

this central hall and a subway under the raised tracks brings the train platforms within easy reach. The waiting room is at one side of the Peach Street corridor, conveniently near the rotunda and the passenger subway.

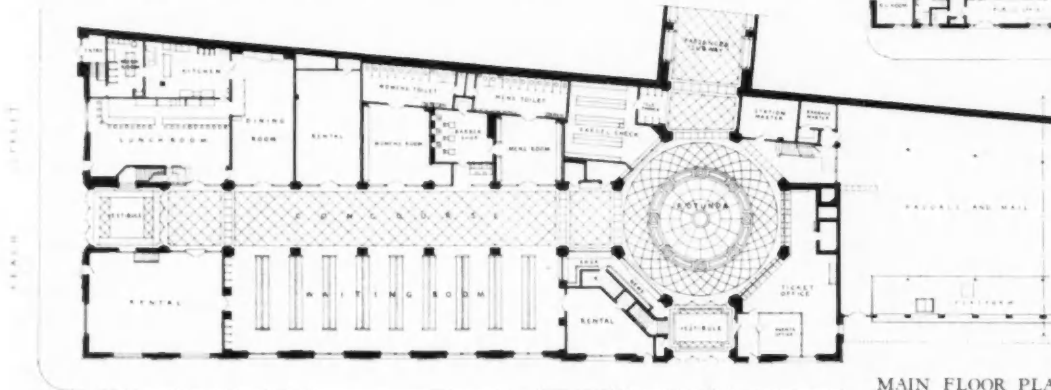
*Upper Floors.* As it was necessary to arrange for space in the building for the divisional staff of both the New York Central Railroad and the Pennsylvania Railroad, with additional provision for future expansion, the main building was provided with two additional stories above the main floor or street level. The first of these, the mezzanine or track-level floor, is devoted to offices and space for future assignment.



GENERAL FRONT ELEVATION WITH VIADUCTS OVER TRACKS



MAIN FLOOR PLAN



OFFICE FLOOR PLAN

NEW YORK CENTRAL RAILROAD STATION, ERIE, PENNSYLVANIA  
ALFRED FELLHEIMER AND STEWARD WAGNER, ARCHITECTS



Photo. Nyholm

MAIN ENTRANCE  
NEW YORK CENTRAL RAILROAD STATION, ERIE, PENNSYLVANIA  
ALFRED FELLHEIMER AND STEWARD WAGNER, ARCHITECTS



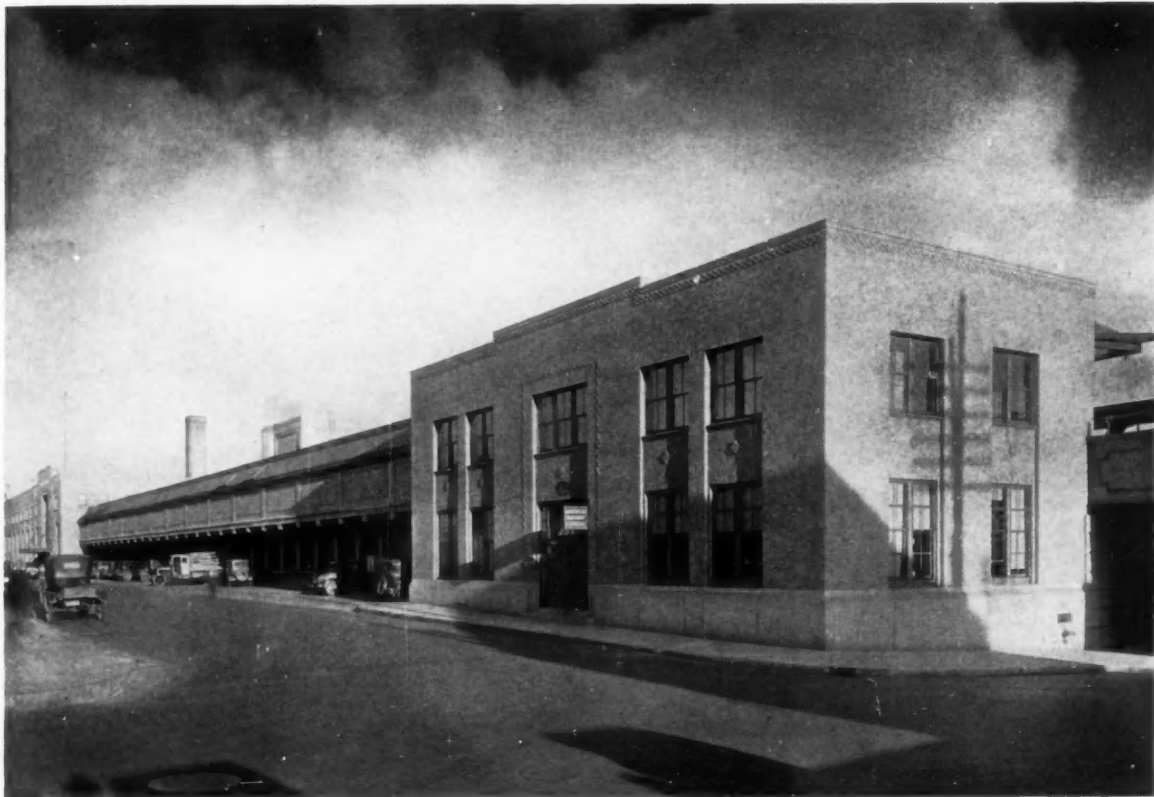


Photo. Nyholm

FREIGHT ENTRANCE  
 NEW YORK CENTRAL RAILROAD STATION, ERIE, PENNSYLVANIA  
 ALFRED FELLHEIMER AND STEWARD WAGNER, ARCHITECTS

The second or office floor is occupied by the railroad staffs.

*Exterior Design.* The architecture of the exterior, for reasons of economy, was kept simple in mass, with a granite base and brick walls above. Decorative effects are obtained in brickwork by appropriate patterns, demarcation of floors, and window enframements. Sparing use has been made of marble panels and terra cotta coping. Instead of making the auxiliary service building—used for the baggage, mail and express facilities—merely an adjunct to the main station as is usually the case, it was designed to harmonize with the main building.

*Interior.* The interior of the building is fashioned of materials that are both durable and sightly and within the moderate operating budget. Use was made of terrazzo

for floors in the public space with mosaic borders and special patterns. The wainscot base of the walls is marble with plaster above, while the ceilings of the main rooms are panelled and otherwise decorated. There are no high ceilings as it has been found that proper effects can be obtained with moderate heights when appropriately designed. The cost is also favorably affected.

The floor areas of the principal facilities were checked as to adequacy by graphs prepared by the American Railway Engineering Association, on the basis of five hundred passengers per normal rush hour. The contract cost (\$1,036,500) included baggage, mail and express building, train platforms and platform shelter sheds, elevators and the interior finish of the passenger and baggage subways. Cubage cost was fifty-five cents per cubic foot.



*Photo. Nyholm*

CONCOURSE  
NEW YORK CENTRAL RAILROAD STATION, ERIE, PENNSYLVANIA  
ALFRED FELLHEIMER AND STEWARD WAGNER, ARCHITECTS



Photo. Nyholm

CENTRAL ROTUNDA (ABOVE) AND CORRIDOR  
NEW YORK CENTRAL RAILROAD STATION, ERIE, PENNSYLVANIA  
ALFRED FELLHEIMER AND STEWARD WAGNER, ARCHITECTS

# WORKING DRAWINGS

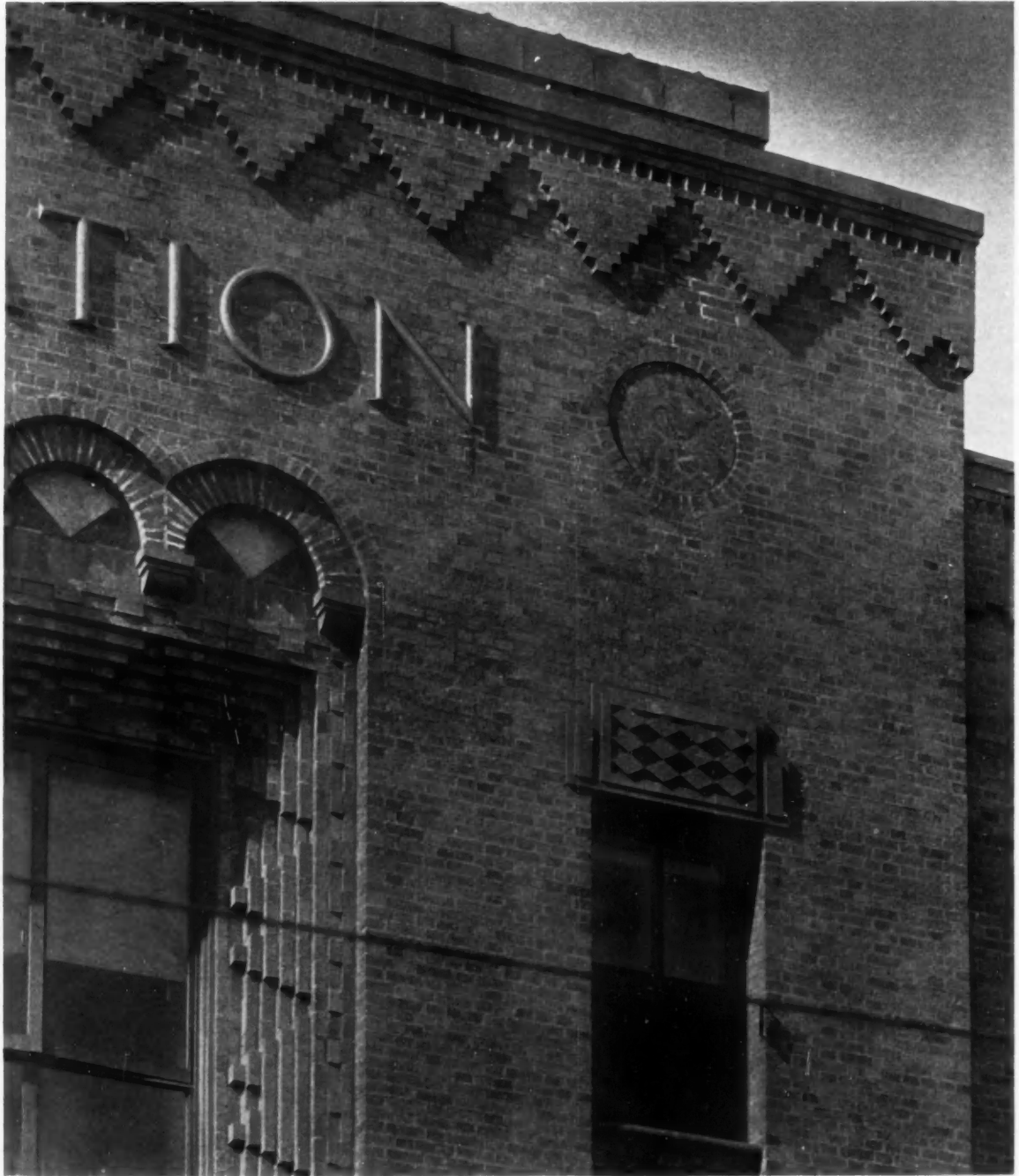
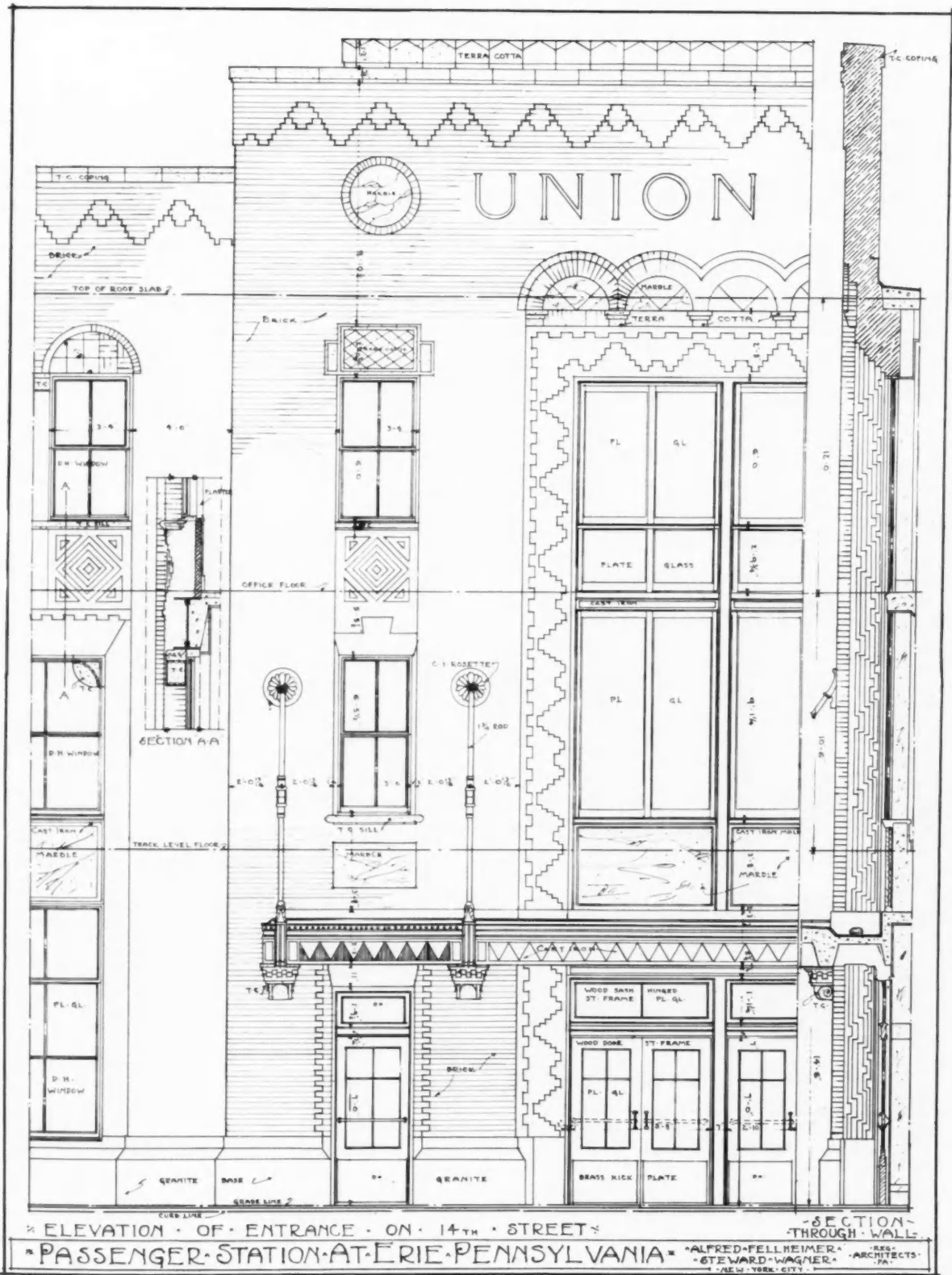


Photo. Nyholm

DETAIL OF ENTRANCE ELEVATION  
NEW YORK CENTRAL RAILROAD STATION, ERIE, PENNSYLVANIA  
ALFRED FELLHEIMER AND STEWARD WAGNER, ARCHITECTS

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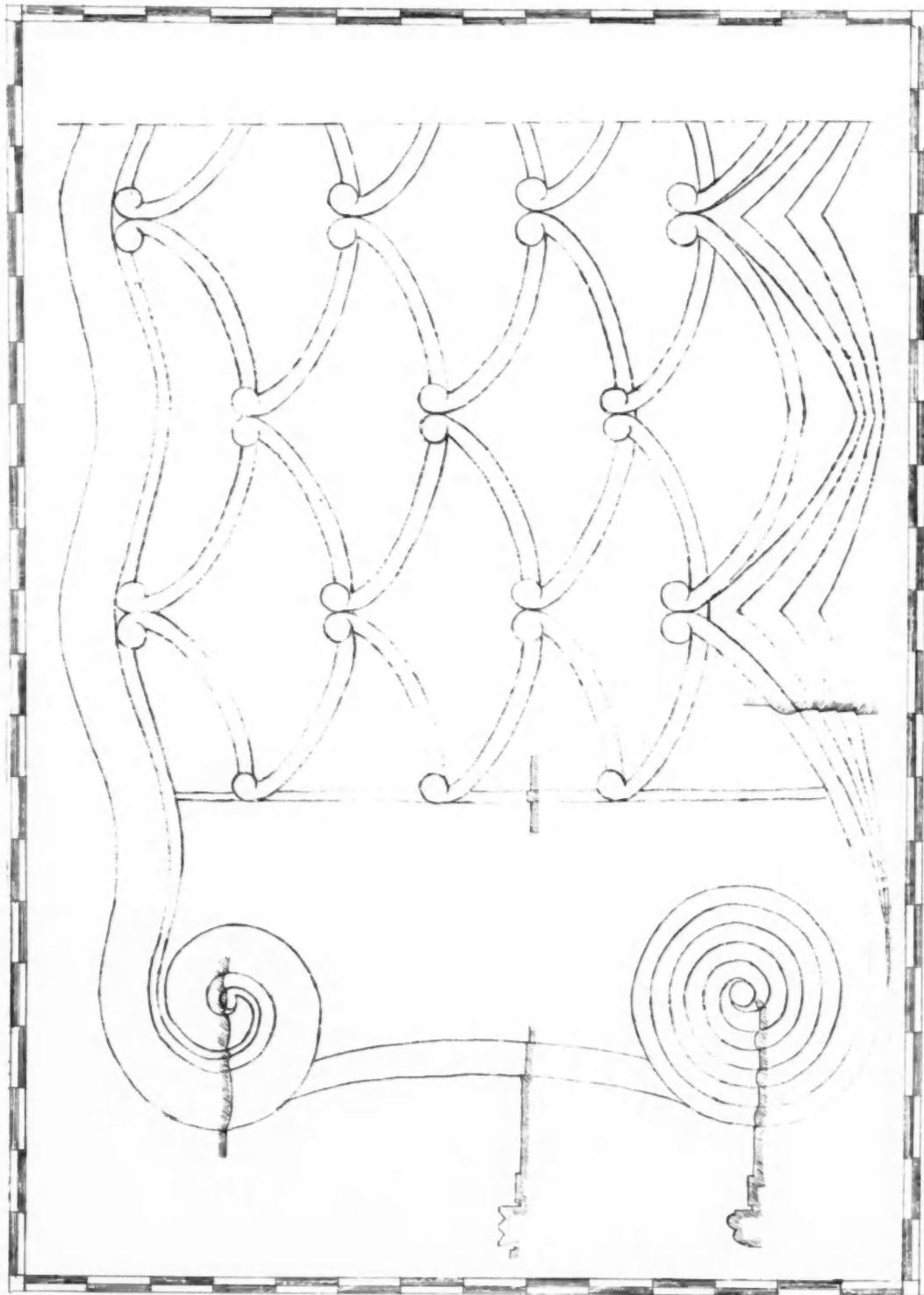


ELEVATION OF ENTRANCE ON 14TH STREET

SECTION THROUGH WALL

PASSENGER STATION AT ERIE, PENNSYLVANIA

ALFRED FELLHEIMER & STEWARD WAGNER ARCHITECTS PA. NEW YORK CITY



BRONZE WINDOW PANEL  
HORN & HARDART BUILDING, PHILADELPHIA  
RALPH B. BENCKER, ARCHITECT



DETAIL OF PLASTER CEILING  
HORN & HARDART BUILDING, PHILADELPHIA  
RALPH B. BENCKER, ARCHITECT

# ROBERT MILLS, 1781-1855

## AMERICA'S FIRST NATIVE ARCHITECT

BY H. M. PIERCE GALLAGHER

### PART II. MONUMENTS

THE INSTINCT of the designer was evident in Mills' creation of enduring monuments among which were some of surpassing beauty and renown.

Assuming independent practice of his profession in Philadelphia, Mills sensed the new demand of a young nation for memorial expression. In an autobiographical sketch he notes that "a general discussion of monuments to the saviour of the country" was taking place. But his ability in this type of architecture first proved itself in a different, though allied, form.

After the disastrous fire of 1811 in Richmond, Virginia, a premium of five hundred dollars was advertised for a votive church to occupy the site of the theatre that had been destroyed. Mills submitted a design which was awarded the prize.

His first monument, strictly speaking, was that erected to the earliest President of the University of South Carolina at Columbia. There is found but slight record of this work, which was designed to commemorate the life and deeds of a man of distinction in his state. It was most unpretentious in character—scarcely more than a shaft bearing suitable inscriptions and the name Jonathan Maxcy.

Mills' next effort was a memorial to De Kalb, in the churchyard at Camden, South Carolina. This was also unimpressive in conception, and any acclaim it may have received was due rather to the presence of General Lafayette at the laying of its cornerstone (1825), than to its own architectural merit. It has been described as "an obelisk in form raised on a pedestal—all of white marble—resting on a granite base composed of expanding steps sur-

rounded by an iron balustrade. A wreath was carved upon its base, and a star near its apex." The individualizing presence of the latter emblem on many of Mills' monuments is said to have had its genesis here. "A brilliant star," so runs the tale, "appeared in the zenith at midday and remained there during the procession from the sepulchre, considerably awing those present while creating consternation among the negroes collected."

Mills' claim to authorship of the Bunker Hill Monument, though never insistent, was, even in his later years, clearly definite. The Massachusetts Historical Society, however, has been equally confident that it was the combined work of Horatio Greenough and Solomon Willard. There was without doubt a coincidence of design among the plans submitted. But the claims of Boston were damaged by the receipt of photostat copies of Mills' Bunker Hill drawings, which the Historical Society discovered in their archives and sent to the writer. Here at least was proof that such designs were made by Mills when it was believed that none existed.

Tuckerman, in his *Memorial of Horatio Greenough* (1853), says, "Greenough constructed a model in wood which was selected by the committee although the prize was never bestowed upon him. . . . Solomon Willard planned the interior arrangement but the form, proportion and style of the monument were adapted from Greenough's model." The word *adapted* again suggests a latitude which we know early American committees allowed themselves in selecting from a group of plans.

Documentary proof that Mills received a



premium for his Bunker Hill Monument design has never been established; there is only the testimony of tradition among his descendants. In his life sketch Mills makes the statement that during his residence in South Carolina, he, by public invitation, presented designs for the monument to be erected on Bunker Hill, opposite Boston. The obelisk design he sent was "adopted in outline, without the decorative effects which would have given it more interest." The word *adopted* is used as though in reference to legitimate custom.

The presence on Mount Vernon Place, Baltimore, of Mills' memorial, the Washington Monument, has caused this gracious square to rank among the great plazas of our country. At the time the coveted honor of creating the first monument to Washington was bestowed on him, Mills was but twenty-nine years old. Surely an unripe age for so classically ripe an achievement! To him, too, is due

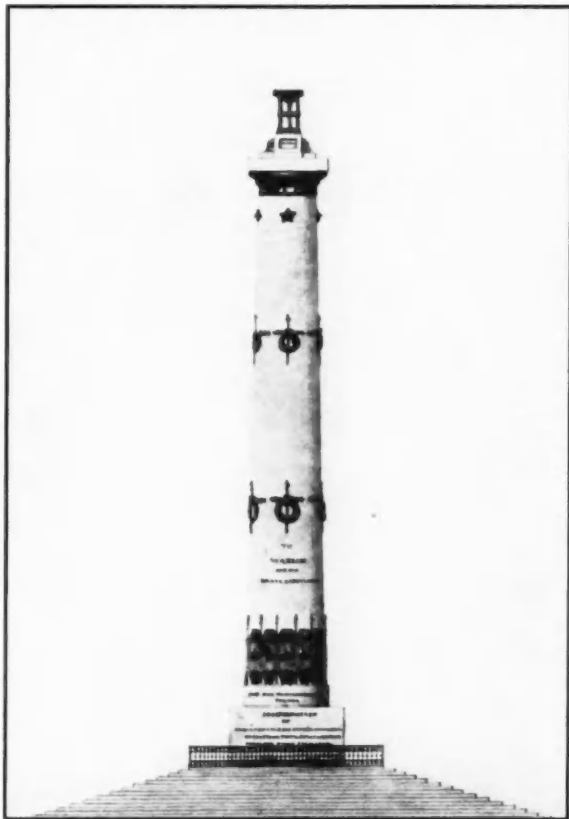
the distinction of being the first to employ the single Greek Doric column to express a commemorative ideal. Fiske Kimball points out that Mills' conception was the direct ancestor of such recent examples as the "Prison Ship Martyrs' Monument," and the "Perry Memorial."

Mills described the Baltimore Monument as follows: "Its outline presents a column of massive proportions. It is elevated on a socled pedestal fifty feet square and twenty-

five feet high. The column, about twenty feet in diameter, rises above one hundred and twenty-five feet, which gives a total height of one hundred and fifty feet, independent of the surmountings. It is entered at each of four sides by a flight of marble steps through a grand archway into the base, by which one passes to the center where circular stairs convey one to the top

of the base, and by following them lead to the summit. The whole fascia will be of white marble; such decorations as may be added to be of either brass or bronze."

It was at first intended to place the structure in the public square between the City Hall and the Court House. But the site was abandoned and preference given to the high ground outside the city, tendered for the purpose by General John Eager Howard, because "it was feared the monument might prove topheavy and in toppling over would crush these surrounding build-



FROM A DRAWING SUBMITTED BY ROBERT MILLS FOR THE BUNKER HILL MONUMENT

ings of importance."

Later on, when two hundred additional feet of ground were required to facilitate the work of construction, General Howard consented to make this grant from his farming land known as "Howard's Woods," "provided a rental of forty dollars per annum be allowed by the committee for pasturage," for the cow thus dispossessed.

As funds were irregular, fourteen years of intermittent labor followed the laying of

the corner stone (July 4, 1815) before the massive column was ready to be dedicated on the twenty-fifth day of November, 1829. An important part of the ceremony was the raising of the statue of Washington to the lofty summit. This was a spectacular feat of engineering because of the height of the monument and weight of the statue (hewn from a single block of marble from the quarries of a Mrs. Taylor, near Baltimore) which measured seventeen feet in length and weighed thirty tons.

Another clash of opinions centers around the authorship of the equestrian statue to Washington at Richmond, Virginia. The architect Mills is denied credit in favor of Crawford, a sculptor of Richmond. It is well known that the main statue and the bronze figures and emblems on the top of the pedestal and around the base were the work of Crawford, aided by Rogers, who executed two of the statues. There is no intent to rob the sculptor of the distinction which his skill and taste in handling the theme confers, but the quality which makes the monument unique is its architectural composition.

The absence of credit for architectural inspiration is not so lamentable where the monument presents a single statue and its corollary, a simple base. But obviously such is not the case in this instance, where the vision of an architect is plainly the basis of the conception. It seems scarcely credible that so splendid and costly a monument as this one projected by the citizens of Virginia would be delivered solely into the hands of a sculptor, whatever his renown.

Montgomery Schuyler refers to this contention in an article on Mills in *The American Architect* of Dec. 21, 1910. "If either art be accessory it is the sculptor's." He also refers to the not uncommon fate of architects who collaborated with sculptors, adding "one is inclined to say that that is the best pedestal which is least noticeable on its own account."

In this monument the architect, whoever

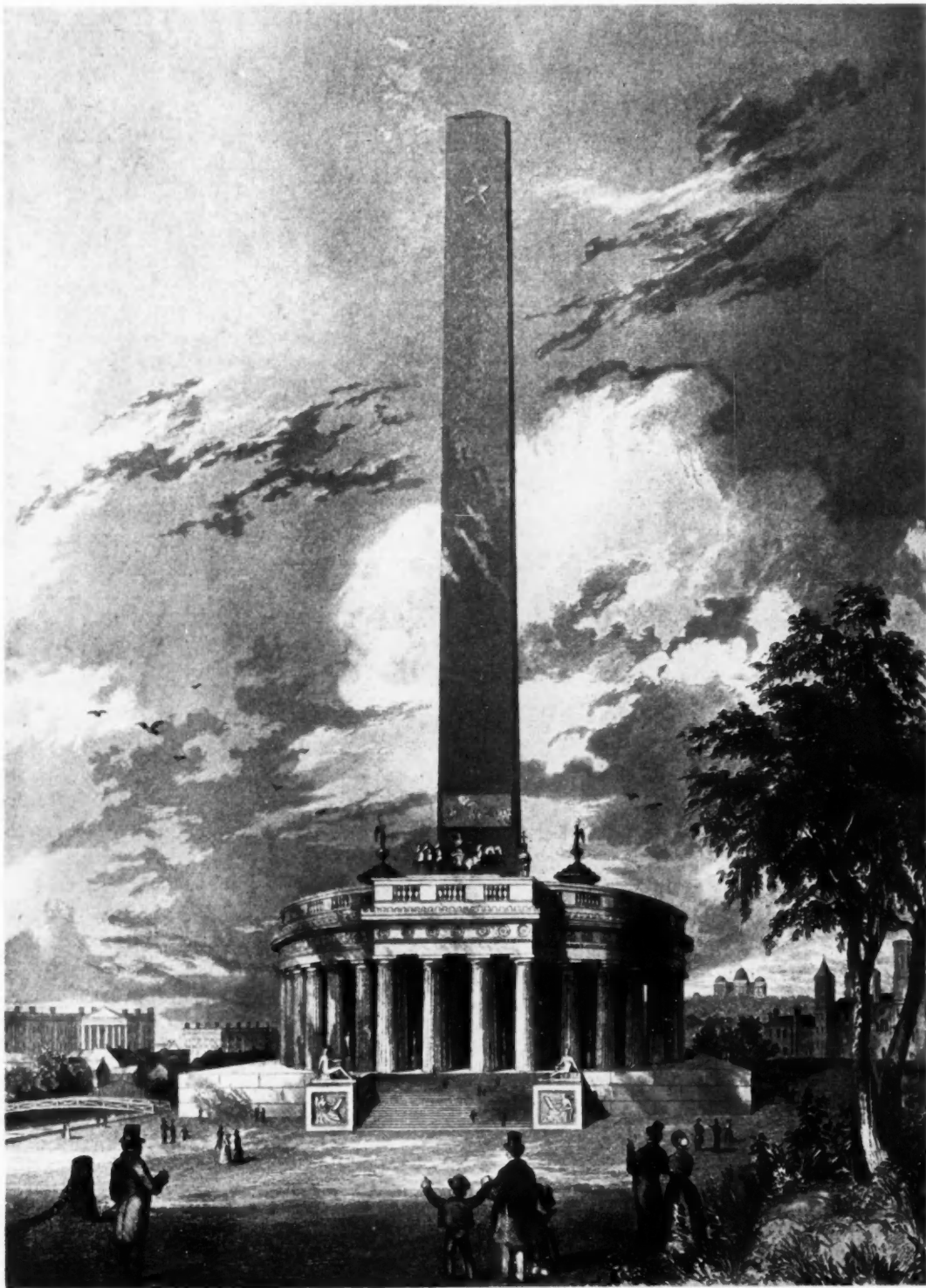
he be, tells a story—the story of Virginia's history—in allegory. And it was, as Schuyler has pointed out in his sketch of Robert Mills, "by far the most important and elaborate purely ornamental project thus far conceived in the United States." He adds significantly, "it fell happily into quite the right architectural hands, as one would be at a loss to name another American architect practising at that time who could have handled it so cleverly."

The Washington monument at the United States Capitol remains the supreme accomplishment of Mills. The Continental Congress pledged itself in 1783 to erect a statue to General Washington "whenever the residence of Congress shall be established." The selection of the site was left to Washington himself, and it was indicated on L'Enfant's plan for the Federal city. When Congress convened in 1799, it was again resolved by a special act "that a monument or statue be created and placed in the city of Washington." An appropriation was proposed in order to carry the resolution into effect. But the Senate failed to concur, for reasons which may be found in the political questions absorbing it and the people until the war of 1812.

Congress was often reminded of its resolution during the ensuing years and as often the resolution was renewed, only to be laid upon the table again. Finally the intended honor to Washington was deferred indefinitely.

In 1833 interest in the project, which had never died, was stimulated by an inspired article in the *Washington Intelligencer*, with the result that a mass meeting was held and a lively discussion took place. At this meeting Congress was roundly censured and the National Monument Association was born.

This body of representative citizens determined that funds for the undertaking should be asked of the people of the United States, independently of Congress. Various schemes and plans for raising \$1,000,000 were suggested. It is recorded that the com-



THE NATIONAL WASHINGTON MONUMENT  
ROBERT MILLS, ARCHITECT

mittee decided to accept a design which "should blend durability, simplicity and grandeur." The site chosen was happily the one designated by Washington himself, at the instance of the Continental Congress, namely, the thirty acres near the Potomac River, west of the Capitol and south of the White House.

The struggle aroused by this memorial started before the formation of the government and continued through the administration of fifteen presidents. Not until the final salute was fired at its dedication on December 6, 1884, as the last stone of the pyramidion was settled into place, did this struggle end. For long periods of time building was delayed, partly owing to lack of funds, partly to the vicissitudes of three wars. Other troubles, too, had come. Its design was questioned. There were such wholesale criticisms as that of general unfitness. Its strength was thought debatable. It was assailed on the ground of high

cost, although it was pointed out that the salary relinquished by General Washington would, at simple interest, have built three such monuments. So great had the clamor against it become, that in 1876 the project was almost rejected. The plans of the sculptor Story would have been substituted but for the intervention of the chairman of the Washington Committee, Robert C.

Winthrop. He it was who made the memorable address at the laying of its corner stone in 1848. It was Winthrop's oration, too, which was read to the assembled throng at its dedication in 1884, though he himself was too infirm to be present.

Winthrop resented the suggestion of deliberately abandoning the monument with its forty memorial stones contributed by as

many states of the Union, some of which had already been embodied in the structure. Moreover, there was at hand a valued collection of marbles, porphyry and precious minerals, and a stone from the ruins of the Parthenon. Owing to Winthrop's entry at the right moment a real dishonor was averted and Mills' majestic conception was saved.

The following is an extract from a description of the memorial published at that time:

"This design embraces the idea of a grand circular colonnaded building, 250 feet in diameter and 100 feet high, from which springs an obelisk shaft 70 feet at

the base and 500 feet high, making a total elevation of 600 feet.

"This vast rotunda, forming the grand base of the monument, is surrounded by 30 columns of massive proportions, being 12 feet in diameter and 45 feet high, elevated upon a lofty base or stylobate of 20 feet elevation and 300 feet square, surmounted by an entablature 20 feet high and crowned



THE WASHINGTON MONUMENT, MOUNT VERNON PLACE, BALTIMORE, MARYLAND  
ROBERT MILLS, ARCHITECT



THE WASHINGTON MONUMENT, MOUNT VERNON PLACE, BALTIMORE, MARYLAND  
ROBERT MILLS, ARCHITECT

by a massive balustrade 15 feet in height.

"The terrace outside of the colonnade is 25 feet wide, and the pronaos or walk within the colonnade, including the column space, 25 feet. The walks inclosing the

cella, or gallery within, are fretted with 30 massive antae (pilasters) 10 feet wide, 45 feet high, and  $7\frac{1}{2}$  feet projection, answering to the columns in front, surmounted by their appropriate architrave. The deep re-

cesses formed by the projection of the antae provide suitable niches for the receptions of statues. . . . .

"In the center of the grand terrace above described, rises the lofty obelisk shaft of the monument, 50 feet square at the base, and 500 feet high, diminishing as it rises to its apex, where it is 40 feet square; at the foot of this shaft and on each face project four massive socles 25 feet high, supporting so many colossal symbolic tripods of victory 20 feet high, surmounted by fascial columns with their symbols of authority. These socle faces are embellished with inscriptions, which are continued around the entire base of the shaft. . . . .

"In the center of the monument is placed the tomb of Washington, to receive his remains, should they be removed thither, the descent to which is by a broad flight of steps lighted by the same light which illuminates his statue."

Mills had long passed from the scene when the following comment appeared in the *New York Tribune* of July 1, 1875:

"The appeal for a Fourth of July contribution to the Washington Monument will not amount to much. Public judgment on that abortion has been made up. The country has failed in many ways to honor the memory of its first president, but the neglect to finish this monument is not to be reckoned among them. A wretched design, a wretched location and an insecure foundation match well with its empty treasury.

"If the public will let the big furnace chimney on the Potomac flat alone and give its energy instead to cleaning out, morally and physically, the city—likewise named after the Father of his Country—it will better honor his memory."

In respect to the strength of the monument, Mills directed prior to the beginning of building operations that a shaft be sunk in the center of the foundations. The strata were found compact and with a solid bed of gravel at a depth of twenty feet. About ten days before the laying of the corner

stone a delegation of scientists made a last examination of the groundwork. The building committee, realizing its responsibility, was sparing no pains to secure the best possible foundation.

After ten years of fitful building, operations languished until they ceased altogether, and four years after Mills' death, Colonel J. G. Ives, topographical engineer, was placed in charge. He reported:

"To those who are aware of the care which was taken in laying the foundation of the monument—both in the selection and preparation of the bed and in the execution of the masonry work—it will be scarcely necessary to enter into any statement in regard to its present condition. . . . For five years, during which the work has been suspended, the foundation has been bearing about four-sevenths of the pressure that it will ultimately be required to sustain, and in a recent examination I was unable to detect any appearance of settling or indication of insecurity."

That the American public is beginning to appreciate Mills is shown by an editorial in the *New York Evening Post* of June 7, 1920, entitled "Freaks of Fame":

"Who would have believed that the designer of the Washington Monument and the Bunker Hill Monument could keep his name from becoming a household word? To have planned either of these monoliths ought to be enough to insure the planner fame; to have planned both of them would be to take a bond of fate. But how many of those who read the account in last Saturday's *Evening Post* of the career of Robert Mills could remember having heard his name? And what stranger irony could there be than that he owes his present fame to the circumstance that he was nominated for a place in the Hall of Fame at University Heights? We are interested in him, not because he is famous, but because he *ought to be famous*. One is tempted to suggest a special section in the Hall of Fame, inscribed, 'Obscure Immortals.'"

ALLIED ARTS  
AND  
CRAFTSMANSHIP



REREDOS OF ST. LUKE'S CHURCH, EVANSTON, ILLINOIS  
TALLMADGE & WATSON, ARCHITECTS

*Featuring*  
ECCLESIASTICAL SCULPTURE



ST. EANSWITH



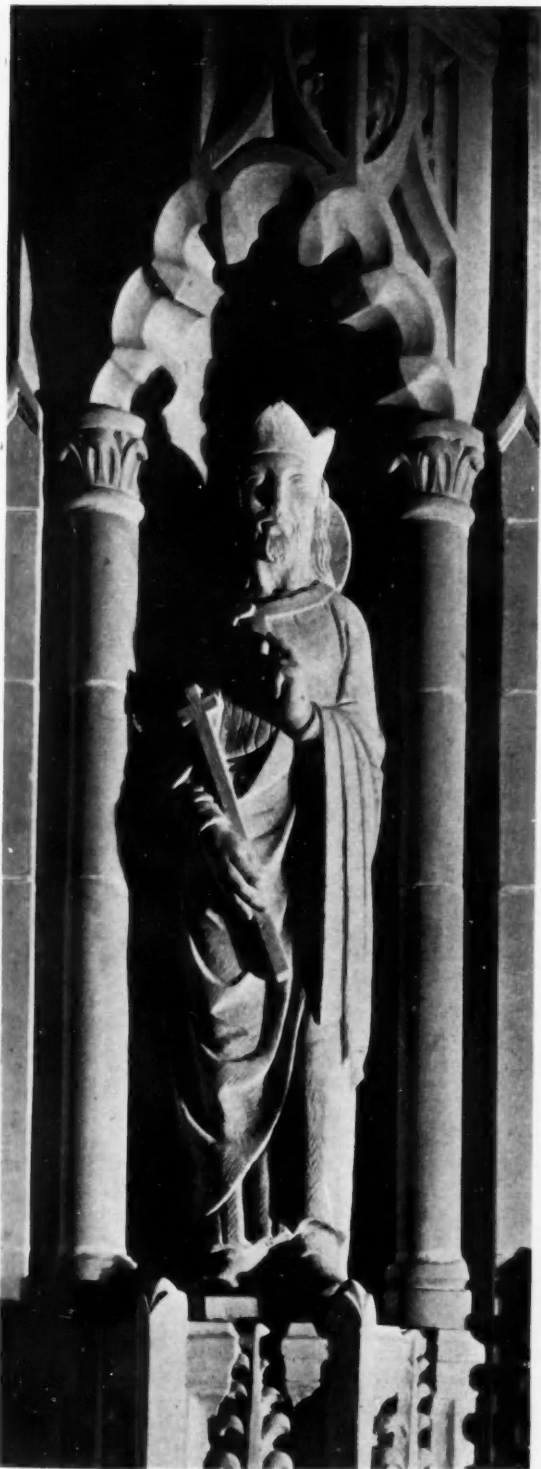
ST. EDMUND

FIGURES IN THE REREDOS, ST. LUKE'S CHURCH, EVANSTON, ILL.

TALLMADGE & WATSON, ARCHITECTS

Carved by U. Langenegger from cartoons by John W. Norton





EDWARD THE CONFESSOR  
ST. GEORGE  
FIGURES IN THE REREDOS, ST. LUKE'S CHURCH, EVANSTON, ILL.

TALLMADGE & WATSON, ARCHITECTS

Carved by U. Langenegger from cartoons by John W. Norton



ST PATRICK



ST GEORGE



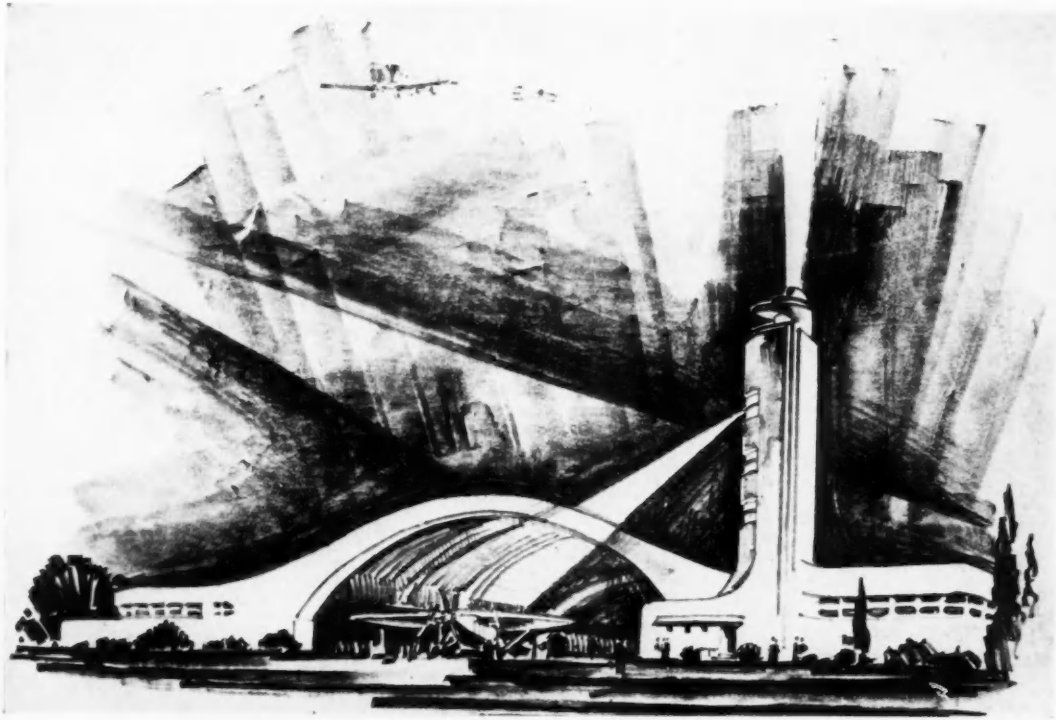
ST DAVID

Cartoons by John W. Norton

REREDOS, ST. LUKE'S CHURCH, EVANSTON, ILLINOIS

TALLMADGE & WATSON, ARCHITECTS

TECHNICAL NEWS  
AND  
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✓ AIRPORTS  
THEIR DESIGN AND CONSTRUCTION

Previous studies of Building Types include: Swimming Pools, Storage Garages, Apartment Houses.

Future issues will include analyses of the following: Store Buildings, Kitchen Planning (Hotel, Club and Restaurant) and Soundproofing the Hospital.

# AIRPORT DESIGN AND CONSTRUCTION

BY ROBERT L. DAVISON\*

*With the evolution of the airplane from an experiment into a regular carrier, the flying field will develop into the well-organized terminal, or "airport." In undertaking the present survey the aim was to summarize available basic information on airport design. As investigation progressed it became evident that few airports could maintain themselves entirely on the income to be derived from services to the flyers and their machines. Profitable operation can be assured, only by services ministering to the comfort and amusement of passengers and spectators. This apparent limitation affords a special opportunity to the architect; he can suggest and develop the auxiliary buildings for the secondary income. Indeed, it is these "secondary" services to the crowds which will eventually give the modern airport, like the modern railway station, its public character, and thus will not only permit the purchase of more expensive and centrally located land, but also will assure interest in the project by the whole community.*

SINCE THE beginning of the year many new aviation companies have been formed with ample financial support. There have been several consolidations, with capital in excess of \$100,000,000, backed by some of the strongest banking interests in the country. This expansion will certainly be reflected in the construction industry. The total value of contracts let for airport construction during the first three months of 1929 as shown in the reports of F. W. Dodge Corporation already exceeds the total value of all work done throughout the year 1928.

The development of the flying field in itself is work for the engineer, while the architect's main interest in the airport is centered on hangars and other buildings. If these structures are to be well-planned and well-designed, the architect must know the fundamental aeronautic requirements for a port.

## I. LOCATION OF THE AIRPORT

### A. REQUIREMENTS OF THE FLYER.

Location from Standpoint of Flyer's Requirements	Relative Value
Freedom from dense river fogs.....	8
Freedom from ground mist.....	5
Freedom from smoke conditions.....	6
Freedom from snow drifts.....	1
Freedom from air travel interference..	4
Prospective neighborhood development	2
Area of field.....	8
Configuration of field.....	4
Freedom from objectionable air currents and eddies.....	1
Approaches—Satisfactory areas under take-offs.....	3
Favorable prevailing winds with reference to runways.....	4
Other factors affecting safety.....	4
Total units.....	50

### B. REQUIREMENTS OF THE PUBLIC.

Location from Standpoint of Public Requirements	Relative Value
Location with respect to the axis of air travel.....	8
Distance and direction from the source of air travel business.....	7
Distance from the geographical center	4
Distance from center of population...	8
Distance from rail terminals.....	2
Distance from water terminals.....	1
Distance from post office.....	6
Distance from hotel center.....	5
Distance from economic center.....	3
Distance from financial center.....	3
Distance from center of airplane manufacturing industries.....	3
Total units.....	50

An airport is first of all a landing field. Factors affecting safe landing and take-off, as rated in a recent article are given above. The final value of a field under this rating is arrived at thus:

"The total number of suitability units would be 100, equally divided between the two headings. If one field measured on this basis had only 50 units and had an estimated total cost of \$800,000 the comparative cost would be \$16,000. If another field had 80 units of desirability and its total cost was \$1,000,000 the comparative cost would be \$12,500. Such a comparison would be a material aid and possibly a determining element in the selection as between any two such locations.

\*Acknowledgment is made to the following for information and valued assistance: E. P. Goodrich, consulting engineer; Major Frank M. Kennedy, Army Air Service; Stacy W. Kapp, C. E.; Gavin Hadden, Airport Consultant; U. S. Department of Commerce; Post Office Department; Aeronautical Chamber of Commerce; various aviation companies and airport authorities.

"In order to illustrate how the various items might be evaluated, consider the item 'Distance from the axis of air travel.' In some locations such an axis can be very definitely located. If it is assumed that the field which lies directly on this axis is to be given maximum value, according to the above table this would be 8. Assuming that the least desirable field, so far as this item is concerned, would be located in the most remote corner of the country or district 20 miles from the line of air travel, a field 5 miles from this axis then should be given a value of 6:

$$(20 - 5) \div 20 \times 8 = 6^*$$

Near very large cities the location will be determined largely by the use to which the field is to be put. Student training fields may be located much further out than taxi or mail fields, while transport terminals should be close to the heart of a city.

Special consideration should be given to the airport's accessibility. There are instances of European airports which have been abandoned because they were too far from the city, or too difficult to reach.

Not only should distance be considered, but also the traffic facilities available for handling crowds. An estimate should be made of the probable crowds and their methods of travel. Road and transportation facilities, too, should be examined for adequacy to the load. Provision is essential for the parking of autos, trolleys, and, at times, railroad trains.

The following table indicates the average traffic capacities of three methods of travel and the parking or terminal space that must be provided for each.

Total Terminal Space per Car	Type of Transport	Capacity of Single Traffic Lane or Single Track		Total** Terminal Space Required
		Cars Per Hr.	Persons	
400	Auto—6*** persons per car	1000	6000	400,000
1000	Trolley—100 persons per car	60	6000	60,000
2000	Steam R.R.—100 persons per car 10 cars per train.	60	6000	120,000
Totals		18,000		580,000

Courtesy of E. P. Goodrich.

\*Some of the Principles of Airport Planning by P. A. Fellows, Engineering News Record, Sept. 6, 1928. Page 341.

\*\*Total terminal space includes an allowance for parking aisles, foot traffic and circulation of autos. With trolleys and steam traffic it includes allowance for platforms and switches with necessary open spaces.

\*\*\*This average of 6 per car is on basis of private vehicles averaging 4 persons per car, one car out of 30 being a motor bus with average capacity of 30 persons.

C. REQUIREMENTS OF U. S. DEPARTMENT OF COMMERCE.

Respecting the interests of both the flyer and the public it is essential that the field and its equipment meet the requirements laid down by the Aeronautical Division of the U. S. Department of Commerce. (See Appendix A, page 512).

II. DESIGN OF STRUCTURES FOR THE PUBLIC

A. PASSENGER REQUIREMENTS.

Department of Commerce "A" rating on equipment and facilities calls for the presence of waiting and rest rooms at the field, for restaurant or other sources of food supply either at the airport or not more than one-half mile distant, and sleeping quarters for at least three men in addition to the field personnel (not more than a half-mile away).

Station Facility	Unit	Number or Size of Facility Required for the Normal Number of Rush-Hour Passengers Indicated								Graph Number	
		250	500	750	1000	1500	2000	3000	4000		5000
1. Area of main waiting room	100sq. ft.	30	53	72	89	112	128	155	178	200	5
2. Seating capacity of main waiting room	No. of seats	143	213	270	315	400	465	570	665	750	6
3. Area of women's waiting room	100sq. ft.	5	7	9	11	14	17	23	29	35	7
4. Area of men's waiting room	100sq. ft.	5	6	7	8	9	11	14	16	18	8
5. Total area for waiting purposes	100sq. ft.	55	66	78	91	111	128	158	187	208	9
6. Total seats in waiting areas	No. of seats	100	300	390	470	590	700	880	1050	1200	10
7. Total area of lobby, concourse and all waiting rooms	100 sq. ft.	80	152	208	256	320	376	472	552	624	11
8. Area of men's toilet rooms	100sq. ft.	4	6	8	10	13	15	20	26	31	12
9. Number of men's water closets	Number	6	9	12	15	19	23	29	35	41	13
10. Number of urinals	Number	5	8	10	12	15	17	20	23	25	14
11. Number of men's lavatories	Number	3	5	7	9	11	13	18	22	26	15
12. Area of women's toilet rooms	100sq. ft.	3	4	5	6	8	10	13	16	18	16
13. Number of women's water closets	Number	7	9	12	14	17	19	23	27	30	17
14. Number of women's lavatories	Number	3	5	7	9	11	13	17	21	25	18
15. Area of ticket offices	100sq. ft.	4	7	9	11	14	17	21	26	31	19
16. Number of ticket windows	Number	3	5	7	8	11	13	16	18	21	20
17. Number of telephone booths	Number	3	4	5	7	10	13	19	25	31	21
18. Area of telegraph facilities	Sq. ft.	100	130	150	170	210	230	280	310	330	22
19. Total area of dining and lunch rooms	100sq. ft.	9	14	19	24	34	43	63	83	102	24
20. Total number of seats in dining and lunch rooms	Number	34	63	72	93	129	173	249	327	407	25
21. Area of kitchen	100sq. ft.	5	8	11	14	20	26	38	50	62	26
22. Area of news stand	Sq. ft.	115	185	240	290	390	450	565	695	820	28
23. Number of barber chairs	Number	2	3	3	4	4	5	6	7	8	29

Station Facility	Unit	Baggage Facilities Required for the Indicated Number of Pieces of Baggage Handled Daily								Graph Number	
		250	500	750	1000	1500	2000	3000	4000		5000
24. Area of baggage room	100sq. ft.	20	32	45	60	87	112	166	219	272	1
25. Baggage room tail-board frontage	Lin. ft.	38	62	79	95	125	150	194	230	261	2

Station Facility	Unit	Parcel Check Room Facilities Required for the Indicated Number of Parcels Handled Daily								Graph Number	
		250	500	750	1000	1500	2000				
26. Area of parcel check room	100sq. ft.	4	6	8	10	14	18				23

Station Facility	Unit	Hand-Baggage Facilities Required for the Indicated Number of Pieces of Hand-Baggage Handled Daily								Graph Number	
		250	500	750	1000	1500	2000	3000			
27. Area of hand-baggage facilities	100sq. ft.	4	6	7	8	10	12	16			27

SPACE REQUIREMENTS FOR RAILWAY STATIONS SUITED TO AIRPORTS

(Journal of the American Railway Engineering Association, March, 1923. Page 930.)

Yet the Department contents itself with leaving the relation between such facilities and the volume and class of traffic in the hands of the individual airport management.

Due to the newness of air passenger traffic, data on this subject are scarce, but it would seem logical to base estimates of probable passenger requirements at an airport on the requirements of a railroad station. These, as worked out by the American Railroad Engineering Association, are presented on page 491 and indicate the waiting room, toilet and other facilities required for a given number of passengers.

Air passenger traffic during the next few years may not be heavy, but every airport should be planned for traffic requirements of the future. Buildings need not be completed at once but extensions should be provided for in advance if costly demolition is to be avoided. It may even be possible to build for the future and put the building or parts of it to other uses until such time as the space is required as part of the transport system.

For example, the toilets provided at present for spectators may be used later by an increased passenger traffic—it being assumed that as traffic increases and becomes a commonly accepted routine there will be few spectators other than those meeting their travelling friends. The use of pay toilets will convert a public convenience into a source of income. There are other ways in which a terminal which is oversize for present traffic may be justified, such as the use of the restaurant facilities for spectators at exhibitions or for cabarets.

In any estimates of requirements, the spectator should not be forgotten, though numbers will probably decrease as the novelty of air travel wears off.

## B. THE TRANSPORT LINES.

Transport lines need to make special provision for the following in addition to general provision for all passengers:

1. **BAGGAGE ROOM.** This room should be convenient to waiting rooms and incoming ground transit facilities and also accessible to the loading platform. In a large terminal a conveyor belt to storage rooms or planes, similar to the belts used in railroad stations, may be of value.

2. **SCALES FOR WEIGHING-IN PASSENGERS.** Provision should be made for weighing in the transport passengers as they embark. In Europe, when the combined weight of passengers and baggage exceeds a set limit, the excess baggage is sent on by a separate plane.

3. **CUSTOMS OFFICES.** In many of the larger ports provision must be made for customs examination. Where this is provided, it is well to keep incoming and outgoing traffic entirely segregated.

The Treasury Department will designate certain airports as ports of entry and will require such airports to furnish office space, heat, light, telephone, etc.

In addition a concrete loading area will be required adjoining the customs office to be used by embarking and alighting international air passengers.

4. **LOADING ARRANGEMENTS.** There are several methods now in use. Frequently, in the United States, passengers are permitted to walk to the plane without protection of any sort from weather or mud. At some flying fields the bus from the city is driven alongside the plane, and passengers and luggage transferred in the open. At other fields the plane is brought close to the waiting rooms and gates and placed so as to prevent the passengers from wandering into the revolving propellers.

Future loading arrangements are difficult to foretell. If planes were all of one size the problem would be comparatively simple but the wide range in size and type—monoplane, biplane, amphibian—complicates matters. It is assumed by many that planes in the future will be loaded under cover of a marquee. If this is provided, gates and gang planks will still be necessary for convenience in loading or unloading. It is possible that an enclosed gang plank may be developed, mounted on wheels or hung from an over-head device which will be adjustable to various types and sizes of planes; this will take care of any small inaccuracies in bringing the plane to an exact loading stop and will insure a convenient and rapid handling of passengers. Mail and baggage might be handled over small gang planks having conveyor belts.

5. **TELEGRAPH, TELEPHONE, MAIL.** Passenger waiting rooms in Air Terminals should contain telegraph offices, telephone booths, mail boxes and other conveniences generally found in a railroad station.

6. **TICKET OFFICE.** Space must be provided for the sale of tickets and handling of the routine business of transportation.

7. **THE TAXI SERVICE.** Taxi service in larger ports should be kept separate from the regular transport service. The planes will generally be smaller and kept stored at the field. Time generally being important, it will be advisable to lay the port out in such a way that the taxi service may leave as soon as passengers arrive without interference from regular scheduled trips. A man or party arriving from the city should be able to go straight to a machine without deviations through the general waiting room.

8. **JOY RIDES.** At present a considerable part of the flying at many fields consists of joy rides. These are generally regarded as a temporary source of income, it being assumed that as flying becomes more of an everyday occurrence they will diminish.

This has delayed the erection of facilities on flying fields that would not only have increased public convenience and safety but would have yielded a greater return on the investment. These permanent facilities can easily be diverted in the future from joy rides to transport or taxi service.

#### C. REVENUE-YIELDING STRUCTURES.

The greatest possible present source of income from an airport is now neglected by the field management, who thinks of the airport in terms of a "flying field."

It is true that when crowds have chanced to gather they have contributed revenue by paying for joy rides and taxi rides, but in most cases secondary sources of income that the field itself might have

twenty-five cents admittance fee charged, 10,000 persons would yield \$2,500 gross return for one day or \$10,000 for the four Sundays of the month as compared with \$1,250 to be derived from hangar space within the same period. There are still other secondary sources of income such as the parking of cars and sale of refreshments.

In the early days of public parking garages, 70% of the income was from parking rentals and 30% from the sale of accessories. Now-a-days often only 30% of the income is from parking while 70% is from the sale of accessories and from service. In like manner it may be anticipated that in a few years 70% to 90% of the income from airports may be expected from secondary sources while only 10% to 30% will result from hangar rents.



COMBINED AIR TERMINAL DEPOT AND ADMINISTRATION BUILDING,  
AERO CORPORATION OF CALIFORNIA, LOS ANGELES, CALIFORNIA

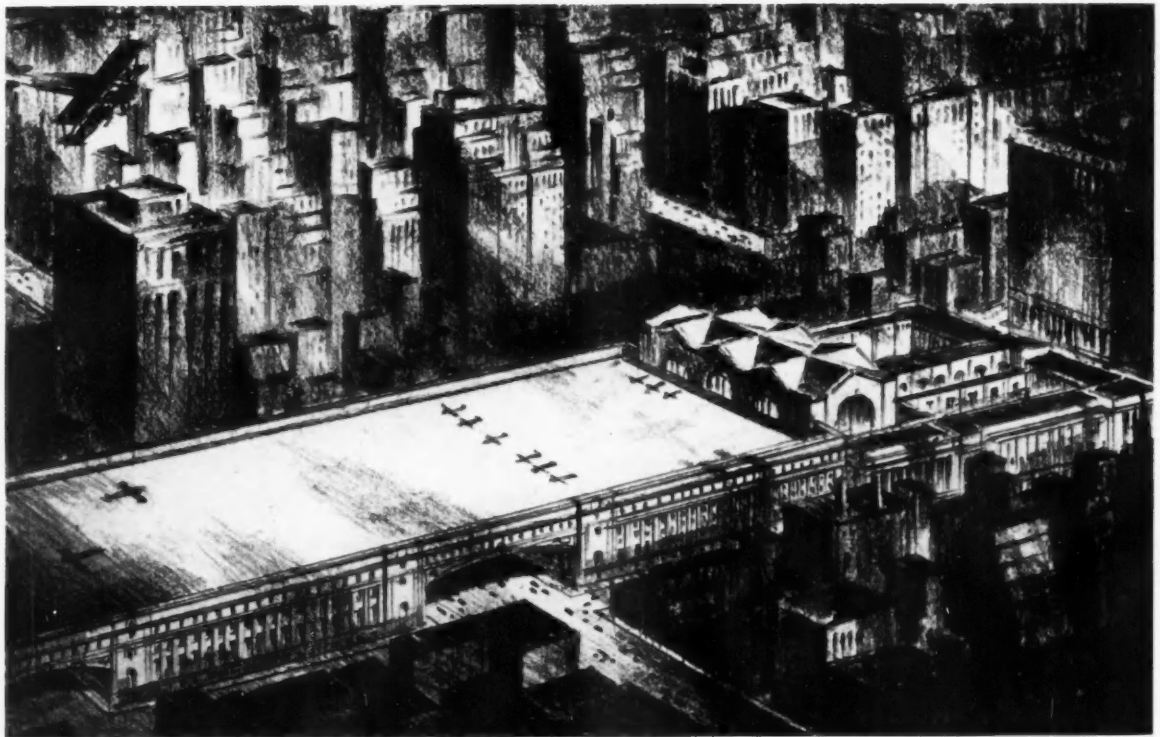
yielded, due to the crowd, have been neglected. Yet this income might have been found to exceed the revenue from hangar rent.

It is in the design of secondary structures that the architect will be of real service to aviation and at the same time find some very interesting problems to solve.

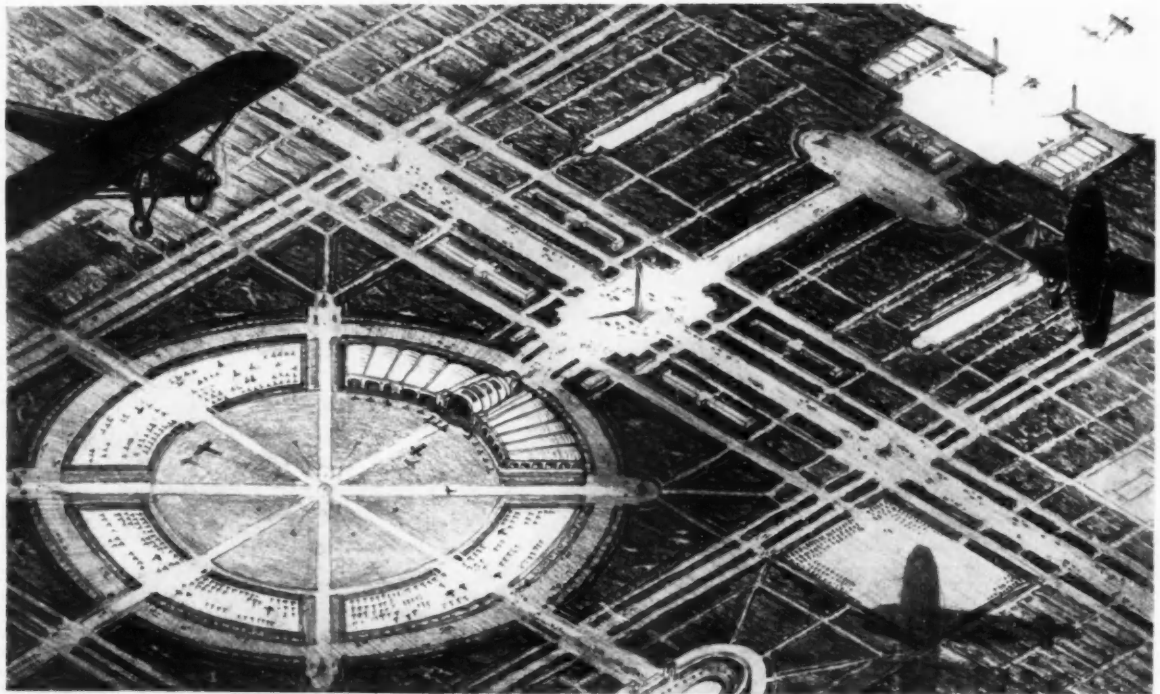
The possibility of new sources of revenue exceeding hangar rent can easily be demonstrated. Hangar rents for ordinary planes vary from \$10 to \$50 a month. A recent survey of fifty-two airports showed \$25 to be the most common charge. The gross income from hangar rent, assuming the \$25 rate and 50 machines, would be \$1,250 a month. At a field having 50 planes it is not uncommon to find a crowd of 10,000 or more sightseers on a single holiday or Sunday. If grand-stands were provided and

1. BLEACHERS OR OBSERVATION SPACE. In European countries, tables are placed on open terraces or roofs where people may eat and drink, listen to band music and watch the regular traffic or sometimes special stunt flights or air races. The same facilities would pay at many of the larger airports in this country, if grand-stand accommodation were provided.

The objection may be raised that in a few years, when flying has become common, stands will not be needed. They may not be used for the observation of flying in general, but stunt or acrobatic flights and races may still occasionally take place. (Note: Department of Commerce Regulations forbid stunting over airports while European rules do not permit stunt flights *except* over airports. Permission to stunt may be secured from the Department of Commerce for special occasions for events held at airports).



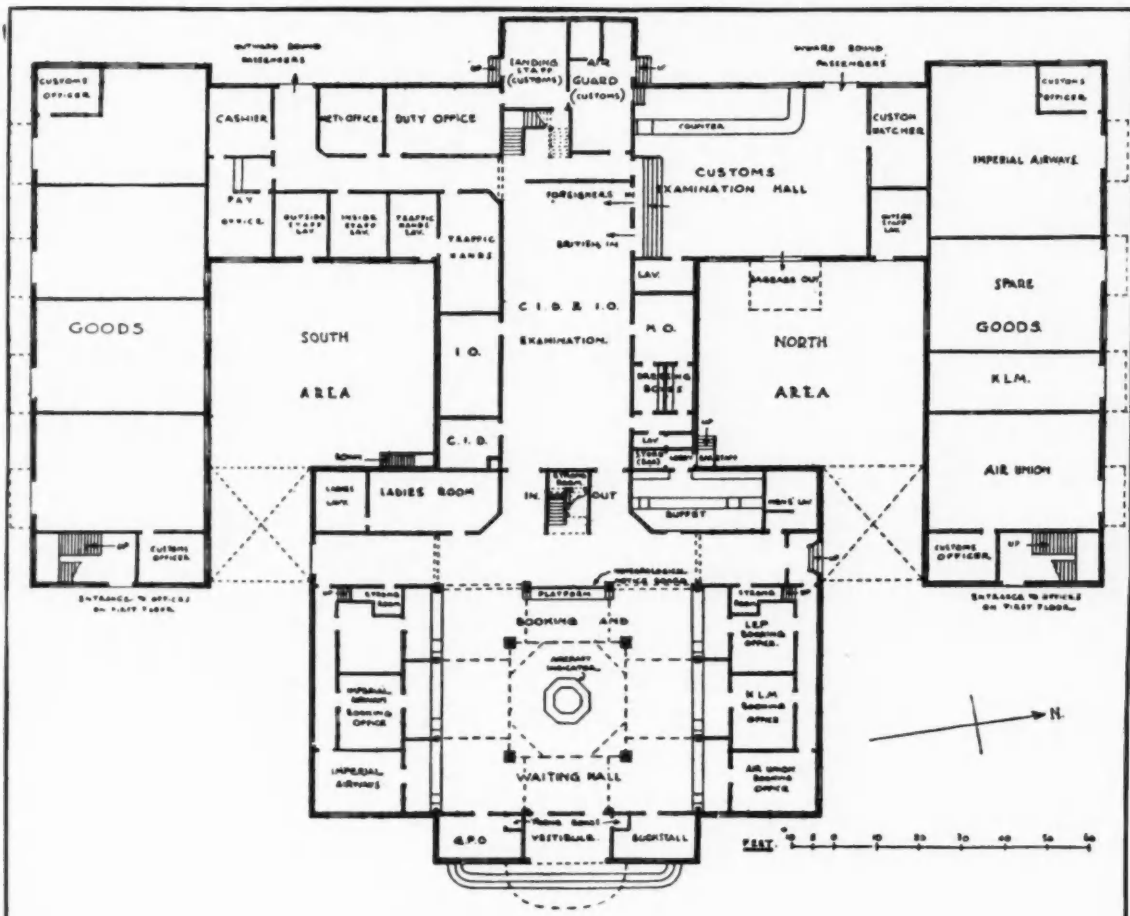
SUGGESTED AIRPORT OVER RAILROAD TRACKS BETWEEN PENNSYLVANIA STATION AND HUDSON RIVER



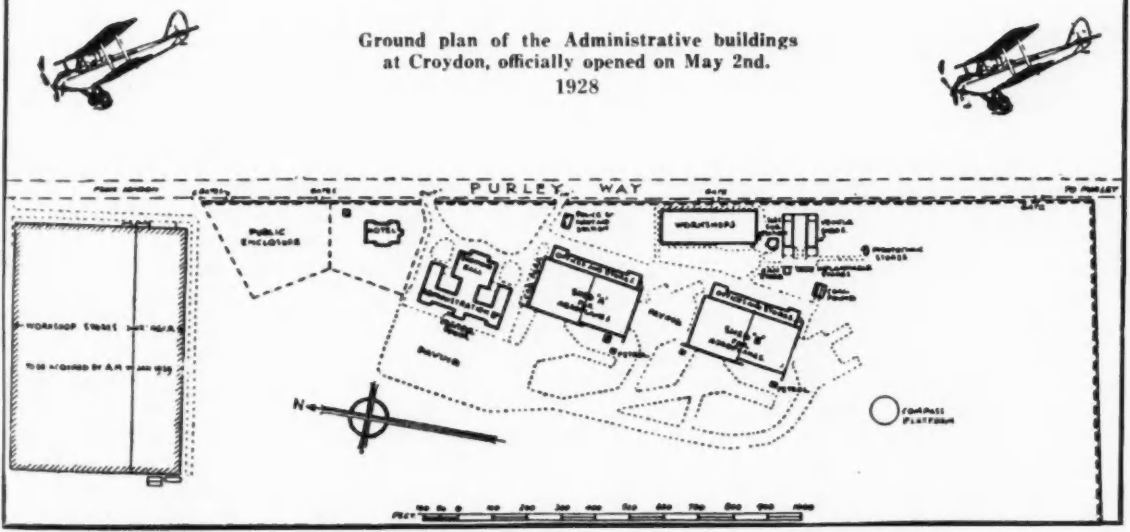
SUGGESTED CIRCULAR LANDING FIELD SURROUNDED BY HANGARS AND AIRPLANE PARKING SPACE

FRANCIS KEALLY, ARCHITECT





Ground plan of the Administrative buildings at Croydon, officially opened on May 2nd. 1928



GROUND PLAN OF CROYDON AIRPORT, LONDON, S. W. SHOWING ADMINISTRATIVE BUILDINGS, HANGARS, WORKSHOP, HOTEL AND CONCRETE APRONS

Once the importance of providing for secondary sources of income is recognized, suggestions for a large group of income-producing auxiliary buildings will be forthcoming.

2. **AUTO PARKING AND ACCESSORIES.** Estimates should be made of the probable number of cars to be parked and provision made for them. With allowance for circulation, 400 sq. ft. per car would be required for out-door parking. Ample provision of gas pumps should be made at entrance and exits and by-passes arranged if the maximum income is to be obtained from this source.

Some parking space should be provided adjacent to the field so that occupants may watch events from their cars.

A tire repair shop and battery station might be a profitable concession.

3. **REFRESHMENT CONCESSIONS.** There should be various types of refreshment concessions—ice cream, soft drinks, hot dogs, etc. The necessary structures need not be of the cheap type so often found at amusement parks but should be given appropriate architectural character.

4. **RESTAURANT.** Space for a first class restaurant at the larger airports is essential. Though such a restaurant might not be able to depend on the present volume of air traffic for its income, it could be run as a superior road-house or cabaret.

Separate lunch counter and dining room facilities should be provided for mechanics who may wish to eat in their work clothes.

Special lunch counter or open-air table facilities should be provided for holiday crowds. The tables might well be placed on the roof with umbrella covering.

5. **DANCE PAVILION.** A dance pavilion has no direct relation to an airport but a financial return may be expected from such a building placed where crowds gather in a holiday spirit. It will also lengthen the pay day of other concessions.

6. **DRUG STORE.** Drug store space should be provided for the sale of notions and souvenirs.

7. **HOTEL.** Hotel accommodation should be provided at every large airport. It is true that airports are noisy with the roar of incoming and outgoing planes, but muffling devices are now being developed which should tend to minimize the noise nuisance now so prevalent around airports. The United States Bureau of Standards in Washington is one of the agencies working towards this end and it believes this result can be accomplished with negligible loss of power. Pilots and other employees will want to be near the field owing to the irregular hours of their employment. Therefore a hotel designed with due regard to the actual and future needs of the airport ought to constitute a sound investment.

8. **AIRPLANE SALES ROOMS.** An airport is the proper place for the display of airplanes and accessories. Anyone interested in purchasing a plane undoubtedly frequents the nearest airport where he may see the latest models in flight and also have the details demonstrated to him.

### III. DESIGN OF STRUCTURES FOR AVIATION

#### A. HANGAR DESIGN.

It is important that the type and size of doors be determined at an early stage in planning hangars. In compliance with Department of Commerce ratings, increase in hangar width is necessary for certain types of doors. Failure to plan the building so that stock doors may be used may greatly increase the cost.

Minimum sizes for hangar designs which will comply with the U. S. Department of Commerce requirements for rating are given on page 513.

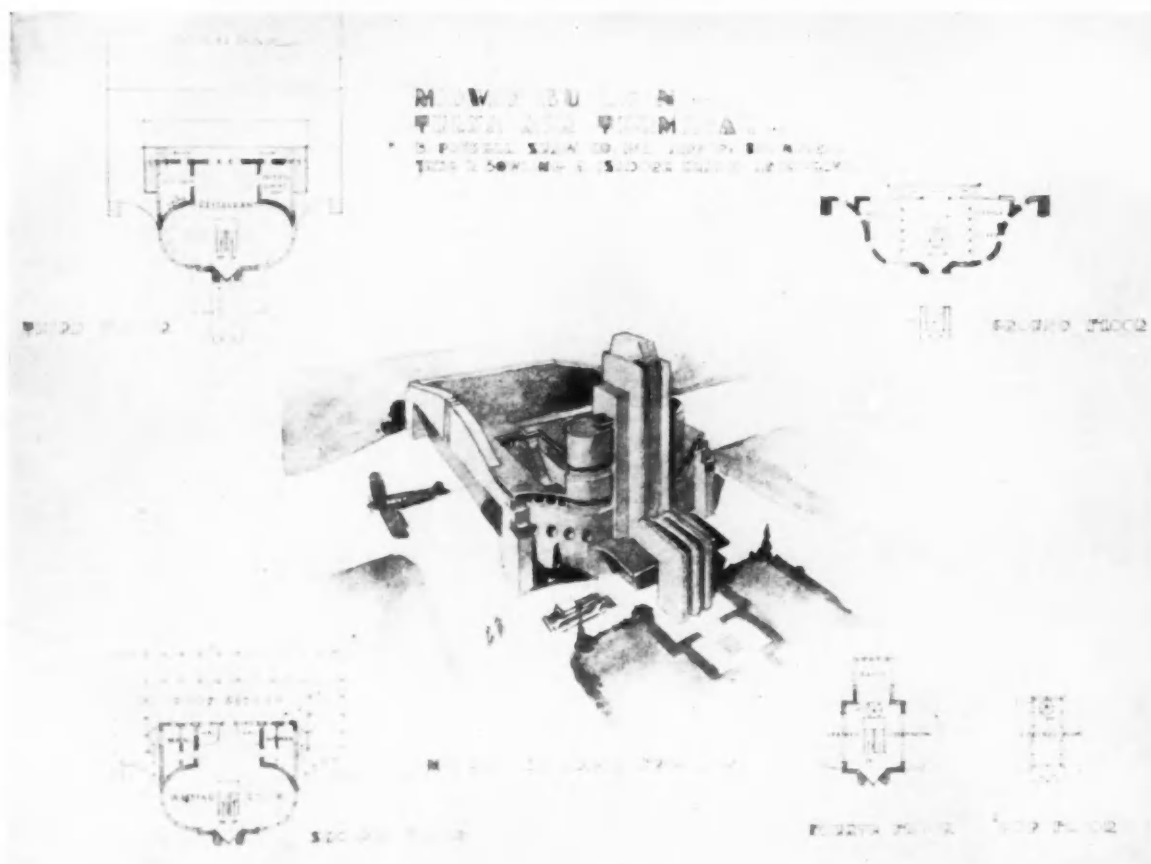
Hangar sizes and clear span will depend largely on the proposed use of the field. On a small field one hangar of wide span will accommodate all types of planes, but for the larger airports and air terminals separate hangars should be designed for specific types.

The table on page 498 gives the sizes of many of the airplanes now on the market.

1. **GENERAL UTILITY HANGARS.** These should comply with U. S. Department of Commerce rating requirements for size and clearance. Various types are given under "Hangar Construction."

2. **HANGARS FOR PRIVATE AND SMALL TAXI PLANES AT A LARGE AIRPORT.** Private planes, and planes used for taxi work can be housed more economically in hangars with a clear span of 60 ft. than in buildings of larger span. The length of the building can be adapted to the site. It is desirable to break the buildings up into units to prevent the spread of fire. The roof should be carried on trusses or arches which parallel the front doors so as to throw the roof load on the side walls and columns away from the doors. Any construction with the trusses bearing over the door opening will require very expensive truss construction and also additional height to obtain clearance at the door. The depth may vary from fifty to one hundred feet, but this depth should not be exceeded unless doors are provided on each side. For an all-purpose hangar, the door height should be 18 ft. as required by the U. S. Department of Commerce, but for a specialized hangar for small planes a 12 ft. height will be found entirely practical.

There should be a definite place for individual hangars for the privately owned plane. This should provide the private owner with space for work bench and tools. Unauthorized persons should be kept away from the property.



3. **TRANSPORT PLANES.** Transport planes now require hangar width of 100 ft. to 150 ft. with 18 ft. clearance and it is quite possible that future planes will require 200 ft. or more. The projected Junkers model J 1000 is to have a wing span of 220 ft.

It is thought that no attempt will be made to house the all-metal air liners of the future within hangar space except, perhaps, for repairs.

4. **COMBINATION OF HANGARS FOR BOTH PRIVATE AND TRANSPORT PLANES.** For the medium-size airport a combination of small and large hangars will be economical and convenient.

#### B. SECONDARY BUILDINGS FOR AVIATION.

1. **CONTROL TOWER.** Provision must be made for a prominent control tower commanding the field and visible to approaching flyers, from which landing directions can be signalled day and night. It should be equipped with radio sending and receiving equipment, control wiring of all lighting equipment, and a communication system with the different hangars and other posts.

2. **EMERGENCY HOSPITAL AND AMBULANCE.** An ambulance, or auto equipped for emergency use as an

ambulance, is required by the Department of Commerce regulations. This should have special storage space in a location convenient to the control tower. In the larger airports it may be advisable to have it adjacent to a first-aid room and arrangements made for the constant attendance of a nurse or doctor so that minor injuries from handling machinery as well as accident cases may be treated expeditiously.

3. **PAINT AND VARNISH ROOMS.** Special attention should be given to the provision of dust-proof ventilated paint, varnish, lacquer and dope rooms.

4. **CLUB ROOMS.** Club rooms with ample locker space should be provided for pilots.

5. **COMPASS PLATFORM.** A turn table should be located on a portion of the field away from stray magnetic influences.

6. **GAS AND OIL.** Gas stations must be located at convenient points. Underground pipes with flexible hose under trapdoor which permit the plane to be taxied close to source of supply, are satisfactory.

7. **POLICE AND FIRE STATIONS.** At a large airport police quarters and fire equipment should be provided.

MANUFACTURER	Designation	Span	Length Overall	Height Overall	MANUFACTURER	Designation	Span	Length Overall	Height Overall
Advance Aircraft Co.	Waco 10	30'7"	23'9"	9'	Irwin Aircraft Co.	M-T-2	20'	13'6"	5'9"
Advance Aircraft Co.	Waco 10	30'7"	23'6"	9'	Kari-Keen Aircraft Inc.	Coupe	30'	22'	6'6"
Advance Aircraft Co.	Waco 10	30'7"	23'6"	9'3"	Keytone Aircraft Corp.	Pronto	30'11"	26'9"	9'3"
Advance Aircraft Co.	Waco 10	30'7"	22'6"	9'3"	Keytone Aircraft Corp.	Pathfinder	66'6"	46'	7'
Aero-Craft Mfg Co.	Aero-Coupe	32'	24'	8'6"	Kinner A. & M. Co.	Courier	35'	23'3"	7'
Alexander Aircraft Corp.	Eaglerock	36'8"	24'11"	9'11"	Kreider-Reisner Aircraft, Inc.	Challenger	30'1"	23'9"	9'4"
Alexander Aircraft Corp.	Eaglerock	36'8"	24'11"	9'11"	E. M. Laird Airplane Co.	Commercial	34'	23'6"	9'3"
American Eagle Aircraft Co.		30'	24'6"	8'4"	Laird Aircraft Corp.	Whippoorwill	36'	27'	9'
Arkansas Aircraft Corp.	Comau d-Aire	31'6"	24'6"	8'	Lincoln Aircraft Co.	Vega	41'	27'5"	8'6"
Arkansas Aircraft Corp.	Heinkel H.D. 40	37'	39'	14'	Lockheed Aircraft Co.	Lockheed Aircraft Co.			
Atlantic Aircraft Corp.	F-7 & C-2	63'3"	49'2"	12'9"	Loening Aircraft Co.	Air Exp.	41'	27'5"	8'6"
Atlantic Aircraft Corp.	Universal	47'9"	33'	8'9"	Loening Aeronautical Engr. Corp.	Cabin Amphibian	45'	34'8"	13'2"
Atlantic Aircraft Corp.	Super-Univ	50'6"	36'	8'11"	B. F. Mahoney Aircraft Corp.	Ryan B1	42'	27'5"	9'10"
Atlantic Aircraft Corp.	Fokker F-10	71'2"	50'8"	12'5"	Metal Aircraft Co.	Flamingo G-1	48'	30'	9'
Arrow Aircraft Corp.	Arrow-Sport	25'6"	19'2"	6'11"	Mono Aircraft Inc.	Monocoupe	30'6"	22'	6'3"
Bach Aircraft Co.	Air Yacht	52'	36'	9'6"	Mohawk Aircraft Corp.	Pinto	30'	20'	6'3"
Bellanca Aircraft Corp.	CH	46'4"	24'9"	8'6"	National Airways Sys., Inc.	Air King	34'1"	25'5"	9'
Berliner Aircraft Co.	No. 6	31'4"	23'6"	8'7"	Niles Aircraft Co.	Williams	26'	18'	6'6"
Bird Wing Commr. A. plane Co.	40-A	44'2"	33'4"	11'8"	Pheasant Aircraft Co., Inc.	H-10	32'6"	23'6"	9'
Boeing Airplane Co.	40-B	44'2"	33'4"	11'8"	Pitcairn Aviation, Inc.	Mailwing	33'	22'10"	8'10"
Boeing Airplane Co.	40-C	44'2"	33'4"	11'8"	Pitcairn Aviation, Inc.	Super Mailwing	33'	22'10 1/2"	9'3"
Boeing Airplane Co.	B-1E	39'8"	32'6"	12'	Pitcairn Aviation, Inc.	PA-4	30'	21'10"	8'7"
Boeing Airplane Co.	B-1D	39'8"	30'9"	12'	Prudden-San Diego Airplane Co.	T-M-1	57'	38'	9'5"
Bourdon Aircraft Corp.	Kitty-Hawk	28'	21'11"	8'6"	Richmond Airways, Inc.	Sea Hawk	46'	28'	8'6"
Breese Aircraft Co.		41'	27'	10'6"	Sikorsky Mfg. Co.	S-36	72'	34'	12'
Brown-Mercury Aircrft. Corp.	C-3	41'6"	25'	10'	Sikorsky Mfg. Co.	S-37	100'	45'6"	16'3"
Buhl Aircraft Co.	Airsedan-C5A	42'	28'	8'6"	Sikorsky Mfg. Co.	S-38	71'8"	40'3"	13'10"
Buhl Aircraft Co.	Airsedan CA-30	36'	25'	8'6"	Simplex Aircraft Corp.	Red Arrow	33'4"	20'3"	6'10"
Buhl Aircraft Co.	Junior Airsedan	36'	25'	8'6"	Starling Aircraft Co.		32'	23'4"	9'
Cessna Aircraft Co.	3-120	40'6"	23'8"	7'4"	Starling Aircraft Co.	C-2-K	35'-28'	24'	9'
Cessna Aircraft Co.	4-125	40'6"	23'8"	7'4"	Stearman Aircraft Co.	C-2-B	35'-28'	23'	9'
Cessna Aircraft Co.	4-200	40'6"	23'8"	7'4"	Stinson Aircraft Corp.	SB-1	35'10"	28'10"	10'3"
Crawford M. & A. Mfg. Co.	A1	30'	17'9"	7'	Stinson Aircraft Corp.	5B-1B	45'10"	32'	9'
Crown Motor Carriage Co.	B3	28'6"	21'3"	8'5"	Stinson Aircraft Corp.	Junior	30'6"	26'3"	7'10"
Curtiss-Robertson A. Mfg. Co.	Robin	41'	25'9"	7'10"	Spartan Aircraft Co.	C-3	32'	23'6"	8'9"
Driggs Aircraft Corp.	Dart II	28'	19'6"	6'	Stout Metal Airplane Co.	4 AT	74'	49'10"	12'8"
G. Elias & Bro. Inc.	M-1	40'	28'	12'	Swallow Airplane Mfg. Co.	Commercial	32'	24'	8'6"
G. Elias & Bro. Inc.	Airmobile	40'	28'	11'3"	Taylor Bros. Aircraft Co.	Chummy	34'	22'	7'6"
G. Elias & Bro. Inc.	Aircoupe	28'1 1/2"	21'	7'2"	Texas Aero Corp.	Temple	33'4"	25'10"	8'3"
Fairchild Airplane Mfg. Co.	FC-2W2 land	50'	32'10"	9'4"	Thaden Metal Aircraft Co.	T-1	53'	35'	11'
Fairchild Airplane Mfg. Co.	FC-2W2 sea	50'	37'2"	11'7"	Thunderbird Aircraft, Inc.	W-14-O	31'	24'8"	9'7"
Fairchild Airplane Mfg. Co.	FC-2 land	44'	30'11"	9'	Thunderbird Aircraft, Inc.	W-14-H	31'	24'8"	9'7"
Fairchild Airplane Mfg. Co.	FC-2 sea	44'	32'5"	11'5"	Travel Air Mfg. Co.	2000	34'8"	24'2"	8'9"
Federal Aircraft Corp.	CM-1	37'6"	29'4"	9'	Travel Air Mfg. Co.	4000	34'8"	23'6"	8'9"
Gates-Day Aircraft Corp.	GD-24	45'	26'	11'	Travel Air Mfg. Co.	6000	48'7"	30'10 1/2"	18'8 1/2"
Gulls Aircraft Corp.	Crusader	32'9"	23'	8'1"	Travel Air Mfg. Co.	Camines	34'8"	24'2"	8'9"
Hamilton Metalplane Co.	H-19	48'	32'7"	8'10"	Travel Air Mfg. Co.	9030	34'8"	24'2"	8'9"
Hamilton Metalplane Co.	H-21	54'	33'7"	9'	Wallace Aircraft Co.	Touroplane	37'	23'6"	7'6"
Heath Airplane Co.	Parasol	23'	16'9"	5'11"	Whites Aircraft	Hum. Bird	33'1"	23'6"	8'3"
International Aircraft Corp.	F-17	35'	25'	9'6"	Western Airplane Corp.	King Bird	35'	25'4"	9'
International Aircraft Corp.	F-18	37'	27'6"	10'6"	Zenith Aircraft Corp.	Albatross	90'	30'	2'6"
Ireland Aircraft, Inc.	Neptune	40'	31'6"	11'6"					

Courtesy "Aviation"

SIZE RANGE	} Wing Spread in Feet.....	20-30	30-40	40-50	50-60	60-70	70-80	90-100
		{ Number of Models.....	8	54	27	8	2	4

TABLE OF AIRPLANE SIZES

IV. HANGAR CONSTRUCTION AND COSTS

A. WOOD.

For a single hangar or a pair of them, wood construction will be satisfactory. From the interior fire hazard standpoint, a wood truss or arch construction will be just as satisfactory as an unprotected steel truss having wood purlins and wood sheathing. In cases where many hangars are under consideration, a non-combustible material should be selected to avoid the danger of conflagration. Some rather interesting new forms of arches and trusses are being used in hangar construction.

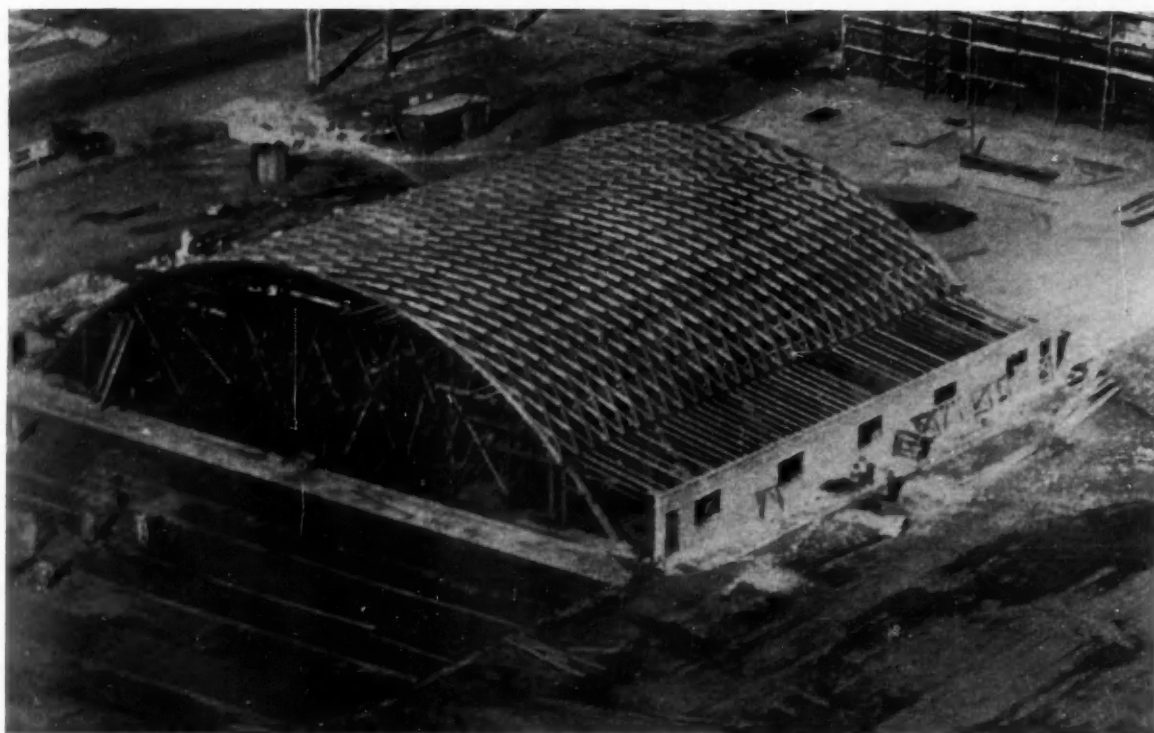
1. SECTIONAL WOOD ARCH CONSTRUCTION. The *Notrus*\* hangars are constructed of curved, factory built, sectional wood units 6 ft. x 10 ft. bolted together in the field. Arch ribs bolted between each row of roof panels and extending the width of the structure provide strength for the arch. This hangar, in a size meeting the Department of Commerce

\*Notrus Hangar Corp., Houston, Texas.

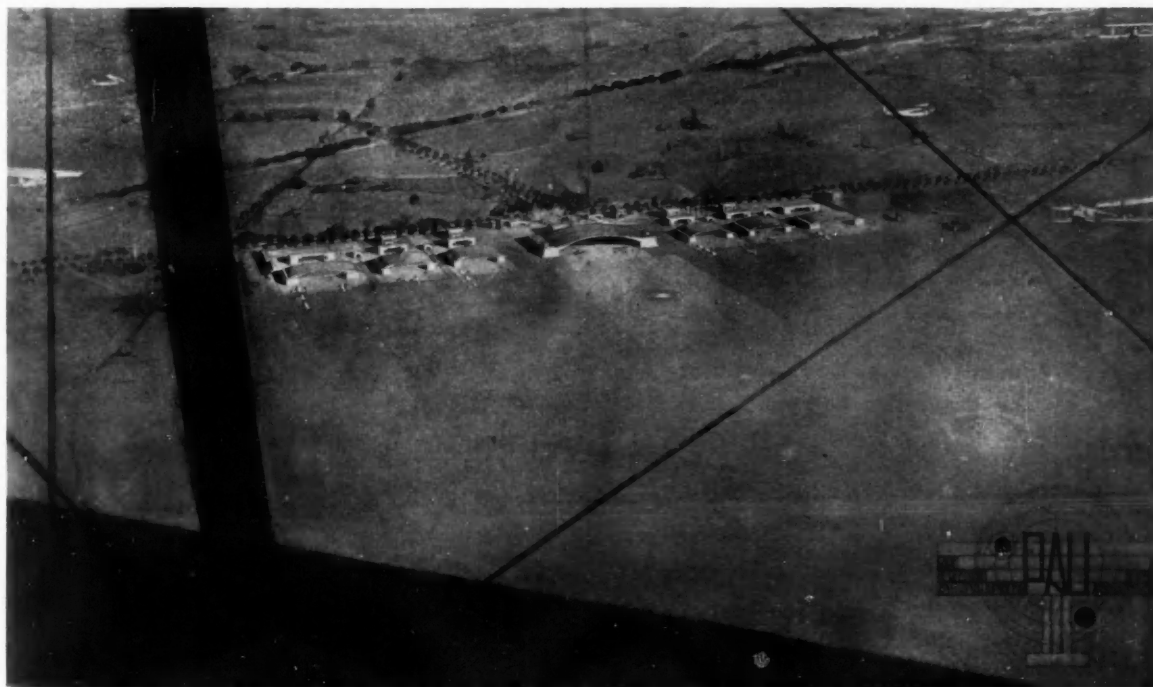
requirements for a Class "A" building, costs approximately \$10,000 erected, including an allowance of \$2,000 for concrete floor.

2. LAMELLA TRUSSLESS ROOF CONSTRUCTION. This is suitable for spans of from 50 ft. to 150 ft. and over, and is in reality a wood arch construction. The thrust may be taken care of by the rods, or taken to ground by buttressed side aisles. The side aisle space may be used for repair or office space. This form of construction is suitable for large hangar space, passenger terminals or for sales rooms where appearance is a factor. It may be easily fireproofed on the underside with plaster board or metal lath and plaster.

The cost is the same or slightly less than that of a wood or steel truss with wood roof. These members may be purchased from lumber dealers in some localities or cut on the job. The cost for this roof complete, including sheathing, varies from forty cents to fifty-five cents per square foot of floor area, depending on the locality. These figures are for spans of from 60 ft. to 100 ft.



LAMELLA TRUSSLESS WOOD ROOF CONSTRUCTION, LOW IN COST  
AND WITH UNOBSTRUCTED INTERIOR



DESIGN FOR INTERNATIONAL AERO STATION, PAU, FRANCE, SHOWING  
POSITION OF MAIN HANGARS AND GENERAL LAYOUT OF FIELD  
MAURICE CHAUCHON, ARCHITECT

3. **WOOD TRUSS.** Various standard truss types may be used. These are so well known that no explanation should be necessary. Erected in place, a hundred foot span truss will cost from \$200—for a 40 lb. loading, where material and labor are cheap—up to \$500 for a 55 lb. loading, where adverse conditions are encountered.

#### B. STEEL.

The conflagration risk is reduced when steel hangars are used. These also have the advantage of being easily moved. The following are examples of a few standard types and a few of the more unusual forms.

Fireproof hangars should be equipped with skylights having fusible fastenings to permit the escape of heat in case of fire. In two recent fires, failure to

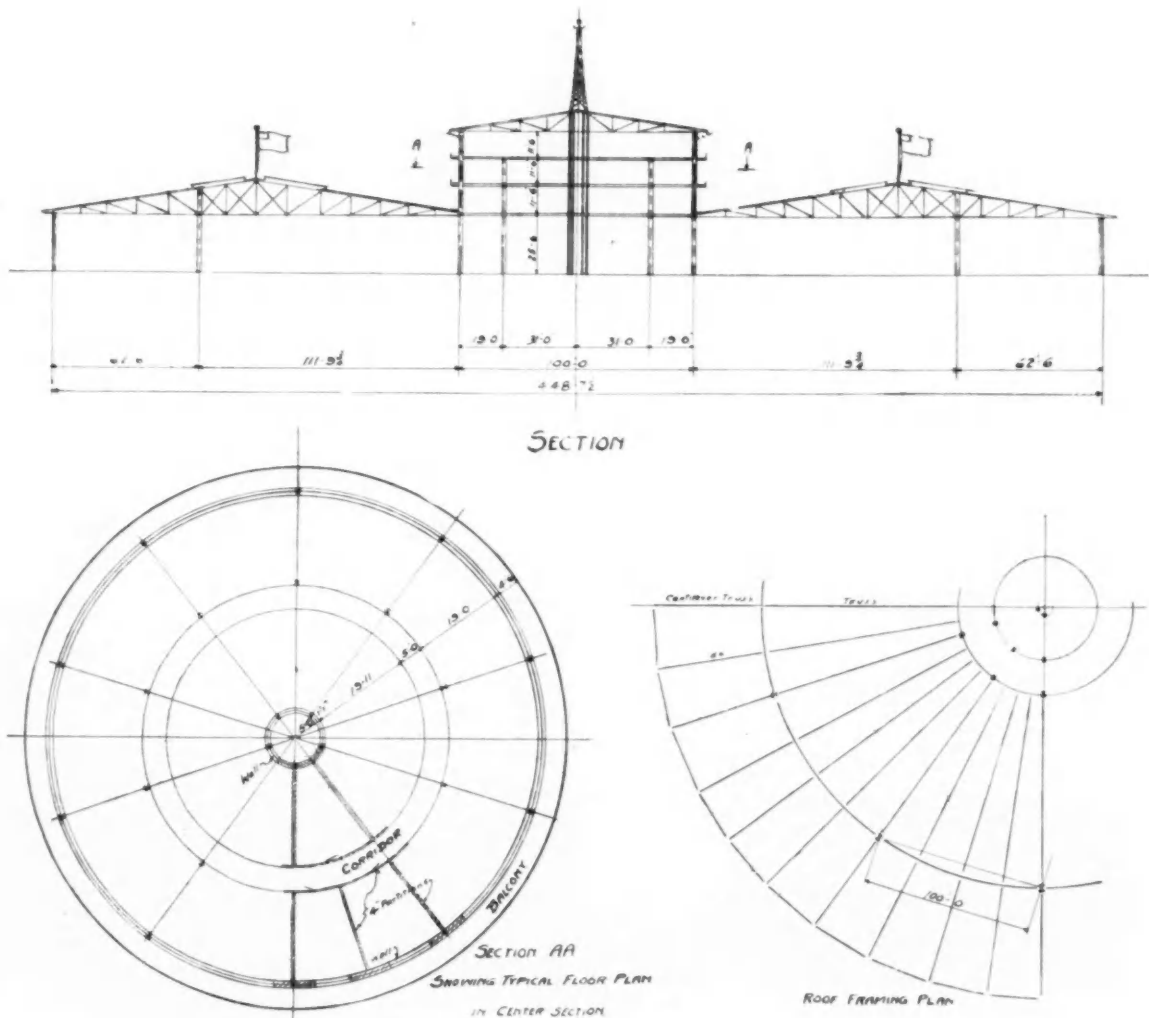
provide for escape of heat resulted in the loss of all the planes.

1. The steel vault is a relatively new form of construction. This type gives unusually clear head room and because of the simplicity and interest of its construction lines would be suitable for sales hangars or other hangars where appearance is of importance.

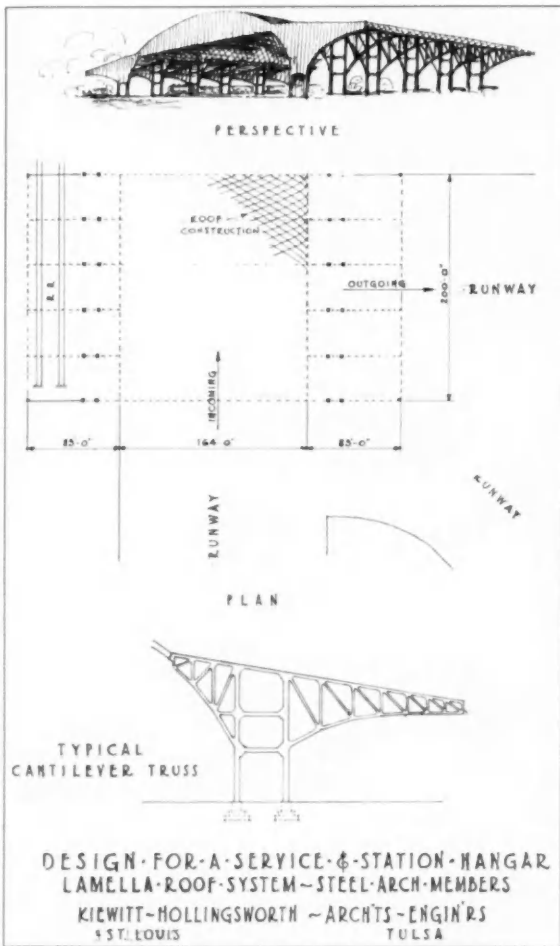
2. **STEEL TRUSS.** The type of steel frame truss now being planned for the Kansas City airport, shown in the illustration below, has many unusual features which recommend it.

(a.) "The Fink or Fan truss is suitable for spans up to 70 ft. and the Pratt or Warren truss for spans over 70 ft.

"The steel frame truss with horizontal lower chord, of minimum depth, supported on masonry piers or steel columns, is of minimum weight and



STEEL FRAME TRUSS, KANSAS CITY AIRPORT, KANSAS



maximum strength per unit of enclosed usable volume. Should the demand for hangar space increase beyond existing capacity, a steel frame floor construction of sufficient strength, supported on widely spaced columns, can be built under the lower chords of the trusses, the trusses raised sufficiently for a second story and attached to new steel columns. With an inclined steel frame ramp and wide platform built along the front, the upper floor can be used for larger and the lower story for smaller aircraft. The great hangar building at Littorio Airport (Rome) is built on this plan." (American Institute of Steel Construction.)

(b.) In hangars of wide spans the space between the bottom and top chord of the truss may be utilized for office, rest-room or restaurant space, the truss being built into the wall as shown on the accompanying sketch (right-hand). With this type of truss, the roof may be utilized for observation space with provision for dining and dancing.

3. CONCRETE. Concrete ribbed vault construction has been used in some European airplane and dirigible

hangars. But concrete has not been used in this country except for walls and floors. (See page 511).

4. VARIOUS COMBINATIONS OF STEEL AND MASONRY. "The characteristics of three types of side wall construction are indicated in the following tabulation:

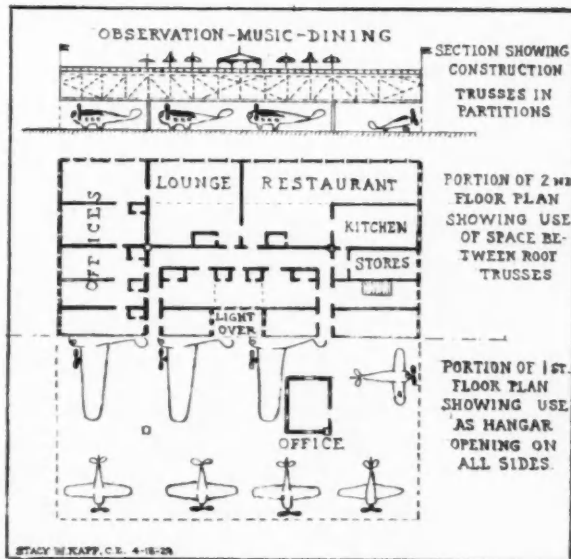
Material	Per Square Foot	
	Cost	Heat Loss
Corrugated Steel . . . . .	37c	2.13 BTU
Protected Metal . . . . .	47c	0.9 BTU
9" Brick Wall . . . . .	75c	0.313 BTU

"The cost as indicated above included the necessary steel girths for supporting the corrugated siding or protected metal.

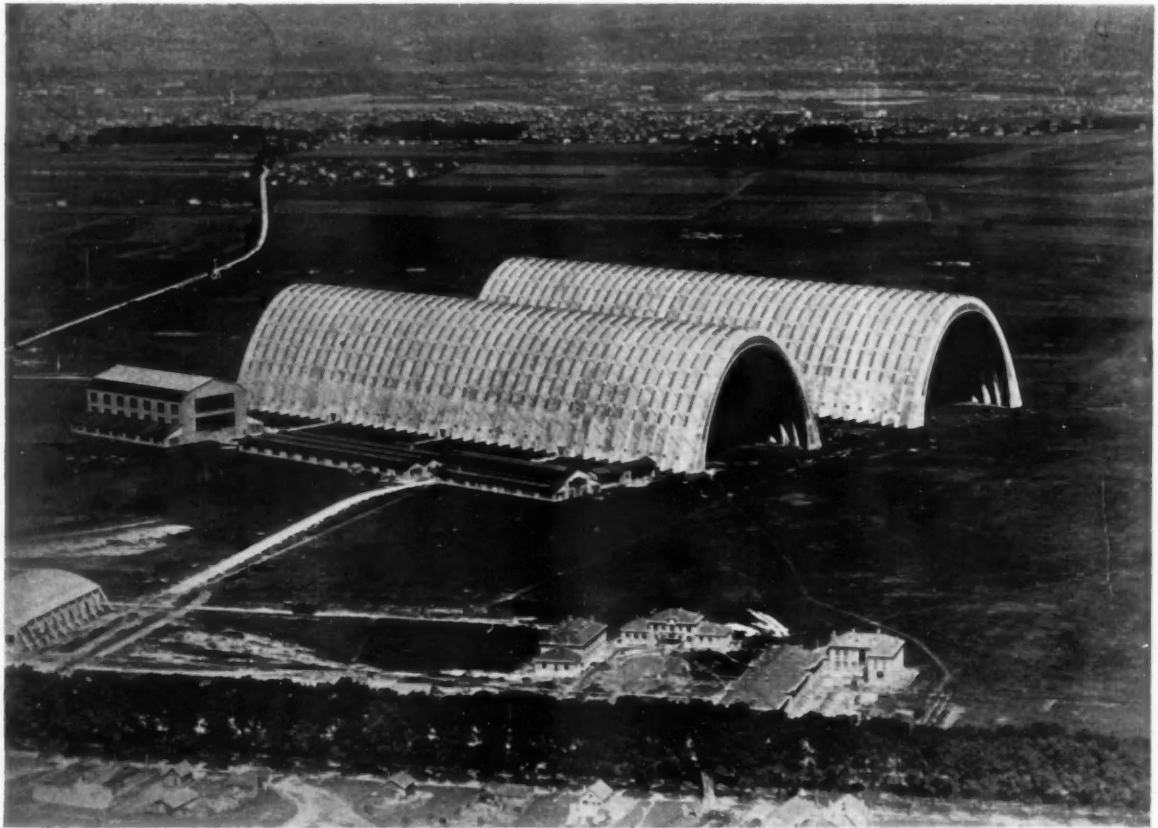
"Data is tabulated below for six typical forms of roof decking:

Material	Per Square Foot		
	Cost	Weight	Heat Loss
Unprotected Steel Sheathing	20c	3 lbs.	2.13 BTU
1" Wood Sheathing . . . . .	26c	10 lbs.	0.47 BTU
2" Wood Sheathing . . . . .	35c	13 lbs.	0.33 BTU
Protected Metal . . . . .	30c	4 lbs.	0.90 BTU
Steel Decking with Insulation . . . . .	39c	12 lbs.	0.23 BTU
2" Concrete Slab . . . . .	35c	32 lbs.	0.64 BTU

"Wood, concrete and steel deckings should be covered with a suitable prepared or built-up roofing. The figures given are based upon and include built-up roofing and Massillon purlin construction. It is interesting to note that the difference in cost between a corrugated steel roofing and a 1" wood roof decking for an 80 ft. x 100 ft. hangar is only \$640.00. At the



WIDE SPAN CANTILEVER TRUSS CONSTRUCTION UTILIZING SPACE BETWEEN TOP AND BOTTOM CHORDS

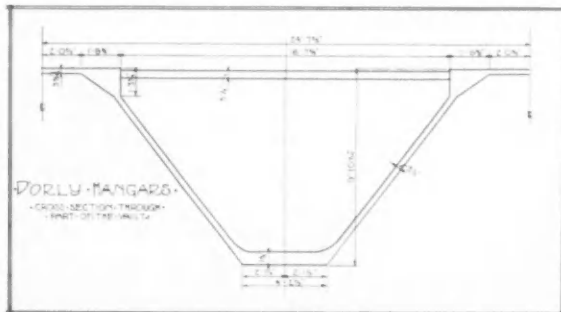


## DIRIGIBLE HANGARS, D'ORLY, FRANCE

DESIGNED BY E. FREYSSINET; BUILT BY LIMOUSIN ET CIE, 1920-24

Span 280 ft.; Height 180 ft.; Length 780 ft.

The shape of the hangar is approximately an inverted catenary. It is designed to withstand a wind pressure of 40 lbs. per sq. ft. Due to the shape it was not thought necessary to provide expansion joints. This assumption has proved sound as no cracks have appeared since its erection in 1924. Airplane hangars have also been built with this same construction but with a comparatively flat arch.



DETAIL OF CONCRETE VAULT  $3\frac{1}{2}$ " THICK  
WITH  $\frac{7}{8}$ " WEB

same time the steel transmits  $4\frac{1}{2}$  times as much heat as the wood. This produces discomfort in hot weather and causes expense in cold weather." (From "Hangar Design for Airports," Macomber Steel Co., Canton, Ohio.)

## V. BASIC FIELD DESIGN

In rising, an airplane must head into the wind, attaining a speed varying from thirty to eighty miles an hour on the ground before rising may be attempted. The lighter machines attain this speed rapidly and can, under favorable conditions, leave the ground in from 50 to 800 feet. The heavier planes used for freight, mail and passengers, require at least one to two thousand feet before leaving the ground.

## A. LANDING STRIP.

The Landing Strip is the basic unit in the design of any flying field and therefore the unit of capacity.

The number of landing strips theoretically possible is therefore the basis of comparison in measuring the relative capacity of different types of fields. It will be used in working out the general ratio of hangar space to flying field and in a rough analysis of cost factors involved. When the "Landing Strip" is used



in an analysis of a design, the comparative efficiency must be computed on the assumption that the wind may come from any direction, although the prevailing wind must be given special consideration from the standpoint of convenience. Most six- or eight-way fields will have a capacity of only one landing strip although some designs not having intersection of landing strip at center may use two strips or sometimes even three if not parallel, provided wind conditions are not too severe. On an all-ways field these "landing strips" are theoretical or may have to be indicated by boundary lights or movable markers as their location and direction will vary with the wind.

1. **WIDTH.** The width actually required by different sizes and types of planes and wind conditions will vary greatly so that for purposes of comparative analysis the U. S. Department of Commerce minimum rating rules, which specify 500 ft. width for a landing strip, should be followed. This need not be paved if the ground is well drained and suitable for take-offs and landings at all times during the year. But the general tendency is to pave to a width of 100 ft. The 500 ft. over-all width is needed in case the plane should be carried out of its course by the wind or, upon landing, should execute a ground loop, that is, swing in a circle to right or left. Such swerving can occur because of an unequal application of brakes, uneven ground, careless handling of the rudder or a sudden gust of wind.

2. **LENGTH.** The Department of Commerce requires a landing strip of 2,500 ft. effective length for "I" rating.\*

The following statement on length of runway was contained in a letter from the City of Wichita, Kansas, which is constructing a municipal airport. "It had developed that the type of ship to be used by certain passenger lines would require landing strips at least 3,500 ft. in length in all directions." It will certainly be advisable to consider special requirements as to size of field before deciding on the length of landing strips.

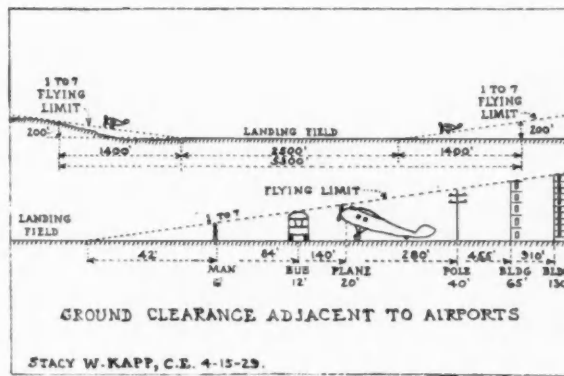
Obstacles at sea level reduce the effective length by seven times their own height as indicated in the sketch in the next column.

3. **CAPACITY.** Although it is impossible to get any definite data on the capacity of a landing strip, most of the estimates favor an allowance of about ten incoming and outgoing planes to a strip per hour.\*\*

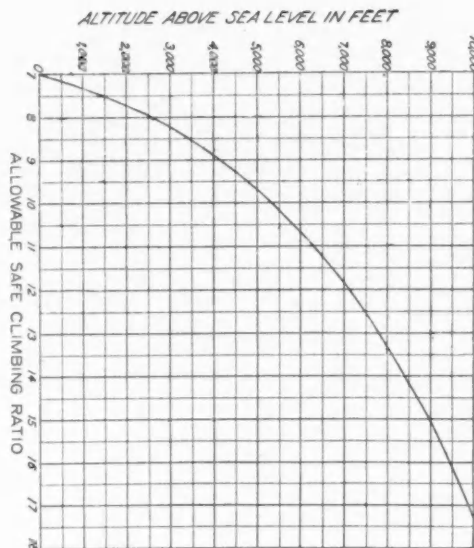
\*See graph for increasing length at various altitudes on this page.

\*\*The estimates from airport managers, aviators and designers, were as follows:

Mr. A: 1-minute interval for departing planes and 10-minute for arriving planes. Mr. B: 3-minute interval arriving, 3 minutes departing. Mr. C: 6 minutes arriving, 6 minutes departing. Mr. D: for a 300 foot landing space, 10 minutes interval for both arrival and departure. Mr. E, a naval flying officer of a great deal of experience, expressed the opinion that a landing strip would handle 60 planes an hour. He said the navy had been able to land



GROUND CLEARANCE AT SEA LEVEL



EFFECT OF ALTITUDE ON GROUND CLEARANCE

4. **PEAK LOAD.** It is almost impossible to get any aviators or airport managers to hazard an opinion on the probable peak load demands at an airport.

In public parking garages about 70% of the capacity may arrive within half-an-hour and a like number leave in the course of the evening peak hour. This peak load factor has been of great importance in garage design. Several parking garages have

and clear a plane every half minute. This landing speed is based on the assumption that there is no ground control of air traffic.

Major Frank M. Kennedy of the Army Air Service, says: "The capacity per theoretical landing strip on an all-way field for commercial operation is approximately ten take-offs and ten landings per hour with ground control of air traffic. This control of landing and take-off is desirable for a commercial airport having any considerable volume of traffic."

The Chicago Municipal Airport now averages twelve landings and departures per hour between 8 A. M. and 4 P. M. which is a close approach to its estimated capacity of fifteen landings and fifteen departures with a single runway used at one time.

proved unsatisfactory due to failure to make ample allowance for the peak load in the original design. In like manner consideration must be given to peak load in airport design if the port is to be entirely satisfactory.

The need for ascertaining some approximation of this peak load relation as a basis for design is evident from the following example:

A large airport has plans calling for an outlay of several millions of dollars. When complete it will have hangar space for 200 planes and a six-way strip field. If the incoming capacity of a strip is taken at 10 planes per hour, only 5% of total capacity can land in an hour's time; the excess will do what automobiles now do on Sunday afternoons. On a Sunday afternoon or a Monday morning the load can certainly be expected to reach close to 25% in an hour's time.

That this problem of peak load is not entirely a problem of the future but already with us, is evidenced by reports from several airports that planes at times must circle for half an hour or more before being able to land. Casey Jones stated that the last time he was in Chicago he had to wait an hour for his turn to take off.

This congestion is partly due to machines taxiing on the runway due to failure to provide broader taxi strips.

It will be useless to design fine airports with hangars for hundreds of machines, if only ten or fifteen can land during an hour.

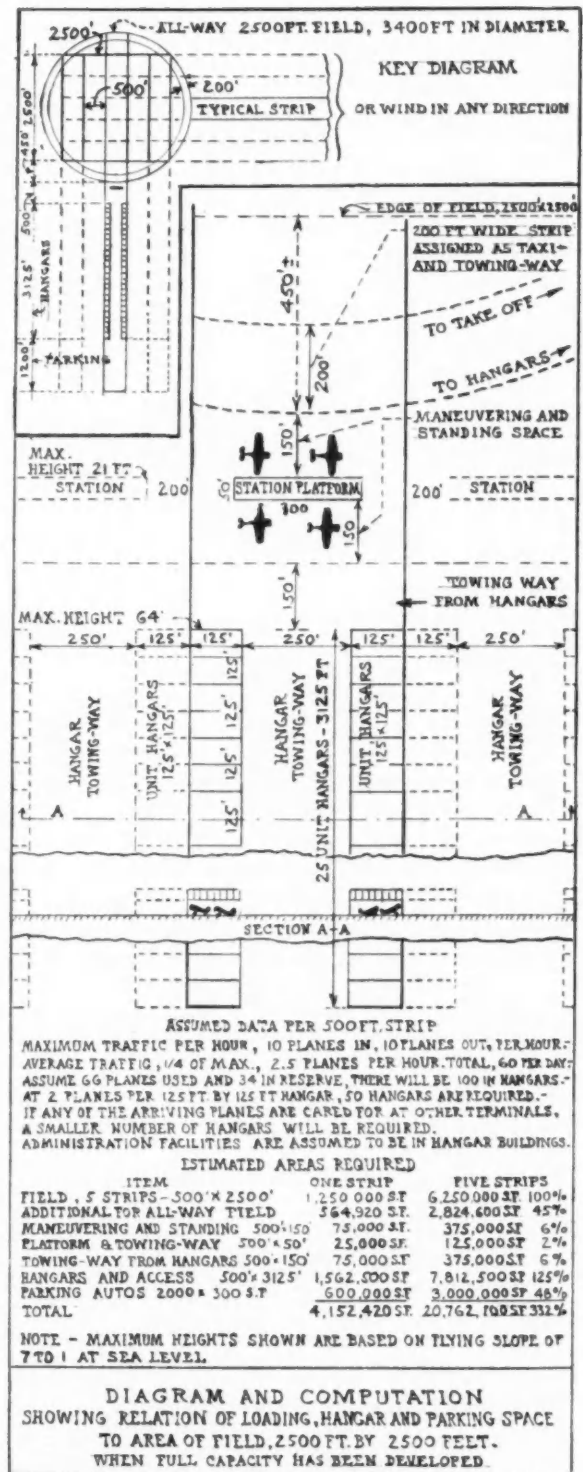
The Traffic Manager of an Air Transport Company expressed the opinion that "a fifteen minute allowance must be made for unloading and loading and servicing a transport plane at an airport." He believes that ground factors such as taxiing, the provision of loading space, handling of passengers and baggage will be the limiting factor in airport capacity rather than the take-off and landing capacity of a landing strip.

A transport plane will require a space approximately 200 feet wide for loading area to allow for maneuvering the plane into position. This would permit two loading strips, with a 100 foot passenger station or canopy between, to a 500 foot landing strip.

Assuming an all-way field with theoretical landing strips 500 feet wide, the loading capacity with double tandem loading platforms on one side of the field would be four planes per fifteen minutes or sixteen per hour per landing strip.

(a.) TRANSPORT LINE. This problem of peak load is going to be especially important where an airport is the terminus or junction point for several airlines as it will be advantageous to have planes arrive and leave at very nearly the same time so that close connec-

tions can be made. For example: A plane coming in to Chicago from the north may have passengers and mail with destination to the east, west, and south,



while planes from these directions may in turn contain passengers or mail for transfer in like manner to any one of several lines. This need of making close connections will lead to very definite peak loads and unless foreseen and planned for in the design of field and facilities, the result will be congestion and confusion. In addition many of the passengers will

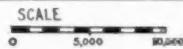
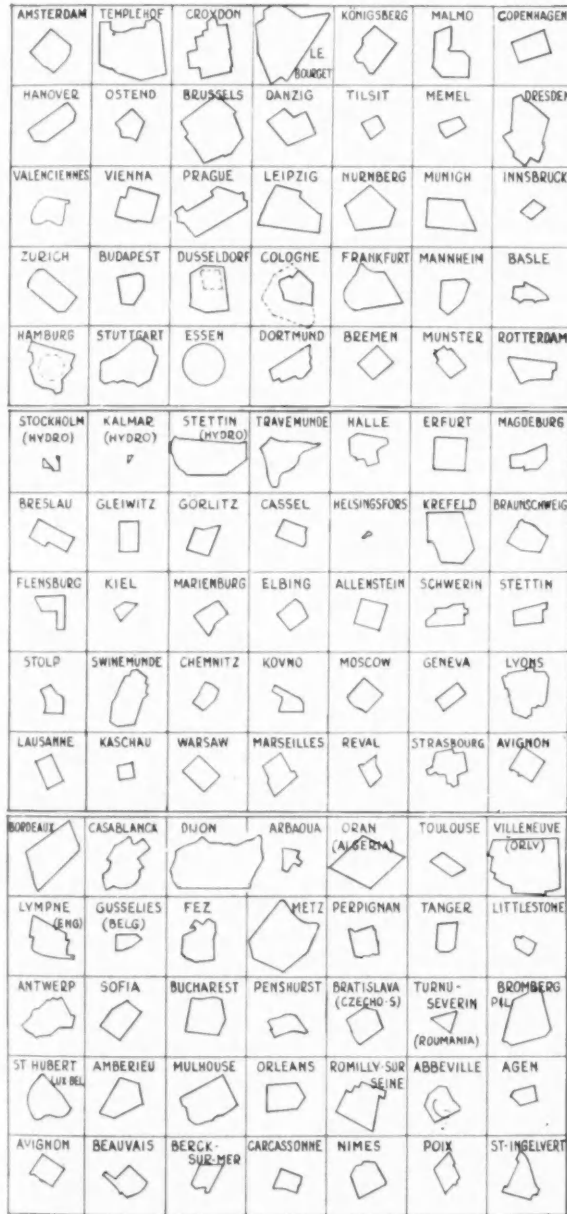
want to arrive at the beginning of the business day.

(b.) TAXI-SERVICE. If landing platforms, fields or water landing are provided in the heart of large cities, the taxi service from suburbs will have a very definite load in relation to business time in the city.

(c.) JOY RIDE. The peak load for joy rides will generally come at a different time from transport and taxi loads, but where it extends into their time, so as to interfere, the time devoted to joy rides should be curtailed.

(d.) STUDENT FLIGHTS will generally occur early in the morning and late afternoon as the wind conditions are best at these times. When a field gets considerable transport traffic, student training should be transferred to another field.

(e.) MILITARY FIELDS should be designed for a 90% peak load in ten or fifteen minutes. Due to practice in formation flying, the take-off and landing time is very much shorter than for commercial ports.



STUDY OF COMPARATIVE SHAPES AND SIZES OF EUROPEAN AIRPORTS

PREPARED FOR THIS ARTICLE BY E. P. GOODRICH, CONSULTING ENGINEER

B. TAXI STRIP.

In considering the capacity of a landing strip, the important question is, whether with the wind in certain directions a machine must taxi to a far end of the field and double back on its take-off. Some field designs provide a separate taxi strip for use in reaching the starting point or returning to hangars after landing.

VI. TYPES OF FIELDS

The size and shape of most flying fields are determined by the size and shape of available land. This is true not only of American but of European airports as well. The sketches shown on this page, drawn to scale, indicate the variety in size and shape of foreign airports.

Although the local ground and weather conditions and use of the field will always determine the specific design, a theoretical analysis will assist in arriving at the best solution of a particular problem.

A. ALL-WAY FIELDS.

1. TYPES OF ALL-WAY FIELDS. The sketches on page 508 illustrate some of the various shapes of landing fields. The area of the plot in all cases is the same. The table shows the areas available for flying field and hangar space and the theoretical landing strip value of the various shapes. It is of interest to note that the circular field (2,500 ft. diameter) with hangar spaces in the four corners is not as efficient or convenient as the Army Type and that the segment of a 7979 ft. circle with central hangars is more efficient than either the 2,500 ft. diameter circle or quadrant. Further development of this segment is shown on page 511.

Attention is called to the necessity of having a border to the flying field which (at sea level) is

seven times the height of surrounding obstructions.

2. TO INCREASE THE CAPACITY OF A LANDING FIELD. Referring to sketches on page 507 it will be seen that doubling the area of a square field does not double its capacity. If the field is doubled in length the capacity will be doubled providing the field is divided into two equal parts and considered as two separate fields. The danger of collision in the air between outgoing and incoming planes would be increased as compared with a single field.

#### B. LANDING STRIP DESIGNS.

Most airports have landing strips laid out with the surface treated in some way to make a smoother landing and take-off. The central hundred feet of the landing strip are often paved. When surfaced or paved, the strip is called a runway. These runways are laid out in various designs depending in most cases on the individual requirements of the field, but in some cases their location is due entirely to the theory of the designer.

A few typical methods of laying out landing strips are given on page 509 and their relative efficiency indicated.

It should be borne in mind that runways are of much more value in take-offs than in landing.

### VII. RUNWAY CONSTRUCTION

If the landing field is well drained with firm top soil, it may not be necessary to provide runways but most fields in the northern states are very muddy for at least a few weeks in the year and if they are to be used for regular mail or transport service it will be necessary to provide some sort of surface for part of the landing strip at least. In general a strip need only be 100 ft. wide. An oiled surface or macadam, asphaltic macadam, concrete and other surfacing materials are used.

"For the fields where development funds are limited, two alternatives are open. Either a permanent pavement can be started and the area increased as funds become available, or a temporary surfacing can be constructed over the field, or on the major runways.

"If possible, a start with a combination of the two methods would be advisable for a field in the process of development. A permanent pavement should be placed in and around the hangars and on the aprons and approaches. The landing area and the runways can be given a temporary surfacing which will alleviate the dust nuisance and provide a safe, firm runway surface in all weather.

"There is no doubt as to the desirability of a hard surfaced pavement for runways. The realization of the advantages of a smooth surface over which the plane may be accelerated until the necessary flying speed is attained is not new. The first successful

flight of the Wright brothers was made by the aid of a crude catapult and a wood rail 'runway'. The adoption of wheels on aircraft seemed to give the use of permanent runways a temporary set-back, but as the development of aircraft progressed with larger loads lifted and faster airplanes constructed, higher minimum flying speeds became the general rule. This meant longer and better runways in order to insure safe take-offs. In the case of trans-Atlantic attempts special ramps were constructed down which the planes rushed to gain the initial impetus. Commander Byrd and crew in the heavily loaded 'America' used such a ramp.

"The ill-fated Hearst plane 'Old Glory' used the same ramp, but wooden trestle work was added in order to increase its advantages. It was stated that the use of the ramp was equivalent to adding 500 feet to the length of the field, thus demonstrating that it is the *effect* of a long runway that is desired rather than actual linear dimensions."

"It is the ability of the runway to provide a surface over which the plane can accelerate to the necessary speed that will determine its worth. Length will still be a major consideration, but surface conditions will be given more attention. (From Aviation, July 16, 1928).

#### A. OILED SURFACE.











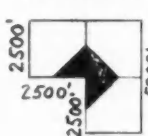




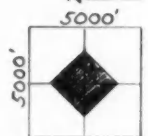
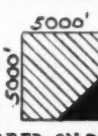



"On runways requiring a firm surface a method similar to that used in oiled road treatment could be adopted. Briefly this consists of scarifying the surface to a depth of two to three inches, applying approximately one gallon of oil per square yard (in two applications of half-a-gallon each) and compaction of the final surface. After each application of oil it should be partially mixed with the surface material by harrowing. The material is then thoroughly mixed by blading into windrows and respread until a uniform color is obtained. The application of fine rock during the harrowing is sometimes necessary if the surface material is deficient in this respect. After thorough mixing and spreading, the surface should be compacted by rolling with a heavy roller. Patching, when necessary, is easily and quickly done by using pre-mixed material and tamping to the desired surface grade.

"The oil used in the treatment described above is largely a light grade of road oil with an asphaltic content of from 60% to 70%.

"The use of such an oiled surface for runways would be of benefit on fields where funds for improvements are necessarily limited." (From Aviation, July 16, 1928).







#### B. LOOSE GRAVEL OR CINDERS.

This method of surfacing has proved unsatisfactory as the loose particles are thrown up by the

FIELD CAPACITY (NOTE A) - ADDITIONAL UNIT FIELDS VS ENLARGEMENT OF UNIT FIELD						
ADDITIONAL UNIT FIELDS			ENLARGEMENT OF UNIT FIELD			
	6,250,000 S.F. 38 STRIPS 2086' AV. LGTH.					6,250,000 SF. 38 STRIPS 2086' AV. LGTH
	12,500,000 S.F. 76 STRIPS 2086' AV. LGTH					12,500,000 S.F. 76 STRIPS 2086' AV. LGTH
	18,750,000 S.F. 114 STRIPS 2086' AV. LGTH					18,750,000 S.F. 70 STRIPS 3441' AV. LGTH
	25,000,000 S.F. 152 STRIPS 2086' AV. LGTH					25,000,000 SF. 84 STRIPS 3900' AV. LGTH

















































NOTE A - COMPARED ON BASIS OF EIGHT-WAY ARMY FIELD, THEORETICAL STRIPS 500 FT. WIDE

UNIT FIELD COMBINATIONS.

CIRCLE	ARMY (SEE FOOT NOTE)	SECTOR OF CIRCLE	TRIARC	TRIANGLE IN SQUARE	TRIANGLE IN TRAPEZOID
(a) 	(b) 	(c) 	(d) 	(e) 	(f) 

(a) HANGAR AND ADMINISTRATION SPACE GOOD (21%) BUT MUCH SCATTERED. (b) HANGAR AND ADMINISTRATION SPACE GOOD (17%) AND CONCENTRATED. (c) HANGAR AND ADMINISTRATION SPACE SMALL (15%) AND CONCENTRATED. (d) HANGAR AND ADMINISTRATION SPACE GOOD (29%) BUT MUCH SCATTERED. (e) HANGAR AND ADMINISTRATION SPACE VERY LARGE (50%) BUT DIVIDED. (f) HANGAR AND ADMINISTRATION SPACE LARGE (36%) AND CONCENTRATED. THE U.S. ARMY AND THE TRIANGLE-IN-TRAPEZOID SHAPES SEEM MOST ADAPTABLE.

TWO-UNIT FIELDS

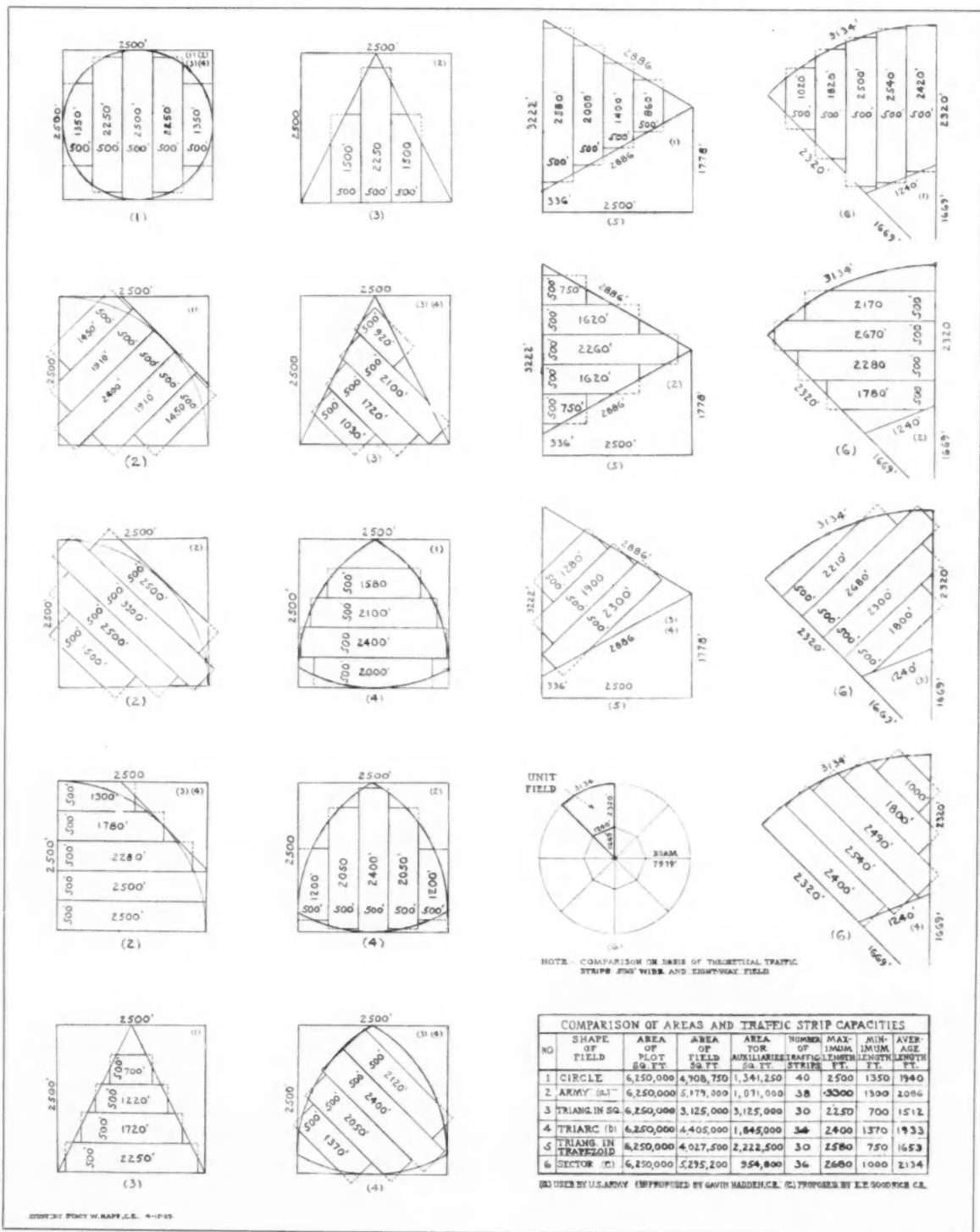
					
					
					
					
					
					
					
					

\*a ADMINISTRATION SPACE WELL LOCATED  
 \*b ADMINISTRATION SPACE, SMALLER  
 NOTE-HATCHED AREAS ARE FOR ADDITIONAL ADMINISTRATION SPACE

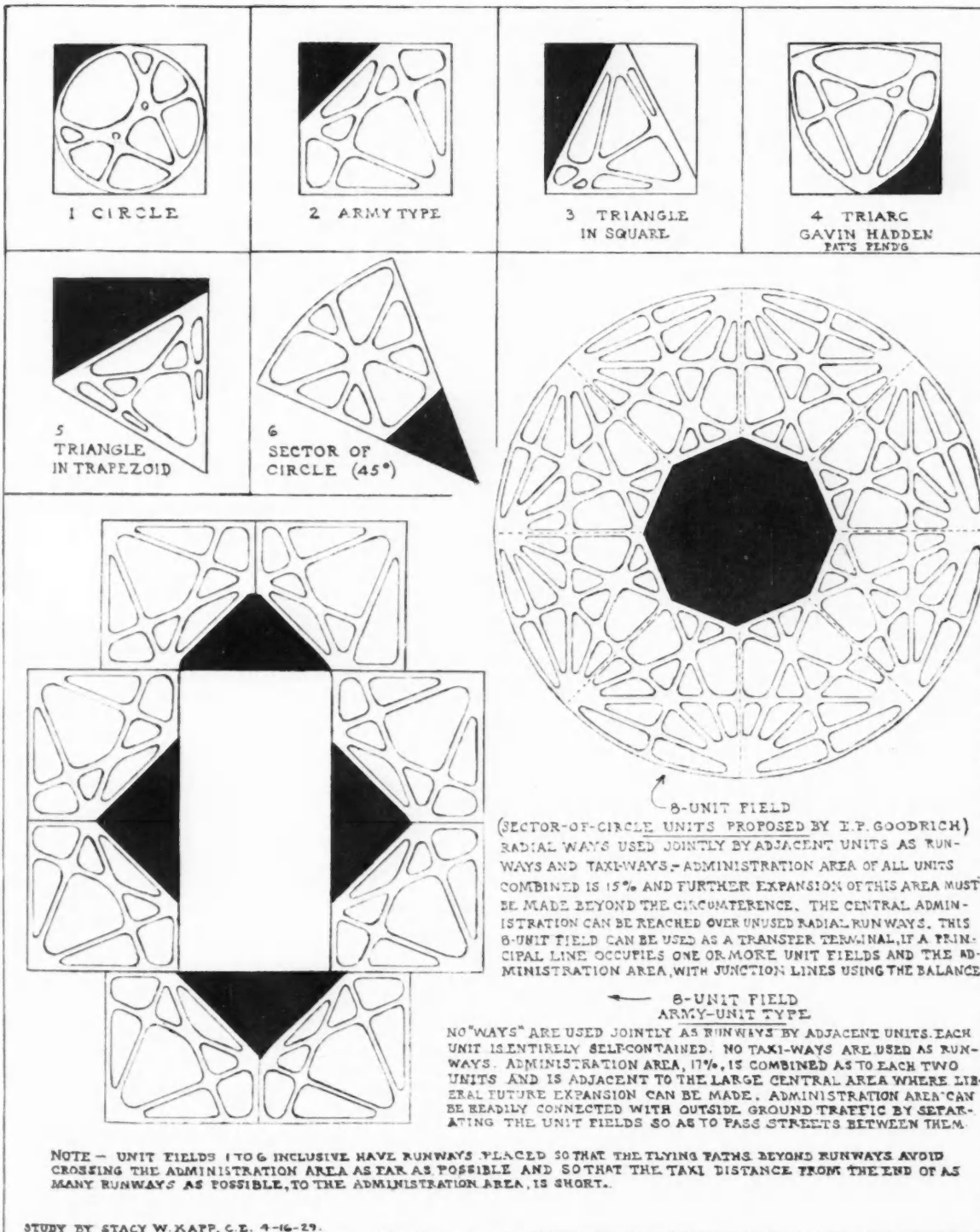
\*c HANGAR AND ADMINISTRATION SPACE COMPACT  
 \*d BEST FOR ADDING THIRD UNIT.-\*e SMALL ADDITIONAL SPACE FOR HANGARS AND ADMINISTRATION.  
 \*f LARGE ADDITIONAL SPACE.-\*g ADDITIONAL ADMINISTRATION SPACE COMPACT.

PRINCIPLES GOVERNING INCREASE IN CAPACITY OF LANDING FIELD

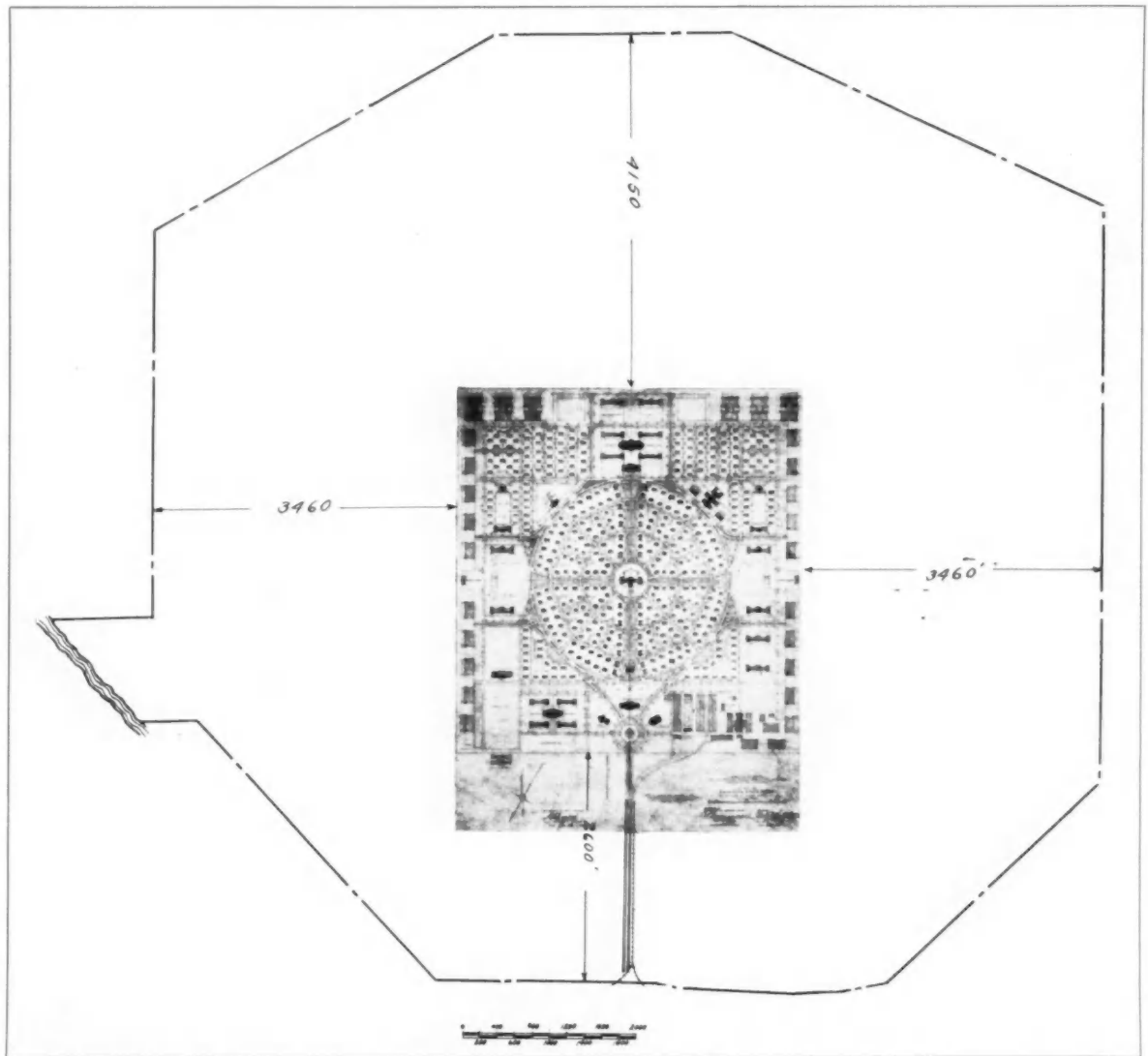
(See also: Army Field, pages 508, 510; Circular Field, pages 508, 509, 510, 511)



COMPARATIVE ANALYSIS OF VARIOUS SHAPES OF ALL-WAY FIELDS



COMPARATIVE ANALYSIS OF VARIOUS TYPES OF STRIP FIELDS



Courtesy of U. S. Army Air Corps. Geo. B. Ford, Consulting Engineer

#### PLAN OF RANDOLPH FIELD, TEXAS

wheels and wind stream from the propellers. Well rolled macadam is considered satisfactory but it should have an asphaltic binder.

#### C. ASPHALTIC MACADAM OR ASPHALTIC CONCRETE.

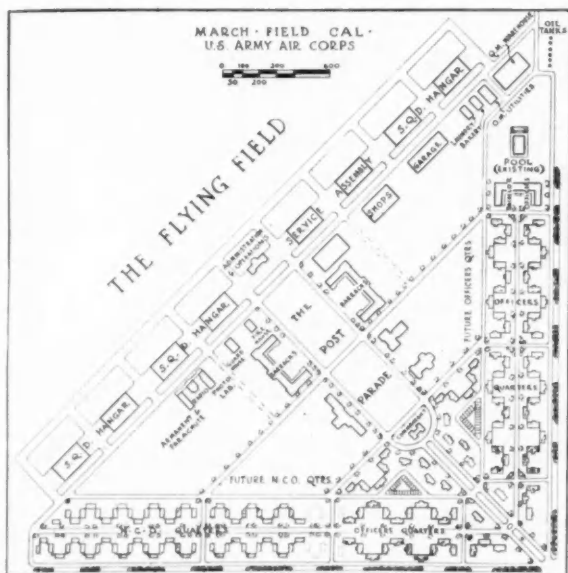
There are several types of asphaltic concrete, usually classified according to the sizes of the stone or mineral aggregate used. For highway construction it is usually laid in two courses, each course being compacted by a heavy roller while still hot and as soon as it has been spread to the proper grade. The customary manner in constructing a standard five-inch pavement is to use a  $3\frac{1}{2}$  in. base and a  $1\frac{1}{2}$  in. surface course.

#### D. CONCRETE RUNWAYS

Portland cement concrete is particularly well adapted for paving at airports, not only for hangar floors and aprons adjacent to hangars but also for runways which may be used for landing as well as taking-off. A smooth, hard surface is secured, the maintenance of which is negligible, and which is ideal under all kinds of weather conditions.

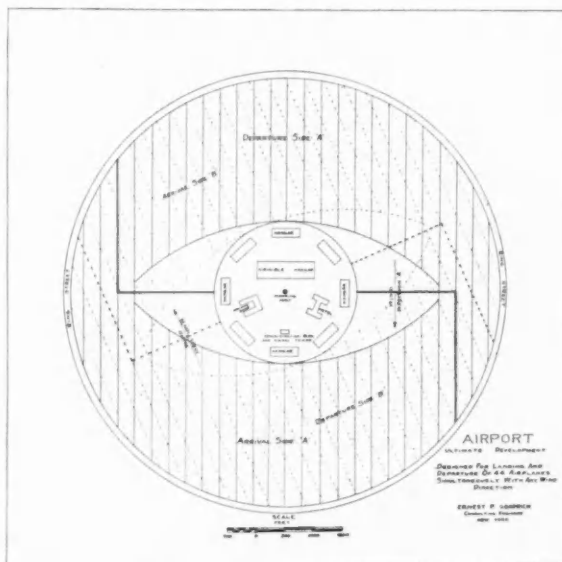
Among the advantages of this type of paving are: visibility at night; skid-proof qualities when wet; a smooth, rigid surface which is highly essential when taking off with heavy loads at high speeds; economical first cost; the lowest of maintenance costs; and ability to sustain heavy loads, including high impact loads which may be several times the static load.





Courtesy of U. S. Army Air Corps. Geo. B. Ford, Consulting Engr.

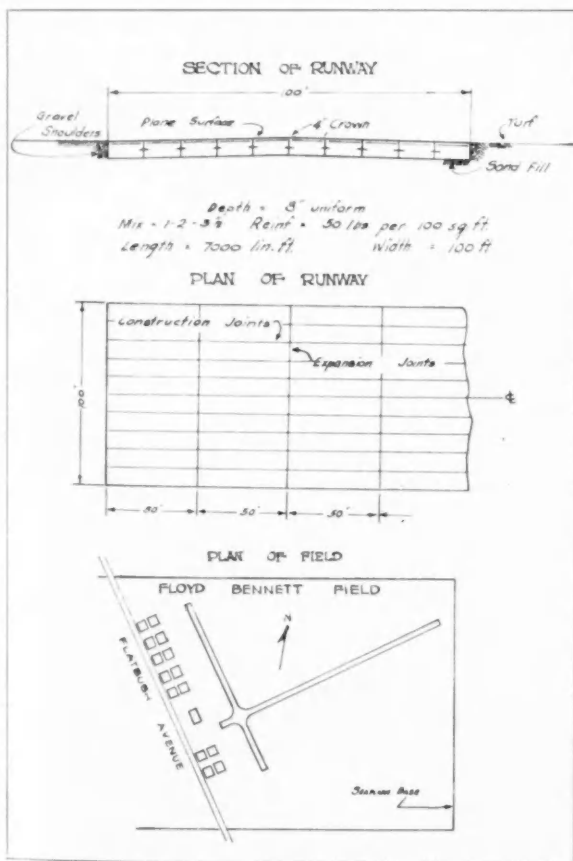
MARCH FIELD, CALIFORNIA



The field shown above is divided into twenty-two departure and landing lanes. The dotted lines show the lanes which would be used for wind direction B. The mooring mast, shops, hangars and other buildings are located around the center of the field, at the point of maximum convenience, but do not in any way obstruct the runways.

This airport may be developed gradually a segment at a time as indicated by the sketches on pages 507 and 509. Taxiing to and from the hangars is reduced to a minimum. This type should be especially valuable as a transport airport having heavy traffic. The planes would arrive into the wind, unload and load passengers at the central terminal and leave the field without any intermingling of incoming and outgoing traffic.

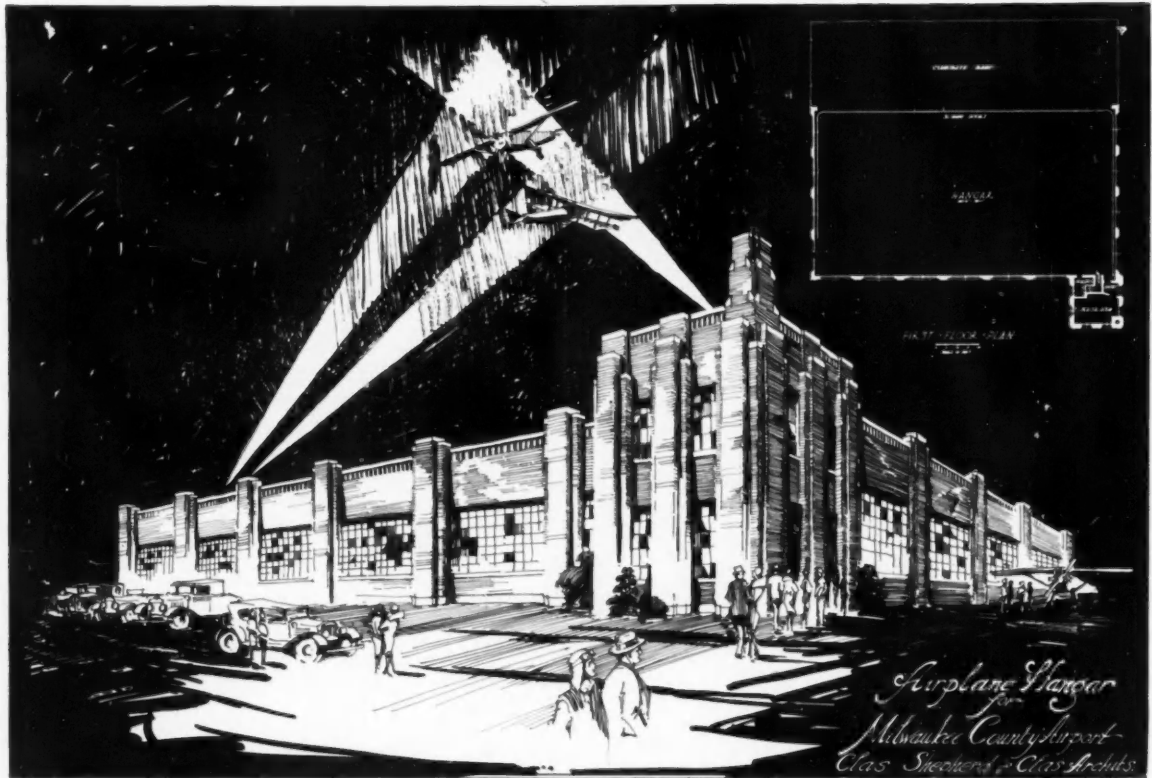
A similar type is now being developed by Mr. E. P. Goodrich for the Chinese government. The latter, due to the lack of railroads and roads, decided to develop aviation as a means of transportation in preference to older methods.



CONCRETE RUNWAYS, FLOYD BENNETT FIELD NEAR NEW YORK CITY

The design and construction of concrete runways are quite similar to those of concrete streets and highways. An indication of cost may be taken from current concrete pavement costs in the neighboring communities. These costs will, of course, depend upon the extent of the work, the quality of the mix, depth of the pavement, amount of reinforcing used, if any, and special local conditions. These costs will vary from \$2.00 per sq. yd. for 6-inch plain concrete to \$3.50 per sq. yd. for 10-inch reinforced concrete. The concrete runway design for the Floyd Bennett Field near New York City, as shown in the sketch on this page is of the highest type constructed in this country, and the cost is \$3.00 per sq. yd.

In planning pavement types for runways, the loads to be sustained, including impact for the heaviest planes, must be taken into consideration. From data obtained from the United States Department of Commerce, the heaviest planes to be provided for will be 30,000 lbs., which, distributed over four landing wheels, would amount to 7,500 lbs. static load per



wheel. Assuming a 100% impact the total wheel load is increased 15,000 lbs. The usual formula used in computing slab thicknesses is  $T = .7\sqrt{\frac{3W}{S}}$  where  $W$  equals the total wheel load and  $S$  is taken as half the modulus of rupture, or 300 lbs. Applying this formula to the above case at the New York City Airport and allowing for the fact that steel reinforcement is used in the slabs, it will be seen that adequate thickness has been provided for present and future loads.

It is interesting to note that the design called for under the present contract for the Floyd Bennett Field provides for the construction of the runways in a series of strips or panels 10 ft. in width, 8 inches in thickness and dowelled together at the joints. This arrangement follows the best practice of today in order to assure an absolutely smooth and even surface, the elimination of longitudinal cracking and practicability in construction operations.

The construction at Floyd Bennett Field provides for approximately 7,000 lin. ft. of concrete runway 100 ft. in width.

#### APPENDIX A

##### REQUIREMENTS OF THE U. S. DEPT. OF COMMERCE

"The Secretary of Commerce will rate airports of

#### VIII. AIRPORTS OF THE FUTURE

Complete utilization of a landing field will require hangar, repair and administration space equivalent to or larger than the landing area. It would therefore seem logical near large cities where land is expensive and where air traffic is heavy to utilize the roof of the hangar space, as a landing and take-off field with the complete elimination of the separate field. This would conform in principle to the Navy Airplane Carriers.

Such a hangar field would have many advantages from the standpoint of cost in relation to income, operation, control and reduced interference from surrounding obstacles. Public streets could be carried through on a lower level permitting direct access to loading platforms for both passengers and freight.

#### IX. CONCLUSION

It is the intention of this article to indicate methods of study and principles to be followed in airport design. The subject is so new and is developing so rapidly that anything given here must be subject to revision as new developments take place.

the United States as to their suitability upon the application of the owner.

"The airport ratings will be based on the requirements hereinafter set forth and will be indicated in each case by a letter, a figure, and a letter. The first letter will indicate the general equipment and facilities at the airport; the figure will indicate the effective landing area; and the second letter will indicate the night lighting equipment. The order will be letter, figure, letter, as A 1 A, which is the highest rating given." (U. S. "Airport Rating Regulations," Dept. of Commerce, Aeronautics Bulletin, No. 16, January 1, 1929.)

The following extracts from the bulletin quoted above give the principal points that are of interest to an architect, but *before designing a field it is absolutely essential that these regulations be studied in detail.*

1. BASIC REQUIREMENTS. "The minimum basic requirements for the rating of airports are as follows:

"(a) *Suitable landing area.* The airport shall afford a firm, smooth, well-drained landing area, approximately level, without obstructions or depressions presenting hazards in taking off or landing, and with suitable approaches. If sufficient area is not available for landing and taking off in all directions, there shall be at least two landing strips 500 feet or more in width crossing or converging at an angle of not less than 60°. The landing area shall permit safe landing and taking off under all ordinary weather conditions. If the surface of the landing area is not sufficiently firm and well drained for this purpose, runways shall be constructed as hereinafter specified. Roads shall not cross any part of the landing area, whether open field or landing strips, and stock and unauthorized persons and vehicles shall not be allowed on the landing area as this area must be kept clear and ready for use at all times. The maximum slope of the landing area shall at no point exceed 3 inches in 10 feet, which corresponds to a grade of 2½ per cent. The mean slope of the landing area shall not be more than 2 per cent in any direction.

"(b) *Freedom from obstructions.* If the field is located at sea level, obstructions surrounding it diminish the effective landing length by seven times their own height. For instance, obstacles 50 feet high along the border of a field diminish the effective landing length for planes landing or taking off over them by 350 feet. (See sketch page 503.)

"(c) *Accessibility.* The airport shall be situated on a good road leading to the nearest city or town.

"(d) *Wind-direction indicator.* The airport shall be equipped with an approved type of wind-direction indicator.

"(e) *Markings.* The landing area shall be marked by means of a circle at least 100 feet in diameter having a band 4 feet wide. The name of the city or town shall be placed near the marker circle (name should not be placed inside of circle) or on the roof of at

least one airport building, or on other suitable area, in such manner as to be visible from an altitude of at least 2,000 feet. (Lettering should be from 10 to 30 feet in height as space may permit.)

"It is recommended that, wherever practicable, a combination of chrome yellow and dead black be used in air-marking roofs and other similar areas and that, particularly in cases where the markings are to be illuminated, the chrome yellow be used for the lettering and other symbols, and the dead black for the background.

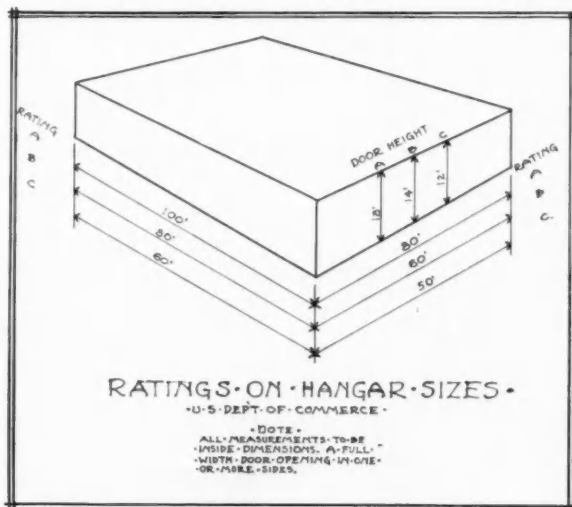
"The outline of the usable portion of the landing area shall be marked by means of painted galvanized sheet-metal cones not less than 36 inches in diameter at the base by 24 inches in height, or by solid 4 foot white or chrome yellow circles constructed of crushed stone, gravel, or other suitable material, or by means of other markers of equivalent effectiveness, placed not more than 300 feet apart along the borders and kept whitewashed or painted.

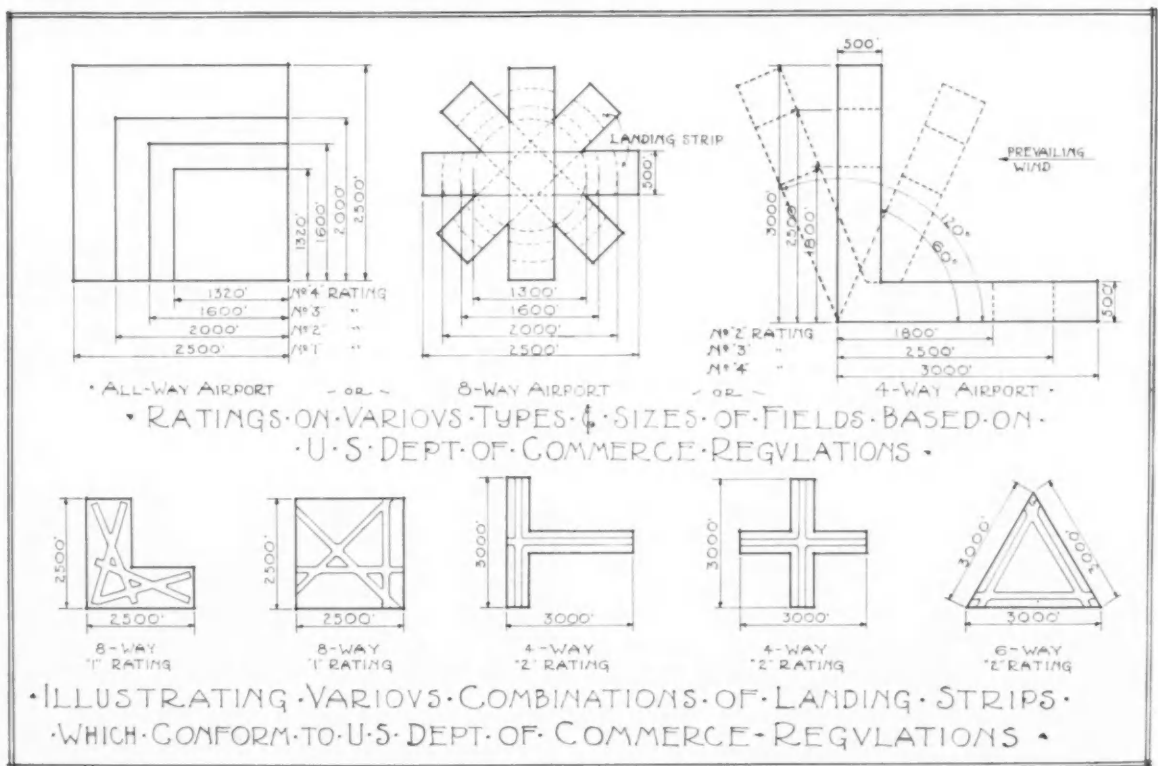
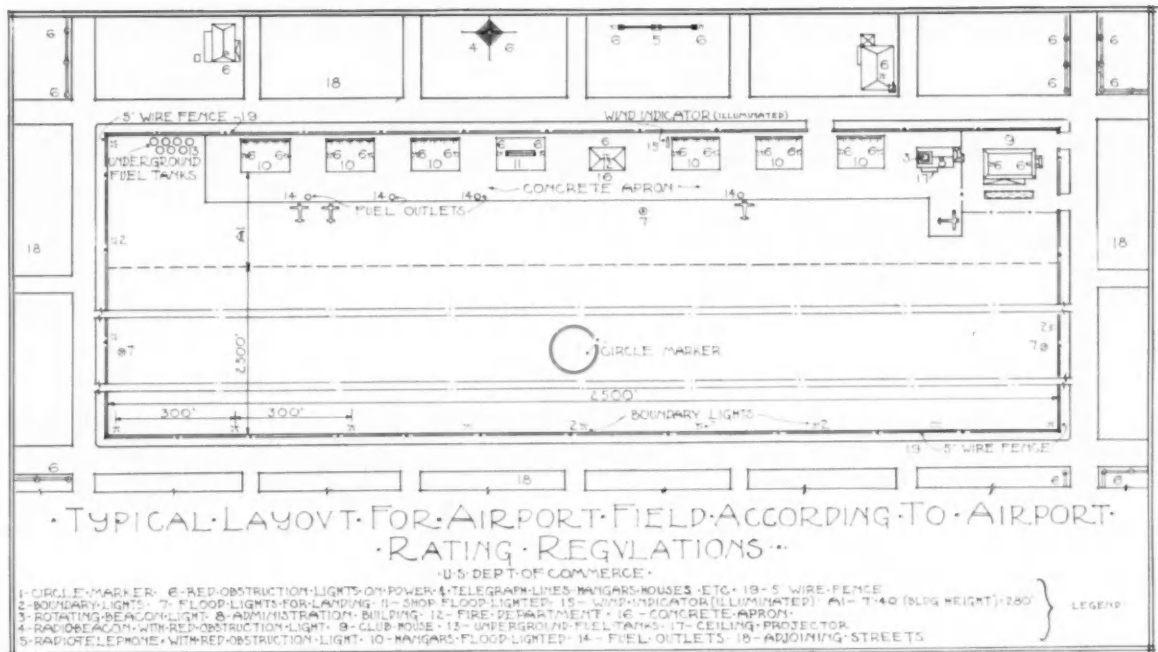
1. EQUIPMENT AND FACILITIES. "A" rating. In addition to the facilities named in the basic requirements, airports receiving an 'A' rating on general equipment and facilities shall have the following:

"(a) At least one hangar measuring not less than 80 feet by 100 feet in the clear inside with doors open, with 18 foot overhead clearance, with full-width door opening in either one or both ends or one or both sides, and with safe provision for heating water and oil. In localities where freezing temperatures are experienced the hangar shall be heated sufficiently to prevent freezing of water.

"(b) One or more *wind-direction indicators* of an approved type.

"(c) All telephone and transmission line poles, radio towers and masts, transmission towers, flag poles, and similar obstructions in the immediate vicinity of the airport shall be day-marked by paint-





ing with alternate bands of either chrome yellow and dead black, or white and dead black, terminating with either a chrome yellow or a white band at the top, depending on the color combination used. The

width of the bands shall be one-fifth of the height of the structure for all structures less than 250 feet high and for structures over 250 feet high, the bands shall be 50 feet wide.

"(d) *Repair equipment*, sufficient to permit changing of engines and landing gear and equipment for major engine and plane repairs.

"(e) *Weather instruments*, including an anemometer, barometer, and thermometer. There shall also be a bulletin board and facilities for giving pilots the most recent weather information.

"(f) *Radio-receiving set* and loud-speaker, under certain conditions, as follows: Airports located within a radius of 400 miles of Department of Commerce Airways radio stations shall be equipped with suitable radio-receiving sets with loud-speakers, in order that those using the airport may avail themselves of the hourly reports broadcast from said stations.

"(g) *Adequate equipment for removing snow* from landing areas or landing strips or equipment for packing snow sufficiently to permit safe landing and taking off of aircraft.

"(h) *First-aid equipment*, consisting of an ambulance or some vehicle which can be used as an ambulance, and crash equipment such as wire cutters, fire extinguisher.

"(i) *A register of arriving and departing aircraft*.

"(j) *Adequate fire-fighting equipment*.

"(k) *Sufficient personnel in attendance*.

"(l) *Sleeping quarters* for at least three men, in addition to the field personnel, at the airport or not more than one-half mile distant.

"(m) *Waiting and rest rooms* on the field.

"(n) *A restaurant* or other public source of food supply. (If not actually on the airport, this shall be not more than one-half mile distant.)"

"'B' rating. In addition to the facilities named in the basic requirements, airports receiving a 'B' rating on general equipment shall have equipment required for airports receiving an 'A' rating with the following exceptions:

"(a) *The hangar* may measure 60 feet by 80 feet in the clear inside with doors open, with 14 foot overhead clearance, with full-width door opening in either one or both ends or one or both sides, and with provisions for heating water and oil.

"(b) *Repair equipment* as required for 'A' rating, except no equipment need be provided for *major* engine and plane repairs.

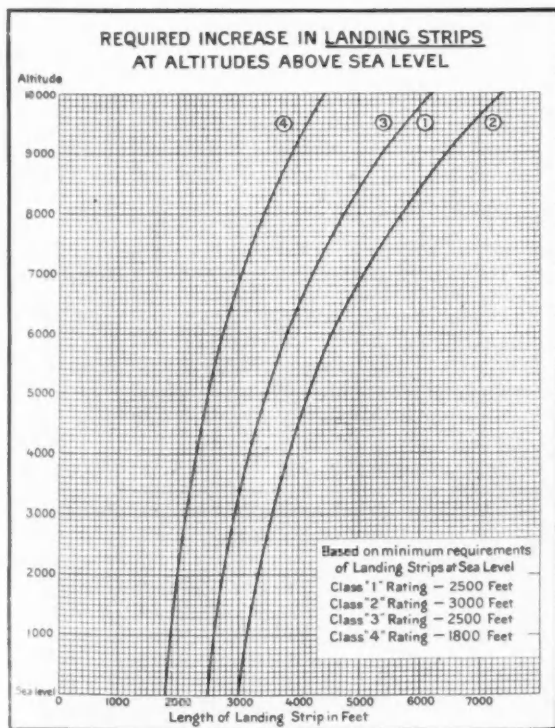
"(c) *Sleeping quarters* for two instead of three men, in addition to field personnel.

"(d) *Rest room* to be provided, but no waiting room or restaurant required."

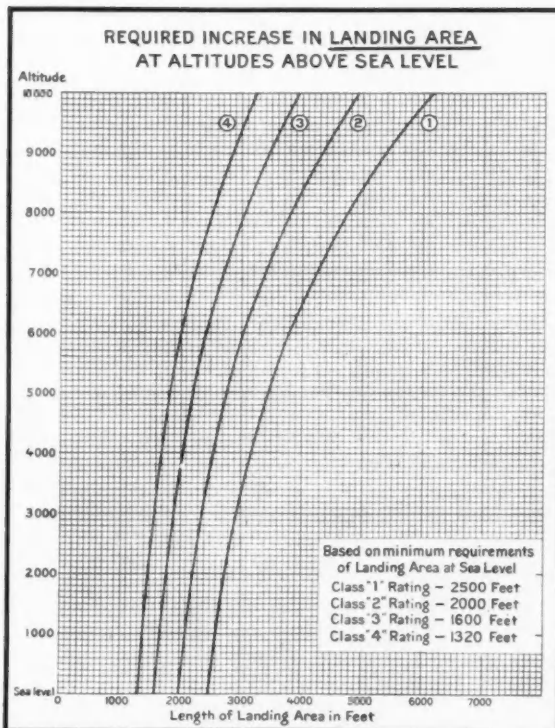
"'C' rating. In addition to the facilities named in the basic requirements, airports receiving a 'C' rating on general equipment shall have equipment required for airports receiving an 'A' rating, with the following exceptions:

"(a) The hangar may measure 50 feet by 60 feet in the clear inside with doors open, with 12 foot over-

(Continued on page 182 of Advertising Section)



From airport rating regulations Dept. of Commerce May 1928



From airport rating regulations Dept. of Commerce May 1928

## NOTES AND COMMENTS

### ARCHITECTURAL GRAPHIC ART

MICHELANGELO, primarily a sculptor, showed naturally in his architecture a vigorous sense of the third dimension. So much is this true that his architectural drawings are as sketchy and mysterious as those in the thirteenth century notebook of Villard de Honnecourt. Indeed the rendered perspectives worked up from his drawings, published last summer in *Architettura e Arti Decorative*, bring out the solidity of his conceptions very surprisingly. The great masters of the Baroque followed in his footsteps and although conditions often made it impossible for them to design a building in the round, there is no one of the great seventeenth century church façades of Rome which is not more tactile than almost any other existing work of architecture. This quality, combined with tremendous ingenuity in interior space composition, was continued in the brilliant eighteenth century Baroque of Germany and Austria, an art hardly intelligible on paper where awkwardness and redundancy alone appear.

Yet if we turn to contemporary architectural books of France, such as Blondel's, and examine their magnificent line engravings, it seems as if we had there a building art that did not need to be built. The limestone of Paris, most neutral of building materials, seems in the actual buildings as the symbol of the reality which was in the engraving. Eighteenth century music has likewise this graphic beauty in its engraved notes. Such an appreciation of architecture and music which is possible in the work of this period is no doubt highly unnatural, but it may be very real—more real, in fact, than the sentimental appreciation one can muster for the anecdotal prints of Cochin and Lavreince.

Strangely enough the development of architectural education in America has been all but wholly graphic. Rendering has replaced the sterner convention of eighteenth century engraving. It is for our students all but the end of architecture. True it is that our schools teach how to build the buildings that are designed but as design they stand or fall graphically. It would be impossible to make models of all the designs which it is desirable a student should make during his years of training, but in the drawing on paper less emphasis might well be put on the execution of the drawing and more on the building of which it is a presentation according to the conventions of perspective.

One of the great virtues of modern architects of Europe is that they place very little emphasis on the execution of their drawings in the sense of illusionary completeness. The linear isometrics of the French and the crayon mass studies of the Germans have more to

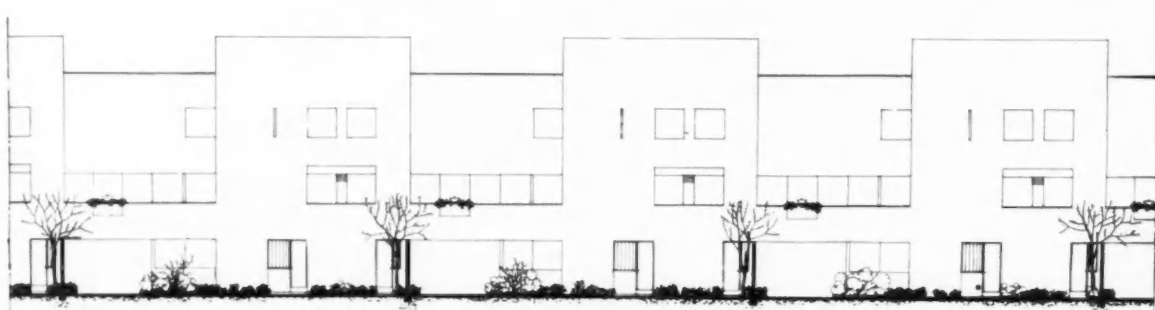
say to the trained eye than the most fully and subtly shadowed and foliated American presentations.

But it is this very question of the trained and the untrained eye which causes the difficulty. For the schools insist that it is for the layman, the client, that these elaborate presentations are necessary. They admit that they distract the student from the essentials of architecture. To some extent this is a fallacy, or at least a vicious circle, for the finished building never looks like the rendered elevation and seldom appears recognizably like a rendered perspective. If the client were aware of the device whereby he is being hoodwinked and could have an explanation of how to interpret simple mathematically intelligible drawings he would be better off. And with the question of illusion in the presentation removed, the relation between the drawings and the building to be built would be clearer. Nor would the loss of the graphic drawings be a serious one. At best our architecture is on such a scale that it can never have the special graphic charm of rococo architecture, and the illusionistic or impressionistic methods of rendering are so ludicrously beside the point that they have less value and interest in themselves than the cheapest form of colored advertisement. Indeed, paradoxical as it may sound, the presentations of those French and German architects who lay little or no stress on the graphical design in itself are in that very way far finer than our own where building is all but forgotten in the luxuriance of trees, clouds, birds, and premature effects of age with which it is hidden.

Students of architecture will give you a further reason for their instruction in rendering. It is said to help to win competition awards. That this should be true and that juries of architects should be deceived by all the trickery of a Frederick Church or the meretricious brilliance of a Birch Burdette Long rendering in judging designs which they must surely realize are but the mathematical symbols of a building, is indeed discouraging. For it shows that students feel that even the fully educated still put the means before the end. Let us hope that the students somewhat exaggerate this situation.

Mr. Van Pelt in his soundly critical article on American architectural education\* has claimed that the student spends too little time in design. It might be said in reply that the hours spent on design would be sufficient if they were actually spent on design and not, as in most schools, chiefly on the camouflaging of bad design. Nor can it even be justified, this work of the Schools of Paper Architecture, from a purely practical point of view. When the architect must pre-

\**Architectural Training in America*. By John V. Van Pelt. Pages 446-451 of *The Architectural Record*, May, 1928.



A ROW OF PRIVATE HOUSES BY ANDRÉ LURÇAT

(ABOVE) STREET FAÇADE (BELOW) GARDEN FAÇADE

sent a client with an elaborate rendering, he turns to the professional renderer. As so often in our educational system, this training has at best but a disciplinary value. It prepares the architect for work which he invariably and wisely delegates to another. It would seem, therefore, that our schools train not architects, but draughtsmen. While in the hierarchy of the profession it is frequently the head draughtsman who corresponds more closely to the architect of the past than does the architect himself, it would seem that some clarification should be made between trade schools and professional schools. More attempt should be made, too, to train the architect for the executive position he will hold than for the work which he will delegate to others.

But it was not my intention to write of "paper architecture," nor to write so generally and unqualifiedly of architectural education. Rather would I urge that, while paper architecture is not necessarily quite without value, it is nevertheless but a pale shadow of architecture of reality. A simplification of rendering would not only remove misconceptions but would also divert emphasis away from the paper design to the completed building. Perhaps we may find an architectural graphic art which in its adaptation to its function would regain some of the dignity and clarity that our contemporary rendering lacks.

HENRY-RUSSELL HITCHCOCK, JR.

## CORRECTIONS

In the March issue (advertising section) the John-

son Service Company made references to the University of Chicago Chapel which did not present a true description of the building. The errors have been corrected in the current issue.

\* \* \*

Credit for the design of the Rittenhouse Plaza Hotel, Philadelphia, illustrated on pages 250, 251 of the March issue, was incorrectly given in the caption. This should have read: M. Hawley McLanahan and Ralph B. Bencker, architects.

ALLEN B. POND, 1858-1929

THROUGH the death last March of Allen B. Pond, the architectural profession lost one of its oldest members and Chicago one of its foremost citizens.

Graduating from the University of Michigan in 1880, Allen B. Pond first taught Latin in Ann Arbor High School and later in the University of Michigan. In 1885 he joined his brother, Irving K. Pond, in Chicago, and the architectural firm of Pond & Pond was formed. He took especial interest in the work of Institute committees, particularly those connected with the standardization of specifications, contracts and documents, and this work gained for him a Fellowship in the Institute.

During the World War Allen B. Pond was actively engaged in constructive work for the Fuel Administration in Illinois. In addition to his activities in connection with architectural and art societies, his interest in the social, educational and municipal affairs of Chicago remained keen up to his death.

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## BOOK REVIEWS

### PLANNING MODERN CHURCH BUILDINGS BRABHAM, MOUZON W.

*Planning Modern Church Buildings.* Cokebury Press, Nashville, Tenn. 1928. \$2.50.

WHEN Mr. Brabham says that the modern church building "must be centered on life," he makes a difference in point of view, not only from the medieval church, but perhaps still more from the Puritan church, or the old fashioned church of our familiar acquaintance. None of their builders, maintainers and users would have used just those terms. The Puritan would have said it was "centered on God," and the medieval churchman that "the church *was* life." In any case it is a common remark that the modern church is institutional and its purpose, to a large extent, social service; and the phrase "centered on life," implies the purpose of the modern church to bring together and merge in one endeavor two kinds of service, the religious and the social, which perhaps can never be identical.

It would be over-emphasizing the social, if one took as a scale of measurement the fact that, of the ten chapters which Mr. Brabham devotes to interiors, one is on the auditorium, eight on the rooms for the educational and other uses of eight different age groups, and one on the parts of the church for social recreation. But it is notable that, in many of his floor plans, the auditorium occupies less space than the other parts. The old fashioned Protestant church is hardly anything else but an auditorium. "Auditorium" has a curiously uneclesiastical sound. Medieval churches, however, had this in common with these newer types, that the part intended for public worship was not the whole thing. This fact suggests that the modern Protestant churches are moving toward a recovery of that close association with everyone's everyday life, which the Catholic church has held to, and the Protestant churches have tended to some extent to lose. The movement seems to contemplate a church building which works week days as well as Sundays.

Any church building must be planned from the inside outward. The interior arrangements must be fairly settled before the exterior is seriously considered. It often happens that a building committee merely wants a building like some other they have seen, and the subsequent discoveries are unhappy both for the committee and the architect.

Mr. Brabham is peculiarly well equipped for producing a book on this subject. He has specialized in religious education, was for years chairman of the

architectural committee of one of the great denominational boards, and is now the official adviser of an architectural organization. His experience has been unusually wide, and his book should be found useful and practical, especially in regard to the parts of church buildings devoted to social and educational activities.

ARTHUR W. COLTON

### ENGLISH GOTHIC FOLIAGE SCULPTURE SAMUEL GARDNER

*English Gothic Foliage Sculpture.* 56, xvi pp. 112 plates. Cambridge. At the University Press. 1927. \$3.00.

MR. GARDNER has told in this excellent little book, equally valuable read as a whole or used as a reference work, the story of English medieval architecture in terms of the decoration of capitals. English foliage sculpture, with the exception of that on certain monuments of French influence of the Transitional period, is quite unrelated to that of the continent. This makes it possible to bring out more clearly here than in a book on architecture from a structural point of view or on figure sculpture, the national character of English medieval art and its autochthonous excellences of invention and decorative richness.

In brief, the account Mr. Gardner gives of this foliage sculpture is as follows. In late Saxon times there was a decline from the high standards of the work produced in the seventh and eighth centuries under a very complicated conjunction of influences from Ireland and the barbarian north on the one hand and on the other from the Byzantine East probably through Italy. With the arrival of the Normans came a brief coexistence of inferior Saxon foliage still delicate and autumnal and the crude geometrical capitals with their ponderous engineering. A brief interlude of use of the late French Romanesque and Transitional Corinthian types followed, especially at Canterbury. Finally there appeared toward the end of the twelfth century the stiff leaf foliage capital. The fourteenth century Decorated style with its crawling bulbous excrescences was essentially the ornament of a late Gothic style in which details were losing significance for themselves. Although it continued in the west of England through the Perpendicular period, in the east it disappeared all but completely as more modern preoccupations with abstract design and the possibilities of purely architectural embellishments such as moldings and panels



came in. Even where foliage sculpture continued to the end of the Middle Ages it became in the Perpendicular period formalized, square cut as by a cubistic convention, and chiefly used, not on architecture, but on the wood and alabaster accessories of architecture. In conclusion Mr. Gardner gives a brief discussion of the native and imported materials available to medieval English sculptors and illustrates their effect on the works produced with them.

Since this little book is likely to have for most architects its chief value in the plates and as a reference work, it has seemed desirable to the reviewer to give a rather full summary of the text. Unfortunately, lack of space prevents more being said concerning the gradual shift of emphasis in medieval style from the solution of engineering problems to the perfection of individual parts. For now that we no longer use the architecture of the past as a grab bag it can speak to us far more clearly than it could to the men of the nineteenth century; and on no problem more than on that of ornament have we need of the speech of the past.

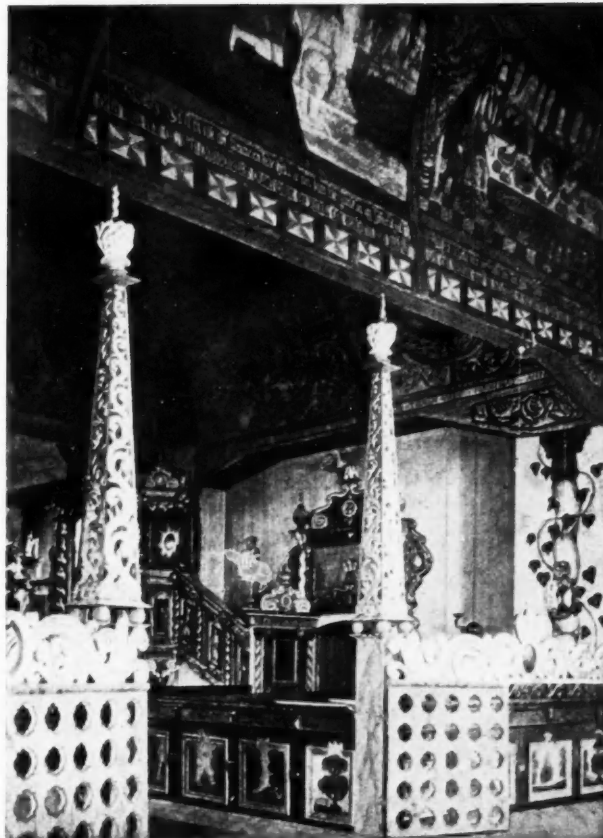
HENRY-RUSSELL HITCHCOCK, JR.

#### A CENTURY OF FINNISH CHURCHES

KLEMETTI, HEIKKI

*Suomalaisia Kirkonrakentajia (Finnish Church Builders)*, 1600-1700. Porvoo, Finland. Werner Söderström Osakeyhtiö. 4to. pp. 331. 4 colored plates. 704 illustrations.

FINNISH architecture reveals Swedish influence on the one hand, and to a smaller extent Russian on the other. It is difficult to state a definition of what is pure Finnish architecture, but out of the difficulty emerges one potent factor which is common to the other arts of Finland—nationality. Wood and granite are the materials of Finnish architecture and sculpture. Wood and granite are Scandinavian materials too, but the Finn has managed to make these his own in a particular way.



INTERIOR OF TORNION CHURCH, FINLAND  
From *Finnish Church Builders*

ample, the interior is heavily laden with decorative adjuncts—massive hanging metal candelabra and sculptured pulpit; painted altars and painted panelled ceilings, all thoroughly in the Baroque taste.

The most characteristic churches form two classes: those in which the tower forms part of the structure either as entrance or central feature, and those in which it is entirely separated from the structure itself, sometimes even divided by the road. Typically they are in three sections: tower, belfry and lantern with surmounting vane. The designs vary from the severe to the elaborate; the real Finnish style is seemingly derived from the conjunction of the Swedish campanulate form and the elaborated cupola of the Russian. In the less pure examples it is in the latter direction that decadence is noticeable.

So proud are the Finns of their churches and other works of art that extensive records have been kept of their building and their architects, and it is in the effective use of these that the immense value of this handsomely produced volume depends. Professor Klemetti has written a scholarly monumental national work which also has international interest for all lovers of the architectural arts.

KINETON PARKES

The country churches of the seventeenth century in Finland are almost all of wood, raised on a rough foundation of stone. The walls are palisaded logs on the outside and horizontal battens within, the lining serving no apparent structural function. The roofs are broken in a single plane or in ascending planes (in the latter case having heavy eaves) or else severely restricted to one steep barn-like piece with but little eave; steep in both cases to rid the heavy snows. Their weight is carried to the ground by columns, sometimes in evidence and decorated.

The interiors are generally of a homely character, occasionally enlivened by typical carving on the pew-ends, pillars, altar-rails and furniture. In other cases, however, Tornion being the most striking ex-

## FOREIGN PERIODICALS

Reviewed by Henry-Russell Hitchcock, Jr.

### ARCHITECTURAL MAGAZINES PUBLISHED IN HOLLAND

*Wendingen*, *Mondblad voor Bouwen en Sieren van Architectura et Amicitia*. Published by C. A. Mees. Santpoort, Holland, No. 11. Series 8. 1927.

The most sumptuous of Dutch architectural publications is *Wendingen*. Unfortunately, it is by no means entirely devoted to architecture; many of its numbers deal with painting, with natural forms related to the forms of modern art and especially with the arts of the theatre. But its large illustrations, its frequent plans and articles in various languages are of great interest. The well known large monograph on *Frank Lloyd Wright* was formed of a collection of *Wendingen* articles that appeared over several years. *Wendingen* has indeed been the chief organ for the Amsterdam school of architects who have owed in the development of their style nearly as much to Wright as to Berlage. The number here reviewed (the last devoted to architecture) contains a brief introduction in Dutch and many illustrations of buildings produced by the anonymous architects of the Amsterdam Public Works Office, admirably indicative of what is today the standard type of architecture in Holland.

The typography of *Wendingen*, designed by the well known Amsterdam architect H. Th. Wijdeveld, represents one of the earliest thoroughgoing attempts at making the form of a magazine harmonize with its contents.

i 10, *Internationale Revue*, edited by Arthur Müller Lehning, 48 Leidsche Gracht, Amsterdam.

i 10, like *Wendingen* is by no means entirely devoted to architecture. But since its architectural editor, J. J. P. Oud, is one of the foremost architects in Holland, its illustrations are of especial interest. It represents the strong international reaction in architecture against the free eclecticism of the early twentieth century and supports strongly the movement which has been described previously in these pages as that of the "New Pioneers," which in Holland may be called the Rotterdam-Utrecht School, as the other is the school of Amsterdam. In the July, 1928, issue there is an article on the *Palace of the League of Nations* by Mart Stam, the youngest and most intransigent of Dutch architects. He is at present engaged in important work on the enlargement of the city of Frankfurt in Germany. There is also a plan and photograph of a garage and chauffeur's house just built by the architect Rietveld of Utrecht, one of the most individual and least known of the younger architects of Holland. The use of a steel frame filled with black and white enamelled

concrete plaques of standard sizes represents a most individual experiment in the current attempt to solve the problem of surfaces in modern architecture.

The number for September includes plans, elevations and a perspective of Oud's project for the Rotterdam Stock Exchange with his description of it. The use of continuous bands of aluminum framed windows is effective and the relation of simple volumes is magnificently handled. There are also reports on an architectural congress held in Switzerland last summer and reviews of several valuable German books by van Eesteren, an architect of Utrecht, and a member of *De Stijl*.

The October number has an excellent article on America by a Detroit architect—Lönberg-Holm.

Fortunately the leading articles in this magazine, when not written in English as is the case of the last mentioned one, are at least summarized in English.

*De Stijl*. *Mondblad voor nieuwe Kunst, Wetenschap en Kultuur*. Editor Thèo van Doesburg, Villa Corot, rue d' Arcueil, Paris.

*De Stijl* is another magazine which is by no means wholly Dutch nor wholly devoted to architecture. But as among the group "*De Stijl*," the leader and the editor of the magazine is Dutch, Thèo van Doesburg, and as the *De Stijl* movement has had an important effect on architecture, it is well worth noticing here. Van Doesburg and his associates after the war made certain models of buildings in connection with their experiments in what they called Neo-Plasticist sculpture. These models influenced strongly the architects of the New Pioneers in Holland and Germany just as they were forming their style. The exact importance of this influence is difficult to judge but certainly the ideas of the men of *De Stijl* were infectious and aided powerfully in the establishment of a new architectural aesthetic. Among the early members of *De Stijl*, Oud and Rietveld have particularly distinguished themselves as architects.

Van Doesburg has always considered himself an architect as well as a painter. The last number of the magazine, 87-89, 1928, illustrates perhaps his most important work—the rearrangement and redecoration of the building known as L'Aubette at Strasbourg as a series of cinemas, dance halls, bars and tea rooms.

The number includes a history and description of the work at L'Aubette, an account of the theory of Elementarism (both in French) and a discussion of the effect of colors in space and time (in German).



A ROW OF WORKINGMEN'S DWELLINGS AT HILVERSUM, HOLLAND



Photo. Bonney

A DOORWAY IN AMSTERDAM, HOLLAND  
TYPES OF MODERN ARCHITECTURE IN HOLLAND

# LIST OF NEW BOOKS ON ARCHITECTURE AND THE ALLIED ARTS

COMPILED BY

PAULINE V. FULLERTON

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ARCHITECTURE, THE NEW YORK PUBLIC LIBRARY

## ARCHITECTURE

BENOIT, FERNAND.

*L'abbaye de Montmajour*. Paris: H. Laurens, 1928.  
95 p. front., illus., plans. 12°. (Petites mono-  
graphies des grands édifices de la France.) 6 fr. 726

Bibliography, p. 93.

A short history and description of this abbey in Pro-  
vence. Uniform with a long series, each volume of  
which is devoted to some individual French cathedral,  
church, chateau or monument. Good illustrations,  
including plans and details.

CLUTE, EUGENE.

*Drafting room practice*. New York: The Pencil  
Points Press, Inc., 1928. 8, 306 p. front., illus.,  
plans. 4°. \$6.00. 744

"The aim in preparing this book has been to assemble  
in convenient form such material as the reader might  
obtain if he were to visit a large number of the best  
architectural offices, have access to the files of drawings  
and talk with the architects and members of their staff  
about the ways in which they design buildings and  
make their presentation drawings and working draw-  
ings."—Introduction.

GROMORT, GEORGES.

*Le hameau de Trianon; histoire et description*. Paris:  
V. Fréal et Cie, 1928. 79 p. 47 pl. (incl. plans).  
8°. 60 fr. 724.144

A sketch of the social milieu of the period that pro-  
duced the "hameau" and of the individual buildings of  
the group. Illustrated by plans, photographs and draw-  
ings.

HALL, EDWARD HAGAMAN.

*A guide to the Cathedral Church of Saint John the  
Divine in the city of New York*. New York: The Lay-  
men's club of the Cathedral, 1928. 132 p. front.,  
illus. 16°. \$1.00 bound; 50 cents paper. 726.62

"Ninth edition."

A history and detailed description of the cathedral,  
with about 40 half-tone plates.

MACK, GERSTLE, AND T. GIBSON.

*Architectural details of southern Spain*; one hundred  
measured drawings, one hundred and thirteen  
photographs. New York: William Helburn, Inc.,  
1928. 4 p. front., 149 plates. f°. \$16.00. 729

"Chosen primarily from the point of view of their  
utility to the architect who undertakes to design mod-  
ern buildings based on Spanish prototypes."  
Renaissance architecture only is illustrated, the differ-  
ences between Italian and Spanish styles is stressed and  
local characteristics are emphasized. For each subject  
both photographs and drawings are used.

## ALLIED ARTS

BENOIST, LUC.

*La sculpture romantique*. Paris: La Renaissance du  
livre, 1928. 183 p. plates. 12°. (À travers l'art  
français.) 15 fr. 735

Bibliography, p. 170-183.

A useful record of the types of sculpture of the romantic  
period, and of the accessible works of its chief artists.

BERNARD, JOSEPH ANTOINE.

*Joseph Bernard*; soixante-huit reproductions.  
Notice par R. Cantinelli. Catalogue de l'oeuvre  
sculpté. Paris: G. van Oest, 1928. 55 p. col'd  
front., 69 pl. (one col'd). f°. 275 fr. 735

An appreciation of Bernard and a detailed catalogue of  
his works from 1880 through 1927.

BODE, WILHELM.

*Florentine sculptors of the Renaissance*; translated  
by Jessie Haynes; second edition revised by F. L.  
Rudston Brown. New York: Charles Scribner's  
Sons, 1928. xii, 258 p. front., 105 plates. 4°.  
\$10.00. 735

A series of essays on individual sculptors or special as-  
pects of Florentine sculpture, well illustrated and in-  
dexed.

BROWN, GERARD BALDWIN.

*The art of the cave dweller*; a study of the earliest  
artistic activities of man. With frontispiece in  
colour, 95 half-tone plates, 58 of which are from  
the writer's own negatives, 4 maps and 70 line  
illustrations. London: John Murray, 1928. xix,  
280 p. front., illus., maps. 4°. 18s. 709

A survey of primitive art from the point of view of  
anthropology, history, design and aesthetic value.

HALM, PHILIPP MARIA.

*Erasmus Grasser*. Augsburg: B. Filser Verlag  
G.m.b.H., 1928. 166 p. 96 plates. f°. (Deutscher  
Verein für Kunstwissenschaft, Berlin. Jahrgabe.)  
20 marks. 734

Bibliographical footnotes.

A documentary and critical study of the personality and  
work of this Late Gothic sculptor of Munich, with a  
series of large half-tone reproductions of his works.

HAVELL, ERNEST BINFIELD.

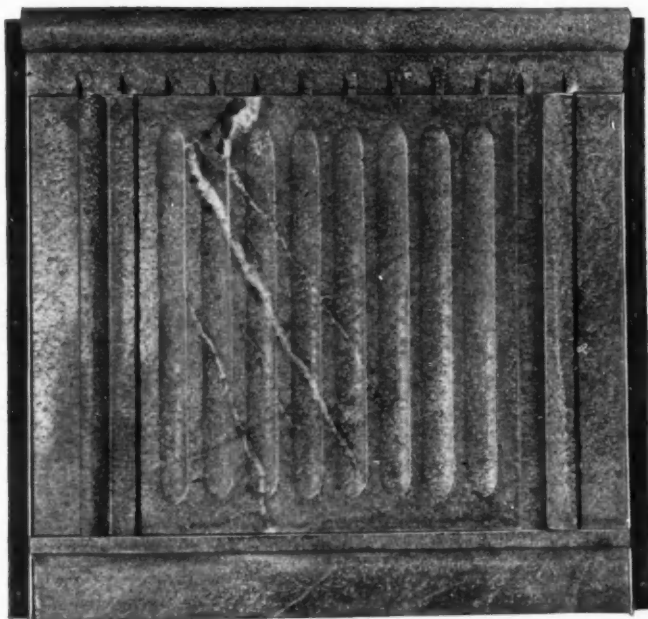
*Indian sculpture and painting*, illustrated by typ-  
ical masterpieces, with an explanation of their  
motives and ideals. London: J. Murray, 1928. 2 ed.  
xxiv, 288 p. front., illus., 78 plates. 4°. 42s. 709.5

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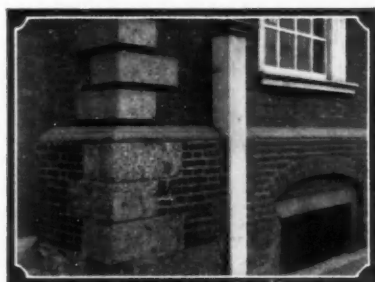
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# ALBERENE STONE SPANDRELS

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# AIRPORT DESIGN AND CONSTRUCTION (APPENDIX A)

(Continued from Page 515 of Editorial Section)

head clearance, with full-width door opening in either one or both ends or one or both sides, and with means for heating water and oil.

"(b) One or more *wind-direction indicators* as required for an 'A' rating, except that wind cone shall be not less than 9 feet long, 24 inches in diameter at the throat, and 10 inches in diameter at the tail.

"(c) *First aid equipment*, fire-fighting equipment, and a register as required for an 'A' rating. (The day marking telephone and transmission line poles and similar obstructions in the immediate vicinity of the airport as required for the 'A' and 'B' ratings are not required for either the 'C' or 'D' ratings, but are most urgently recommended.)

"(d) *Rest room*."

"'D' rating. Fields which do not possess sufficient general equipment to obtain 'A,' 'B,' or 'C' ratings, but which meet the basic requirements, will receive a rating of 'D' on general equipment."

2. LANDING FIELD RATING. "'1' rating. In addition to the basic requirements, an airport receiving a '1' rating on size of effective landing area shall have at least 2,500 feet of effective landing area in all directions, with clear approaches, and the field shall be in good condition for landing at all times; or it shall have landing strips not less than 500 feet wide, permitting landing in at least eight directions at all times, the landing strips not to cross or converge at angles of less than 40°, nor may any one of the landing strips be less than 2,500 feet in effective length, with clear approaches.

"By clear approaches is meant absence of buildings, towers, and other obstacles over which a seven to one glide or climb to or from the edge of the landing area would not be possible; also absence of smokestacks, towers, and high tension power lines which constitute menaces even though beyond the 7 to 1 ratio.

"'2' rating. In addition to the basic requirements, an airport receiving a '2' rating on size of effective landing area shall have at least 2,000 feet of effective landing space in all directions, with clear approaches, and the field shall be in good condition for landing at all times; or it shall have landing strips not less than 500 feet wide, permitting landing in at least eight directions at all times, the landing strips not to cross or converge at angles less than 40° nor any one of the landing strips to be less than 2,000 feet in effective length, with clear approaches; or it shall have two landing strips (one aligned with the general direction of the prevailing wind) permitting at least four-way landing at all times and having clear approaches, the landing strips to be at least 500 feet wide and not less than 3,000 feet in effective length and not to cross or converge at an angle of less than 60°."

"'3' rating shall meet requirements for '2' rating except landing area may be 1,600 feet and landing strips 2,500 feet effective length."

"'4' rating shall meet requirements for '2' rating except landing area may be 1,320 feet and landing strips 1,800 feet."

"'5' rating. Airports not having landing areas meeting the minimum requirements for a '4' rating, and which the Secretary of Commerce considers safe for the use to which they are being put, shall receive the rating of '5' on the size of their landing area."

"'o' rating. An airport which, in the opinion of the Secretary of Commerce, is unsafe for operation, but from which operations are nevertheless taking place and which requests a rating, will be rated 'o' on size of effective landing area."

3. LIGHTING EQUIPMENT RATING. "'A' rating. Airports receiving an 'A' rating on night lighting equipment shall have the following:

"(a) *An airport beacon*.

"(b) *An illuminated wind-direction indicator*.

"(c) *Boundary lights*. The outline of the usable portion of the landing area shall be shown at night by boundary lights spaced not more than 300 feet apart and served by an underground distribution system.

"(d) *Obstruction lights*. All obstructions on and in the vicinity of the airport shall be clearly marked with red lights of the same wattage or lumen output as the red lights specified for the boundary circuit.

"(e) *Hangar floodlights and roof marking*. The exterior surface of each hangar on the airport shall be floodlighted to an average intensity of illumination of at least 2½ foot candles. This may be accomplished by a system of at least 200-watt lamps with industrial reflectors, mounted about 10 feet above the surface and spaced on 20 foot centers in each direction on the roof and along the eaves and ends of the roof, or by the use of floodlight projectors giving this specified intensity of illumination. Such projectors shall be so installed as not to produce a glare that will interfere with planes using the airport. The hangar floodlighting equipment shall be lighted at times when night landings are being made.

"The exterior surfaces of the hangars, excepting roof-areas used as the background for air markings, shall be of such a color as to reflect not less than 50 per cent of the light.

"(f) *A ceiling projector* for the purpose of measuring the height of ceiling (clouds or fog).

"(g) *Landing area floodlight system*. This system, which may consist of one or more units, shall be such as to provide an even distribution of illumination (free from abrupt changes in intensity and from shadow areas) over the entire usable portion of the landing area. The usable portion of the landing field shall have an illumination of 0.15 foot candle.

"(h) *All-night operation of lighting equipment*. The airport beacon, wind-direction indicator lights, boundary lights, obstruction lights, and roof marking lights shall be kept burning all night (from sunset till sunrise) every night. (It is preferable that this equipment be kept burning from one-half hour before sunset until one-half hour after sunrise.)

"(i) *Night personnel*. Sufficient personnel shall be in attendance throughout the night for proper operation of the lighting equipment, for servicing aircraft, making minor repairs and giving weather



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Architect,  
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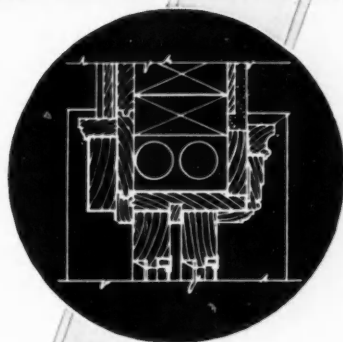
Prominent architects have counselled us in the design of Andersen Frames. Therefore, architectural requirements have inspired many of the superior features which these stock frames embody.

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service, and for operating the fire-fighting equipment."

" 'B' rating. Airports receiving a 'B' rating on night lighting equipment shall fulfil requirements for 'A' rating with the following exceptions:

"Only one hangar need be floodlighted.

"The illumination over the usable portion of the field shall equal 0.035 foot candle."

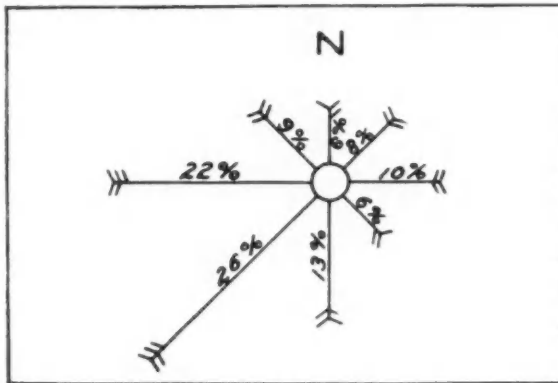
" 'C' rating. Airports receiving a 'C' rating on night lighting equipment shall fulfil the requirements for 'B' rating with the following exceptions:

"All night operation of lighting equipment as required for an 'A' rating. But attendance available on request only."

" 'D' rating. Airports not possessing sufficient night lighting equipment to receive a 'C' rating but which possess either an airport beacon or boundary light system, or both, together with an illuminated wind-direction indicator and adequate obstruction lights, will be given a rating of 'D,' provided all such lighting equipment is kept burning all night, every night."

" 'E' rating. Airports having the necessary night lighting equipment to meet the requirements of any of the above rating and which keep this equipment available for operation on request, but which do not give the all-night operation required for these ratings, will be given the rating of 'E' on night lighting equipment."

" 'X' rating. The rating of 'X' will be given to airports having no night-lighting equipment, or which do not provide all night operation of lighting equipment or which do not keep this equipment available for operation on request as hereinabove required."



A "WIND ROSE"

4. USE OF WIND ROSES. The "wind rose", which appears on sketches in the airway bulletins of the Department of Commerce, is a symbol used to indicate relative wind frequencies and average velocities at each airport or landing field shown. The lines radiating from the center show wind directions toward that center, the length indicating the relative frequency of the wind from the various directions. The number of barbs on the lines represents the number to be used in the Beaufort scale for ascertaining the average velocity in any particular direction.

In the wind rose shown, which is for Buffalo, N. Y., the highest prevailing wind is from the southwest. As shown in the sketch, the wind blows from

this direction 26 per cent of the time. The five barbs on this line indicate, as shown in the Beaufort scale, a velocity of from 19 to 24 miles per hour. The next highest wind is from the west, from which it blows 22 per cent of the time with the same average velocity. The lightest winds are from the southeast and from the north, their velocities being 8 to 12 miles per hour. These winds prevail 6 per cent of the time.

The preparation of a wind rose should be the first step in the design of any flying field. The design should then be prepared so as to conform to wind conditions as far as possible.

A night "wind rose" for the locality should be secured to assist in the laying out of the lighting installation. A night "wind rose" will often show an exactly opposite prevailing condition than is evident during daylight hours.

## APPENDIX B

The average plane, including needed space for lockers and work benches, occupies 500 to 1,000 sq. ft. (28 ft. by 36 ft. equals 1,008 sq. ft.) of floor area. Hangars vary in cost from \$1 to \$7 per sq. ft. of floor area of 500 to 7,000 per plane. The monthly carrying charge (interest, depreciation, repair taxes, etc., but no heat or service or land charge) would be about 1 per cent of the cost, or \$5 to \$70 per month. The depreciation and repairs would be less on the more expensive buildings but the obsolescence charge would have to be very much higher.

With such a wide variation in hangar costs and carrying charges it is apparent that a thorough analysis of cost factors in relation to hangar rents is imperative.

*Additional information on airport design and construction will appear in a later issue of The Architectural Record.*

### CALENDAR OF EVENTS

#### GENERAL ANNOUNCEMENTS

May 6-18	Boston Society of Architects Exhibition.
May 20-23	National Conference on City Planning. Twenty-first annual meeting, Buffalo and Niagara Falls, N. Y.
May 30	National Commemoration of Major Pierre L'Enfant and William Thornton, by Federal and State organizations devoted to architecture.
June 13-15	International Hospital Congress. Exhibit of plans and models of modern American hospitals. Atlantic City.
June 19-23	International Management Institute. Paris.
Sept. 12-19	International Housing and Town Planning Congress. Rome.
October 29- November 7	World Engineering Congress. Tokio, Japan.
Nov. 7-22	Excursion and inspection tours in connection with the World Engineering Congress.



# BUILDINGS THAT LAST



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## NEWS OF THE FIELD

THE executive offices of the American Institute of Steel Construction, Inc., are now located in the International Combustion Building, 200 Madison Avenue, New York City.

ALBERT KELSEY, technical adviser of the Pan American Union, sailed recently for Spain, where he will confer with the Spanish Permanent Committee and arrange for the Exposition of the designs submitted in the first Columbus Memorial Lighthouse Competition. They will also make arrangements for the entertainment of the International Jury. The Duke de Veragua is chairman of the Spanish Permanent Committee. The Spanish government has given fullest support to this project. The exhibition will be opened by the King, accompanied by the ambassadors and ministers of the Latin American republics who are stationed in Madrid. Twenty prize designs will be chosen. The designers of ten of these are to re-compete. The final judgment will be made under the auspices of the Government of Brazil in Rio de Janeiro after a lapse of a year.

ALAN WOOD STEEL COMPANY, formerly Alan Wood Iron and Steel Company, has announced its change in corporate name. General offices of the company have been removed to plant headquarters, Ivy Rock, Pa., fifteen miles north of Philadelphia. The post office, express, and telegraph address is Conshohocken, Pa. A district sales office will be maintained at Room 1820, Widener Building, Philadelphia. The company continues under the same management.

THE MILLER COMPANY of Meriden, Conn., announces the opening of a New York office and showroom in the Scientific American Building, 24 West 40th Street, between Fifth and Sixth Avenues. The showroom contains a complete display of the Miller products. The company was founded in 1844 and pioneered in the manufacture of kerosene lamps and gas lighting equipment in pre-electrical days.

A NEW educational motion picture entitled "Modern Manufacturing with a 'Stable-Arc' Welder," has been released by The Lincoln Electric Company of Cleveland, Ohio. The picture portrays the advantages of arc welding and the widespread possibilities of its application. The film is purely technical, advertising having been kept out of it. It is offered for showing by the company without charge.

THE NEWPORT BOILER COMPANY, manufacturers of magazine feed buckwheat burning boilers for homes and buildings, announce the opening of an office in Philadelphia, Pa., at 1600 Arch Street.

THE PENNSYLVANIA-DIXIE CEMENT CORPORATION plant of Kingsport, Tenn., has been awarded the Portland Cement Association Safety Trophy for operation during 1928 without a lost-time accident to any employee. The plant functioned without a lost-time accident not only during the year but for 486 consecutive days, according to Blaine S. Smith, president.

THE ARMSTRONG CORK COMPANY announces the consolidation of the offices of all divisions at Lancaster, Pa. The general office of the company and all executive offices, including those of the Cork Division and of the Armstrong Cork and Insulation Company, were affected by the change. The purchasing department will remain in Pittsburgh.

THORNTON LEWIS of Philadelphia, Pa., was elected president of the American Society of Heating and Ventilating Engineers during the 35th annual meeting, held in Chicago. Mr. Lewis has been a Council member of the organization for six years, working on technical research, finance and executive committees. He is the developer of the Lewis Control System, a master electric controller for operating a large number of electrically driven pumps.

KEWANEE BOILER CORPORATION announces the removal of their Chicago office to 1858 South Western Avenue.

THE following will serve as officers of the Stedman Products Company, South Braintree, Mass., during this year: Herbert O. Phillips, president; Merton A. Turner, first vice-president; Walter W. Rowse, second vice-president; James J. Finnie, treasurer; George W. Bailey, secretary.

THE RIC-WIL COMPANY announces the opening of two new direct factory branch offices, one in Chicago, Ill., and one in Baltimore, Md. Ralph E. Sutherland and Fred G. Austin will be in charge of the Chicago office at 724-725 Harris Trust Building, 111 West Monroe Street. The Baltimore office, 517 Garrett Building, will be under the management of Louis G. Vance. The home office of the company is in Cleveland, Ohio. Other branch offices are located in New York City under direction of C. W. Lemmerman, and in Atlanta, Ga., R. V. Klein, manager.

ANNOUNCEMENT is made of the merger of A. W. French and Company of Chicago with Blaw-Knox Company of Pittsburgh and its subsidiaries. The personnel and policies of A. W. French and Company will remain unchanged. Its plant and sales organization will function as a separate division of Blaw-Knox Company.

A RECENT association of interest in the building field is the merger of Hoggson Brothers of New York and Chicago and The Dresser Company of Cleveland. Hoggson Brothers, for the past thirty-five years, have specialized in the design and construction of bank buildings. The Dresser Company has been engaged in commercial and industrial structures. In addition to offices in New York, Chicago and Cleveland, an office will be maintained in Pittsburgh, Pa., and one in Charlotte, N. C.

READING IRON COMPANY, Reading, Pa., announces the establishment of a district sales office in New Orleans, La. George E. Tyson, formerly of the Reading district, will be in charge of the new office with headquarters at 1216 Hibernia Bank Building.