

The ARCHITECTURAL RECORD

Vol. LII
No. 2

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Serial
No. 287

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PUBLISHED MONTHLY BY
THE ARCHITECTURAL RECORD COMPANY
115-119 WEST FORTIETH STREET, NEW YORK

T. S. MORGAN, Pres.
E. S. DODGE, Vice-Pres.

M. A. MIKKELSEN, Vice-Pres.
J. W. FRANK, Sec'y-Treas.

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86^a

PLATE I—Represents the cornice model of a building recently designed. It illustrates the practical application in a modern work of the principles explained by Leon V. Solon in his treatise on architectural polychromy, published in this magazine. The value of the Greek method of color alternation is demonstrated, as is also the value of the Greek method of color separation by means of the decorative color fillet. The color values of the various members treated are graduated in strength from top to bottom. The ornamental contrast introduced in the color design of the torus molds follows the Greek precedent which is so admirably carried out on the Treasury of Gela. The structural material is a stone of an orange buff tone.



PLATE I—POLYCHROME TREATMENT OF THE CORNICE OF A BUILDING
NOW UNDER CONSTRUCTION



PLATE II—CAPITAL AND PILASTER CAPITALS OF THE SAME BUILDING

PLATE II—The Ionic capital is colored with red, dark and light blue, black, buff and gold. The gold encircles the collar of the shaft and extends a short distance down the flutes; the eye of the volutes is solid gold. As the pilaster caps are not structural members, but are essentially ornamental features, it was permissible to develop polychrome effect to the maximum extent; the colors are the same as on the capital.

c:
86



EXTERIOR VIEW—RESIDENCE OF COLONEL
MICHAEL FRIEDSAM, NEW YORK CITY.
FREDERICK G. FROST, ARCHITECT.

87.

The
RESIDENCE of COLONEL MICHAEL FRIEDSAM
NEW YORK CITY. FREDERICK G FROST. *Architect*

By
Matlack Price

THE city house of today, a complex problem in planning under ordinary conditions, has enlisted the best efforts of the most capable of our architects for some years past. Through many stages of evolution the city house shed its earlier stupid planning, and realized a maximum of space and light—the two essentials—at the same time experiencing a steady change for the better in appearance. Poor economy of space and general lack of ingenuity and resourcefulness made the average city house of two score years ago a sorry architectural compromise.

Today the situation is different. The architect has triumphed over the inherent limitations and restrictions of the problem so completely that he is in a position to concentrate further resourcefulness and vision upon special requirements.

Such an opportunity was offered to Mr. Frederick G. Frost in designing a city house for Col. Friedsam, to house one of the greatest and finest private collections of paintings and other works of art in America. And not only was this collection to be housed, but the necessary galleries were to be a part of the house—not a formal, detached private museum. The fact that Col. Friedsam lives with his treasures, and humanly enjoys them as an intimate part of his life, was to be expressed in the design.

With this, a certain architectural dignity, even conventionality, was to be attained, and the illustrations give some idea of the success with which the architect's effort was rewarded.

From the street, the house presents an effect of the utmost restraint, being designed in the Italian manner, which has proved so pleasantly adaptable for urban use. There is, in this façade, an expression of the fact that there are important rooms on the *premier étage*, but the fact

is not exaggerated, or even entirely disclosed. There is, on the other hand, that non-committal, ultra-formal air which has come to mean good taste in city architecture. To achieve this, and at the same time to avoid the commonplace or the totally inexpressive, is not so easy as it looks, or the product of such a facile absence of effort as deceptively suggests itself at the first glance.

Within the Tuscan entrance, a grille and door of wrought iron admit one to the main foyer, where an impressive flight of stairs leads directly up to the galleries on the *premier étage*. These doors, as well as the wrought iron railings of the stair-well above, are from the forge of that remarkable metal-working genius, Samuel Yellin of Philadelphia.

The foyer hall, designed primarily for the display of tapestries, is of ashlar Rosata marble, and the entire treatment is of a splendid simplicity and restraint. From this hall the stairway carries directly up into the center of one of the spacious picture galleries.

These galleries, coming, as they do, between the entrance and the living rooms of the house above, are designed to eliminate the cold informality of the usual picture gallery, and seem, to a great extent, to have accomplished that end.

Fulfilling their purpose as picture galleries, they are pleasantly free from austerity, yet provide a maximum of unobstructed wall-space, and while they are harmoniously related *en suite*, they avoid the danger of monotony by means of different wainscot and cornice treatments. The center gallery is lighted from the base of the light court, and the front and rear galleries also share some of this, in addition to the light from the tall windows at the front and rear. The wainscotings are of walnut, and the walls covered with Rembrandt velours, which has been found



ENTRANCE DETAIL—RESIDENCE OF COLONEL
MICHAEL FRIEDSAM, NEW YORK CITY.
FREDERICK G. FROST, ARCHITECT.

to be one of the best possible backgrounds for paintings.

Above the floor occupied by this suite of galleries, the stairs are planned at the sides, in order that the spacious effect shall not be impaired. The hallway on the third floor, which is reached by this stair, is a pleasantly modified type of Italian treatment, made additionally interesting by the utilization of Col. Friedsam's antique painted glass of the 13th, 14th and 15th centuries. Swiss painted glass of the 17th century is effectively utilized in the same way in the corridor which gives access from the hallway to the rear part of the floor. The entire width of the house on this floor is given up to a great living room of which the central feature is the chimney

piece, a replica, executed by Hughes Tallemont, of the 16th century example in the Musée de Cluny in Paris. As one of the main purposes of this living room is a further display of paintings, the walls are covered with the same material used in the galleries.

So much for the tangible facts of the principal points of the house. A study of the block plans will give a perfectly adequate picture of the remaining facts of the plan, from the first to the fourth floors. The fifth and sixth floors contain the usual extra bedrooms, and accommodations for the servants.

What, further, of a nature not so tangible has the architect accomplished? He has rendered, certainly, the maximum of an architect's function to his client. The manifold conveniences, the innumerable ingenuities and devices of planning are,

as usual, taken for granted, and are not apparent in the photographs of the finished work. They are, to be sure, definite facts in the fabric of the house as a whole, and few architects expect or wish special commendation for achieving the

things that are taken for granted.

But upon a foundation of mechanical, and perhaps routine, coördination of countless material items of plan and equipment, the architect has built values of a purely architectural nature.

He has achieved an expression of the owner's tastes and personality, of dignity and simplicity, in the setting for a famous and priceless collection of the best of the world's art of other ages and countries.

It is an unfortunate fact, so far as public education

is concerned, that the most intelligent and constructive criticism of architecture is likely to come only from architects. And professional etiquette builds its inevitable wall of restraint about their utterances. There are so many angles from which to criticize architecture, or to comment upon it, that the undertaking is one that is peculiarly baffling to the lay critic. An academic professor of architecture, whose detailed erudition far outruns his first-hand knowledge of actual architecture, might learn an astonishing amount if he could but spend a few months in the draughting room of a large architectural office. There the casual conversation of the draughtsmen, as they ply the T-square and pencil, especially the "veterans," abounds in keen and incisive criticism of the first water. If a building



DETAIL OF IRON ENTRANCE DOOR.



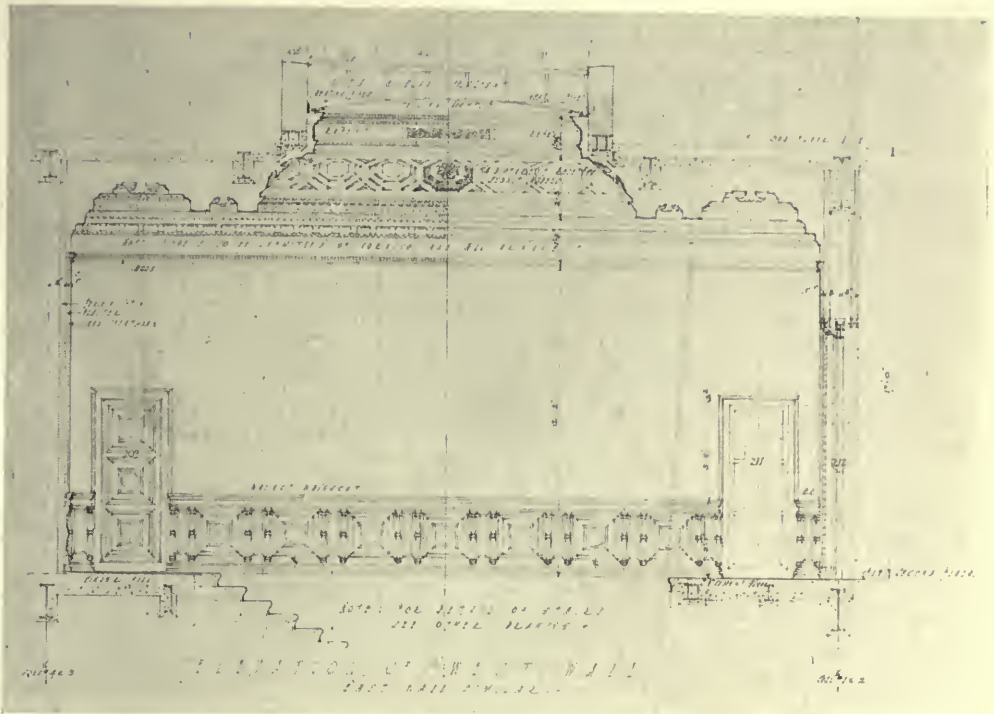
MAIN HALL, WITH GRILLE AND TAPESTRY—
RESIDENCE OF COLONEL MICHAEL FRIEDSAM, NEW
YORK CITY. FREDERICK G. FROST, ARCHITECT.



STAIRWAY FROM FIRST TO SECOND FLOOR—
RESIDENCE OF COLONEL MICHAEL FRIEDSAM, NEW
YORK CITY. FREDERICK G. FROST, ARCHITECT.



DETAIL OF MAIN HALL—RESIDENCE OF
COLONEL MICHAEL FRIEDSAM, NEW YORK
CITY. FREDERICK G. FROST, ARCHITECT.



ELEVATION OF WEST WALL—RESIDENCE OF COLONEL MICHAEL FRIEDSAM,
NEW YORK CITY.

Frederick G. Frost, Architect.

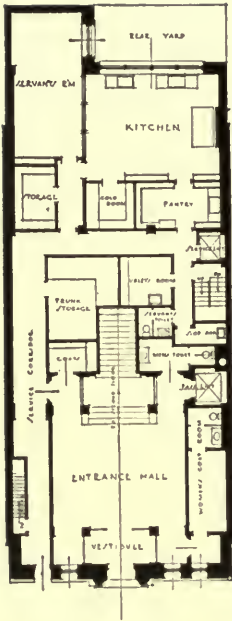
under discussion has in it any hidden insincerity, any cleverly concealed inaptitudes, the draughtsman is quick to detect them and name them, free from the unwritten convention of professional etiquette which forbids the unreserved comment of the practicing architect. And the recognition of merit is as unerring and as freely given by the draughtsman as his commentary on faults.

The point of this digression is a real one and an important one. There are many features of this city residence for Col. Friedsam which could be fully appreciated only by architects or designing draughtsmen. They see any building first from the angle of the problem involved, then from the angle of its solution. The lay critic seldom thinks of a building as a problem, and thinks of it subjectively rather than objectively. If he sees in it anything of the problem, it is in a remote and impersonal way, and not in the definite way necessitated by having to solve

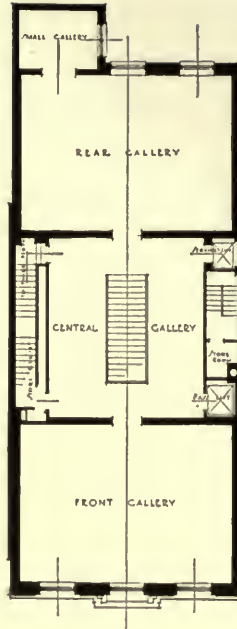
the problem and work out the design.

The most conspicuous problem presented by the city house illustrated in these pages consisted, obviously, of the planning and treatment of the picture galleries in such a manner as to relate them to the house as a whole. The value and importance of the works of art for which the rooms were planned made it necessary to subordinate certain features of the house because the galleries are more important than anything which could have taken their place. The disposition of all the other rooms in the house will be seen to be governed by the galleries as the main and central fact. To have arranged the plan otherwise could have been, at best, but a compromise with the fundamental requirements of the owner.

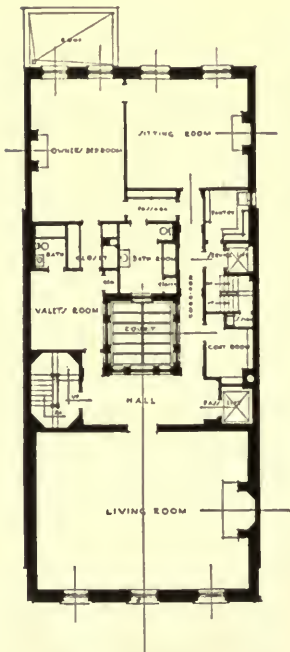
The dignified simplicity of the exterior adds further corroboration to the writer's belief that the days of showy and ostentatious residential architecture are on the wane, if not actually gone. The same



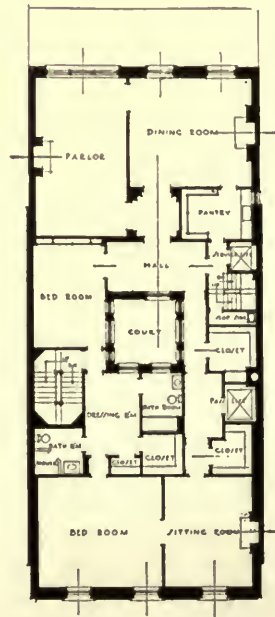
FIRST FLOOR PLAN



SECOND FLOOR PLAN



THIRD FLOOR PLAN



FOURTH FLOOR PLAN

RESIDENCE OF COLONEL MICHAEL FRIEDSAM, NEW YORK CITY. FREDERICK G. FROST, ARCHITECT.



FRONT GALLERY ON THE SECOND FLOOR—
RESIDENCE OF COLONEL MICHAEL FRIEDSAM, NEW
YORK CITY. FREDERICK G. FROST, ARCHITECT.



CENTER GALLERY ON THE THIRD FLOOR—
RESIDENCE OF COLONEL MICHAEL FRIEDSAM, NEW
YORK CITY. FREDERICK G. FROST, ARCHITECT.



LOOKING FROM FRONT GALLERY, ACROSS STAIR-
WELL INTO REAR GALLERY, ON SECOND FLOOR—
RESIDENCE OF COLONEL MICHAEL FRIEDSAM, NEW
YORK CITY. FREDERICK G. FROST, ARCHITECT.



REAR GALLERY ON THE SECOND FLOOR—
RESIDENCE OF COLONEL MICHAEL FRIEDSAM, NEW
YORK CITY. FREDERICK G. FROST, ARCHITECT.



DETAIL OF STAIR NEWEL—RESIDENCE OF
COLONEL MICHAEL FRIEDSAM, NEW YORK
CITY. FREDERICK G. FROST, ARCHITECT.



HALLWAY ON THE THIRD FLOOR—RESIDENCE
OF COLONEL MICHAEL FRIEDSAM, NEW YORK
CITY. FREDERICK G. FROST, ARCHITECT.



HALLWAY ON THE THIRD FLOOR—RESIDENCE
OF COLONEL MICHAEL FRIEDSAM, NEW YORK
CITY. FREDERICK G. FROST, ARCHITECT.

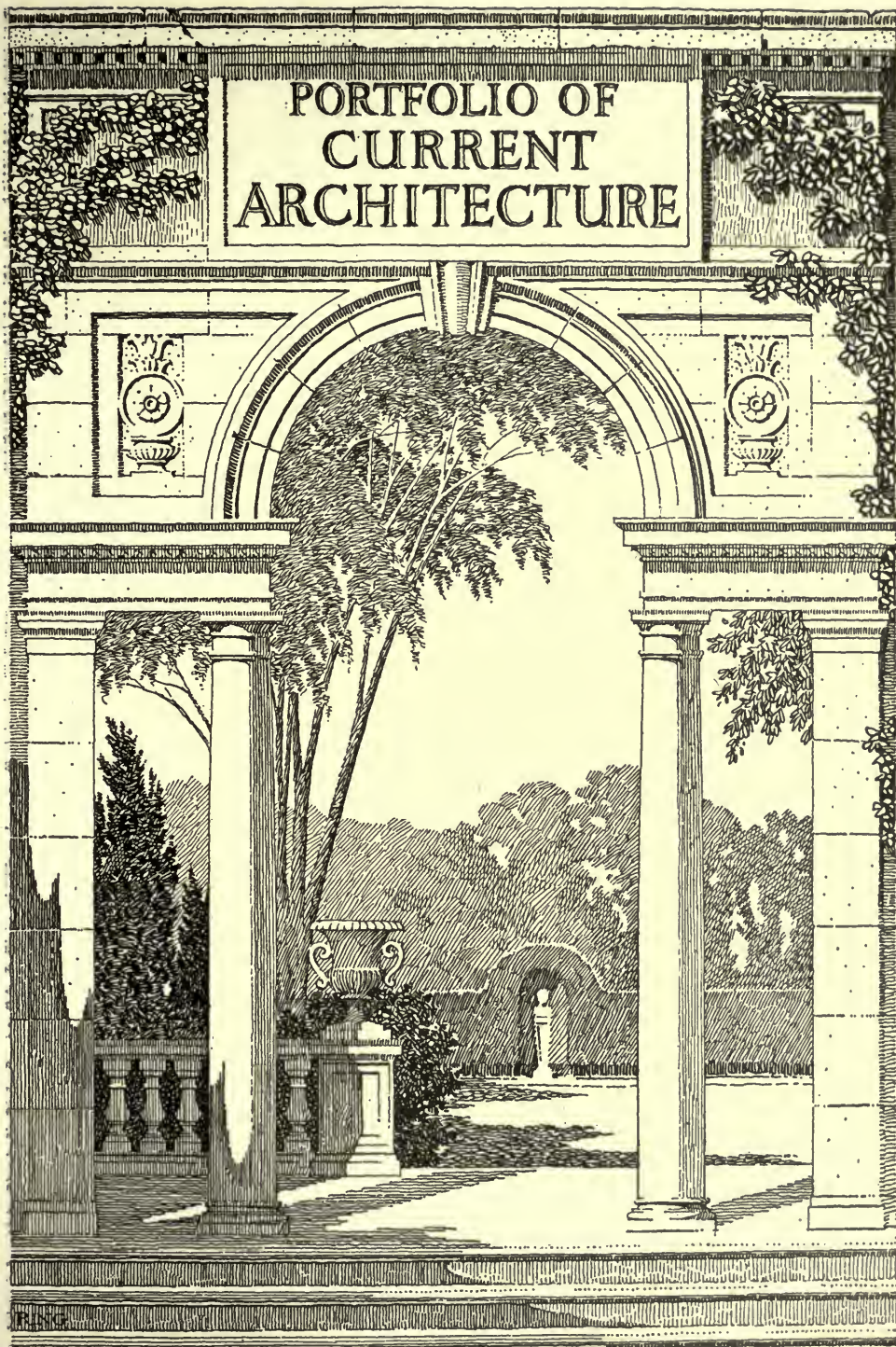


LIVING ROOM ON THE THIRD FLOOR—RESIDENCE OF COLONEL MICHAEL FRIEDSAM,
NEW YORK CITY.
Frederick G. Frost, Architect.

tendency was apparent in the large but admirably unostentatious town house of Mr. Thomas W. Lamont, by Walker & Gillette. It seems that there is a definite move away from the old idea of effecting in terms of architectural elaboration an expression of every dollar expended upon the house. Expenditure is managed nowadays with much better taste, and the pure architectural rendering of the dwellings of wealthy Americans seems full of a new promise. Architecture no

longer need attempt to perform functions outside its proper esthetic scope, and the architect has a new freedom in expressing architecturally only such aspects of a building as are the most appropriate and the most essential.

Good taste and good judgment alike forbade the architect of Col. Friedsam's house to put his architecture in competition with the works of art for which it is properly no more than a beautifully suitable and adequate setting.





GENERAL VIEW—FIRST NATIONAL BANK, JERSEY CITY, N. J. ALFRED C. BOSSOM, ARCHITECT.



LOWER PORTION OF ENTRANCE FAÇADE—FIRST NATIONAL BANK, JERSEY CITY, N. J. ALFRED C. BOSSOM, ARCHITECT.



PART OF MAIN BANKING HALL—FIRST NATIONAL BANK, JERSEY CITY, N. J. ALFRED C. BOSSOM, ARCHITECT.



MANTEL IN DIRECTORS' ROOM—FIRST NATIONAL BANK, JERSEY CITY, N. J. ALFRED C. BOSSOM, ARCHITECT.



ENTRANCE TO THE VAULT—FIRST
NATIONAL BANK, JERSEY CITY, N. J.
ALFRED C. BOSSOM, ARCHITECT.



DOORWAY IN DIRECTORS' ROOM—
FIRST NATIONAL BANK, JERSEY CITY,
N. J. ALFRED C. BOSSOM, ARCHITECT.



WESTBURY CHAPEL, WESTBURY, LONG ISLAND. JOHN RUSSELL POPE, ARCHITECT.



WESTBURY CHAPEL, WESTBURY, LONG
ISLAND JOHN RUSSELL POPE, ARCHITECT.



WESTBURY CHAPEL, WESTBURY, LONG ISLAND. JOHN RUSSELL POPE, ARCHITECT.



RESIDENCE OF MRS. J. H. ALEXANDER, GLEN HEAD,
LONG ISLAND. WARREN & CLARK, ARCHITECTS.
MARIAN C. COFFIN, LANDSCAPE ARCHITECT.



DETAIL OF ENTRANCE—RESIDENCE OF MRS.
J. H. ALEXANDER, GLEN HEAD, LONG
ISLAND. WARREN & CLARK, ARCHITECTS.



DETAIL SHOWING THE WELL—RESIDENCE OF MRS. J. H. ALEXANDER, GLEN HEAD, LONG ISLAND. WARREN & CLARK, ARCHITECTS. MARIAN C. COFFIN, LANDSCAPE ARCHITECT.



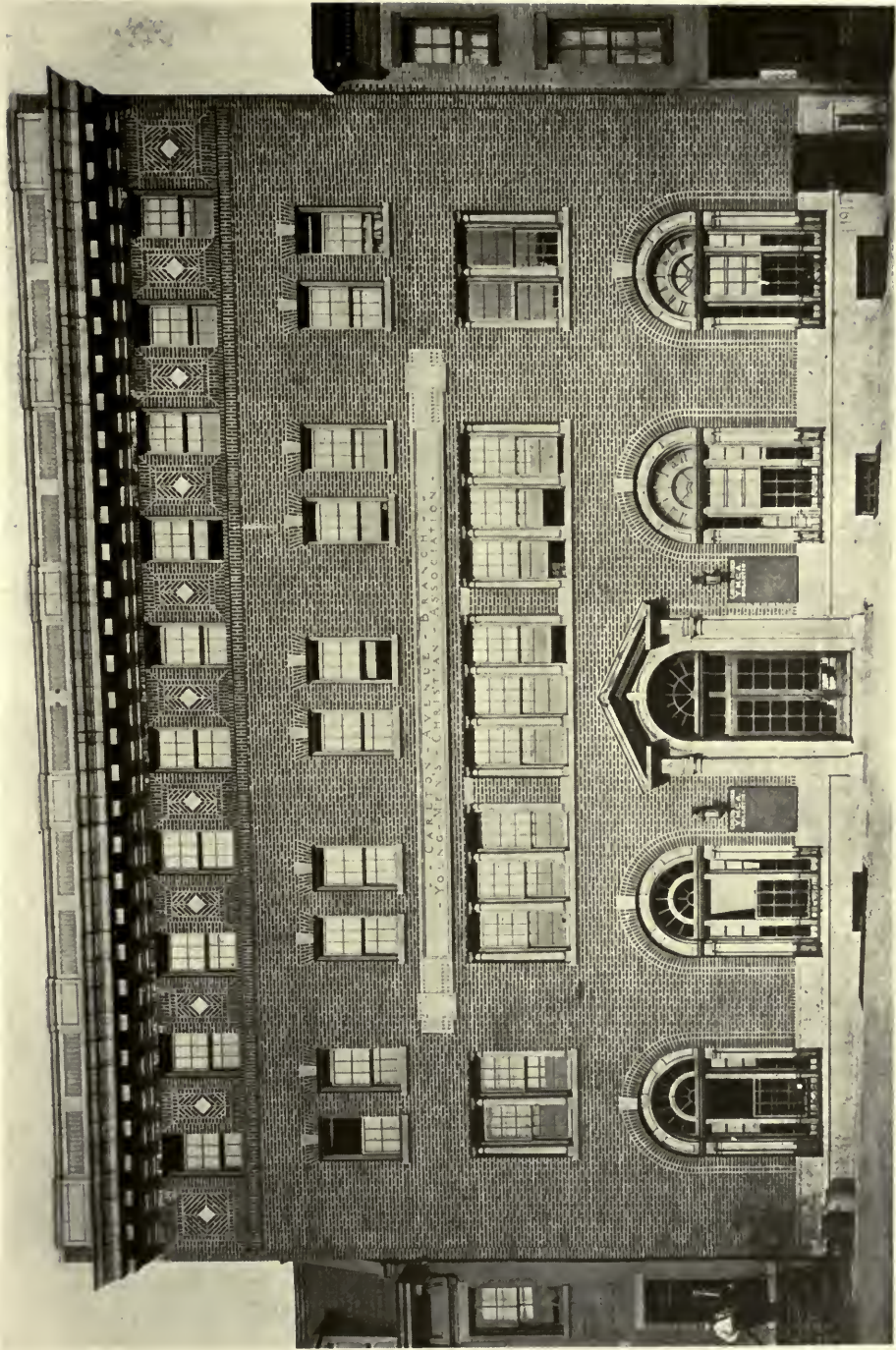
THORNTON-SMITH CO. STORE, TORONTO, ONTARIO. INDIANA
LIMESTONE FAÇADE. JOHN M. LYLE, ARCHITECT.



BARNS—ESTATE OF E. S. CLARKE, ESQ., COOPERSTOWN,
N. Y. FRANK V. WHITING, ARCHITECT.



FARM BUILDINGS—ESTATE OF E. S. CLARKE, ESQ.,
COOPERSTOWN, N.Y. FRANK P. WHITING, ARCHITECT.



CARLTON AVENUE BRANCH Y. M. C. A., BROOKLYN,
N. Y. LUDLOW & PEABODY, ARCHITECTS.



RESIDENCE OF MRS. MARY MCKELVEY, SPUYTEN
DUYVIL, N. Y. JULIUS GREGORY, ARCHITECT.

The Fifty-Fifth Annual Convention of The A. I. A. ~



By Harvey Wiley Corbett

Important things with a national or international influence are apt to seem uninteresting. This is true of the deliberations of architects as of other assemblages. The discussion of a projected idea of even such potential importance as the improvement of living conditions is, on the face of it, apt to be something of a bore.

One would not, therefore, expect to find that part of the annual convention of the American Institute of Architects (Chicago, June 7, 8, 9) which was devoted to the routine business of the convention, to have been of a lively character. But beyond all doubt, it demonstrated the increasing national influence of the architect.

Like many other organizations in recent years, the Institute has emerged from the status of a small and strictly professional body into spheres of national influence. Upon its members rests a national responsibility. It will be called upon more and more to establish broad principles for the improvement of housing, living and working conditions in America.

What influence will the convention have upon the art of architecture? What change or improvement will it effect in the architecture of America? The answer, of course, is one of opinion. But to my mind its most important result in this respect lies in unifying the art effort of the profession. Its real value lies in the association of its members with one another, in bringing the Eastern, Mid-Western, and Western men together, and in encouraging the interchange of opinions and ideas. This result is reached more through the informal contacts than in

the deliberate proceedings. It is obtained not through a single convention, but through the constant association of ideas. In a word, it standardizes the architectural opinion of America.

This standardization of architectural opinion can be illustrated: The direct act of the American Institute of Architects, in awarding the medal of the Institute to Mr. Henry Bacon, architect of the Lincoln Memorial, places the highest stamp of approval upon that work as a perfect piece of architecture. The Lincoln Memorial is a very striking example of rigidly classic architecture. The award, therefore, stamps the tendency of American architects towards the conservative. This judgment is buoyed up by foreign opinion. By foreign architects, America, although a young and vigorous nation, is regarded as essentially conservative in architecture. To the Bolsheviks in architecture we are reactionaries.

What influence is the convention calculated to have on the practice of architecture? I cannot better illustrate my impression than to state that the report of the Committee on Education is the most important feature of the Convention. I earnestly advise members to read it carefully, if they have not already done so. The effort taken to surround the teaching of architecture with conditions that cannot fail to help students, to increase the preliminary cultural work, and to raise the standards of instruction, must have a nation-wide influence. To carry out this program, Mr. C. Howard Walker, of Boston, was engaged to visit faculties of colleges throughout the United States, and personally address

them to the end that the university faculties themselves may carry forward the many broad aims of the Committee on Education. The direct personal missionary work among the faculties themselves by a man of Mr. Walker's calibre, is bound to have a lasting influence.

I may mention another phase of the influence of the Convention upon the practice of architecture. And in referring to the Convention I include the movement which it represents and inspires. The American Federation of Labor agreed to abide by the decisions of the Board of Jurisdictional Awards, on which member of the American Institute of Architects sits. I might illustrate this by the question of such a thing as pipe railings. Who should put these on? The plumber, the steamfitter, or the ironworker? Frequently a dispute of this kind had resulted in all the men going on a strike. A number of awards have been made in questions of this kind, and the Unions have abided faithfully by them.

The question was raised: was the American Institute of Architects deciding an issue between labor and the open shop? The answer was no, because the issue only arose where Union labor was concerned, and the question was, which men of several Unions should handle the work in question.

It is not possible to touch upon all phases of the Convention, upon the exhaustive and careful reports that were submitted by the Committees or the work that underlies them. I can only here mention the spirit of the Convention. Community planning, structural service problems, war memorials, registration of architects and coöperation with the Fine Arts Commission, Education and many other topics were reported by the Committees.

Now as to public welfare. It has been demonstrated beyond any doubt that the Institute has taken up a definite ideal of service. I might illustrate this by the work of the Small House Bureau, which is undertaking to standardize plans, to direct, help, and improve the very small-

est simple type of dwelling. As a whole, the American Institute of Architects represents the cream of the architectural profession of America. Its endeavor to standardize the movement for the beautification and improvement of small homes may be compared to the effort that would be put forth if the most expensive Fifth Avenue tailors were to concentrate their endeavors towards improving inexpensive ready-to-wear clothes.

A year ago the Institute received twenty-five thousand dollars from an anonymous donor to be devoted to the cause of architectural education. For a long time it was not found from whom the money came. In Chicago it was announced that Mr. D. Everett Waid, the architect, who is known to every member of the A. I. A. for his devoted spirit of service, had made the donation. Architects are not rich men. This donation certainly meant a greater sacrifice to the architect than a million dollars would have meant to a Rockefeller, and it certainly meant more to the Institute than a million dollars would have done. Yet only a few years ago "Joe" Cannon got up in Congress and asked, "What is an architect?"

In concluding, I may say that the attitude of the Institute toward this question of service and its cheerfully self-imposed obligation to the community, recalls a story.

From the South not long ago I received a letter from an ambitious and really talented young architect who had been in some of my courses at Columbia. He outlined his plans and work quite fully, and concluded by asking, "Would you advise me to join the American Institute of Architects? What can I get out of it?"

The question was a poser. At first I was at a loss as to how to answer him. But when I cogitated upon the spirit of service that animates the Institute, the answer came readily enough—"It is not what you can get out of the American Institute of Architects that counts; it's what you put into it."

The EARLY ARCHITECTURE of PENNSYLVANIA

PART XIII - Ironwork



By A. LAWRENCE KOCHER

“**T**HY God bringeth thee into a good land,” wrote William Penn, “of brooks of water, of fountains and depths that spring out of valleys and hills, a land whose stones are iron, and out of whose hills thou mayst dig brass.” A continued encouragement was given by Penn to the rumors of “minerals of iron and copper in divers places.” “I am glad,” he writes to his secretary, James Logan, “that mines so rich are so certainly found, for that will clear me of all other encumbrances, and will enable me to reward those that have approved themselves faithful to me and my just interest.” Penn had iron beds of his own at Hawkshurst in England and appreciated the significance of the discovery. The first iron works in Pennsylvania was established in 1716 by an English Quaker and ironsmith, Thomas Rutter, who built a forge on Manatauny Creek, near Pottstown. It was not long before the province was dotted with forges and furnaces, busily smelting the newly discovered iron deposits into square bars of pig iron and rounded “blooms”. These products were transported by wagons and animal-back to Reading, Lancaster, Philadelphia and other towns for the purpose of manufacturing and for export to England.

Having been thus favored by circumstance with an almost unlimited wealth of iron ore, it is to be expected that the province would contribute materially to the host of industries and crafts that are dependent upon this metal for their prosperity.

The manufacture of hand-wrought nails was one of the first activities to come into flourishing existence. We are told that the aggregate of nails produced throughout the Province, in small nail-

eries conducted by common blacksmiths or others, was probably very considerable. It was one of those branches in which the country earliest became independent of British supplies.*

Iron entered into the making of many other local needs, including bolts, straps, hinges, anchors and implements for tilling the soil. Of more special interest to us now are such products of the blacksmith's hammer as wrought iron railings and grilles and fireplace fittings. These possessed, in a large degree, a rare attractiveness which raises them above the merely utilitarian or the commonplace. The exact nature of this contribution was expressed in terms of craftsmanship, so that it will be proper to dwell somewhat upon the peculiar characteristics and aims of the art.

The success of true craftsmanship resides in the fitting union of utility and beauty. Neither utility nor beauty can be an end in itself—a point of view often overlooked in these days when the artist is so seldom the craftsman. We have come to look upon use and beauty as an “unnatural bondage”. The acute specialization in art, as in many other items of our living, has tended to place art on a higher plane, as something beyond and distinct from the more utilitarian and plebeian (by implication) crafts, and has created the term “fine arts.”

The design of a chair or a piece of iron work should be associated with the execution of that design, for it is an axiom in art that both the conception of a design and the work necessary to execute it should be done by the same individual. “Decoration is the most natural expression of an artist's feeling for his

*J. L. Bishop, “A History of American Manufacture from 1608-1860,” p. 143.



WROUGHT IRON HAND RAIL—SOUTHEAST CORNER OF SEVENTH AND SPRUCE STREETS, PHILADELPHIA.

material; it is vitalized by energy which is behind the tool, and is addressed to the senses of seeing and feeling.”* Only in this way can the propriety and suitability of a wrought design to its location be achieved. As Ruskin has pointed out, “the greatest art in the world was done for its place and in its place.” The art of iron working is utilitarian in its aims, but it achieves beauty from its suitability and from what is known as the joy of creative work.

The fashioning of wrought iron is as direct as the efforts of the sculptor with clay. The results are achieved by a personal or individual touch that in no sense partakes of the fixed and mechanical processes. The hammering of iron under a red heat, when the metal is as tractable as lead, produces a certain irregularity

which gives an added and accidental charm to the finished design. Mr. J. S. Gardner has said: “The salient characteristic of the craft of the blacksmith is that his chief operations are hurried; he may ponder and think over the important works, but once undertaken, he must strike while the iron is hot, the heat and glare in his eyes, amidst showers of sparks, while the telling blows are delivered by assistant hammermen. His results under such conditions cannot fail to be more or less impressionistic, and hence they, perhaps, appeal so strongly to the artistic sense.”*

The nature of iron is such as to suggest two characteristic and distinct methods of treatment. It can be either wrought or it can be cast. With wrought iron, the metal comes to the craftsman’s

*G. P. Bankart, “The Art of the Plasterer,” p. 2.

*J. S. Gardner, “English Ironwork of the 17th and 18th Centuries.”



WROUGHT IRON PORCH AND STAIR RAIL, 272 SOUTH AMERICAN STREET, PHILADELPHIA.

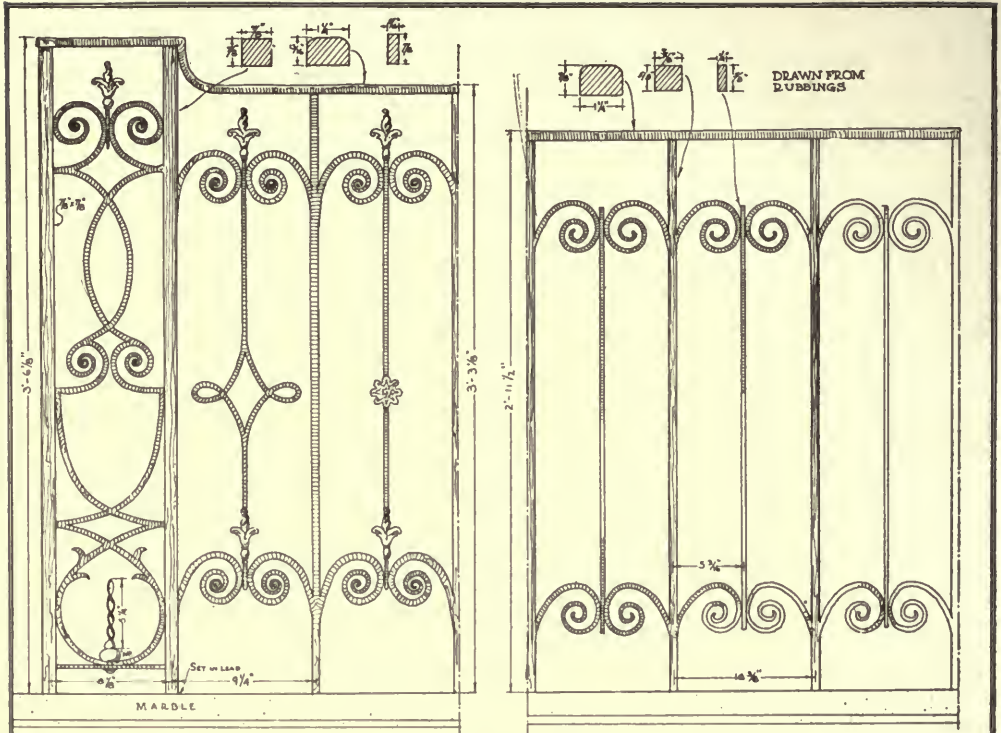
hammer in a partly refined and malleable state, so that it may be drawn or readily hammered out to the properly attenuated and varied shapes. The cast product, on the other hand, is made from a baser metal: it is brittle and coarse in texture and is suited to being poured in a molten condition, into molds of sand. Of the two methods of treating iron, the latter is not so desirable and essentially not so beautiful, for it is further removed from the plastic and deliberate touch of the worker, and it is somewhat objectionable because it is exact and subject to repetition. "Cast iron," said Isaac Ware, "is very serviceable to the builder and a vast expense is saved by using it; in rails and balusters it makes a rich and massive appearance when it has cost very little, and when wrought iron, much less substantial, would cost a vast sum. But, on the other hand, there is a neatness and a finished look in a wrought iron that will never be seen in cast, and it bears accident vastly better."*

It is as an adjunct to urban architec-

*Isaac Ware, "Complete Body of Architecture, 1756," p. 89.

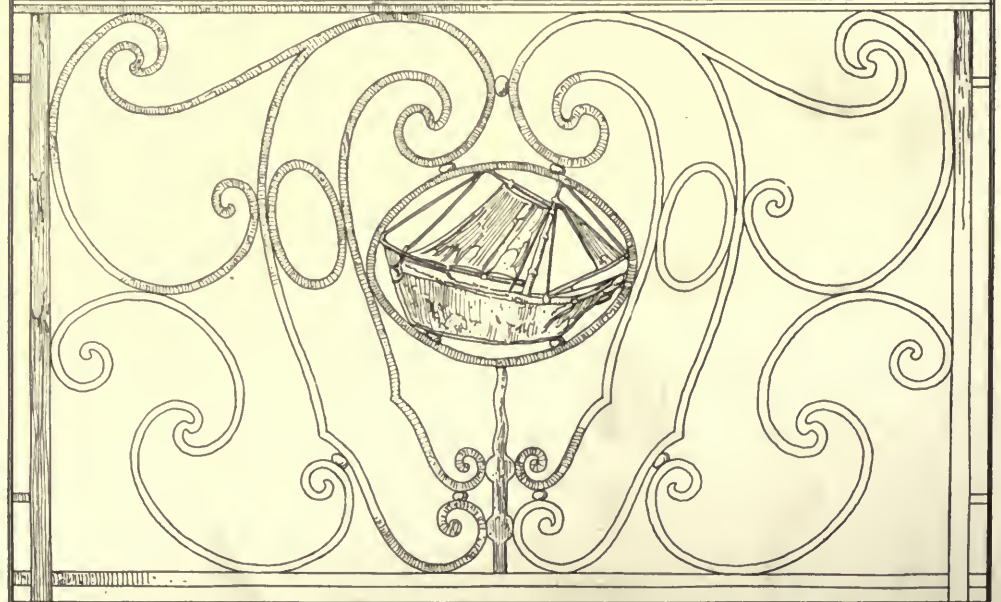
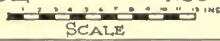
ture that we find the chief and most attractive use of ironwork in Pennsylvania. Philadelphia houses and the dwellings of inland towns were invariably set back a few feet from the line of frontage to give space for the platform and steps of stone. These steps and the landing required the protection of a handrail, which, in conjunction with the extensive use of stone and brick for the house proper, was almost always and logically of iron. Nowhere in America did ironwork receive greater favor. In no other locality did the nature of the current architecture so naturally demand this sturdy material as an accessory in building. The colonists of New England took less kindly to the iron railing and balcony because their dwellings were predominantly of wood. For them the wood rail was both proper and desirable. In the South, where the building traditions of England were most closely followed, there is a highly refined but scattered usage of this material.

Let us examine a few specimens in Philadelphia and elsewhere to acquaint ourselves with some of the characteristics



F. E. BELTZHOVER HOUSE
CARLISLE, PA

1206 WALNUT ST., PHILA.



DE'TAIL OF BALCONY RAILING, S. GIRARD WAREHOUSE, PHILA., PENN., A. L. K.

1796



DETAIL OF PORCH RAIL OF F. E. BELTZHOOVER HOUSE, CARLISLE.

and excellencies of this craft. The hand-rail example at 316 South Third Street in Philadelphia is typical of the simpler form. Such a railing is generally composed of vertical bars of hammered iron, from one-half to one inch square or oblong in section (rarely round), spaced four and one-half to five inches apart and held together by means of the handrail of larger section, into which the vertical balusters are "let" as tenons. The alternate vertical bars are sunk into the stone platform and fixed by means of lead or cement. The scroll, as featured here, was popular and consisted of a flat piece of iron, hammered with a slight taper to the shape of a volute or scroll and welded to the heavier vertical bar.

More ambitious railings adopted variations of the fret, lyre shapes, spear heads, loops, circles, ovals, twisted rods, and scrolls. A very limited use was

made of hammered leafage and masks. Quite frequently cast iron rosettes, decorative palmettes, pineapples and balls appear in conjunction with the more directly wrought bars, as at 218 South Ninth Street in Philadelphia.

The graceful stair and landing railing at 272 South American Street in Philadelphia is, perhaps, one of the finest of the hand wrought sort.

The railing of the F. E. Beltzhoover House of Carlisle is sturdier and not so rhythmical in the alternation of curves and straight lines.

It is evident that there was a common origin for both the railing and for the marble steps, for designs in different places are strikingly similar. It is rather significant that the heavily molded steps are usually unlike the lighter molded features of the houses to which they are attached. The railing and semi-circular steps of the Beltzhoover House in Car-



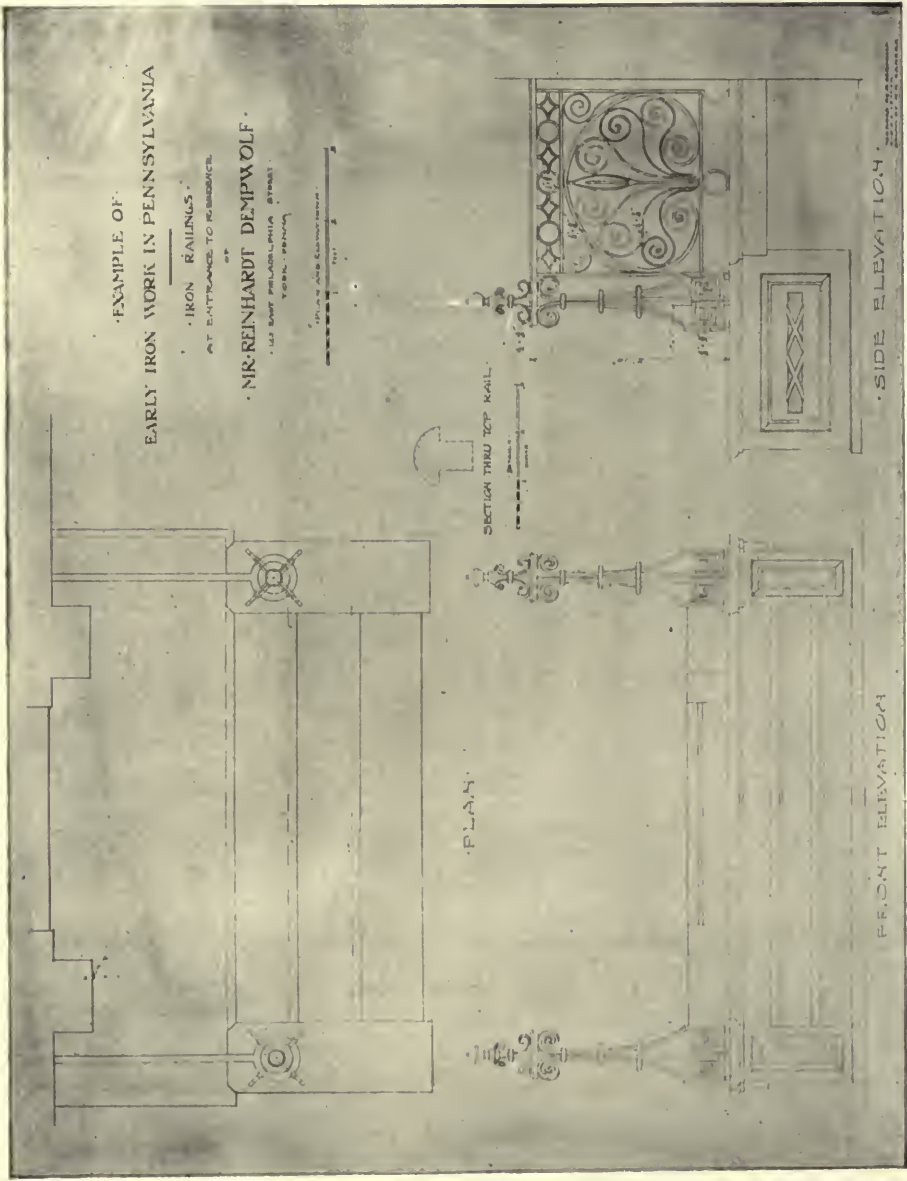
DETAIL—BALCONY RAIL, STEPHEN GIRARD WAREHOUSE, PHILADELPHIA, 1796.



DETAIL OF NEWEL POST AND RAIL, 218-SOUTH
NINTH STREET, PHILADELPHIA, SHOWING
COMBINED USE OF WROUGHT AND CAST IRON.



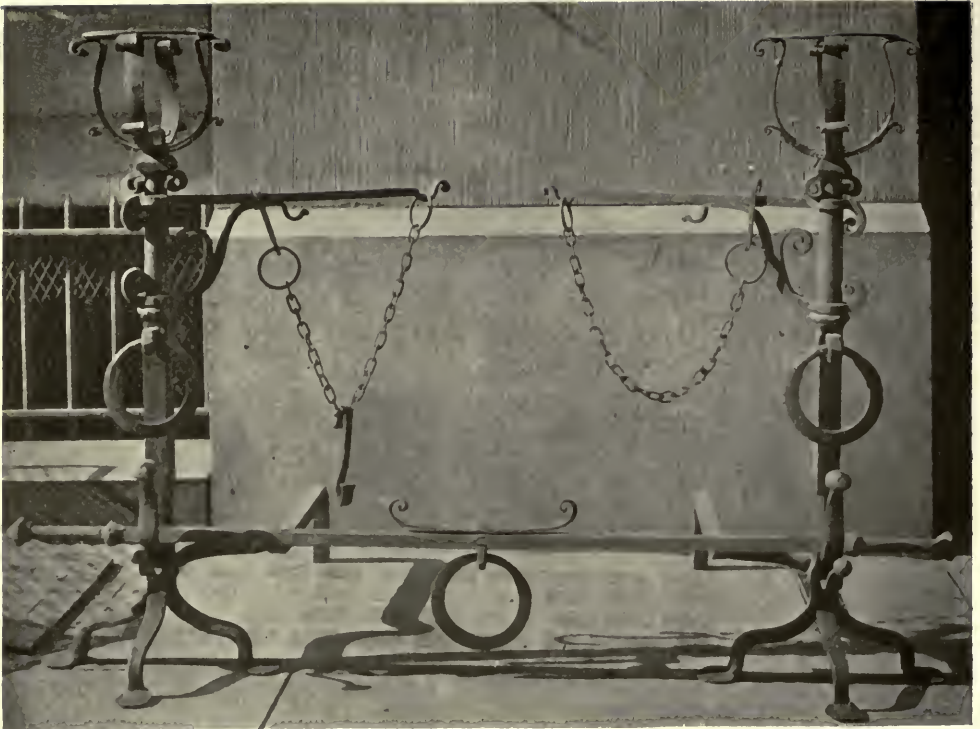
DETAIL OF NEWEL AND RAIL, SEVENTH
AND LOCUST STREETS, PHILADELPHIA.



IRONWORK DETAILS OF ENTRANCE—RESIDENCE OF REINHARDT DEMPWOLF, ESQ., PHILADELPHIA, PA.



PORCH AND STAIR RAIL, 316 SOUTH
THIRD STREET, PHILADELPHIA.



WROUGHT IRON ANDIRONS (WITH POSSET DOGS) MADE BY A WELSH WORKMAN.

dise are clearly a duplication of the Philadelphia specimen at 715 Spruce Street. The railing at 216 South Ninth Street also simulates the rail at the southeast corner of Seventh and Spruce Streets.

In the early days of the city, many of the better houses were provided with balconies. As early as 1685 Robert Turner wrote to William Penn, "We build most houses with balconies." An early resident, describing the reception of Governor Thomas Penn on his public entry from Chester in 1732, said, "When he reached here in the afternoon the windows and balconies were filled with ladies, and the streets with the mob, to see him pass."

Balcony railings differed but little from the treatment accorded the railings of porch platforms. Their use often added much to the external appearances of dwellings, as with "The Highlands," near Whitemarsh.

The warehouse of Stephen Girard, which formerly stood at number twenty,

Delaware Avenue, in Philadelphia, has an iron balcony of exceptional interest. This balcony consisted of several panels treated with a fine elaboration and rugged vigor. In the center appeared the date of the building, 1796, and the initials of S. Girard. The panels at the ends possess a vigorous scroll treatment that surrounds ovals which contain in the one, a representation of a sailing vessel, and in the other, a sheaf of wheat. These were symbolic of the interests of Stephen Girard.

Foot scrapers of iron were made in graceful shapes and vividly recall the days of miry streets and unpaved walks. Many were worthy specimens of true smithing, well suited to their purpose as well as delightful in silhouette.

Andirons, fenders, cranes and other fireplace accessories are frequently treated in a decorative way. The wrought iron fire dogs illustrated in this issue were equipped with an arrangement at the top for holding tankards or mugs and



WISTER HOUSE



320 SOUTH THIRD STREET

EXAMPLES OF FOOT-SCRAPERS IN PHILADELPHIA



THIRD AND SPRUCE STREETS



SOUTH THIRD STREET

EXAMPLES OF FOOT-SCRAPERS IN PHILADELPHIA

were given the special name, "posset dogs".

Door latches, knockers and hinges—all exhibit much fine smithcraft, and an

honesty of execution. They show few marked differences in design and are invariably wrought according to the accepted traditions of metalwork.



DOOR KNOCKER, 324 SOUTH SEVENTH STREET,
PHILADELPHIA.



A DEPARTURE IN HOUSING FINANCE

*The Metropolitan Life to Build Four
Blocks of Apartments in New York City—
Andrew J. Thomas & D. Everett Waid, Associate Architects*

By

JOHN TAYLOR BOYD, JR.

WHEN a great life insurance company decides to build and own 50 apartment houses, giving homes to nearly 2,000 families, and when this housing embodies the highest standards of fine architecture, we have surely encountered a real event in the history of American architecture.

Indeed, the thing is revolutionary. And so in New York was it considered. The extraordinary enthusiasm which the project roused in the daily press—news articles on the front page, special articles and editorials following rapidly in succession for several days—showed that the popular imagination had at last been awakened. Nor did the newspapers dwell only upon the sensational items of the news. They gave full space to the technical details of the plans, and they quoted the Tenement House Commissioner's opinion that the project would "revolutionize city housing".

When architecture crowds out scandal and crime from the front page of metropolitan journals, it has become a "popular" profession. To me, this is one of the weightiest facts among the many in so huge and so many-sided a project. And architects should realize the broader human aspect of the project, because it

marks the beginning of a great change in our architectural progress.

We are not dealing with an accidental event, but with one which has its reasons for being, chief among which is the profound change in economic conditions now taking place in the United States. This generation is viewing the passing of the old-style real estate speculator from control of the building world—the man whose activity has shaped the form of American towns and cities for a hundred years. The evil results of the speculator's work are evident today in the rigid conditions for housing and city-planning, involving untold loss and social discomfort.

The cost of removing these economic and social evils will be enormous, yet they must soon be removed if only for the reason that they cost more to maintain than to abolish. All the unfortunate aspects of this situation should not, however, allow us to forget that, in his day, the speculator had at least some reason for existence. After all, he but fitted in to the scheme of *laissez faire* economics. In the United States he was important economically, because he played a chief part in our pioneer development. When, at the end of the first quarter of the 19th

century, our huge agricultural expansion began and at the same time the industrial revolution swept over the country, it was the real estate speculator who established towns in the wilderness or on open farm land over night and made them grow. In his work, he had the advantage of an inexhaustible supply of cheap lumber, cut from land of little or no value. Cheap lumber made the rapid expansion of the 19th century possible. Whether the heavy price paid for it in civilization was worth while, is not in question here. The point is that the stage of pioneer and industrial economics was a period of "extensive" cultivation in all fields of activity, not only in farming but in industry, business and real estate as well.

This pioneer period is now drawing to a close. The last frontier and the last free land of value disappeared before the end of the 19th century. The character of our industries are now well-defined, as are also our transportation systems and the communities which they serve. Economic pressure is now forcing us to cultivate more and more what we already have rather than to seek what we may exploit. Extensive methods change to intensive methods. In every field of activity Americans have begun to look ahead, to plan carefully, to demand security, to discuss amortization—in a word, to seek solidity.

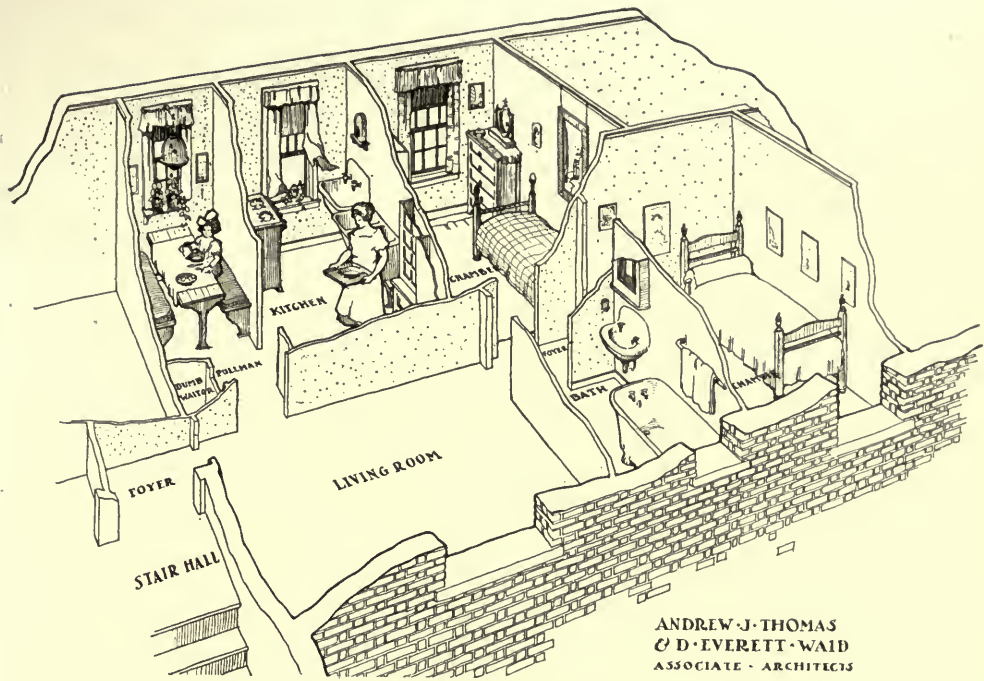
In real estate these economic changes imply permanent construction and improved design, and will soon mean comprehensive community planning, not only to obtain social betterment, but to insure efficiency and security. The beginnings of this new ideal are seen in the rapid spread of zoning since the war. As regards construction, even the reign of the jerry-builder is threatened. Even his mainstay, cheap lumber, is passing. In another generation, when lumber is cultivated as a crop, from higher-priced land, fire-resisting construction will be increasingly popular. This period of change from extensive to intensive cultivation offers unusual opportunity to the architect, who thrives best in a settled, intensive civilization. In the next generation he should make his

position in American life beyond peradventure secure.

The key to the lock which bars out the architect from housing is the power of finance. As in other activities of modern life, the final decision rests with the banker. When expansion was the cry of the country, the banker financed the old style real estate speculator as an incident in the expansion. He lent the speculator money on mortgage, his chief security being the margin above the loan. As a result—and here is the whole point of the matter—the speculator whose interest was in make-shift plans and jerry-construction, barred the architect, through his control of finance, from the construction field. The architect could secure only certain classes of structure of a necessarily permanent type, such as public and institutional and high class residential buildings. As the country became more settled, the architect has slowly progressed down from the top to the commoner forms of buildings. In fact, if one looks back to the remarkable rise in architecture of the past thirty years, he will, I believe, find that it coincides with the passing of pioneer conditions in the various fields in which the architect works. The background of the rise of American architecture is the period of economic change, from extensive to intensive methods.

In view of this economic background, the main fact of interest to the architect is that financial circles are to-day not so hearty in their support of the old-style real estate speculator. The banker is turning to the architect. And, when a great institution like the Metropolitan Life Insurance Company invests millions of dollars in the highest standards of architecture, to create the greatest group of its kind in the United States, and—even more—points to this group as an educational standard, it can only be that the company has sensed the change in economics.

These broader aspects of the situation are for architects the most important factors in this Metropolitan Life Insurance Co.'s housing. The technical principles of Mr. Thomas' designs should be by now



SECTION OF INTERIOR OF TYPICAL APARTMENT—APARTMENT HOUSES FOR THE METROPOLITAN LIFE INSURANCE COMPANY, NEW YORK CITY.

well understood in the profession, and the progress shown in this latest model over his previous ones is all that need be pointed out here.

What this technical progress is may be seen by comparing the Metropolitan plan with the design for the "Homewood" group of the City & Suburban Homes Co. Both groups are true wage-earners' housing, or "tenements" in the popular sense of the term. Three years have proved the value of "Homewood" in every element of good housing—design, finance, management and maintenance; and today this group in Brooklyn stands as one of the soundest achievements in Mr. Thomas' work. The bigness of its architectural conception, the splendid openness of the design, and the remarkable outside light, sunshine and ventilation, are not bettered even in the Metropolitan plan.

The Metropolitan Life project has progressed beyond the "Homewood" standards chiefly in respect to the vaster scale, whereby important economies are created, and the thoroughness with which one hundred thirty-five

the design has been perfected in every detail in order to make the most of quantity production; also in the improved arrangement of the typical apartment. As a result of these superiorities and because of the slightly smaller room sizes, the Metropolitan design reaches a slightly lower rental class than does "Homewood".

More specifically, the Metropolitan housing covers 50 per cent of the lot area, as compared with 44 per cent for "Homewood". The difference means a slight sacrifice of garden space, since the long garden in the centre of the Metropolitan block is not more than 36 feet wide. However, the cross-gardens, formed by the two courts back to back of the U-shaped plan, with vistas running entirely through the block, offset this slight drawback. In my opinion, this narrowing of the rear garden only proves that the width of the typical New York City block—200 feet between building lines—is too small. The U-shaped unit of the apartment house is the right size for making

full use of the four stair cases and could not well be shortened. If a 15-foot longitudinal strip were added in the center of the block, the plan would be improved and the slight added cost almost paid for by the saving made in eliminating an occasional street.

In the Metropolitan plan, the side alleys between the buildings should be noted. They are among the most valuable features of Mr. Thomas' planning. By cutting openings through the building mass at intervals of one hundred feet, into the rear garden, these alleys are made essential to the principle of design which Mr. Thomas calls "block-ventilation". How important this principle is, one may realize if he stands in the rear garden of the group at Jackson Heights, and, on a day without wind, notes the steady current of air, almost a breeze, flowing into the garden from the passageways. But the alleys have other good points. They admit light into the building mass, increase the number of corner rooms in the apartments, and furnish good protection against fire. Also, from the view-point of architecture, they break up the monotonous appearance of the solid street wall into separate buildings, thus giving to the blocks of apartments, the character of homes rather than of institutions. And they facilitate the removal of fire-escapes from the street front.

In respect to the typical apartment plan, the introduction of the tiny dining room alcove—called a "Pullman"—is a new departure. Although some housing experts have questioned its adoption, those most familiar with the living conditions among the people who occupy these buildings, have welcomed it. The housewives themselves, to whom Mr. Thomas and Mr. Waid submitted their plans for criticism at several public meetings, have thoroughly approved the "Pullman," saying that the arrangement not only saves labor by isolating the preparation and eating of food from the living apartments, but makes for more privacy.

Important as any detail of the whole group are the room sizes. They are slightly smaller than in "Homewood," but still, except for the kitchenettes, do not

reach the legal minimum. They have enough space for the usual furniture with room allowed for circulation of people. After all, they reflect the high cost of construction, but are much larger than those offered at the same rentals—including central heating, hot water and electricity and dumbwaiters—in other model tenements. This advantage gives an idea of the economic benefit of the large scale of the project.

Such are the chief points of excellence in the architectural design, together with its differences from Mr. Thomas' previous models. Striking and original as the design is, it is but one of a series made by its author, each marking either an advance in standards or the application of a new principle.

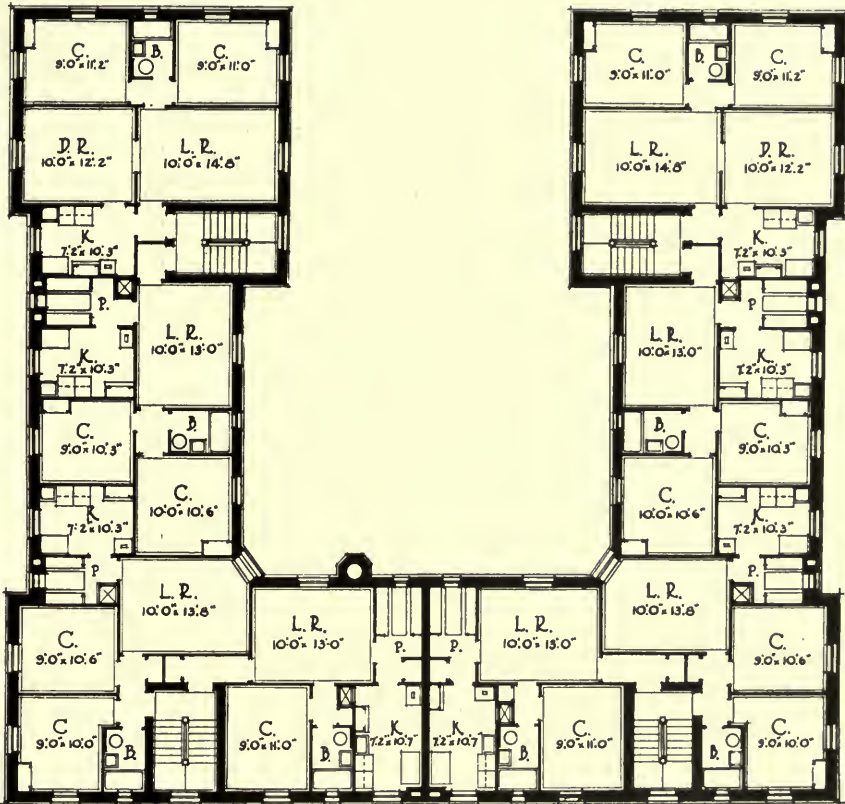
With the architecture of the project in mind we may turn again to the broader aspects of the Metropolitan housing. In addition to the economic background considered above, they cover all the many sides of housing—finance, promotion, production and construction, and management and maintenance. Of these, finance has the newest interest.

First stands the background of local conditions which make such a huge project possible. These are the contributions made in New York City to the perfecting of non-architectural factors of housing, and include the efforts made by architects for many years to incorporate the new principles in design. In this achievement the experience gained in government housing during the war had an important influence.

Progress in the non-architectural side of city housing in New York became evident generations ago, but solid achievement began with the founding of the City & Suburban Homes Co. in 1896. Mr. R. Fulton Cutting, believing that relief of housing conditions was necessary, invited to New York Dr. E. R. L. Gould, a young graduate of Johns Hopkins, to carry out a housing project. At the University, Dr. Gould advanced original ideas of real estate finance in his thesis for the Ph.D., and, after graduation, was sent to Europe by the United States Government to study social and living conditions there.

KEY :
 L. R. - LIVING ROOM
 D. R. - DINING ROOM
 C. - CHAMBER

KEY -
 K. - KITCHEN
 B. - BATH ROOM
 P. - PULLMAN



TYPICAL FLOOR PLAN

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 ANDREW J. THOMAS
 & D. EVERETT WAID
 ARCHT. & ENGRS.

APARTMENT HOUSES FOR THE METROPOLITAN LIFE INSURANCE COMPANY,
 NEW YORK CITY.

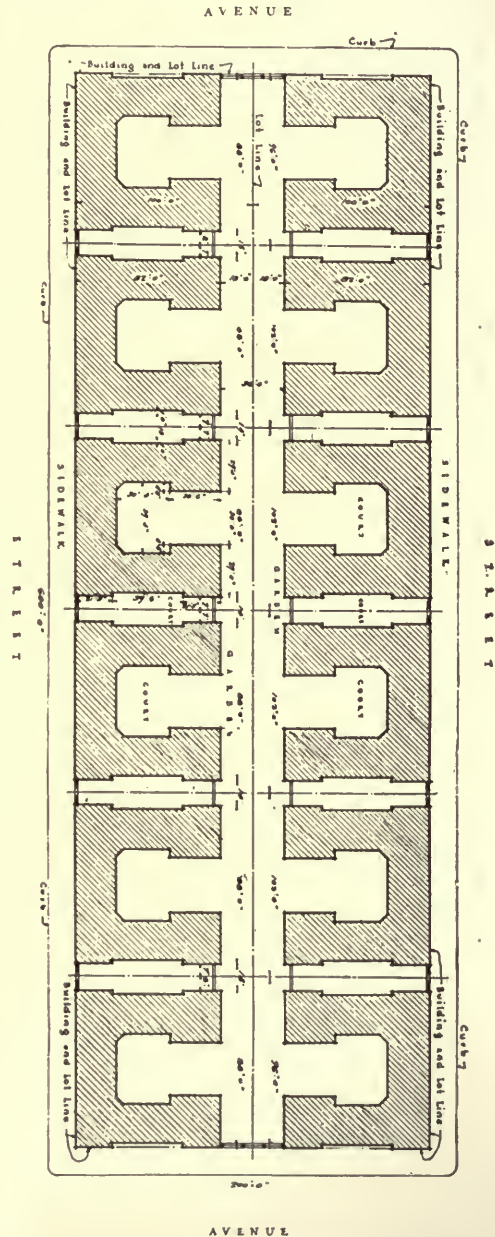
A few public-spirited citizens helped Mr. Cutting and Dr. Gould financially in founding the City & Suburban Homes Co. with a capital of \$1,000,000. Although its founding was philanthropic rather than strictly business-like—the subscribers to the stock thinking rather of the social value of the project than of the gain, dividends being limited to 4 per cent. by the charter)—Mr. Gould immediately placed his company on a strict business basis. He began putting his theories into practice in a small scale, insisting on scientific accounting, with full allowance made for depreciation and amortization, and, most important of all, he worked out practically the principles of maintenance and of management in relation to the design and operation of tenement properties. By organizing all the various factors which enter into housing into a single business concern, he could study relationships and coordinate them and create economies as never before. The striking success of Mr. Gould's administration was proved by his housing the wage-earners under better conditions than before, at market rentals, while continuing to pay dividends on one of the most difficult businesses in real estate.

One of Dr. Gould's finest achievements was the use of life insurance in housing finance. The first 100 houses built by the City & Suburban Homes Co. were sold to wage-earners on a 20-year contract, on a monthly payment basis, supported by a life insurance policy. The last payment on these houses has been made. In a number of cases the policy holder has died, but his family, although deprived of much of their income, retain their homes because of the life insurance feature of the contract. Needless to say, this is a real achievement in carrying out successfully that difficult social policy of home-ownership.

Today the City & Suburban Homes Co. has grown until it houses over 10,000 wage-earners, and its capital has increased from \$1,000,000 to \$6,000,000. Mr. Gould died in 1915. To date the culmination of the City & Suburban Homes Company's efforts is the "Homewood" group referred to, the highest

standard of wage-earners' housing existing previous to this Metropolitan plan.

Except for "Homewood," however, the burden of raising housing standards in



BLOCK PLAN OF APARTMENT HOUSES FOR THE METROPOLITAN LIFE INSURANCE COMPANY, NEW YORK CITY.

New York since the war has been carried mainly by the Queensboro Corporation. This is a private real estate company, and it is significant, I think, that the standards first advanced by Mr. Gould, which seemed so visionary that only philanthropy would or could support them, had, by the time of the war, become so firmly established that a private company found it profitable to put them in practice on a vast scale. The Queensboro Corporation owns a tract of land about half as large as Central Park and houses over 1,000 families in apartments built mostly since the war, 600 of them under the tenant-ownership plan. Tenant-ownership (explained in detail in the June issue of THE ARCHITECTURAL RECORD) is the Queensboro's great achievement in housing—to be added to the contribution of the City & Suburban Homes Co.—including the life insurance idea—in finance and management and maintenance and open planning, in the rounding out of New York housing standards in all sides, except one. This side still left undeveloped is appraisal. The Queensboro Corporation's maintenance and management is extraordinary, as is its equally well-known promotion, and it has done more to further open planning than any other agent.

The example set by these two big companies in working out the principles of housing finance, followed occasionally by other interests, has naturally had immense influence in New York. Their standards, together with the prohibitions of the Tenement House Act of 1901 and the Zoning Resolution of 1916, restrain the irresponsible speculator from being quite so injurious as he is in other parts of the country. Defective as these laws are in many respects—they are too complicated, not always well administered, and were drawn to govern an entirely different type of tenement house than Mr. Thomas has created—they are, nevertheless, indispensable, and their valuable support to fine standards should be realized.

Important as any other factor influencing the production of the Metropolitan design is the influence of the war housing of the U. S. Government. In the huge effort made to house the wage-earners in

industrial plants in 1918, architects, almost for the first time, learned the value of large scale housing carried out in comprehensive architectural design, with co-ordination of all the various sides of the problem into a unified whole, and based upon a thorough knowledge of the conditions of the problems, obtained through the coöperation of all the different (and differing) experts—architect, financier, promoter, manager, builder, engineer, manufacturer of materials, and labor—all working together toward a common end.

War organization is necessarily improvised and suffers accordingly. The architects at Washington made mistakes, but as I said at the time, their experience in large scale work and in setting standards put American housing years ahead in progress. This was true of the individual small house and now it is seen to be true of city housing. Unfortunately, the rapid rise of construction costs in 1919 foiled many attempts made by architects in various sections of the country to establish large scale private housing. Mr. Thomas, since his return to private practice after having served as supervising architect for the housing of the U. S. Shipping Board, has worked tirelessly for this object. His efforts were aided by the officers of the City & Suburban Homes Co. and the Queensboro Corporation, many of whom had also taken part in the war housing.

It should be explained that the Metropolitan Life Insurance Company has in its turn made important contributions to housing finance. It had long noted the defects of older types, particularly their heavy depreciation losses. To ensure sounder construction and better planning in the buildings on which it placed loans, the company retained Mr. D. Everett Waid, well known as an architect of the highest professional standing, to pass upon the designs for buildings. Loans are made by the Metropolitan Life Insurance Company subject to Mr. Waid's approval of plans, specifications, materials and methods of construction. Changes are made in the plans, in the interest of efficiency, and durable construction is insisted on in order to reduce maintenance and depreciation loss. Inspections are

made of work under construction. Mr. Waid has done this kind of work for the Metropolitan and other corporations since 1902. Naturally, his standards have been opposed, but without effect. Many a speculative builder who has borrowed from the Metropolitan has come to see that Mr. Waid's principles are sound, and, finding that they are also profitable, has taken a pride in improving his methods. Mr. Waid's experience is a striking illustration of the value of the architect's services in building finance.

Upon this foundation of progress, to which it had itself contributed, the Metropolitan Life Insurance Company reared its huge enterprise. It was able to establish the undertaking on a new scale, which its predecessors had taken years to reach from small beginnings. It is evident that in backing, with its vast resources, these new housing standards of Mr. Waid and Mr. Thomas and others, the Metropolitan Life Insurance Company gives them a prestige before the public which should hasten their adoption. In fact, experienced observers of all types in New York City, including representative journalists, now agree that it is only a question of time before these standards become universal. How long will it take? This is the question for the architect. For, if the big financial interests enforce the highest standards of architecture in housing, architecture will profit extensively.

In furthering this object much depends upon the architect. If, in a given case, the banker says to the architect: "I understand now that city housing means large scale architecture if it is to be produced at low cost, financially sound for a loan and profitable to the investor. I realize that it is not good business to encourage an investor to build an inefficient type of building, even though I protect myself, as I can, by loaning only a small part of the valuation placed on the building, thus guarding against heavy depreciation losses, and though I further cover myself by requiring heavy amortization of the loan. But this policy simply passes the risk along to the investor and to the tenant, and it is not the best kind of banking to finance a business involv-

ing an element of risk. Furthermore, the wage earners who live in these tenements deposit their earnings in my savings bank, or else they buy life insurance from the insurance company across the street in which I am a director. Hence I have every reason to see that the wage earner's money goes into savings and insurance, to their benefit as well as mine, rather than permit it to be sunk in bad design and excessive depreciation. Besides this, the interest of the community and of every business and industry in it—which is my bank's interest—demands that wage earners be economically and cheaply housed. We have here a lot of a given size, in a good location, and a borrower wishes to erect housing on it. He has a plan which looks to me old-style, which he says he arrived at by improving here and there the plan of an older building which he built a few years ago. He thinks highly of his plan and our appraiser approves and I can't show them where it isn't sound. So, unless you can point out to me any weak points in it and can draw me up a better one, I shall give him his mortgage and let him put up his building."

Here the banker has placed the architect at a disadvantage. He has brought up appraisal, the sole factor in housing finance which yet remains to be stabilized. Appraisal is still nearly as crude as it was twenty years ago. The lack of an accurate system of appraisal bars the architect from much commercial work, because he has now no means of measuring accurately the efficiency of his plans. He can figure mathematically the strength of a beam, but not the financial soundness of a plan. When an architect offers a plan in competition with the old-style speculative type, it is almost impossible for him to compute its saving in waste space, or its economies of construction and of maintenance and thus prove in figures how much his plan will earn. He can only claim in a general way that it embodies sound principles of design. But the banker requires that the architect prove his claim in dollars and cents. As a result of the lack of an accurate method of appraisal, the architect can hardly hope

to oust the speculative builder, who is apt to be the better salesman and can usually be got the issue enough to uphold his idea of what is practical in a commercial design.

Therefore, if the architect would enter extensively into large scale housing work, he must develop appraisal. It is a task in itself, and only certain principles of the subject may be pointed out here.

Appraisal involves chiefly the four following factors:

1. Land values and rental values in a given neighborhood.
2. Analysis of the financial efficiency of the architectural design.
3. Financial responsibility of the builder in promotion and management.
4. Soundness of the contractor.

Of these four principles, the first, relating to land and rental values, is fairly well developed in current systems of appraisal. Often it is a matter of judgment and experience on the part of the appraiser, who usually is an old real estate man who can often give a sound guess on local values. Under zoning, however, land and rental values become more stable and in New York are subjected to a more detailed analysis, with tables of rentals and sales records, etc., essential to scientific accounting. Too often, however, appraisal concerns itself but little with future changes in land and rentals and in construction values, although in recent years amortization has come into use to correct errors of this kind.

Appraisal is beginning to take account of the financial integrity of the investor and of his ability in the promotion and operation of housing properties. Only beginning, however, one must admit, because the City & Suburban Homes Company and the Queensboro meet with too little competition in this respect.

The technical soundness of the builder, is also not sufficiently insisted on, and it is chiefly to Mr. Waid's work for the Metropolitan, noted above, that we owe the advance in standards on permanent construction in New York. Maintenance has become a more important factor in building finance since the war, as a result

one hundred forty-one

of high construction costs. Ordinarily, the appraisers rely too much on the local building code for financial security in construction. This reliance is not enough, as Mr. Waid has proved, because, although the building codes prevent the worst operations of the jerry-builder, they cannot well distinguish between refinements in maintenance, in cost of materials and of construction, which are matters of finance and not of law. Besides, a new race of jerry-builders has appeared under the building codes, who though not so flagrant indeed in their methods as the old race, are adroit in skimping construction and baffling inspectors.

However, unsatisfactory as the three factors of land and rental values, experience of the operator, and integrity of the builder, may be, they offer no unusual difficulties. The second factor, financial analysis of plan, is the real problem. This is purely an architect's problem because it is, in essence, design. The architect must have some means of computing the square foot area and volume of waste space in a plan and of determining accurately whether the percentage of this waste is reduced to its lowest terms, much as an engineer computes the stresses in column and beam. Though easy to state, this principle is not so easily applied in practice in a particular plan on a given site. "Waste," or non-rent-paying space, occurs not only in corridors and communication, but in room sizes, closets and lobbies. For example, if it is decided that a 10'x12' room, with a 2'x3' closet is ample for good living conditions and will bring a given rental, then an excess in these sizes must be classed as non-rent-paying space, unless it brings in a proportional increase in income. If, here and there in his plan, the designer cannot use all the space and throws it into a few of the 10'x12' rooms, making them 10'x16', he has, from a financial standpoint, wasted 33% of the space in those rooms, unless he can rent the enlarged rooms at a higher figure. Designers are apt to think that such waste is unavoidable, yet they would find no excuse for a man who increased the sizes of his floor beams by 33%, which is a far less expensive mis-

take. Five per cent. or even ten per cent. wastage in a building is difficult to detect without rigid analysis. And, when it is detected—here is the real trouble—the architect alone can tell, by changes in the plan, whether the minimum of non-rent-paying space has really been reached. In a large apartment house plan, to eliminate excess space in two or three rooms may require the re-arrangement of every room in the plan.

Such rigorous methods of analysis disclose astonishing differences in the value of designs, discoverable only in this way. If such methods were universal in appraisal, architects would be surprised at the rapid advance in housing standards. Nor would the sole surprise lie in the elimination of the old-style speculator's plans. Architects would see their own standards vastly improved at the same time.

It is therefore the duty of architects to create a scientific system of appraisal. In view of the expert architectural knowledge that this step implies, one need not wonder that the banks have failed to bring their appraisal methods abreast of the progress made in other factors of housing finance. Existing methods of appraisal vary, but the best are said to be inefficient. Mr. Frederick Lee Ackerman has drawn attention to the "cubage" system, whereby the volume of a building is computed and its value appraised as the product of this volume times a unit figure per cu. ft. which is assumed as a reasonable cost for buildings of the same character. As Mr. Ackerman well says, this

system puts a premium on waste space and lost motion in a plan and penalizes progress in design. Under the cubage system, the more excess space in a building, the higher its valuation—though its real value be lower—and the higher the loan obtained upon it. A good plan has no market value if it cannot bring the market loan.

This, then, is the next task for the architect in housing—to develop appraisal, the last unknown factor in building finance. The banker is now ready for this step, as this new housing of the Metropolitan Life Insurance Company proves. Architecture must develop a means of measuring accurately how far other designs come up to the new standards. No real estate man, nor accountant, nor engineer can do this work because, after the simple arithmetical calculation of percentage of waste space in a plan is made, only an architect can analyze the plan and compare it with others, to find out whether the non-rent paying space is at the minimum and, most important of all, to reduce it if it is not. Even this is not the whole of appraisal. The architect can best judge how to embody to the full the big principles of design in the plan, its value in openness, sunlight and cross-ventilation, and can best determine the exact percentage of area of the plot which can most profitably be covered.

Viewed in this light, appraisal is a financial analysis of the volume of a building. It becomes design and is peculiarly the province of the architect.



MOSAIC DESIGNS *by* FRANK BRANGWYN ARA
IN SAINT AIDAN'S CHURCH AT LEEDS

By
ARTHUR FINCH

UNDOUBTEDLY the one outstanding contribution that the American painter has made to the art of his country has been in the sphere of mural decoration. In the enrichment of American public buildings names such as Bancroft, Leftwich Dodge, Mathews, John Sargent, Edward Simmons and Robert Reid signify more than the mere possession of a masterly technique. They stand rather for a thorough understanding of the part that the decorative artist must play in relation to the architect's design and to the building he is to enrich. Conversely, the American architect, as he expresses himself collectively through such an expressive body as the Architectural League, and individually in architectural design as in some of the work of such men as Louis Mullgardt, Henry Bacon, Bernard Maybeck, William Mead—to name no others, has certainly aided the successful accomplishment of the mural painter's work whatever the medium he has employed—oil, tempera or fresco.

For the preliminary design is required a masterly decorative painter, having a knowledge both of the possibilities and

the limitations of the material, its relation to the lighting and the position it is to occupy in the building in relation to the architecture. Then, for the execution, highly accomplished craftsmen are necessary. Added to these difficulties are the limitations of the tesserae themselves, which must express through the blending and massing of the colors, jointing, and formulation of the finished mosaic, an approximately perfect interior decoration on the requisite large scale; a result more easily accomplished in any other branch of mural painting, and most easily in tempera.

Admittedly, then, the difficulties to be overcome for mosaic decoration are many. At the same time it possesses qualities that counterbalance the disadvantages. Mosaic becomes indissolubly part of the structure itself, a permanent decorative unity with the architecture; this outweighs the advantage of finish in mural decoration possessed by tempera and fresco. With this fine structural decorative quality, that the Byzantine mosaicists used so advantageously, there is combined a durability that no other media of architectural decoration possess in so high a

degree. But, more than these, the two general qualities it has—(1) imperviousness to the action of smoke; (2) diffusion of an atmosphere of repose and coolness in combination with rich tonal quality and luminosity—are of no little importance in determining its use both for ecclesiastical and secular buildings in a country like the United States. Where there is a smoke-laden atmosphere, as in the steel-melting districts, its utility cannot be gainsaid; for no other material is so easily divested of surface films of dirt. The second quality has no mean advantages under climatic conditions such as are present throughout important parts of the Union. In the Northeast, for example, they are akin to that of Northern Italy, possessing the remarkable early mosaic of St. Apollinare Nuovo and others in Ravenna; on the Pacific slope and to the Southeast conditions similar to Cairo and Algiers prevail, such as also obtain in the vicinity of Santa Sophia, Constantinople.

When, however, the conditions necessary for an imposing mosaic decoration as set out above are taken into consideration, it is not surprising that in England tesserae have been set aside during the past three or four decades in favor of other media for mural painting; though at the time of the Gothic revival it was used with some success by Dr. Salviati, of Venice, in the decoration of the Wolsey Chapel, Windsor, and for the figure designs in the arcades of the Victoria and Albert Museum, London, and by a few others more recently in the spandrils of St. Paul's Cathedral, Westminster Abbey, and some secular buildings of note. Such efforts have not, however, been carried out on the requisite large scale wall surfaces to do justice to the qualities of mosaic that have characterized modern examples in Italy and Russia.

The conditions necessary for large scale treatment and architectural fitness were present for the execution of the mosaic designs prepared by Frank Brangwyn, forming the subject of this article, and make the work here illustrated of considerable importance to architects and decorative artists both of the old world and of

the new. It was carried out in St. Aidan's Church, Leeds, through the generosity of Mr. R. H. Kitson, whose father was well known in the city. The building is typical of the early basilica churches, of which there are still remains extant in England indicative of the Roman occupation, similar to those to be seen all over Central Italy. The plan embodies many of the characteristic features of such early basilican churches as St. Agnes and St. Maria Maggiore, at Toscanella, northeast of Rome, and of the German master builders of the Rhenish school, whose Romanesque style incorporated the fine features of the basilica with its clerestory, with direct lighting of the nave. Thus there is a nave with aisle on either side, choir at East End with apse, in cruciform style; the nave colonnades having rounded shafts carrying Corinthian capitals from which spring the round arches carrying the clerestory wall.

Coming now to the mural decorations, it will be perceived that the interior architecture of St. Aidan's Church, with its dark stone masses and spacious interior, lighted by the clerestory windows, lent itself opportunely to color incrustation. Particularly will this be understood, when regard is paid to the damaging effect the smoke and grime of the woollen manufacturing center of Leeds would have on a less permanent material than mosaic. And it was the latter fact, borne in upon Frank Brangwyn after he had visited the church and vicinity, that decided him in favor of mosaic rather than the tempera for which he had himself planned the principal design.

The scheme itself was designed to be carried out in two distinct, yet associative parts, within the choir. On the apsidal wall is the main design, covering an area of 1,000 square feet, from which centre, so to say, springs the semi-dome, treated in a low-toned gold key, somewhat suggestive of the backgrounds of the Byzantine mosaicists. With a perspicacity that has never failed him in the selection of a suitable theme for all his great decorative paintings, Frank Brangwyn chose to utilize the story of the life of St. Aidan, the famous Abbot of



DETAIL OF MOSAIC: ST. AIDAN PREACHING—ST. AIDAN'S CHURCH, LEEDS.

Designed by Frank Brangwyn.

Lindisfarne, or Holy Island, in Northumbria, who with Oswald, king thereof, undoubtedly laid the foundations of that great period of Saxon culture and artistic achievement after his arrival in England *circa* 640 A. D. The story has it that he came from the monastery of Iona, in Scotland, founded by St. Columba, to Holy Island, off the coast of Northumberland, and with a band of monks went forth therefrom through the wilds of the northern region—now Northumberland, Durham and Yorkshire—teaching Christianity to the primitive inhabitants. Brangwyn's design takes a tripartite formation. There is "The Landing of St. Aidan" and "Welcome to the Poor," his "Preaching," and his "Death". Below, the apse is treated with small tesserae, filling an area of 500 sq. feet. Then beyond the altar

one hundred forty-five

rails is the massive stone chancel screen, filled with panels of monks and acolytes in attitudes of worship, covering an area of 300 sq. feet and forming the subsidiary and complementary design.

Consider first the cartoons as a whole: the general structure of the designs and their relationship to the interior architecture. No mural decorator could have made a more difficult choice of subject matter. It involves the use of a large number of human figures, always difficult of successful treatment, especially for faces in tesserae, by reason of the complexities of jointing. But Brangwyn had three outstanding qualities that helped towards a favorable result; the absence of which, despite their general fine qualities of drawing and modeling, have spoiled so much of the work of French and Italian



ST. AIDAN PREACHING — ORIGINAL
DESIGN FOR MOSAIC — ST. AIDAN'S
CHURCH, LEEDS, BY FRANK BRANGWYN.



THE LANDING OF ST. AIDAN IN NORTHUMBRIA
—ORIGINAL DESIGN FOR MOSAIC, ST. AIDAN'S
CHURCH, LEEDS, BY FRANK BRANGWYN.



ST. AIDAN FEEDING THE POOR—
ORIGINAL DESIGN FOR MOSAIC,
ST. AIDAN'S CHURCH, LEEDS,
BY FRANK BRANGWYN.



DETAIL OF MOSAIC: DEATH OF ST. AIDAN—ST. AIDAN'S CHURCH, LEEDS.
Designed by Frank Brangwyn.

mosaicists in recent times. He is a designer by instinct—if the expression may be allowed; a colorist who is able to take a large view of structural design; and an artist imbued with the romance of the subject matter rather than its realistic interpretation. These qualities, combined with powerful line drawing, have certainly enabled Frank Brangwyn to give repose to the composition—that essential decorative quality of which he gave fine promise long since in his little-known painting, "The Bathers"—and a general affinity with the surrounding architecture.

By some readers who have examined carefully the principal design, however, it might be questioned whether it would not have been improved architectonically if the masses of trees had been carried up to the roof where it meets the sky (or, had

there been pillars where the spindly tree trunks and cropped foliage show), so as to give a better effect of supporting the semi-dome than appears to have been obtained by the representation of sky as in the decoration. At the same time, I venture to say that, with the exception of the late Puvis de Chavannes, few modern mural decorators have shown, as Brangwyn has in the principal mosaic, the mastery of decorative principles that has enabled him to give his work its architectonic character. This quality he has obtained by care exercised in the right distribution of the various parts of the pattern. Added to this is the clever utilization of the difficult artifice of simplicity in massing of figure groups with their evenly-balanced limbs and perpendicular draperies, the method so ably em-



VIEW OF APSE WITH MOSAIC IN
POSITION—ST. AIDAN'S CHURCH, LEEDS.
DESIGNED BY FRANK BRANGWYN.

ployed by the early Byzantine mosaicists; and the disposition behind them of vertical tree masses strongly outlined against the purplish-blue of shadows which loom up from the horizon across the divided water.

When one proceeds to a closer examination of the cartoons and the completed mosaics, one cannot help being struck by the fact that while the artist has properly sensed the necessity of giving to both compositions a certain formality of style, the figures in each of the interdependent groups are full of animation. This admirable quality is also seen in the faces of the undraped heads of monks in the processional treatment of the chancel screen groups, contrasting well with the general severity of the design, reminiscent in some respects of the Ravenna mosaics.

The individual figure types will be familiar to those who saw Brangwyn's tempera paintings of "The Four Elements," in the Court of Abundance, at the San Francisco Exposition of 1916. They show no slavish imitation either of the fine qualities or weaknesses of the past or the mannerisms of the present. In the formation of the groups, rich coloring and handling thereof, dignity of manner and solidity of forms and background masses, he evinces an indebtedness to the great master designers of the past. Yet his work is individual to a degree, if modern in feeling. It differs markedly in form from the stiff, lifeless demeanor characterizing 11th century Italian mosaics, as also from the carefully modeled, refined types, full of lively action, represented by Rizzi's mosaic at the entrance to St. Mark's Cathedral, and of the more modern work of Italian mosaic designers. Brangwyn's types are curiously crude, typifying animalism. His manner is expressed vividly in the brutish strength of the first two figures, female and male, standing athwart the slender tree trunks, with the bulldog at their feet, and in the breadth of draperies in the kneeling and sitting figures in the foreground, seen on extreme left of the decoration in the rendering of "St. Aidan Welcoming the Poor". Unlike many modern imitators, Brangwyn is true to his

own art ideal. He knows the important part that contrasting yet associative figure types have in the balancing of the composition, apart from the contributory effects of color and draperies. Accordingly, in the rendering of the last incident, "The Death of St. Aidan," he has, by devices of handling, portrayed with no little insight and power the complementary characteristics of awe and dumb stolidity associated with the attitude of primitive folk in face of an untoward happening. Interposed, as it were, on the deep concern and sorrowful understanding of the purple-flecked and grey-robed monks, grouped around and ministering to the dying St. Aidan in a gown of purplish-white, are the two semi-nude humans (with the blue robed girlish figure immediately behind them), whose brick-red draperies partially covering their muscular limbs contrast so strongly and significantly with the sombre dress of the monks. The one is markedly stolid; the other listening intently and wonderingly to the last ministrations. And, fittingly closing the whole composition, as well as balancing the grey, purple-tinted white and deep purple draperies and schemation of the opening episode, is the cleverly posed group of listening, yet stolid, peasant women types, with their alternate red, purple-flecked, white and orange headdress contrasted by the black cloaks against the purple-greys and white of under garments, appropriately uncovered in the end figure to light up the olive-grey cloaked, seated monk.

Employing a long-distance perspective, the central design with its multitude of figures, falls correctly into position as seen from down the aisle; the figures have the illusion of equality in size, an advantage when considered in relation to the nearer figures of the chancel screen groups. The designer has employed many artistic devices for the effective grouping and emphasizing of the central figures in each. In the strongly outlined and powerfully drawn introductory episode of "St. Aidan Landing", with its massing of purple-tinted grey-brown sail and ship, the whitish robe of the monk, with the crouching figure beside him,



VIEW OF COMPLETE MOSAIC—ST. AIDAN'S CHURCH,
LEEDS. DESIGNED BY FRANK BRANGWYN.

stands out prominently against them and the figures in white hauling in the vessel. Then in the representation of "St. Aidan Preaching" he utilizes a long scarf, and a staff held by the supporting figure of a monk, as a foil to outline the form, so making St. Aidan the center of vision in the composition. He also adds to the interest of the spectator by grouping around him men, women and children, in their bright spotted red, green, sky blue, deep purple and bluish robes, and variously colored hair and coverings, representing in their facial expressions and postures (note the excellent arrangement of the group immediately to the right of St. Aidan) their interest in the preaching of the Abbot.

The cartoons, as also the executed mosaic, reveal a wealth of color detail, though the broad manner employed of contrasting neutrals with the primary and secondary colors avoids those subtleties sometimes employed with resulting disadvantages to the mosaic design as a whole. Certainly the colors are sumptuous: that is a characteristic of Brangwyn's work in all mediums: and how greatly the reader will miss this quality in the illustrations here! His background masses of color are particularly good, giving harmony to the design. There are the before-mentioned purple-blues of the expansive sky, breaking up into whites, greens, greys and other tints and hues. These combine with the deep blue of the distant background against which are the small tree masses in greys outlined thereon leading to the lighter-toned mass of greenish-blue water; the soft greensward of the foreground on which are disposed the contrasting tones of tulips, geese, etc., reminiscent of the incidentals employed by Benozzo Gozzoli in many of his mural decorations; together with the finely disposed vertical tree masses in greys and browns with black and orange tinted foliage, with the blue and purplish tints of the shadow background cast from the trees and horizon beyond. There are no complicated lighting effects in the mosaic. Frank Brangwyn employs the simple aids of contrasting colors in draperies against backgrounds and dexterous handling in

the treatment of folds and important incidentals, such as headdresses, etc. These are assisted by his adaptation of simple technical media that his experience as an etcher has, no doubt, led him to utilize advantageously in relieving effects of strong lighting.

The execution of the design was entrusted to Mr. Jesse Rust, member of a well-known mosaic firm in Battersea, London, whose father was responsible for the figures that adorn the principal hall in the Victoria and Albert Museum. Having the full-sized detail of the cartoons before them on the reverse side, the mosaic being downwards, the cubes are fastened by skilled workers by means of paste to sheets of brown paper, whereon the cartoon has been traced. This done, it is ready for actual fixing by means of cement on the wall surface, the brown paper then being removed from the face of the mosaic. The result of this method is that, whilst it involves, particularly for figure treatments, as in the present instance, great skill and long experience in working with the material, it enables designs to be executed without recourse to the builders' scaffolding, and can accordingly be sent any distance. In carrying out so difficult a task much credit is due to Mr. Rust and his staff. They have selected carefully the tesserae; wisely arranged the mosaic to follow leading lines of important parts of the composition, the long perpendicular lines of draperies, and particularly the trees giving the effect of height to the design, and the horizontal lines for backgrounds aiding the effect of distance in the composition. And, withal, the necessary impression of gradation in the treatment of the draperies and flesh tones is given, the latter being enameled to bring out the effects of color. Comparison between the cartoons and the executed mosaic, of course, reveals the difficulties of jointing; though there is clear evidence of attention to the well-tried methods of the mosaicists of the past in the arrangement of the mosaic of the same colors as the ground to follow the leading contours outlined on the background, giving the well-defined effects that characterize stained-glass execution.

The LAW OF SQUARES

~ A Study of Proportion ~



BY ERNST JONSON

WHEN one compares the proportions of well designed architectural or decorative motives, it appears that a proportion which is right for a large motive is not right for a similar motive of smaller size. A low building requires a relatively deeper cornice than a tall building. The border of a large rug is relatively narrower than that of a small one. Is there a law which governs these variations of proportion?

Before attempting to answer this question it must be realized that the size which is most significant with regard to proportion is not absolute size, as measured in feet and inches, but the size measured on a proportional scale. In architecture, the scale of modules or half column diameters is a proportional scale. That is to say, for the purpose of comparing the proportions of different structures their magnitudes must be measured in modules, not in feet.

The most characteristic dimensions of the members of an architectural composition undoubtedly are the depths of cornices and mouldings, especially the depth of the main cornice. Unfortunately nearly all the monuments of Classical Antiquity that remain to us are one-story structures. There exists today but one Roman façade of several stories which may be regarded as typical and which still carries its main cornice—the Colosseum in Rome.

This façade is 110 modules in height, and the depth of its cornice is 3.8 modules, the depth being taken to the lower edge of the cymatium of the architrave. That is to say, the height of the façade of the Colosseum is about four times that of the typical Corinthian temple portico, but the depth of the cornice of the Colosseum is only twice that of a Corinthian cornice. In other words, the depths of

the cornices of these structures are proportional to the square roots of the heights of the façades.

Let us test this formula on some of the typical examples of Roman and Renaissance architecture.

The following figures represent the depths of main cornices given in terms of the square root of the height of the façade in modules. That is to say, when the square root of the height of the façade is multiplied by one of the following coefficients, the product is the depth of the cornice.

Arch of Titus, Rome	0.38
Arch of Constantine, Rome	0.36
Arch of Septimius, Rome	0.39
Pantheon, portico, Rome	0.37
Nerva's Forum, Rome	0.32
Temple of Jupiter Stator, Rome	0.40
Temple of Antoninus, Rome	0.31
Temple of Fortuna, Rome	0.35
Nero's Frontispiece, Rome	0.38
Average of Roman one story structures	0.36
Colosseum, Rome	0.36
Cancellaria, Rome	0.36
Giraud Palace, Rome	0.37
St. Mark's Library, Venice	0.37
Loggia, Brescia	0.34
Bevilacqua Palace, Verona	0.35
Average of buildings of several stories	0.36

A minor cornice or moulding evidently is most directly related to the portion of the façade which it crowns. Thus the attic cornice is proportioned with reference to the height of the attic, the string course with reference to the height of the story, and the pedestal cap with reference to the height of the pedestal.

Following are the depth coefficients for secondary cornices and mouldings of

some of the typical examples of Roman and classical Renaissance work.

ATTIC CORNICES	Coefficient
Arch of Constantine, Rome	0.37
Arch of Septimus, Rome	0.31
Nerva's Forum, Rome	0.33
<hr/>	
Average	0.34
STRING COURSES	
Colosseum, Rome, 3rd Story	0.35
“ “ 2nd Story	0.31
“ “ 1st Story	0.34
Theatre of Marcellus, Rome	0.32
Cancellaria, Rome, 2nd Story . . .	0.32
Giraud Palace, Rome, 2nd Story .	0.33
Giraud Palace, Rome, 1st story . .	0.29
<hr/>	
Average	0.32
PEDESTAL AND PODIUM CAPS	
Arch of Titus, Rome	0.34
Arch of Constantine, Rome	0.34
Temple of Fortuna, Rome	0.27
Colosseum, Rome, 3rd Story	0.32
“ “ 2nd Story	0.29
Theatre of Marcellus, Rome, 2nd Story	0.37
Cancellaria Rome, 3rd Story	0.29
“ “ 2nd Story	0.31
“ “ 1st Story	0.35
Giraud Palace, Rome, 3rd Story . .	0.31
“ “ 2nd Story . .	0.30
“ “ 1st Story . .	0.28
<hr/>	
Average	0.31
Average of all	0.32

The foregoing comparisons indicate that the formula which was derived from the relation of the depth of the cornice of the Colosseum to that of the temple cornices may be regarded as a reasonably accurate expression of a law of proportion—a law which may be stated in this way: Corresponding features of motives of different sizes are related to one another as the square roots of the sizes of the motives. This law, then, may be called the Law of Squares.

Owing to the lack of uniformity in works of art it is impossible to directly establish this law with anything like a satisfactory degree of probability. An

adequate working confidence in the Law of Squares can be acquired only through its application to one's own work, or in the critical analysis of existing work. When used as a norm of criticism it often indicates faults of proportion which otherwise might have remained unnoticed. And when used as an aid to design it saves time, and prevents errors of proportion as well as errors of scale.

In applying the Law of Squares to architectural compositions, it is necessary first to determine the size of the module. When an order is introduced into the composition as a principal feature the module is given, but when no such order is used, the determination of the proportional scale becomes a matter of judgment guided by precedent. Analyses of existing façades show that the proportional scale increases when there are no principal orders. And as the masonry becomes more prominent the scale increases correspondingly. Thus the scale of a heavily rusticated façade may be three or four times as large as that of a façade with orders, while a façade of the type of the Farnese Palace in Rome is about twice that of an order façade.

The proportional scale of an existing façade without a principal order may be determined from the depth of the cornice, for this depth in modules may be assumed to be 0.36 of the square root of the height of the façade in modules. Hence the size of the module in feet is obtained by taking the square of the depth of the cornice in feet and then dividing this figure by 0.13 of the height of the façade in feet. If the dimensions are given in meters the operation is precisely the same, the result obtained being expressed in meters.

Calculations involving square roots consume much time unless a table of square roots is used. Before trying out the Law of Squares such a table should be provided, and it should be a table running up to 10,000. A shorter table of squares may be used by reversing its reading; that is, using the squares as numbers and the numbers as square roots.

The CHURCH of SAINT SOPHIA

By

Charles H. Moore

THOUGH well known by name, the architectural character of the Church of Saint Sophia of Constantinople, and its importance among the monuments that remain of the world's artistic patrimony, are too little known. Saint Sophia is not only the grandest and the most magnificent architectural product of the early middle ages in Europe, but is the only one in which the Byzantine style, whether as to structure or embellishment, was ever fully embodied in its integrity and completeness. As the Parthenon stands in relation to other Greek building, and as Amiens to other French Gothic art, so stands Saint Sophia among the works of the Byzantine Greeks. In this noble fabric, the Greek genius after the long period of stagnation that followed the decline of its ancient artistic culture, found renewed expression under conditions that called for a complete recasting of ancient forms; and these conditions were met with consummate inventive and executive skill, controlled by the finest powers of design, so that we have in it an entirely distinctive style of architecture of great majesty and beauty. Happily, the building remains substantially intact after the lapse of more than thirteen centuries, save in a few parts where some distortions and ruptures have developed.

The building is of noble simplicity and entirely rational design, and its structural system invites close attention. It is vaulted throughout, and in its vaulting the distinctive character of the monument primarily resides. The vaults are mainly of two kinds, both of which differ fundamentally in principle and resulting conformation from previous vaulting—which was on Roman lines. Its general character may be described as follows:—

In plan it has the form of the Greek cross enclosed within a rectangle into which the north and south arms are

opened, so as to give an aisle on either side. The eastern and western arms are apsidal, with two apsidal alcoves opening out of each, while a smaller apse on the main axis breaks the eastern wall of the enclosing rectangle.

In elevation the square of the crossing is covered by an almost hemispherical dome, of a little more than a hundred feet in diameter, resting on pendentives. The pendentive is the distinctive feature of Byzantine dome construction—the dome and the pendentive together forming a compound vault which may be described as a hemisphere with a diameter equal to that of the square of the crossing, resting on four segments of a larger hemisphere whose diameter is equal to the diagonal of the square. These segments are the pendentives, and are what remain of the larger hemisphere after it has been cut by a horizontal plane at the base of the dome, and by four vertical planes coinciding with the sides of the square.

The supports consist of four great piers, one on each corner of the square, connected by arches carrying walls that reach up to their crowns—the four walls together forming the reëntrant angles within which the pendentives are built.

Externally, the dome is fortified against thrust by a ring of abutments, with narrow intervals, their outer faces inclining inward as they rise, so that together they form a short frustum of a cone. There are forty intervals, and the dome is pierced with corresponding openings which give a circle of light. The buttresses are connected by arches, making a continuous ring of masonry over the haunch of the dome. It should be noticed that by this abutment a large part of the dome is hidden from view; but this detracts nothing from the appearance of the structure. It rather improves the

outline, I think, and it may be said in general that whatever is functional in construction only adds beauty to the fabric if it be properly shaped and adjusted.

Internally, the dome surface is broken by slightly salient ribs rising against the buttresses and decreasing in salience as they ascend. By this means the vault—which is remarkably thin for its magnitude—is materially strengthened.

This distinctively Byzantine scheme of construction has the advantage over the Roman scheme—in which the dome rests on a circular drum—of giving unlimited freedom in planning; for the area covered by the vault may be open on each of its four sides, so as to communicate with adjoining parts, which may be multiplied indefinitely. Here in Saint Sophia it opens east and west into the great apses, while north and south it communicates with the aisles through shafted arcades. These arcades are great features of the interior, and are in two tiers on each side—the upper one reaching to the springing of the pendentive arches, while the tympanum space is filled with a wall pierced with two tiers of lights.

The half domes that cover the great apses coincide with the pendentive arches, and thus abut at their crowns on the base of the dome. They require no pendentives, since the supports of each stand on a curve corresponding with the vault.

The aisles are in two stories answering to the arcades, and their vaulting is in rectangular compartments of varying proportions. Of these, the larger ones on the ground story have groined vaults of a new form that had far-reaching influence on later vault construction in Northwestern Europe, and calls for particular notice. It can be best described by comparing it with the Roman groined vault. It is well known that the Roman groined vault has, normally, the form of two half cylinders interpenetrating at right angles. The groins of this vault are therefore necessarily elliptical in elevation since they are the curves of oblique sections of cylindrical surfaces. A vault of this form can be adjusted to

a square area only. The groined vaults of Saint Sophia are fundamentally different in principle and in conformation; and this difference arises from the fact that it is not a result of interpenetrating surfaces, but a consequence of the curve of the groin arch, which is formed independently. That is to say, instead of being a semi-ellipse given by the oblique section of a half cylinder, it is made, like the arches on the sides of the compartment, semi-circular or segmental. It follows that the groin arches, being on the diagonals of the compartment, and thus having longer spans than the arches on the sides, reach a higher level, which makes the vault domical, i. e., higher at the center than elsewhere. Thus in either transverse or longitudinal section the crown of the vault is arched, instead of being in a straight line like the Roman vault. The Byzantine groined vault has no regular surface, but is variously hollowed according to the proportions of the plan and the consequent differences in the spans of the several arches to which they are shaped. It will be seen that this form of vault gives unlimited freedom in construction, since it can be adjusted to a rectangle of any proportions as readily as to a square.

In the Byzantine groined vault no ribs occur, save for a wide arch of rectangular section, and deeply embedded, which separates one compartment of vaulting from another. This arch, or rib, is but slightly salient at the springing, but increases in projection as it rises, yet without becoming very pronounced even at the crown. It is, however, a step in the direction of that systematic ribbed construction which distinguishes the progressive type of Romanesque architecture of Western Europe, out of which the French Gothic style of the twelfth century was evolved.

The lesser structural features of Saint Sophia are as remarkable in their way as the vaulting, for in the shafted arcades we have, in fact, a new order of support, which is a rational evolution out of the orders of Greek antiquity adapted to the needs of arched construction. The Roman architects, in springing arches from columns, made no changes in the forms of

the members of which the columns were composed. That a column devised to carry the entablature of a trabeate system, was not a proper support for an arched system, they did not perceive. Without entering into a discussion of all the conditions which determine the form of a column suitable for the support of an arch, we may notice a few points in which the columnar supports of Saint Sophia are shaped for their function.

The colossal marble shafts of the great arcades on the north and south sides of the nave—which are magnificent monoliths gathered from more ancient buildings—have no pronounced entasis, and do not taper very perceptibly, neither of these features being suitable in arched building. Whether they were found in this form, or were reworked by the Byzantine builders, we have, I believe, no means of knowing; but the fact that they have this form should be noted. They have, however, the mouldings at the bases and the neckings, which are features of the columns of classical antiquity that are unsuitable for the new conditions, and were thrown off in Northwestern Europe as arched building developed. But the bases on which these columns rest, though retaining much of the character of ancient models, more particularly as to their profiling, are a good deal transformed to meet the new exigencies. They are more spreading than those of the ancient orders, and are raised on large square plinths. But the capitals show the most marked change and most fully reflect the genius of the Byzantine craftsmen. The new function of the capital was here comprehended. This function is to prepare the relatively small round shaft to carry a bulky square load under conditions that subject it to chances of lateral disturbance from the active principle latent in the arch. In developing its form with these conditions in mind, the Greek workmen made it a curious, yet an entirely natural fusion of the three ancient Greek types, the Doric, the Ionic, and the Corinthian.* The Doric element appears in the convex outline of

the bell, and in the thick square abacus, the Ionic element in the bolsters, and the Corinthian in the proportionate height of the whole member. For such a structural system, this form leaves little to be desired, and, like the groined vault just considered, it had far-reaching influence on the progressive types of architecture in the West, and particularly in the Ile de France in the twelfth century—as may be seen strikingly in the apses of Senlis and Noyon.

These capitals are enriched with elaborate carving in low relief, which is in fact little more than surface chasing. It is an appropriate ornament for a massive system like the Byzantine, and is carried out on the arch soffits, on the faces of the archivolts, and on the spandrels. But except as surface chasing it has little merit. It is a monotonous sort of arabesque, and although on the capitals there is some suggestion of leafage, nothing of the vital beauty of natural plant life, comparable to that found in ancient Greek foliage, appears. It remained for the ornamental carvers of the French Gothic school to produce architectural foliage in which the beauty of nature is expressed through the natural conventions of stonework.

Great splendor is given to the interior of Saint Sophia by incrustation of the walls and piers with slabs of colored marbles, by illumination of the vault surfaces with mosaics, and by the many shafts, large and small, of richest marbles, including porphyry and verd-antique. It is a monumental sort of color decoration, of enduring magnificence. But it is greatly disfigured by the introduction of iron railings on the ledges of the arcades and by Turkish furniture and banners. To what extent the mosaic enrichments have suffered loss or injury through the ages I do not know.

I have alluded to the fact that some distortions and ruptures have arisen in a few parts of the structure. These may be of long standing. There were disasters even before the completion of the edifice, when the great piers are said to have partially yielded under the charge of the pendentive arches. The contemporary

*Cf. *My Development and Character of Gothic Architecture*, pp. 304, 305.

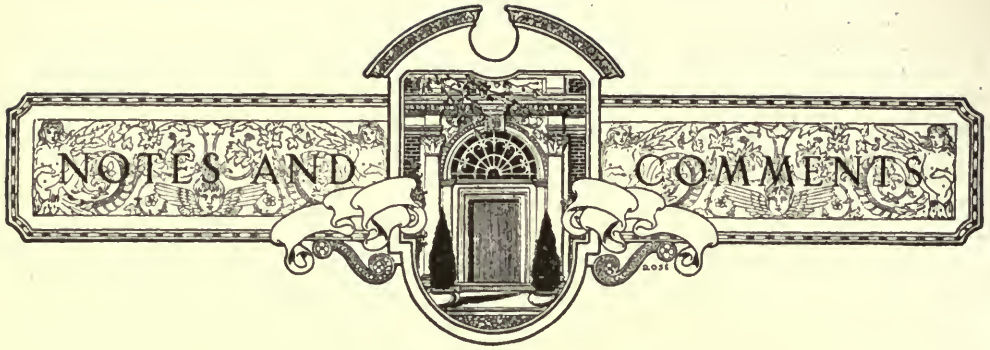
historian, Procopius, tells of this and describes, not very intelligibly, what was done to consolidate the work. He also describes the church as first completed, and his remarks on the dome seem to show that it was then nearly the same as it now is. It is said, by other old writers, that in the year 558 the eastern part of the dome collapsed during an earthquake and that the emperor restored it, making it twenty feet higher. Since that time the monument appears to have remained as we now see it, save for extensive re-workings of some parts of the exterior, and for the addition of Turkish minarets, and some other things which now confuse the composition. Yet, notwithstanding all alterations and accretions, the external aspect of the whole as it now stands is very admirable. The vast dome with the abutting half-domes, east and west, the massive buttresses, north and south, and the square mass enclosing the pendentives, make up a total scheme both structurally logical and of impressive grandeur.

Of all the large domed edifices of the world, Saint Sophia is the only one, save the Roman Pantheon, that is built on rational lines, and it is unique among the architectural works of the Middle Ages for duration. Its builders recognized the true principles of stability in dome con-

struction. They saw, as the builders of the Pantheon had seen, that no hemispherical vault of stone masonry can be made safe without abutments reaching far above the springing; and that therefore such a vault cannot be made a very conspicuous feature externally without departure from sound principles of building. The dome of Saint Sophia is accordingly not imposing from the outside, as the great domes of the Renaissance are, all of which are maintained precariously by binding chains.* It is true that the Italian architect, Fossati, who followed Poleni's example in the dome of Saint Peter's, put a chain of iron around this dome in the last century, as a measure of precaution, but the structure had already survived for twelve hundred years before it was done.

I regret that this study of Saint Sophia is not based on examination of the monument on the spot. My information has been gathered from some seventy large scale photographs, acquired for the Fogg Museum of Harvard University, showing every essential feature of the structure in detail. These photographs are always accessible to anyone who may visit the Museum and ask for them.

* I have discussed this matter in detail in my *Character of Renaissance Architecture* (The Macmillan Company, New York, 1905), pp. 24-55.



Park Foresight In Exposition Planning

What shall be the aftermath of expositions in heritage to the city plan?

When the cheers of closing have stilled, the last goodbye been said; when the lights have been

turned out with fitting ceremony at the twelfth hour of the last day and the many visitors from other places have taken their departure; with the obscurity of yesterday already seeking to enshroud the magnificent structures, their impressive approaches and forecourts, their settings and greensward, their embellishment of balustrade and parterre, of fountain and mirror basin and all the golden concepts that the architects and assistant artists have contributed to glorification of the exposition ideal, what fateful forces shall await the first glimmer of the morrow to enter upon the scene? Shall in the early glow of dawn arrive a jackal horde to strip away exhibits and all objects of value, and then building wreckers and salvage companies to break up the remains?

Is appreciation so fleeting, memory so fickle? Would it not be better that the entire exposition should lie a-mouldering than that noble avenues and vistas, cascades and sculptured fountains should be annihilated so ruthlessly; than that splendid gardens, achieved by utmost effort of architect and gardener, should suffer ignominious end with no hand raised or word said for their preservation?

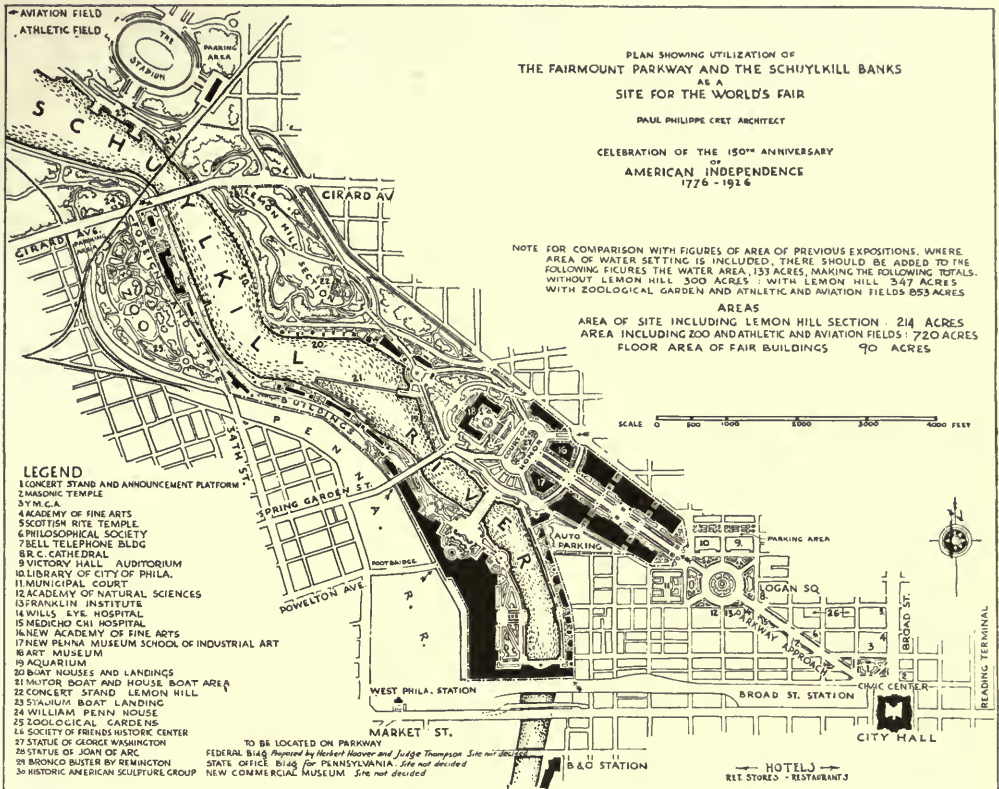
A protest is sometimes lodged against tearing down exposition buildings adaptable to other purpose; there have been efforts in one or two expositions to make some of the buildings permanent; a scheduled exposition has proposed to build "in stone, not staff". But such thought applies only to the buildings; no patronage is extended to permanence of grounds, to perpetuation of the park areas and gardens common to every exposition.

Possibly the extent and cost of the landscape setting of an exposition are not generally com-

prehended; at St. Louis, 75 miles of roadway and walk were constructed, 9,000 deciduous trees were planted, 1,300 evergreen trees, 60,000 shrubs and 5,000 vines. The exposition grounds included a horticultural park of 50 acres, a sunken garden 750 by 150 feet, a rose garden of 7 acres, with 10,000 plants which included every hardy variety. The cost of cascades and water basins was given as over \$300,000; of landscape gardening, over half a million. Such expenditure was not unique to St. Louis, for the San Francisco Exposition included a cost item of \$600,000 for "gardens".

Preservation of the garden and landscape features of an exposition after it has ceased to exist as such, is not a new idea, though one as yet unaccomplished to any extent. Ten acres now known as Kountze Park were donated to the City of Omaha from the grounds of the Trans-Mississippi Exposition held there in 1898, and two miniature lakes made from the "Hand Mirror" lagoon which featured that exposition. The grounds of the exposition held in Nashville in 1897 have been turned into a city park, and the park department at this time is expending \$200,000 in re-building the replica of the Parthenon which was a part of that exposition. Piedmont Park in Atlanta comprises the grounds of the 1895 exposition held there, and Charleston boasts a 75-acre park on the site of the 1901 exposition held in that city. The first two examples, however, were fair grounds which had been partially used as parks before the exposition periods, and little evidence exists in the latter two examples that other than the most minor advantage was taken of any landscape portion of the exposition layout. Likewise no record appears that the designers of the Chicago or the San Francisco Fairs looked beyond the closing day of those expositions. Obviously the design of none of these expositions anticipated retention of the grounds permanently or park accomplishment by mere removal of exposition buildings.

San Diego, on the contrary, designed its ex-



position with view to eventual park and public garden endowment. Unfortunately the city failed to consummate its plans promptly at the expiration of the Fair. The war at the close of the exposition caused the temporary buildings to be converted into barracks, a proper and worthy proceeding, the need for which has now passed; and it remains to be seen whether the same idealism and civic pride which distinguished San Diego in its initial accomplishment will signalize the community during the post-exposition period. Mr. Goodhue sounds a note of disappointment in the delay: "I am certain that were the temporary work to be removed, the various sites properly parked and planted, with formal parkways, allées, fountains and pools, the resulting garden would in time be one of the finest, perhaps, on this side of the water." The beautiful drawing of the future possibilities of the San Diego Exposition site arouses one's enthusiasm in Mr. Goodhue's vision and hope for its speedy realization.

Philadelphia in its plans for an exposition to commemorate the 150th anniversary of the signing of the Declaration of Independence, gives importance to the factor of permanent

park development in its selection of exposition site. In the Report of the Engineers' Club of Philadelphia, prepared in collaboration with the Philadelphia Chapter of the American Institute of Architects and the Philadelphia Real Estate Board, emphasis is placed upon the salvage which may be expected after the Fair, in the form not only of permanent buildings but of parks, bridges, monuments, and landscape features. There have not been specifically mentioned the game and athletic fields which are common to exposition, nor the bandstands, pavilions and ethnological shelters which might be retained profitably.

It is proposed, on the other hand, that the Philadelphia exposition be located on park area already in possession of the city, so as to eliminate the cost of acquiring land. This is a many-sided question. St. Louis experienced little opposition to a park location for its World's Fair, according to its printed report:

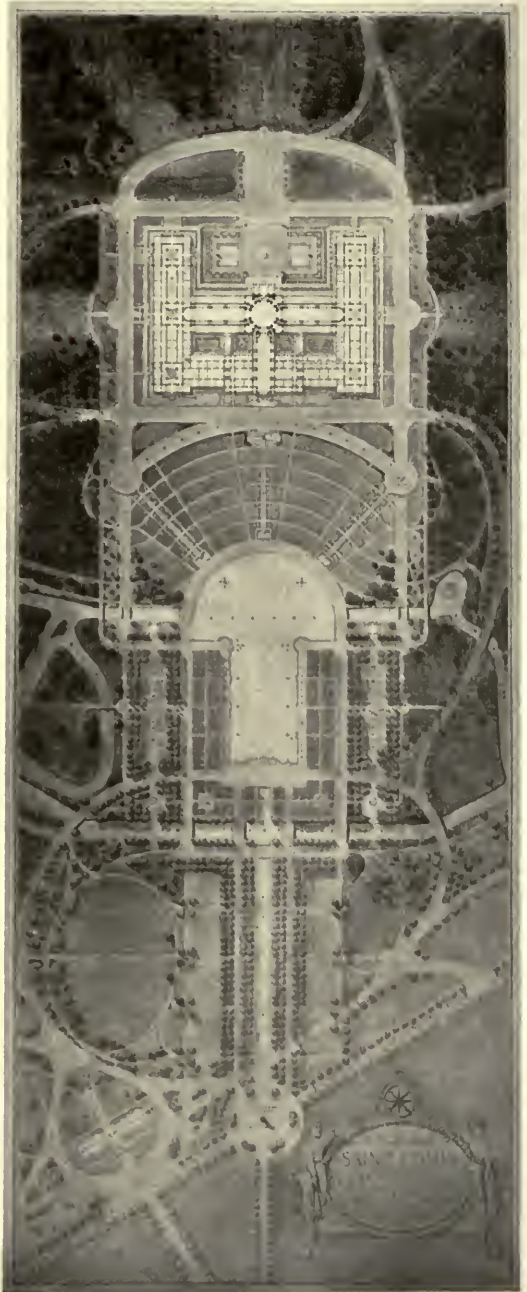
"The selection of the western half of Forest Park for the site was accepted and approved by the sentiment of the city. The location was endorsed as admirable by the press, and by the country at large. The result of a test suit to

enjoin the use of the park for the purpose served to emphasize the unanimity of approval. The petition was argued and the injunction was denied after a week's consideration."

The aesthetic requirements of an exposition and park area are similar, in the sense of picturesqueness, value of water in the landscape and the desirability of "offscape". It is stated in connection with the Fairmount Park proposal that "it might be thought that there would be possible inquiry as to the appearance of the Park, due to the selection of a site within it, although a careful topographical survey will reduce this possibility to a minimum and the ultimate appearance of the Park will be improved rather than injured." This would appear to be substantiated by St. Louis again: "The Park is more beautiful and attractive than it could possibly have been if the World's Fair had not been held there." A further statement, however, should not escape attention, that "the grand total of \$1,457,747.98 was expended for the restoration and betterment of Forest Park." This estimate probably included the Art Building and the statue of St. Louis.

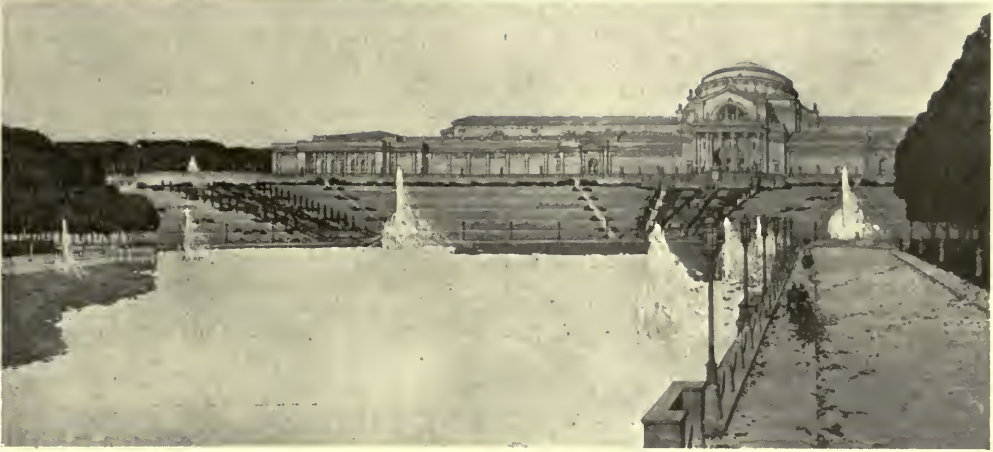
An advantage from the park standpoint may be advanced that the area needed to accommodate a modern exposition—estimated for Philadelphia to be from six to eight hundred acres—can rarely be found within a single park, unless so outlying as to be inconvenient of access, and that the area necessarily added may later be retained as permanent park extension. The Pan-American Exposition in Buffalo unfortunately bestowed no such benefits, although the layout of the exposition included part of Delaware Park; aside from such portion of the park area as was used, the exposition ground has been built up for residence and industrial purpose. Neither did the City of Cincinnati profit by the extension to Washington Park which was used in connection with the exposition in 1888: "After the close of the Exposition the property was left in its original condition, nothing being added or taken away from the park system"—a quaint expression by the park authorities of relief at having come out of the affair so well!

The placing of a fair within a park area doubtless hastens a park development. In a report by the Audubon Park Commission of New Orleans is the statement: "In the year 1884, the World's Industrial and Cotton Centennial Exposition was opened and the park at a bound gained a national reputation. The grounds of the park were much improved by planting, paths and driveways, which were the park attractions for many years. Unfortunately, the care and upkeep of these improvements absorbed all the funds which the Commission was



Plan by Cass Gilbert for the reclamation and restoration of a portion of Forest Park, St. Louis, occupied by the World's Fair.

able to obtain." There is an English saying that "he who inherits a farthing needs spend a pound"; and the expense of upkeep may often



The central portion of the St. Louis Museum of Fine Arts, Cass Gilbert, architect, was permanently constructed at the time of the World's Fair. The radial cascades recall the original exposition plan.

preclude the maintenance of exposition gardens intact. This factor should not militate against retention of some portion of the gardens, at least, and of the entire area until such later time as adequate finances may permit their full restoration and even expansion, as has come to pass within the last few years in the case of New Orleans.

An exposition site as pointed out in the Philadelphia report should be such as to bring about increase in taxable property of the city after the exposition and have a good effect on the city's future planning and development.

Illustrations abound of the increase in value of real estate adjacent to newly developed parks, Kansas City being an outstanding example of values enhanced in excess of the cost of the entire park system. Regarding the effect on future city planning, the Seattle Chamber of Commerce reports one of the after effects of the Alaska-Yukon-Pacific Exposition to be "an extension of the park and playground system, which had origin in the public spirit that was engendered by the Exposition."

Paul P. Cret, whose plan for utilizing the parkway and adjacent portions of Fairmount



The Grand Basin of the World's Fair is retained in the Cass Gilbert plan for the restoration of Forest Park, St. Louis. The Festival Hall and Cascades which featured the Exposition have been removed and the amphitheatre regraded according to the new design.

Park as a site for the Sesqui-Centennial Exposition accompanies this article, gives as two main purposes in his selection of site:

"First: To bring about within a reasonable time the completion of the Parkways and the improvement of the river banks. This may be achieved by securing the necessary condemnation of land by including it within the limits of the Fair and by making compulsory improvement of the site, all of which, later on, will become a permanent part of Fairmount Park and the Parkway.

"Second: To have as large a part of the buildings, bridges, roads, and decorative features as possible built in permanent materials, so as to become city improvements after the end of the Exposition.

"A fair which does not leave behind some permanent benefit to the city where it is held, fails in one of its most important results. Paris has gained from former expositions the Trocadero and its garden, the Alexander III Bridge, the two Palaces of the Fine Arts at the Champs Elysées. Other cities have in the same way, by using foresight in linking a temporary exposition to general city planning, gained assets which could not have been secured without the help of popular enthusiasm created by a world's fair scheme."

Mr. Cret, like Mr. Goodhue, sees a great park and garden scheme as an ultimate ideal of expositions rather than a haphazard salvage. "Not heaven itself upon the past hath power," and if a city is to enjoy an inheritance from expositions rather than suffer an aftermath, the first plan must anticipate the eventual park lay out. Failure to realize this in the past may have occasioned the heavy expenditure in Forest Park, St. Louis, where, according to the landscape architect of the grounds, who was director of restoration as well, roads were changed because they "conformed to building lines and could not be used in the plan of restoration" and the formal canals of the World's Fair waterways were converted into a chain of naturalistic lakes. It is interesting to examine in this connection the after-plan of Mr. Goodhue, which eliminates the building features of the San Diego Exposition without necessity of complete change in general layout.

A park may be such without aping a wild, untrammled woodland, and the stamp or impress of an exposition design may well be retained as commemoration and record of the exposition once held there. If a park is a legitimate after-product of an exposition, the exposition ground plan may be seen as a park in embryo. A park which perpetuates rather than erases the characteristics of an exposition will inherit the virtues of that exposition. The

original design, like a palimpsest, will influence the park development along lines common to European parks but seen infrequently in this land where the "naturalistic school" held firm sway during the pioneer days of park development and not until recent years has been subject to challenge. Philadelphia by foresight in the design it adopts for its coming exposition may kill two birds with one stone and achieve one of the finest laid out parks in this country by process of descent. As a result of Philadelphia's example, magnificent parks, parkways and public gardens may well become the logical civic patrimony of expositions henceforth.

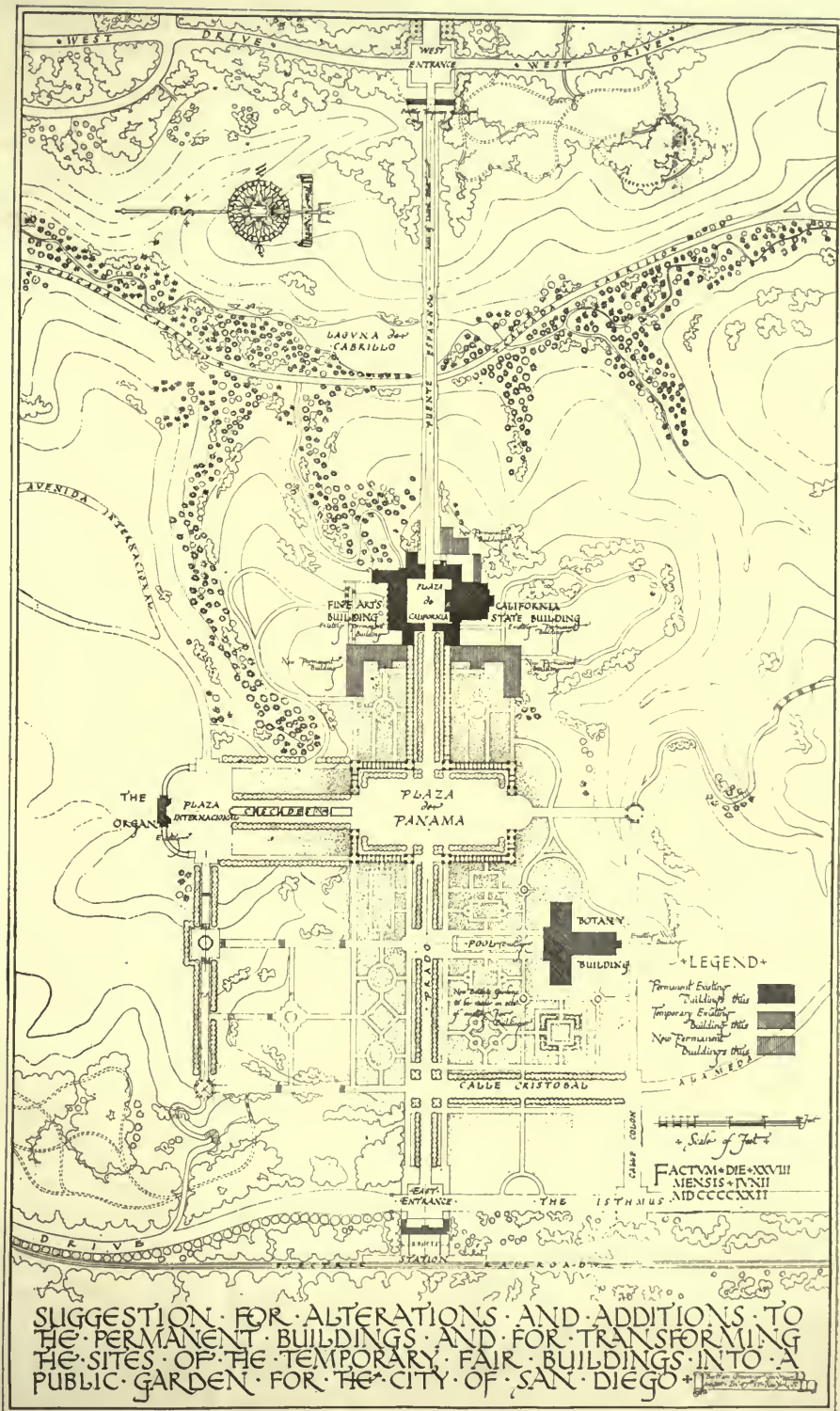
GEORGE BURNAP.

A Method for Color Description

In certain arts, it is necessary to depend for the preparation of pigments upon individuals who are not artists, and who by training or temperament are incapable of grasping the aesthetic objective. The making of colored diagrams, stating precise requirements, with those pigments most generally used by painters or decorators, is not a practical solution, as there is always considerable difficulty experienced in matching colors produced by one chemical method with other types of pigment.

Another argument against the preparation of such drawings is the time and consequent expense involved; this alone renders the consideration of a practical solution a profitable line of thought. The designers in certain applied arts constantly feel the need of a reliable means with which to describe simple decorative color requirements, in such fashion that an accurate interpretation may be assured by those who are to prepare the requisite colors. Such a resource would be invaluable in such crafts as dyeing, ornamental painting, terra-cotta, faience, etc., etc. The main difficulty lies in stating with any degree of accuracy the denomination of certain subtle quantities such as are contained in the two most important factors of color effect—radiant-energy and tone-value; a further difficulty lies in the intangible character of composite tones.

In view of the fact that equally indeterminate factors in music have been reduced to graphic description, the prospect of a practical solution appeared less far-fetched. In music, a simple sound, a complex tone, key classification, sound volume, and other musical features are so transcribed that one general interpretation only is possible. A plan was vaguely contemplated by the writer for some time of



DESIGN FOR A PUBLIC GARDEN FOR THE CITY OF SAN DIEGO. BY BERTRAM G. GOODHUE, ARCHITECT.

paralleling musical methods for color description. The general plan was on the following lines: Each elementary color with its modulations would correspond to a musical key. The elements of composite tints could be indicated in much the same manner as that which is adopted in "figured-bass" to denote those sounds that are grouped together to form a chord. Chromatic intensity, or radiant energy, could be conveyed by certain signs, just as the gradations of tone that exist between a fortissimo and pianissimo are stated in music. But, as an exact statement of the degree to which this latter quality is present in color, is vital to effect, the inadequacy of signs to convey grades of color intensity called for another solution.

A very interesting little brochure entitled, "The Munsell Color System," treating of this subject, was recently brought to my notice, in which a method for measuring the principal factors of color effect is ingeniously contrived. It treats in a general way with the colors of the spectrum, but in such a manner that its principles might be applied to most types of pigment used in the applied arts. The objective of the system is to enable us to state a color in formula form. In the plan devised for color analysis, a color is regarded from three separate angles, viz.: Hue, Value, and Chroma; these terms are defined as follows:

Hue.—This is described as "the quality by which we distinguish one color from another, as a red from a yellow, a green, a blue, or a purple". A diagram shows the five elementary colors with their five complementary colors arranged in their prismatic sequence: Red, Red-purple, Purple, Purple-blue, Blue, Blue-green, Green, Green-yellow, Yellow and Yellow-red. The next diagram shows the two ends of the ribbon joined together making a circular band; the spaces between each of the above colors is divided into five sections. The spectrum colors are shown in complete rotation. The ten divisions between the primary colors cover each primary in its pure state, and the intervening transitions to its adjoining primary; these are numbered from 1 to 10. The "hue-formula" for a color that is neither red nor yellow-red, might be 7R, or 8R, according to its nearness to red, or to yellow-red.

Value.—This is described as "the quality by which we distinguish a light color from a dark one." A diagram represents the scale of tone values by a vertical pole, divided into nine equal parts. A systematic gradation of tones ranging between black and white, determined by the photometer, fill the nine sections; number five being the mid-tone value. When determining a color's value for formula statement, it

takes the number of that tone on the scale of which it is the nearest approximation. This number in the formula is placed above the line,

e.g., a blue of medium strength is $B \frac{5}{-}$.

Chroma.—No definition is given of this term, but the summary of a lengthy explanation is, that it corresponds to "radiant energy." An ingenious device shows the inter-relation established between Hue, Value, and Chroma. Chroma is indicated by lines that converge from the spectrum hand to the axis, on which the tone scale is graded. In a formula, Chroma is indicated by a figure placed below the line. The formula for a green of medium tone-value,

and of medium intensity would be, $G \frac{5}{3}$.

There is an advantage in this arrangement of the spectrum colors on a circular plan, in that the complementary color is at the opposite end of that axis on which its primary is located. An interesting diagram shows the way in which the result of color mixtures may be predetermined, developed upon the phenomenon demonstrated by the Maxwell Discs, which proved that by revolving at high speed a card, covered in equal parts by a primary color and its complementary, a perfectly neutral grey is produced, whatever the combination of primary and complementary. The diagram shows the degrees of color modification that result from various mixtures.

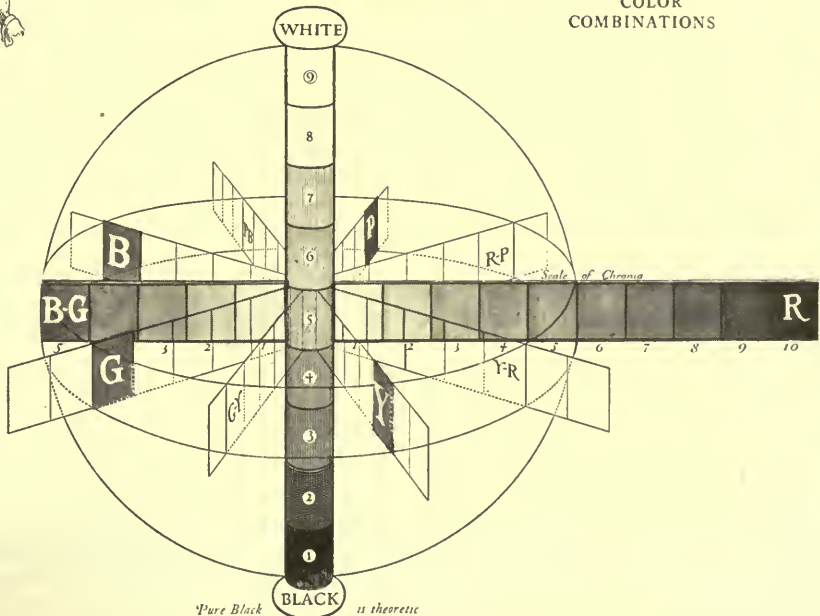
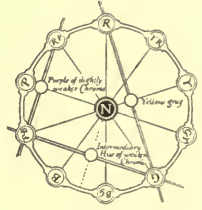
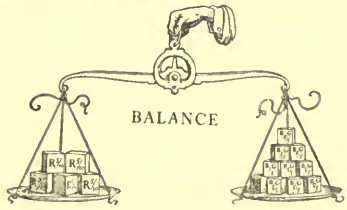
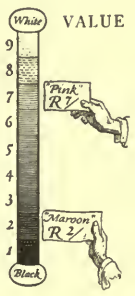
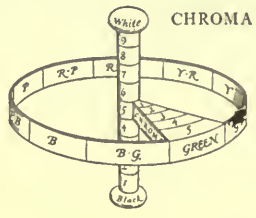
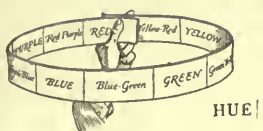
The Munsell principle is applied to the problem of color balance in design, on the basis of tone and chroma measurement. Colors of the greatest radial properties are allotted a higher range of numerals than colors possessing a lesser degree. A red, for example, takes ten numerals to cover its range, while its complementary, blue-green, needs but five. The method of establishing a color balance is explained as follows: "Let us suppose that we wish to employ in a design the maximum of red, with blue-green of middle value. Since we are speaking of balance, a pair of scales is an apt figure with which to illustrate the point. In the pan on one side we put five

$\frac{5}{10}$ blocks of red of its maximum Chroma, R—.

To balance this we must put in the other pan, ten blocks of the strongest blue-green, which

is $B.G. \frac{5}{-}$. We will find that to balance two

$\frac{5}{5}$ colors of unequal Chroma, but of the same tone-value, we must use a larger area of the weaker color, and a lesser area of the stronger, and that the proportions are simply in inverse



Pure Black is theoretic and not practically attainable.
Therefore Black and White are represented by words only and Value step 1 is the darkest gray and step 9 the lightest



ratio to the strength of Chroma in each: or,

$$\text{with } R \frac{5}{10}, 5 \times 10 = 50: \text{B.G. } \frac{5}{5}, 5 \times 5 = 25, \text{ the}$$

color balance will be obtained by 50 parts blue-green and 25 parts red." On the practical utility of such adjustment in designing, it is futile to comment, other than to remark that it would inflict a serious embarrassment in composition: we quote merely for its theoretical interest. A plan for composing color is touched upon, but it is of little practical value.

LEON V. SOLON.

The time has been extended in the competition for a design for the proposed Calvary Baptist Church at Washington, D. C. Competitors' sketches will be accepted up to and including September first.

Architects are invited to submit plans and designs on a competitive basis for the proposed Church and Sunday School at Williamsport, Pa. Particulars may be obtained from the Rev. W. W. Scholl, Pastor, 1416 West Fourth Street, Williamsport, Pa.

The Indiana Society of Architects are making the proposal to the War Memorial board that competition for the designing of the Indiana war memorial shall be put upon an equal competitive basis for Indiana and outside architects.

This proposal runs counter to the plan the architects declare was suggested recently by the memorial board in conference with the architects of the state. That plan was to invite certain prominent architects from outside the state to compete, with an assurance of compensation, while the Indiana competitors would receive nothing unless a local design should be accepted.

The architects' counter-proposal suggests that a series of prizes be offered, architects throughout the country taking equal chance.

The Tenth International Congress of Architects will be held under the auspices of the "Société Centrale d'Architecture de Belgique" in Brussels, September 4-11, 1922.

**Tenth
International
Congress of
Architects**

An International and a National Retrospective

Architectural Exhibition will be held at the same time.

There was never a more auspicious moment than the present for holding an International Congress. The war, it will be remembered, interrupted the preparations for the Tenth Congress, which was to have been held in Petrograd in May, 1915, under the august protection of H. I. M. Emperor Nicolas. During and even since the war the architects of various countries have been isolated from each other. It is further thought to be an especially appropriate time for renewing these gatherings, when the Société Centrale will be celebrating the fiftieth anniversary of its foundation.

The Congress, which will include delegates from all friendly countries, will be held under the distinguished presidency of M. Girault, Member of the Institute of France. The Belgian Committee under the Chairmanship of M. J. Caluwaerts with M. B. Moenaert as Secretary, is assured of the cooperation of Spain, Holland, Canada, Portugal, England, Italy, the United States, and Switzerland.

American architects are cordially invited to attend and take part in what will be one of the most unique and original gatherings of architects ever held. The subjects to be discussed are of international interest; the excursions will be instructive and the receptions of unusual interest.

There is a permanent Committee of the Congress that attends to all the business of the organization between sessions. It also selects the country in which the next Congress is to be held, and the subjects for discussion. There are, about one hundred members from various countries. The American Section consists of Francis R. Allen, Glenn Brown, W. R. Mead, Cass Gilbert and George Oakley Totten, Jr., Secretary.

All desiring to attend should communicate with the Secretary, 808 17th St., N. W., Washington, D. C.

Growing recognition abroad of the achievements of American architecture is attested by the bestowal of the Royal Gold Medal for architecture upon Mr. Thomas Hastings of New York. The medal was founded by Queen Victoria in 1848 and has been presented every year since that time. The list of holders of the medal already includes the names of Richard Morris Hunt and Charles Follen McKim.