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THE NEW WASHINGTON GLADDEN HIGH SCHOOL OF COLUMBUS, OHIO

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THE Washington Gladden Technical High School of Columbus, Ohio, opens a new era in public school architecture in that its exterior classic design and the selection of suitable construction material for the execution of such design became paramount issues in the planning of the school. Although individuality of design and exterior treatment are always of importance to the school builder, the development of the exterior usually follows the evolution of the interior plan. The Washington Gladden School presented a different scheme of things.

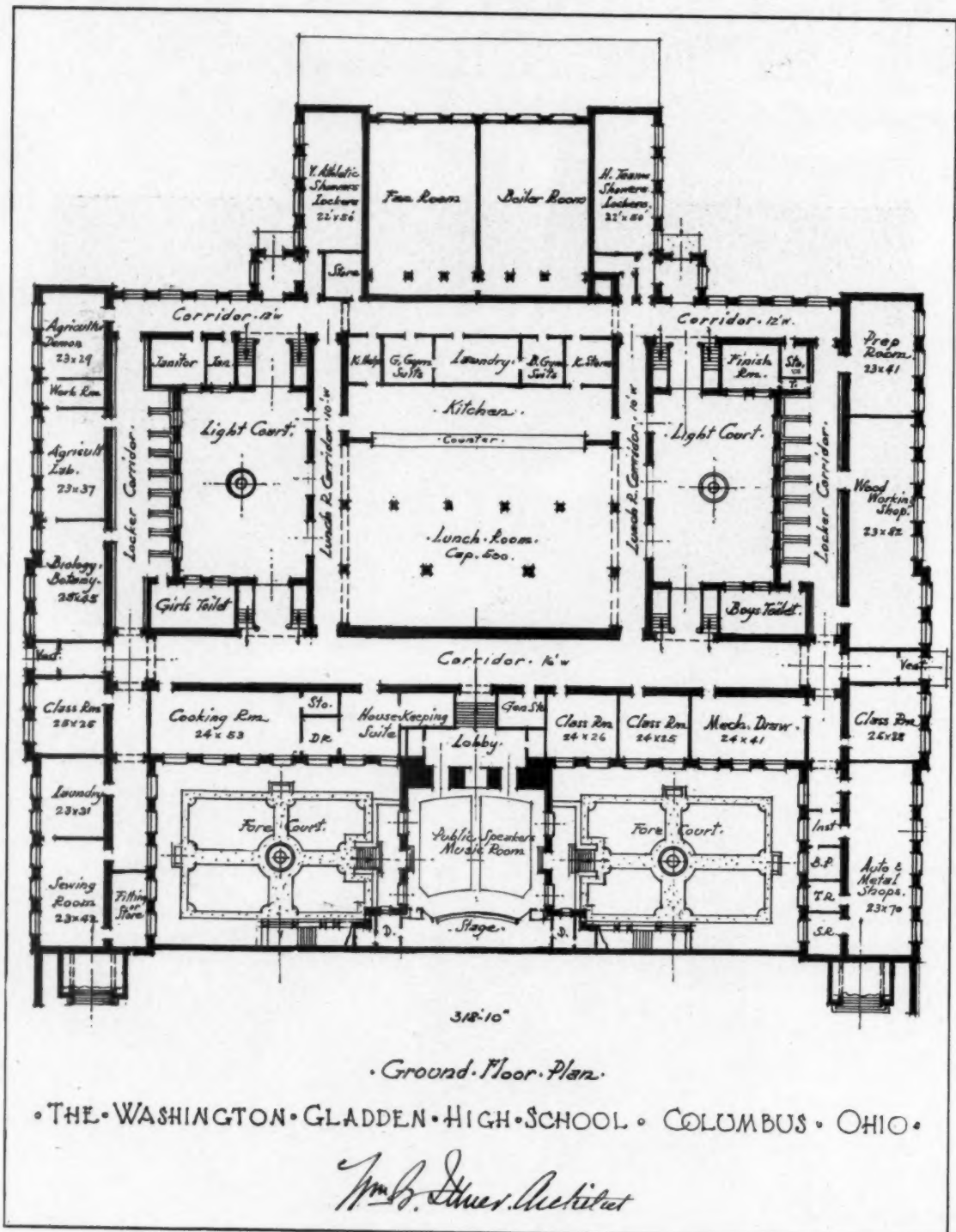
Along the Scioto River which divides the city, are extensive tracts of ground secured by the City Plan Commission for a new civic center. The initial building in this civic group is the Washington Gladden Technical High School, for which a site of 17.8 acres was secured by the Board of Education. Aside from including all the rich and varied facilities essential to a com-

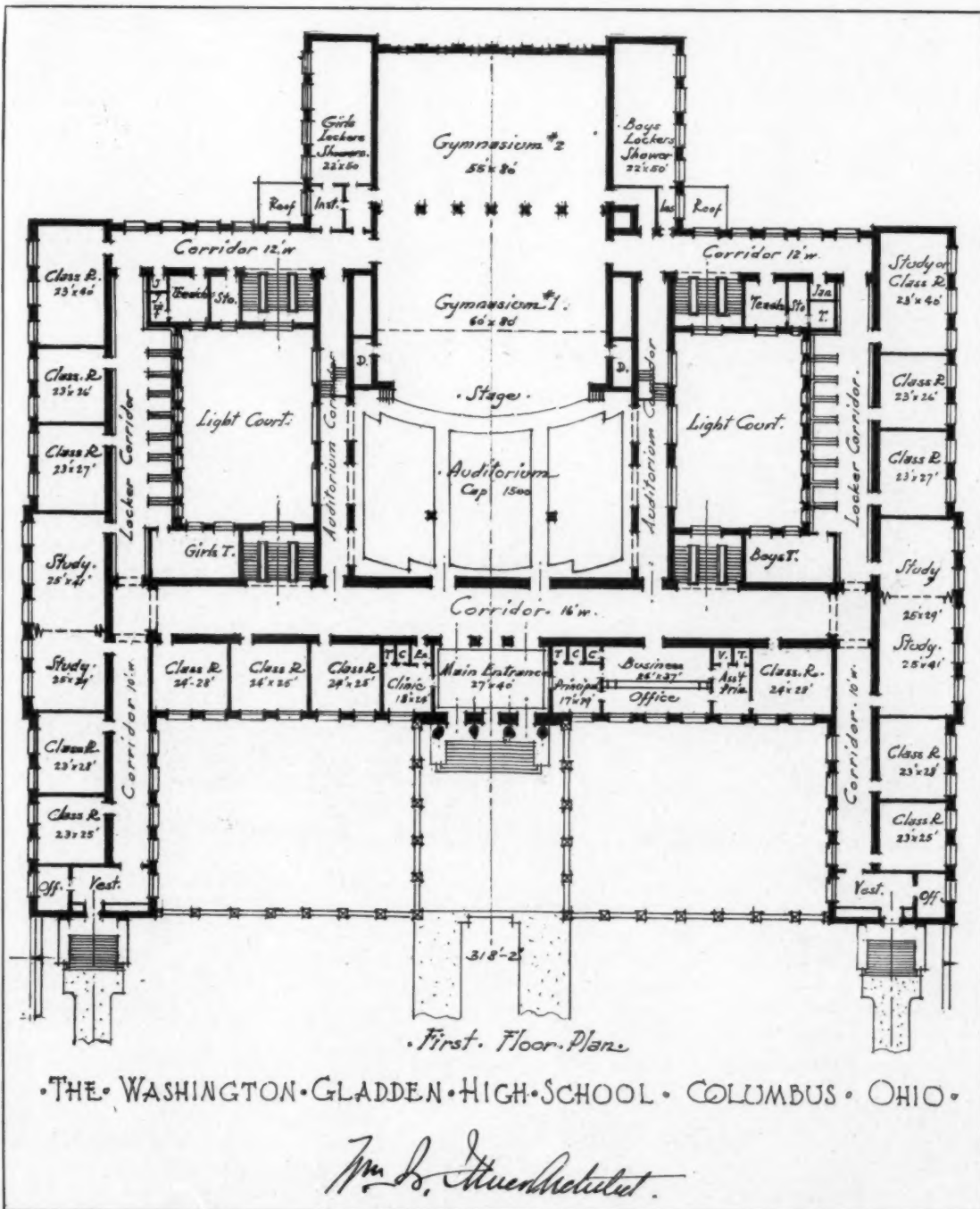
prehensive high school, the new plant will also incorporate the key design for all buildings to follow. A classic design is therefore desired.

School buildings are difficult to design in classic style, owing to the regulation of window areas, and the counterbalancing wall space. The kind of material at the disposal of the architect is also an obstacle. Brick is most commonly used in construction owing to its economy, coupled with durability. Pleasing exteriors are possible with brick but for classic architecture stone should be employed and stone is more costly than brick. The Indiana limestone used in the construction of the Columbus school is possible because the taxpayers are willing to spend \$50,000 more for a stone exterior.

The particular style of the Washington Gladden is dictated by the location in the key position of the proposed group of public buildings. Its architectural expression is suggestive of Greek

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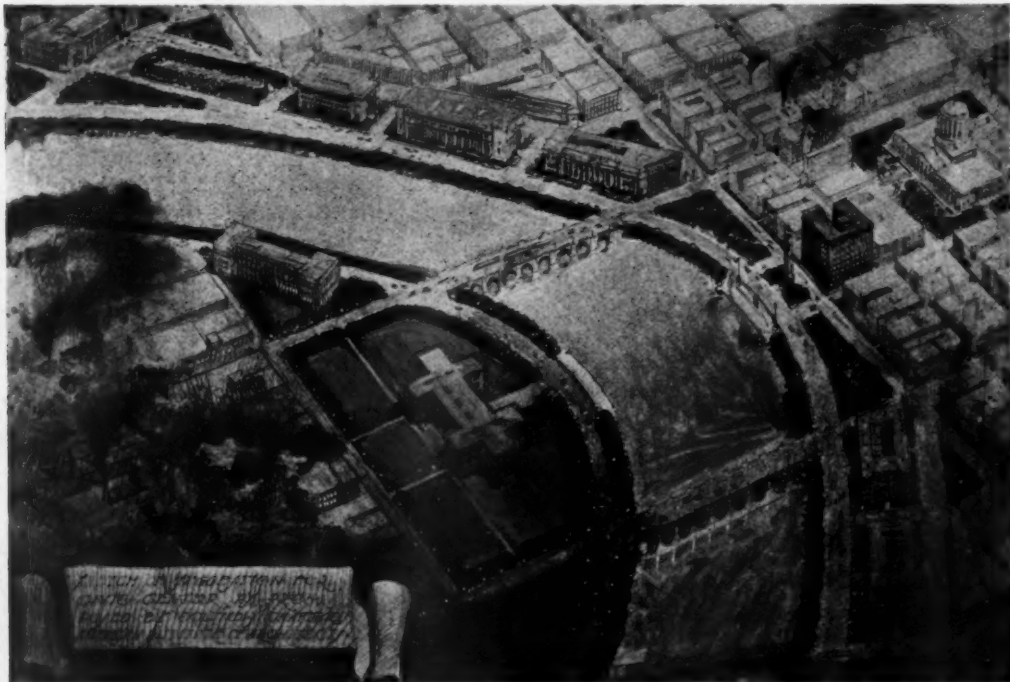
dignity and simplicity. The ample site of 17.8 acres in the central part of the city with a boulevard drive and the Scioto River paralleling its front terrace gives to the building a commanding setting. The size of the site permits of adequate lawn space and makes provision for expansion, as well as for full outdoor recreational features.

The school is to be in every sense a cosmopolitan high school including complete facilities for commercial and vocational subjects, as well as the usual college preparatory courses. It is planned for 2,000 day students and since its location is downtown and its facilities extensive, evening

er rooms flank the gymnasiums, making them also directly accessible to the grounds. Additional shower and locker rooms immediately below, one for the home athletic team and one for the visiting team, add to the convenience of the out-of-door activities.

THE ASSEMBLY ROOMS

The main entrance of the building looks toward the centrally-located commodious auditorium. Its 2000 seatings and stage-gymnasium will serve for large assemblies. The music-lecture room will suffice for small gatherings. It is located on



Sketch of Suggestion for a Civic Center as proposed by Columbus Chapter, American Institute of Architects, Showing Location of Washington Gladden High School

and continuation school work will be conducted continuously during out-of-school hours. Extensive plans are being evolved for Americanization activities and commercial work.

THE PHYSICAL EDUCATION GROUP

Everything to be desired in a complete out-of-door physical education equipment is possible with the large site; two baseball diamonds, a football field, a quarter-mile running track, space for tennis, ample acreage for miscellaneous activities, and an amphitheatre for spectators are included.

The two indoor standard-sized gymnasiums connect with the auditorium. Both are on a level with the stage and may be united with it. Boys' and girls' dressing rooms, shower and lock-

er rooms flank the gymnasiums, making them also directly accessible to the grounds.

PROVISION FOR ACADEMIC ACTIVITIES

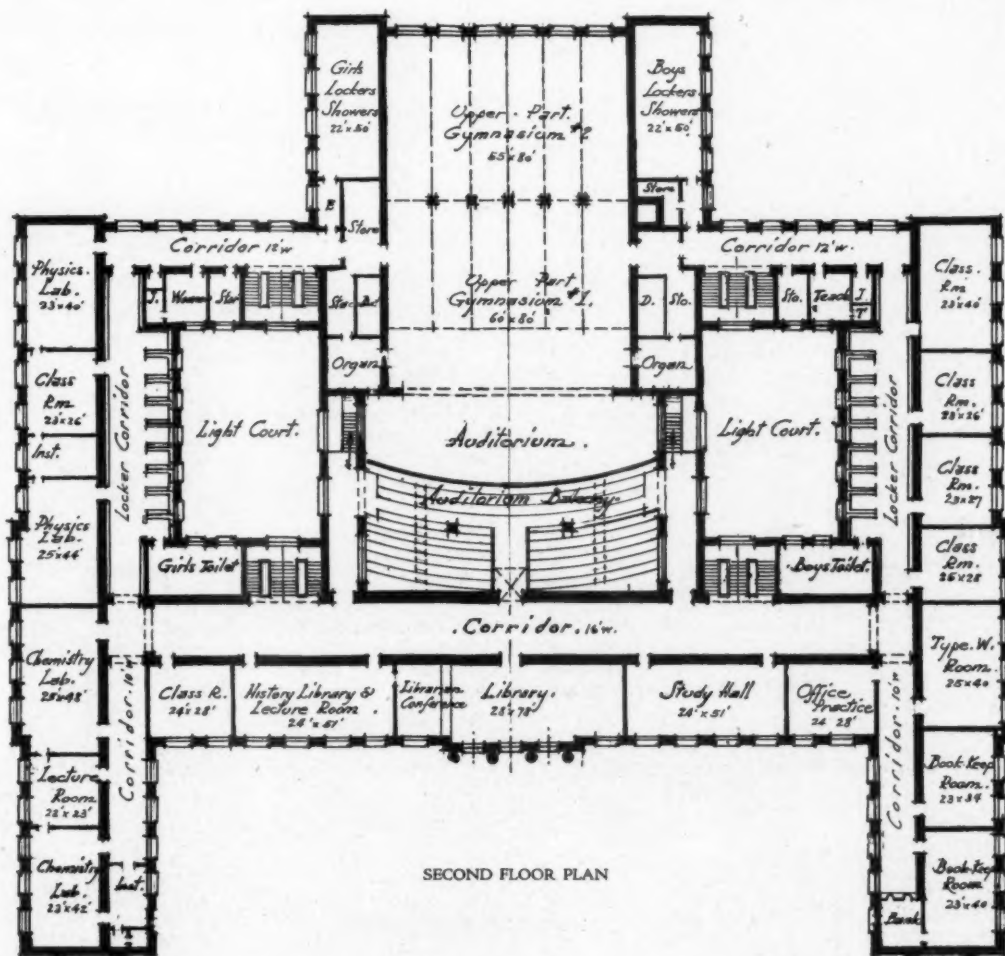
The classrooms occupy the bulk of the areas on the main and second floors. Three study halls, two on the main and one on the second floor, correlate with them. The main study hall on the second floor also connects with the school library, which offers accommodations to 100 students. A lecture room with a similar capacity and equipped with visual apparatus also connects with the library. The library, study hall and lecture room are thus arranged *en suite* and all three overlook the forecourts formed by the projecting wings of the building.

There are seven science laboratories; two for chemistry on the second floor, separated by a lecture room, two for physics, also on the second floor. The agricultural and biology laboratories are located on the ground floor in order that ready access to the out-of-doors may be secured. The entrances to the agricultural laboratories are arranged so that tractors, farm machinery and live stock may be brought in for demonstration and study.

Four large undivided areas supply the shop space. Sub-divisions will be cared for by movable partitions in order to accommodate changes and readjustments in the vocational activities. All shop areas are located on the ground floor.

THE HOME ECONOMICS

A cooking room 24' x 53'-8" connecting with a model apartment, a sewing and millinery work room and a laundry are included in the home



SECOND FLOOR PLAN

PROVISIONS FOR VOCATIONAL ACTIVITIES

As the school is located in the central part of the city and as it replaces the old high school of commerce, its commercial department is naturally extensive. Two rooms are provided for book-keeping, one for typewriting and one for office practice. The bookkeeping and typewriting rooms are each about 24' x 38' in size and are arranged *en suite* on the second floor. The school bank, an office and a general store room are included in the group.

economics equipment. They are located on the ground floor with the lunch room facilities which are arranged to care for 800 students at a time. A large community kitchen adjoins the lunch room and the group is equipped with a laundry, storage space and accessory rooms.

ART AND DRAWING

The central portion of the building is carried up to include an additional floor and this space is divided into the various arts and crafts quar-

ters and printing. A commodious art work room (25'-2" x 62'-11") a commercial art room, a ceramics laboratory, metal working room, three class rooms and two store rooms constitute the group. All open to a top-lighted art gallery corridor.

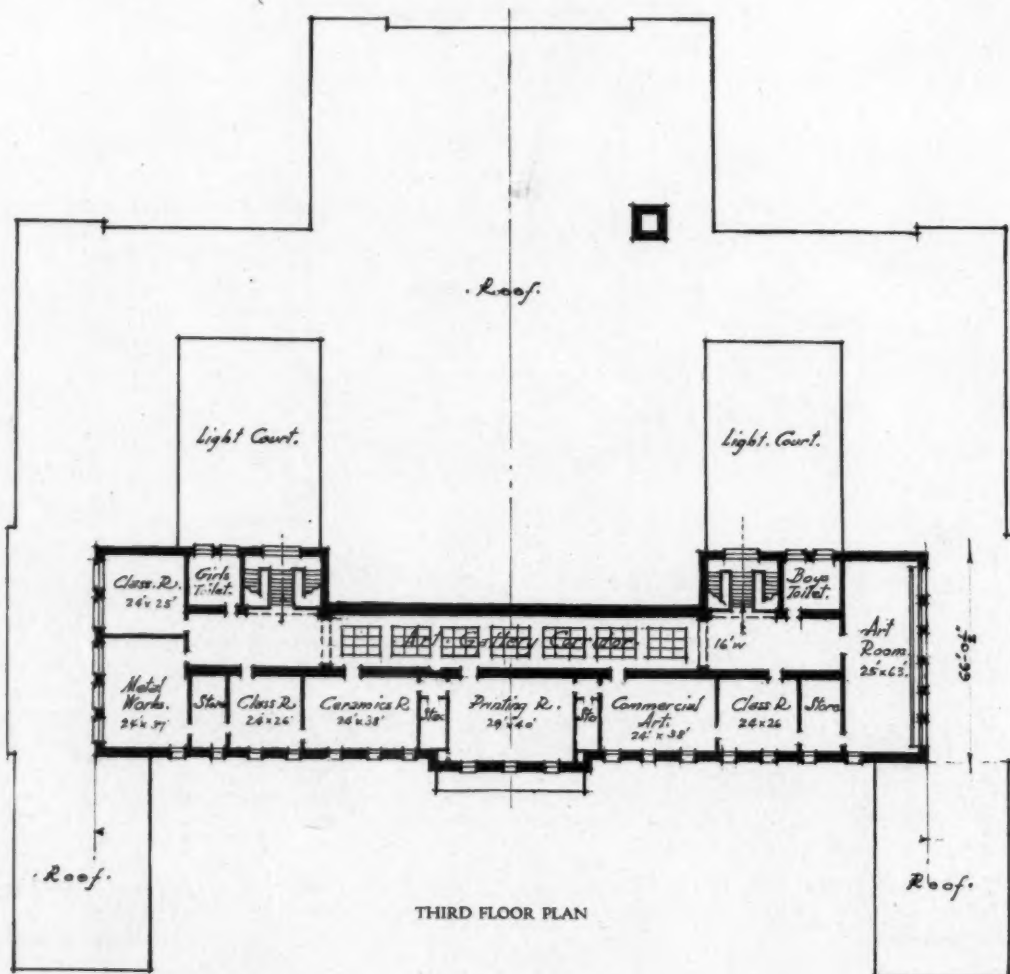
THE MECHANICAL PLANT

It is planned to locate the power plant in close correlation with the shop wing, for the reason that in this location it will present educational

opportunities not otherwise obtained. Its location in the central portion of the shop wing will insure safety, and will minimize underground connection.

Costs

The total cubical content of the school is 3,726,000 cubic feet. The contracts were let at a cost of 28.42 cents per cubic foot, making the total cost \$1,059,092 or approximately \$529 per capita.



THIRD FLOOR PLAN

TECHNIQUE IN CLAY PRODUCTS

BY F. S. LAURENCE

Executive Secretary, National Terra Cotta Society

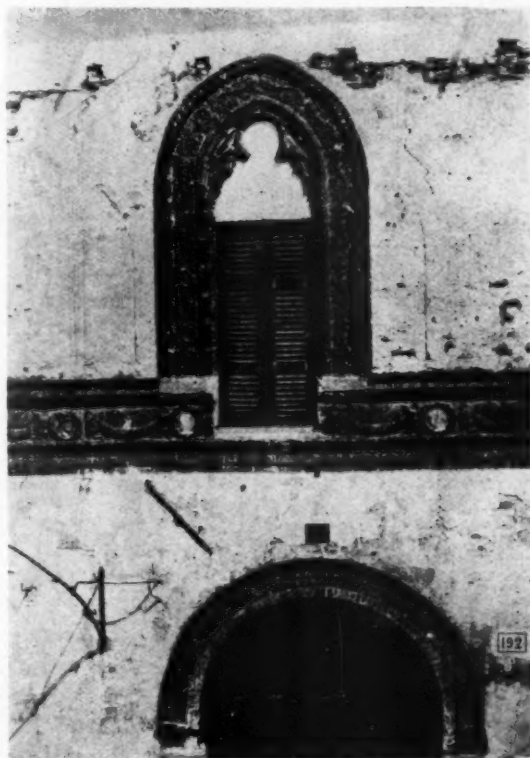
SUPPLEMENTING a series of articles on Color in Architecture, recently presented in these pages, a word should be added upon certain aspects of technique in the use of the clay products which today offer the principal opportunity for color expression.

Clay becomes usable for building purposes only after it has passed through a firing process reducing it to the necessary hardness. In this process all perishable substance in the clay is consumed and as the latter is a natural product, however refined by preparatory treatment, irregularities of form are bound to occur in the shrinkage resulting from this consumption. From what has been already said about variations of color similarly occurring, this corresponding formal limitation should be frankly accepted as belonging to the very nature of things in a ceramic product. Consistency in the use of such a medium requires that its nature in all points should be regarded, and coloring which is frankly ceramic demands form which is frankly ceramic. Similarly the quality of modeling in ornamental design should be that naturally yielded by the nature of wet clay before being dried and burnt. Wet clay cannot be chiseled and given the sharp edges of a finely grained marble or stone. The rigid character which is inseparable from the carving of a hard resisting substance has no place in the modeling of one which yields with the most plastic freedom to the touch of the bare hand. Yet we find everywhere a demand that modeling in a product like terra cotta shall be finished "sharp and true," the result be-

ing that it often presents an aspect of mechanical rigidity entirely antithetic to the feeling of a yielding clay reduced to intense hardness by the freely playing action of flame.

The same applies to the results commonly demanded in jointing and alignment. An exami-

nation of the terra cotta work of the early Italians shows that they took their material as the kilns gave it to them, neither worrying about the frank presence of the necessary jointing nor seeking to reduce this to mechanical accuracy through grinding or other arbitrary treatment of the fired pieces. The result was that while their alignments and curves were to some extent broken and irregular the effect, when associated with a consistently free treatment of modeling, exhibits all the charm of a freely handled crayon drawing and it is this spirit which is appropriate to design in a clay material both in the treatment of form and the handling of color. On a previous page reference was made to the feeling of a loosely handled water color in



Detail from an ancient Italian villa illustrating free treatment of Terra Cotta in line, form and finish, these qualities occurring naturally in the manufacture. Color is red, unglazed. The somewhat similar modern application shown on page 800 affords an interesting study of comparative effect in these points

wash and this we do not commonly associate in rendering with the tight precision of nicely finished pen drawing for the expression of line and form, much less any embodying use of the ruler and compass in the final touch. Clay mediums, in other words, present a possibility of realizing in actual construction the charm of free hand feeling which is often the compelling interest in a rendering—one that not uncommonly captures the imagination of the client (and sometimes a jury). We all know what a highly artistic drawing may convey in

comparison with the coldly realized actuality of its execution in a building it is aimed to portray.

In this connection, some of our most accomplished architects have gone to extreme pains to secure in executed work results reflecting all the

what will result under fire action has been largely eliminated. In chemical structure and the compounding of materials a similar certainty of command has likewise been achieved. In the manufacture of terra cotta, for instance, it has been found that by grinding and adding to the



Detail of entrance, Clawson School, Oakland, California
J. J. Donovan, Architect

Illustrating a flat treatment of Terra Cotta in mottled gray matt glaze. (Design is equally appropriate for polychrome treatment)

charm of early primitive process in various applications of tile and terra cotta. The difficulty that has been met in this respect has lain chiefly in the fact that technical improvement in all lines of ceramic production has resulted in bringing these mediums to the point where uncertainty in

raw unfired clay a certain proportion of fired clay the unequal shrinkage formerly encountered in firing is largely overcome and the ware can be given a truer form and more even size than were formerly obtainable. Larger pieces can also be made, and in other respects a correspond-



Detail of Terra Cotta modeling in arched windows of the Ospedale Maggiore, Milan

The irregularities of finish in burnt clay frankly accepted by the early Italians are nowhere better illustrated than in this instance. Note the soft contours and irregular edges and jointing. The modeling expresses perfectly the plastic nature of a clay medium under the direct touch of the hand. Coloring is also the natural result of the firing in its variations, which range from red to golden brown, burnt orange and sienna. This work was executed about the year 1456 A. D. and is still standing

ing technical improvement of the highest practical value has been reached, greatly increasing the scope of possible applications. In all ceramic materials a technical advance of the most pronounced nature has been made in modern times and this fact must be recognized in developing any vital and appropriate technique for these mediums. We cannot go back to the individual craftsman basis of limited hand production and crude process which has yielded so much of surpassing charm in the ceramic work of past periods. All we can hope to do is to recover so much of this

missible in certain specific mediums. But very little may be said in relation to the case of brick, especially the glazed varieties which may be included under the term ceramic material. The rigid limitations of the brick making process present no possibility of employing brick in any other way than frankly as brick. The jointing will always so announce it even where moulded varieties are employed. One circumstance in the employment of modern brick stands out in very significant illustration of the permissive aspects of the principle formulated above. In



Clawson School, Oakland, California

J. J. Donovan, Architect

A type of design in brick and Terra Cotta wherein color can often be used to enrich effectively simple construction, dispensing with the need of formal enrichment and shadow for variety of interest

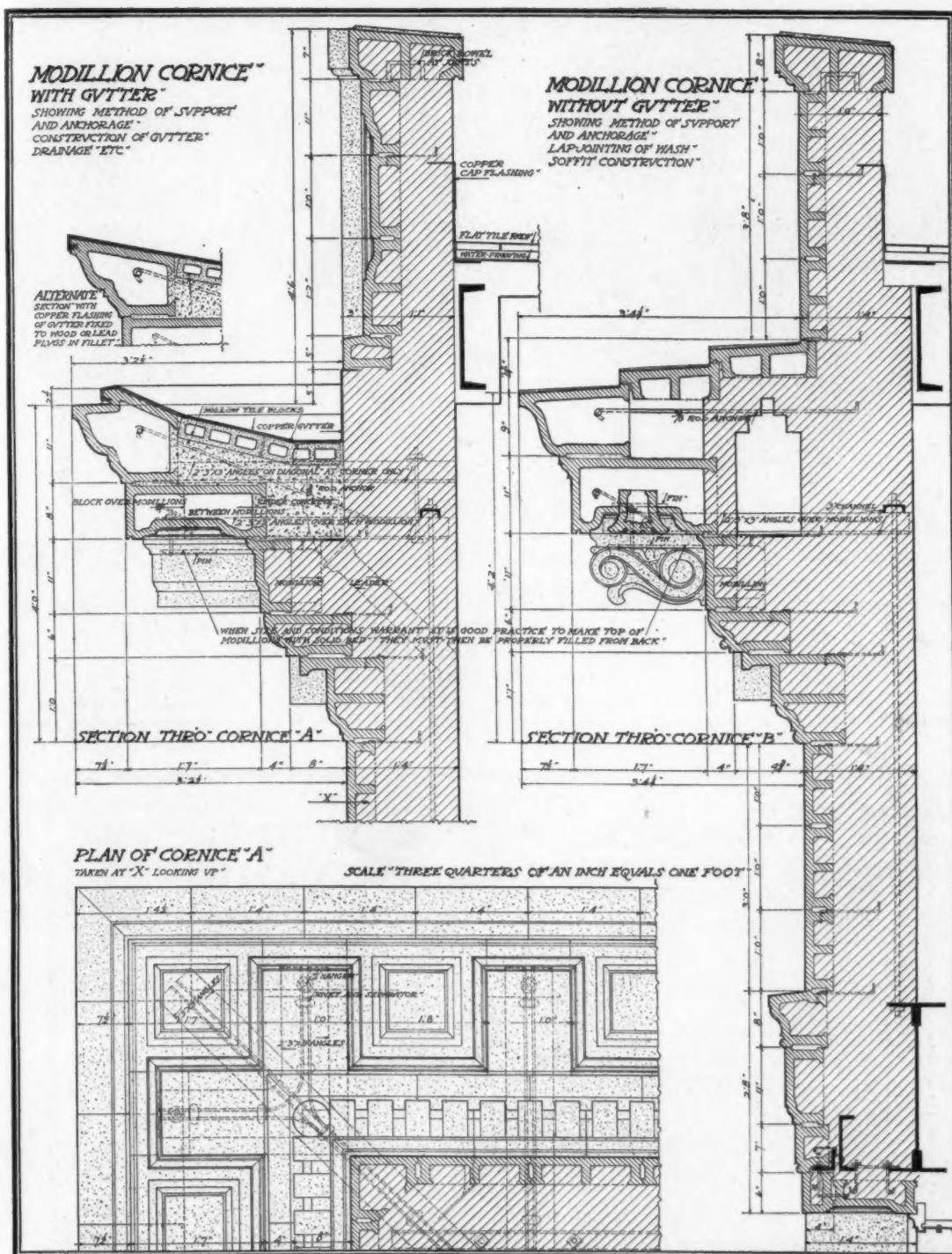
lost quality as is compatible with the necessary conditions of production today and which lends itself naturally to the very much wider scope of use which the present development of ceramic mediums admits.

LEGITIMATE EFFECTS IN TECHNIQUE

From this fact we may formulate the following definite principle of technique: *A fundamentally correct employment of any material is the use which can be made of it in design without doing violence to its essential nature.*

Application of this principle brings up at once the question of what is permissible and not per-

certain varieties of unglazed brick effects are being obtained variously designated as "tapestry" and "rug texture" surfaces. A literal construction of these terms to mean the duplication in brick of exact characteristics of pile or weave so as to present the appearance of a woven fabric would seem to involve the utmost insincerity and inappropriate conception of medium. Even a similarity sufficient to justify use of the terms "tapestry" and "rug," etc., which are employed for want of words equally convenient and accurate as description, suggests the idea of imitation which is so repugnant to the sincere designer. But is there after all any real basis for



Typical details of Terra Cotta construction in projecting cornice features. Projections like these can be considerably reduced if well conceived color treatment is adopted, thus minimizing the use of anchoring and supporting devices and reducing the cost.

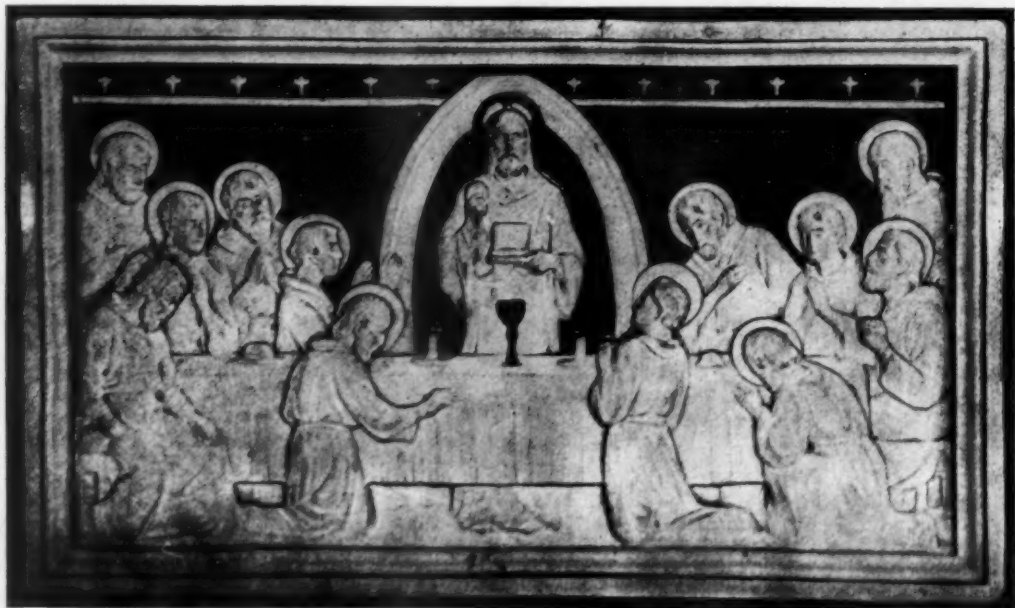
(Reproduced from "Architectural Terra Cotta Standard Construction")



Examples of modeling in unglazed buff Terra Cotta which express well the quality and feeling of clay work

this objection? The suggestion of tapestry or rug fabrics in color and texture is quite readily obtainable under the modern process of brick manufacture. Their realization involves no straining of the nature of material, no forced inappropriate process or impracticable expense, but is something which is now quite naturally possible to the clay medium and as the approxi-

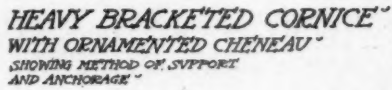
mation of effect does not include any yielding softness of the surface to the touch there is nothing in the problems of good formal design which forbids use to express significantly and consistently the fact of a solid wall surface. The obvious jointing, if nothing else, disposes of that. A "tapestry" or "rug texture" brick wall cannot be anything in appearance but a brick wall not-



Terra Cotta panel for Chapel of St. John's Hospital, St. Louis, Mo.

Barnett, Haynes & Barnett, Architects

Field in deep blue with gold stars; figures and border in warm gray. This design illustrates a simplicity not only in line with the best early precedent in ecclesiastical decoration but appropriate and economical for Terra Cotta



PLAN OF CORNICE
TAKEN AT BED "A" LOOKING UP

1

SCALE-THREE QUARTERS OF AN INCH EQUALS ONE FOOT

SECTION THRO'
CORNIC E ON LINE B-B

ELEVATION OF CORNICE

(Reproduced from "Architectural Terra Cotta Standard Construction")

withstanding the implication of these terms and the duplicating effort they may imply.

In the case of terra cotta, however, effects approximating other materials in color and texture, however naturally produced, encounter no such safeguard for preserving the identity of this material as we find in the rigid limitations of familiar brick jointing and where the design of ornament deliberately seeks to repeat the rigid feeling of stone carving the casual observer may readily mistake the medium. Limitation to the success of such intention occurs, however, where consistency

designer to determine where a merely visual satisfaction of either kind is legitimate or if the aspect of sincerity in construction calls for the actual fact of larger size masonry units and a consequent selection of material affording this. (If we get too deeply into that we might have to rule out the whole system of clothing steel frame buildings with any covering simulating masonry construction, as the sincerity of that in any form so applied is debatable.)

In this connection, a solution which is growing in favor with progressive architects is that a



Detail of New York Orthopedic Dispensary Hospital, New York City

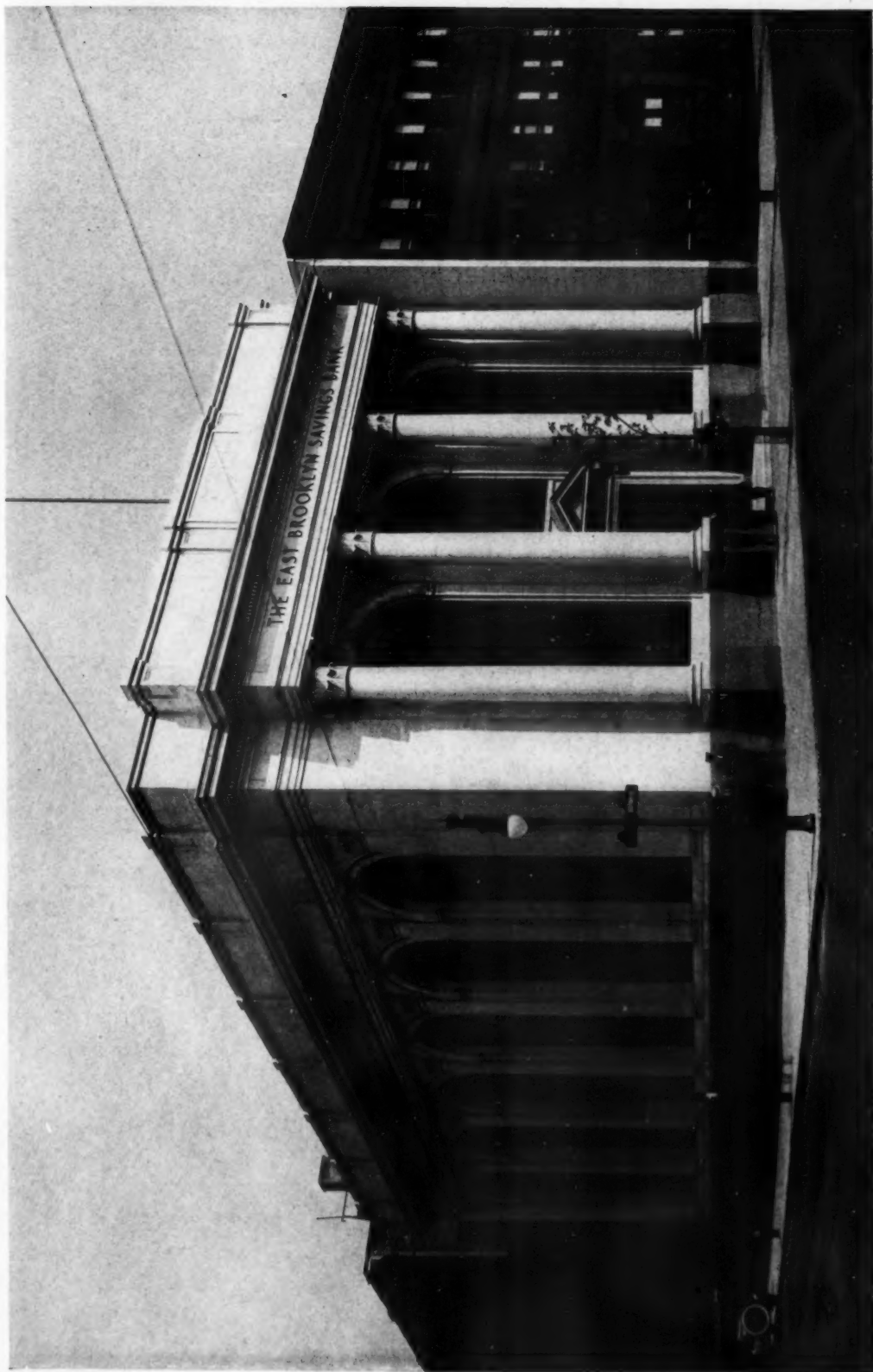
York & Sawyer, Architects

An application of red unglazed Terra Cotta and stucco similar to that shown in the Italian example illustrated on page 353. The suppression of jointing and extreme precision of alignment are qualities commonly demanded in Terra Cotta to the detriment of its interest as material. Recognition of this appears to have led to pointing the joints with white cement to emphasize them frankly. Less regularity would have enhanced the character

in scale calls for monumental proportions in terra cotta pieces which are beyond the possibility of economical production and except where the expedient of concealed joints in certain ornamental features is practicable the identity of terra cotta is evident from its visible jointing. The expedient of rusticated alternate or more widely separated joints often adopted in stone and terra cotta may give the effect of larger units than commonly produced in either, but a difference in shade or coloring readily admitted by a ceramic medium may also be used to satisfy the eye's demand for larger unit interest. It must remain for the

scheme of visible jointing for large wall surfaces in terra cotta may be made to assume a textural interest analogous to that occurring from the jointing of brick when spread over a large surface and as perfectly consistent in structural feeling. The writer recalls several instances of terra cotta construction where, intentionally or otherwise, the use of a moderate size unit readily producible in terra cotta yielded a most satisfying effect in this way. Where conditions admit, this solution appears to be preferable to that sometimes attempted of forcing the production of terra cotta

(Concluded on Page 384)



EAST BROOKLYN SAVINGS BANK, BROOKLYN, N. Y.

KOCH & WAGNER, ARCHITECTS

(For floor plans of this bank see Pages 303, 304, 305)



DETAIL OF MAIN ENTRANCE
EAST BROOKLYN SAVINGS BANK, BROOKLYN, N. Y.
KOCH & WAGNER, ARCHITECTS



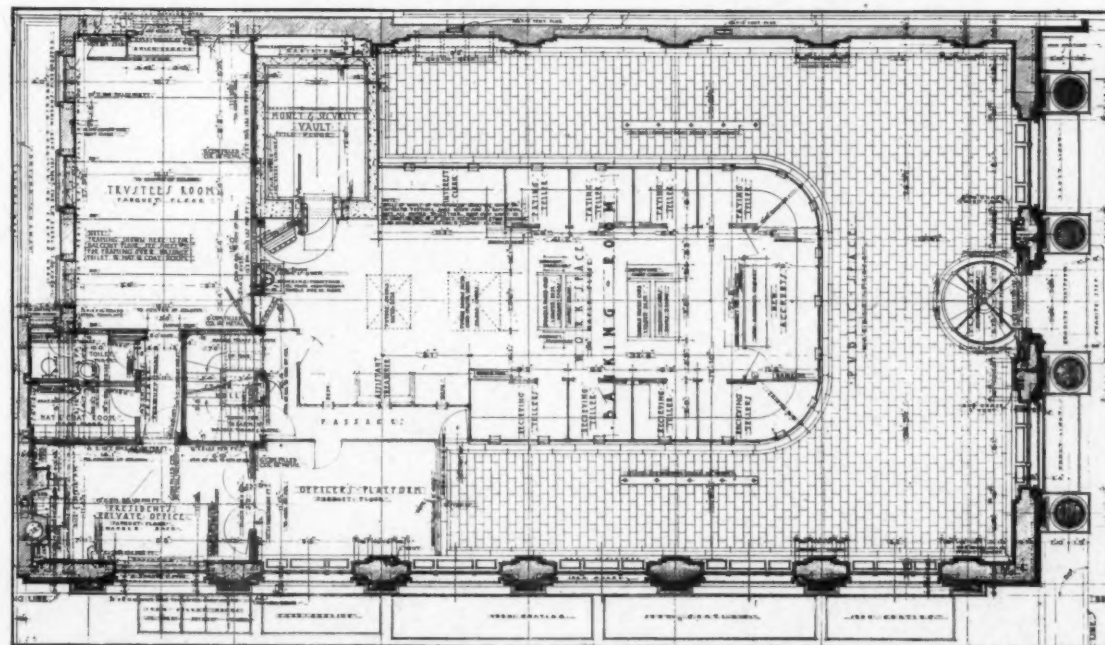
MAIN BANKING ROOM, LOOKING TOWARDS ENTRANCE



BOARD OF DIRECTORS ROOM

EAST BROOKLYN SAVINGS BANK, BROOKLYN, N. Y.

KOCH & WAGNER, ARCHITECTS

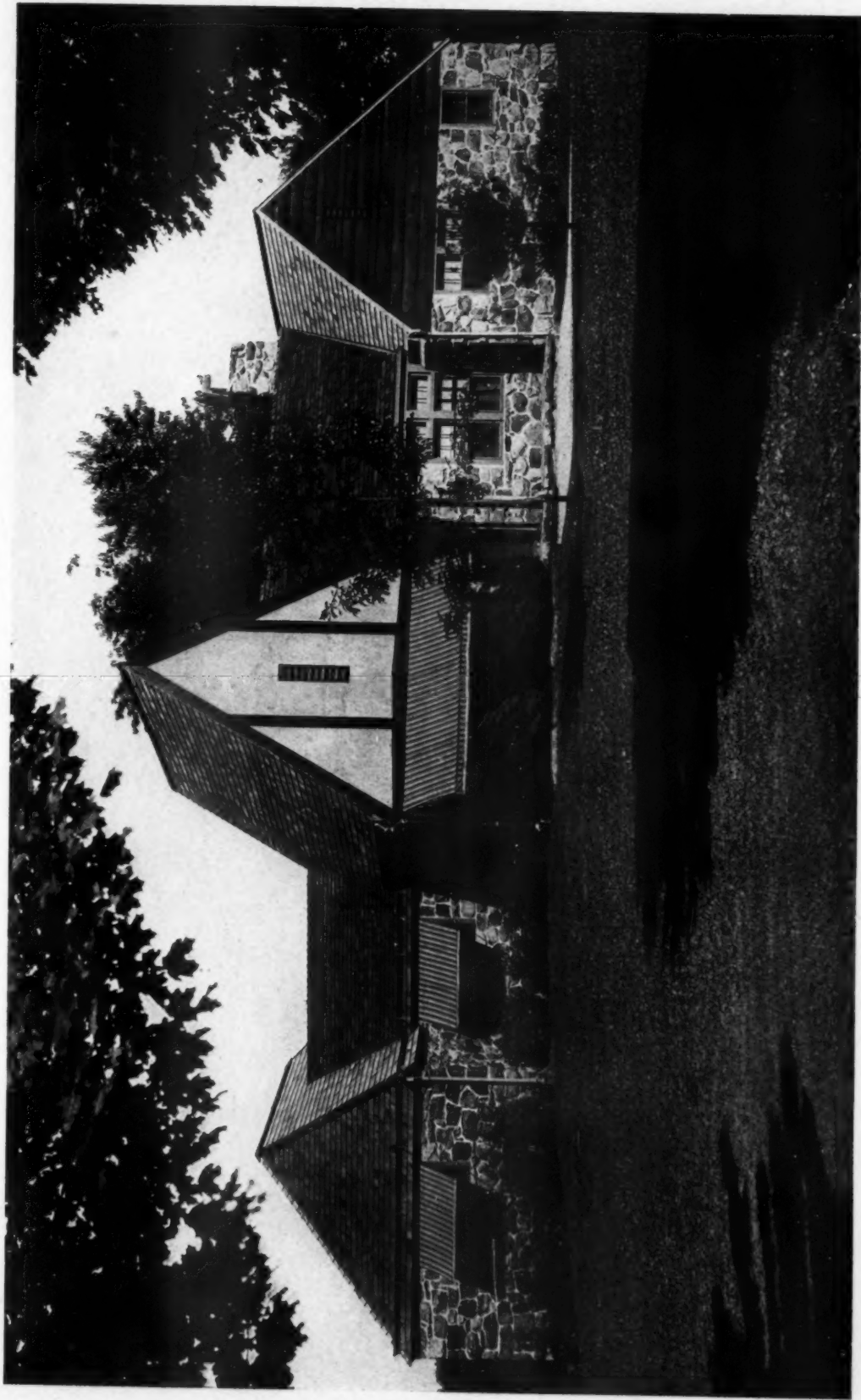


MAIN FLOOR PLAN

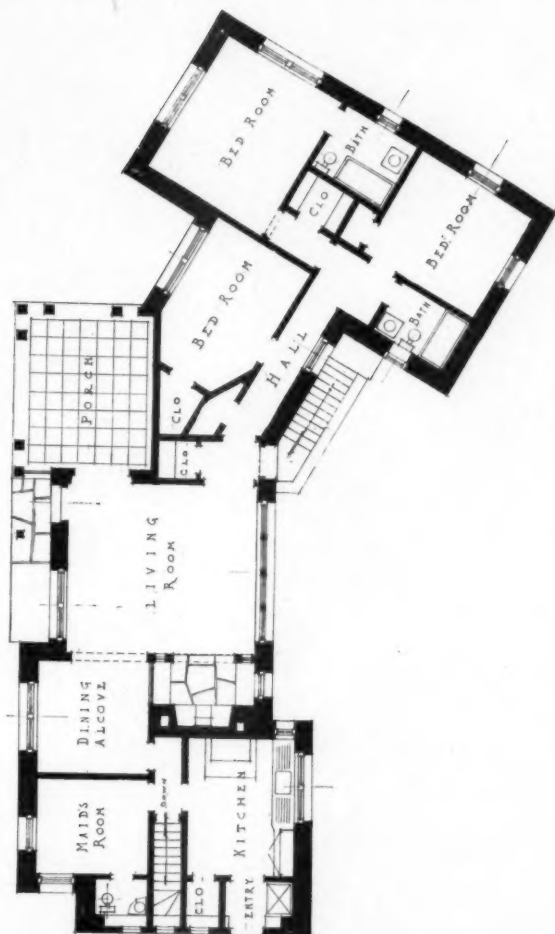
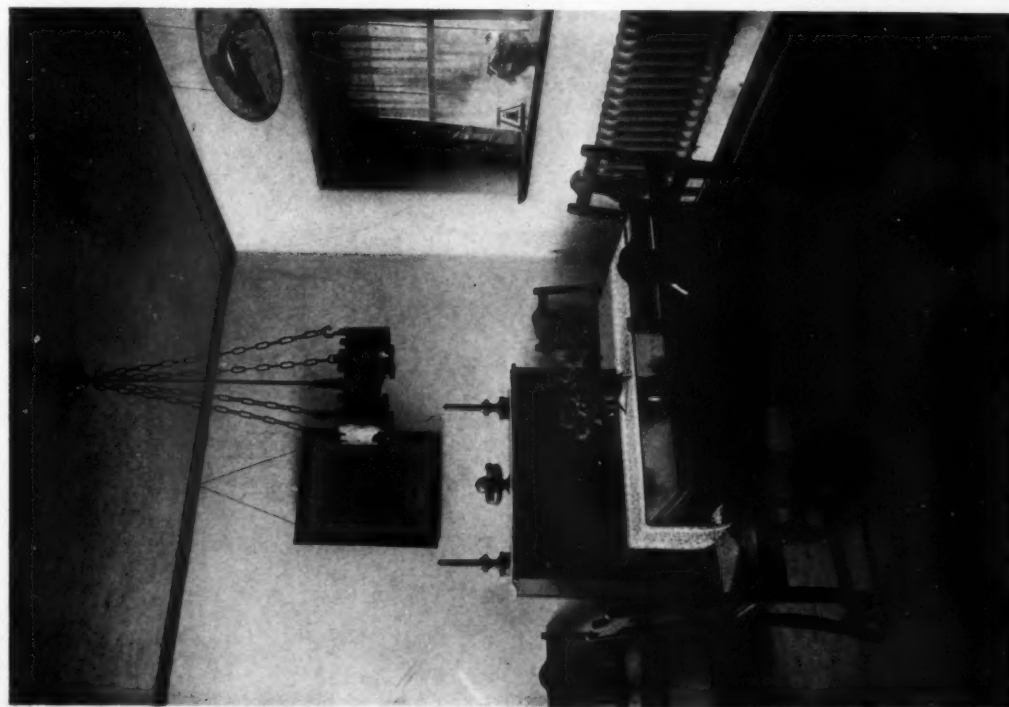


EAST BROOKLYN SAVINGS BANK, BROOKLYN, N. Y.

KOCH & WAGNER, ARCHITECTS



HOUSE OF H. C. MINER, ESQ., RIVERSIDE, CONN.
WESLEY S. BESSELL, ARCHITECT



HOUSE OF H. C. MINER, ESQ., RIVERSIDE, CONN.

WESLEY S. BESSELL, ARCHITECT



TWO VIEWS IN LIVING ROOM
HOUSE OF H. C. MINER, ESQ., RIVERSIDE, CONN.
WESLEY S. BESSELL, ARCHITECT



ST. GEORGE'S CHURCH, RICHMOND, PA.

WALTER H. THOMAS, ARCHITECT



ST. GEORGE'S CHURCH, RICHMOND, PA.

WALTER H. THOMAS, ARCHITECT



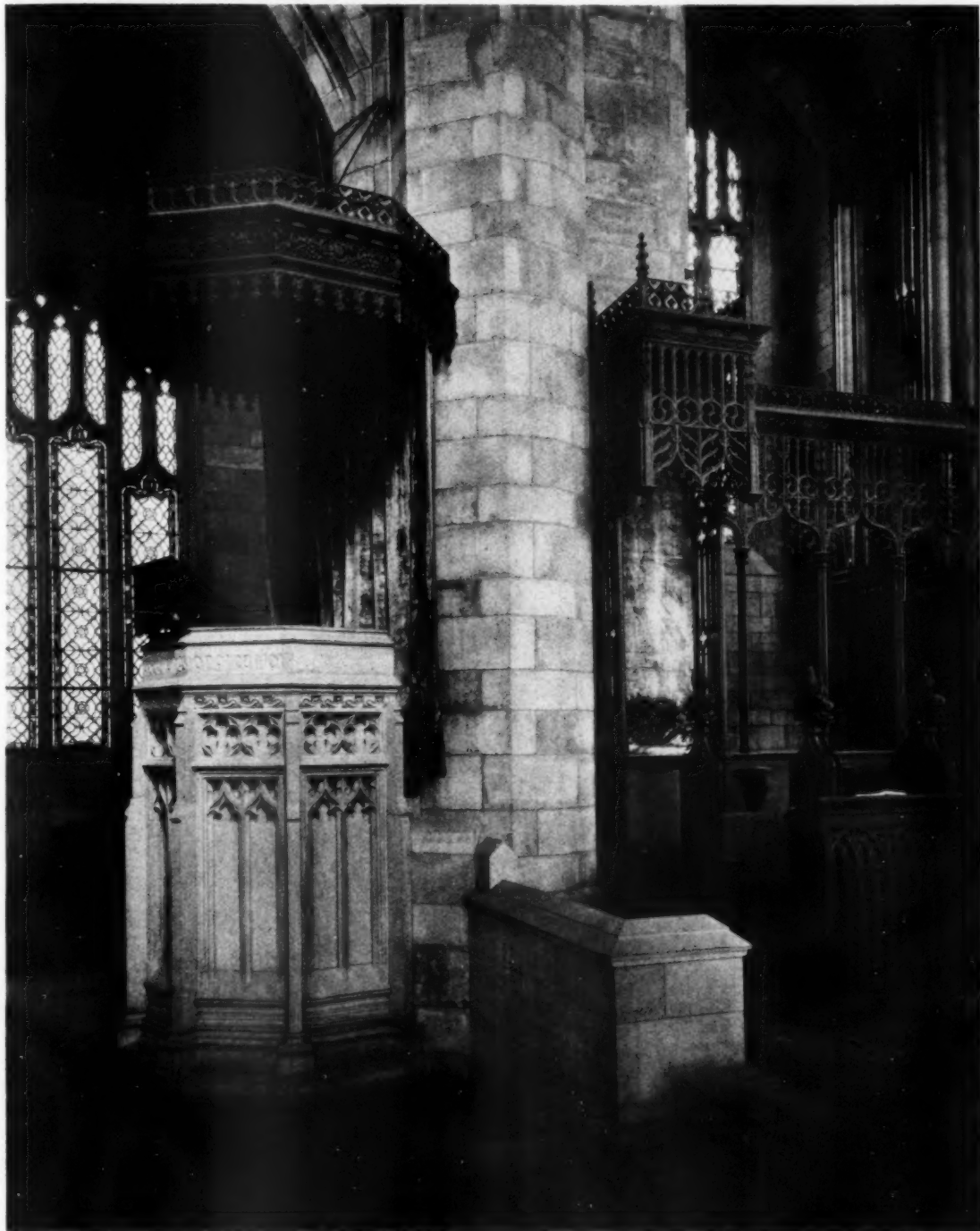
CHAPEL OF THE MEDIATOR, PHILADELPHIA, PA.

WALTER H. THOMAS, ARCHITECT

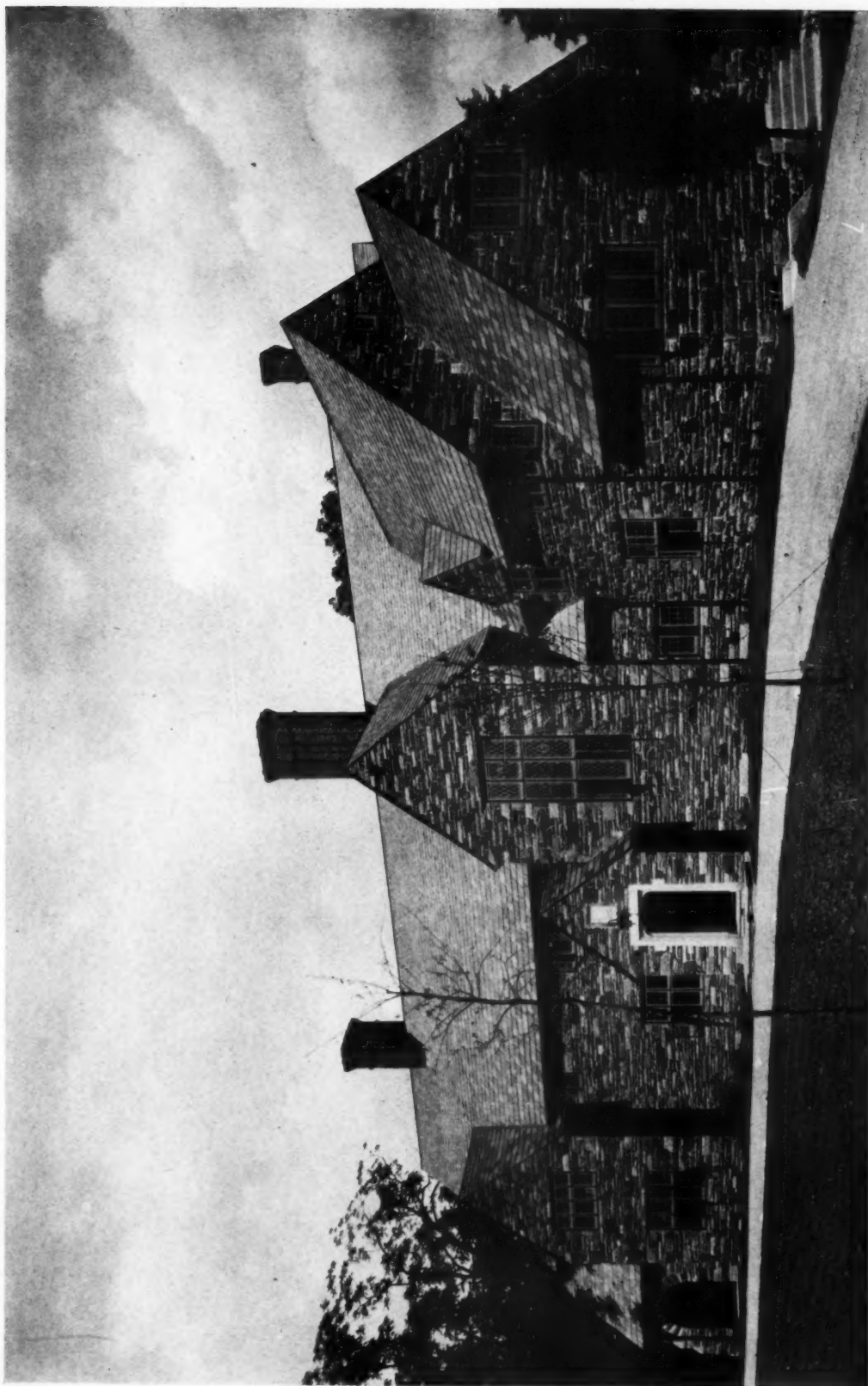


CHAPEL OF THE MEDIATOR, PHILADELPHIA, PA.

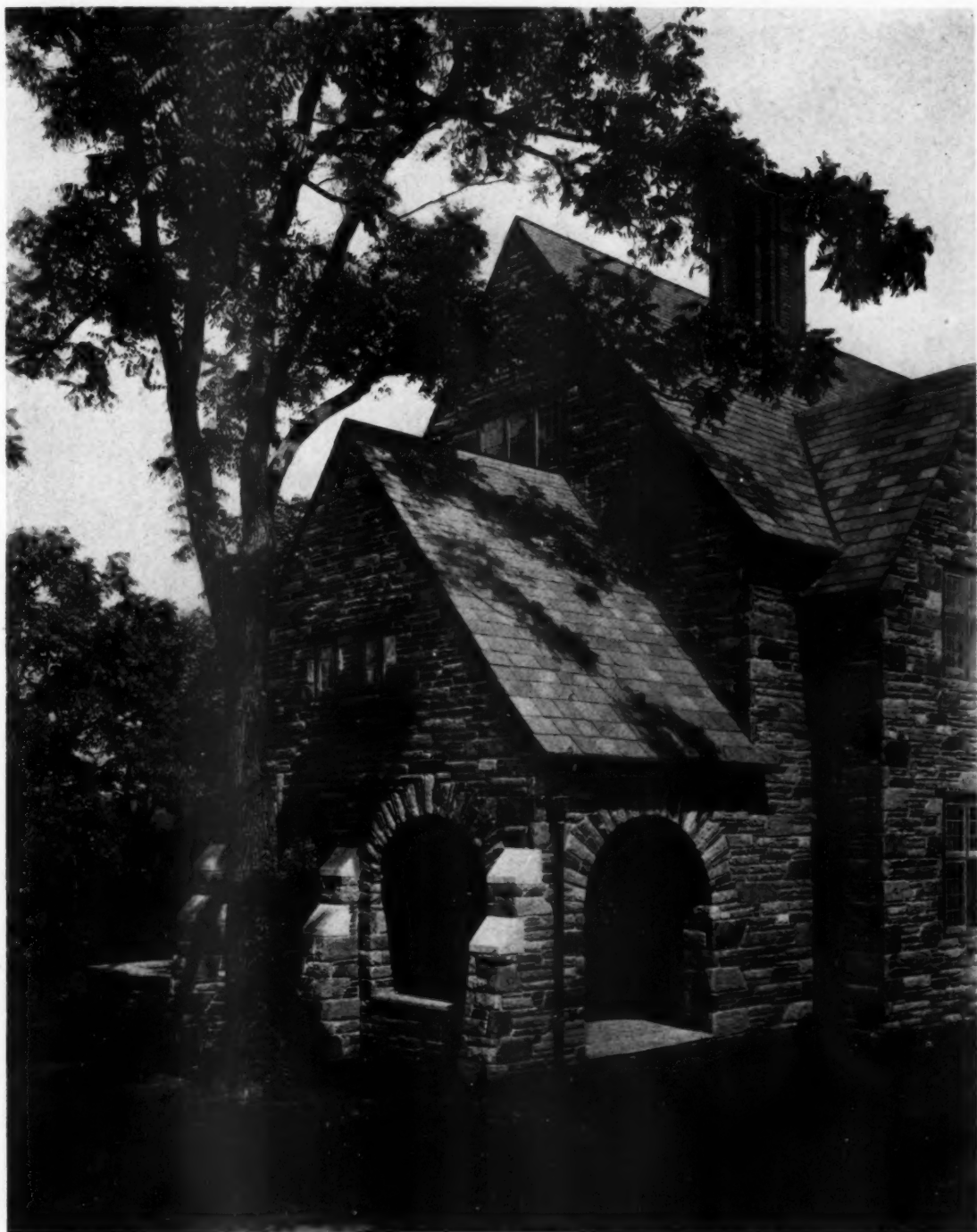
WALTER H. THOMAS, ARCHITECT



CHAPEL OF THE MEDIATOR, PHILADELPHIA, PA.
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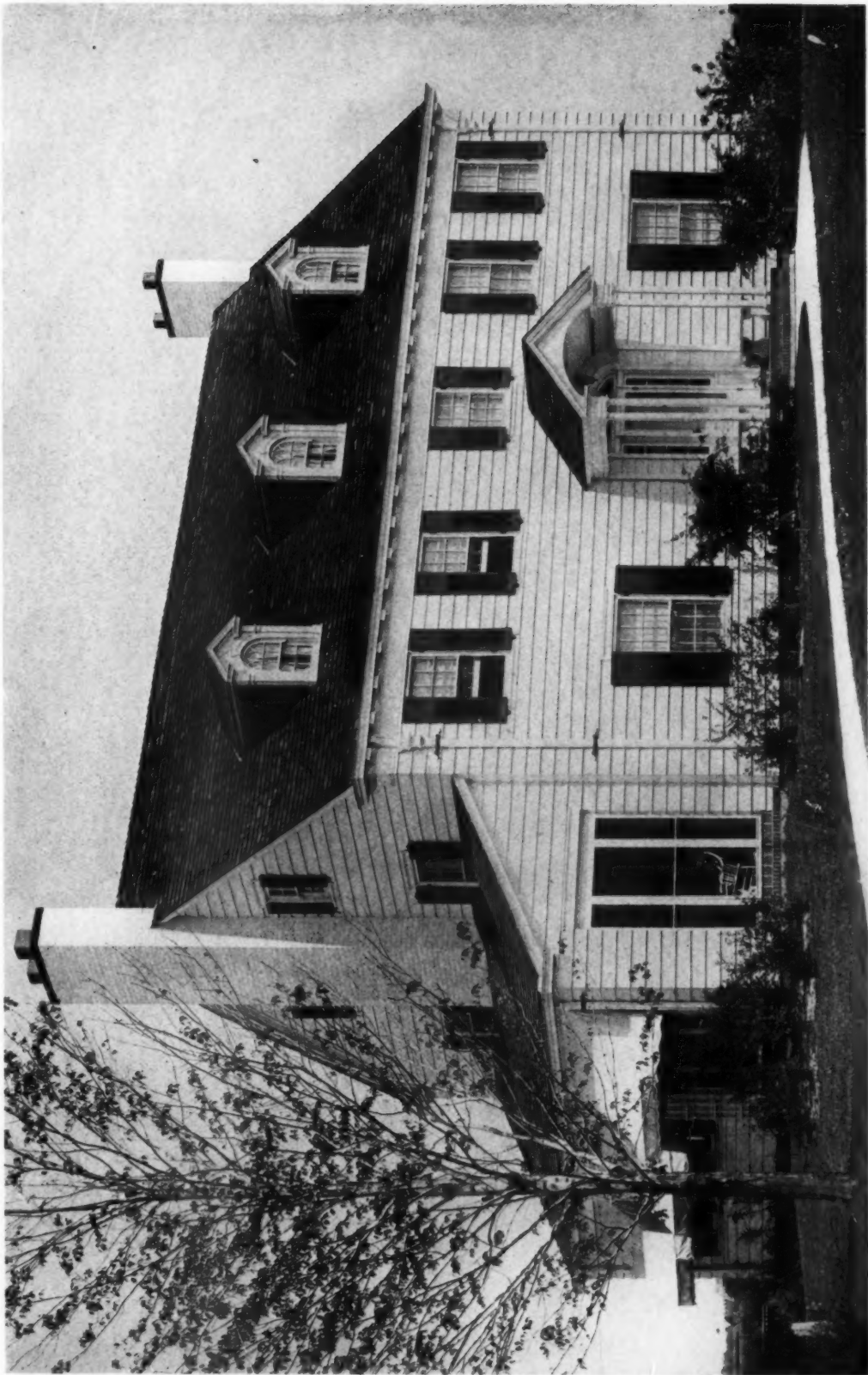
HOUSE OF ROLLO S. KNAPP, ESQ., EASTON, PA.
THOMAS, MARTIN & KIRKPATRICK, ARCHITECTS



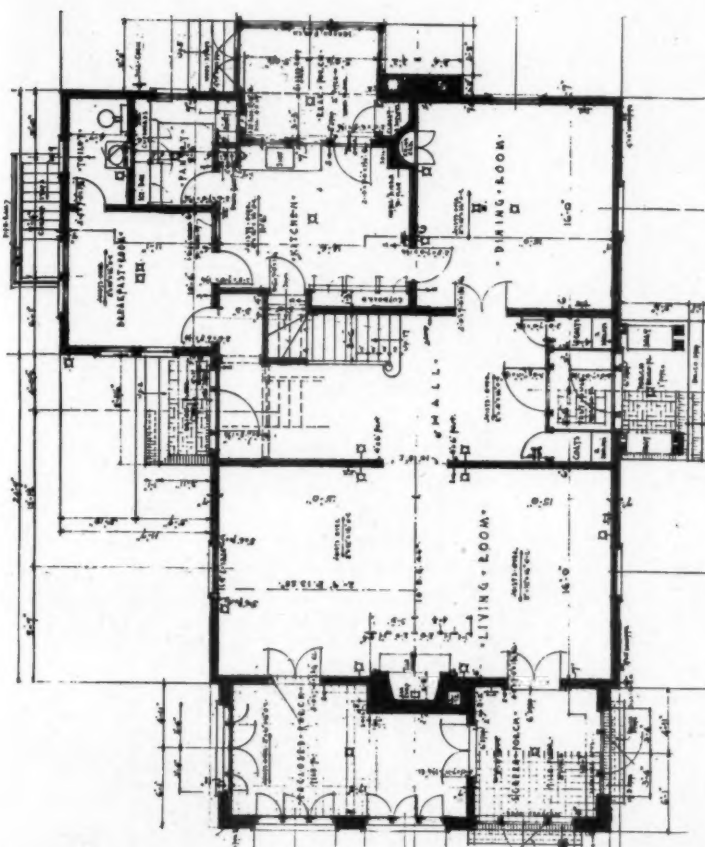
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THOMAS. MARTIN & KIRKPATRICK, ARCHITECTS



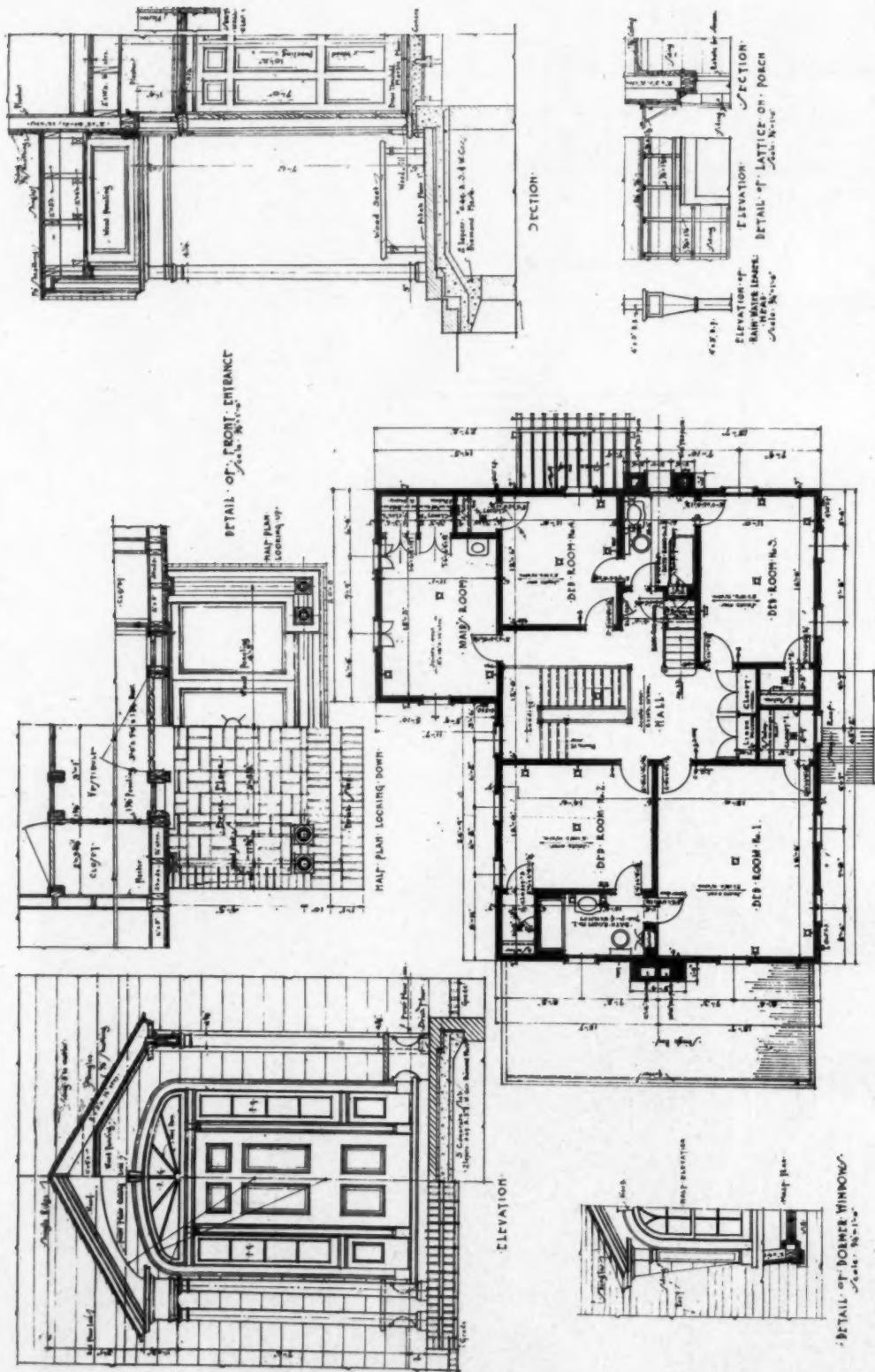
HOUSE OF OTTO ANWILER, ESQ., MONROE, MICH.
MILLS, RHINES, BELLMAN & NORDHOFF, ARCHITECTS



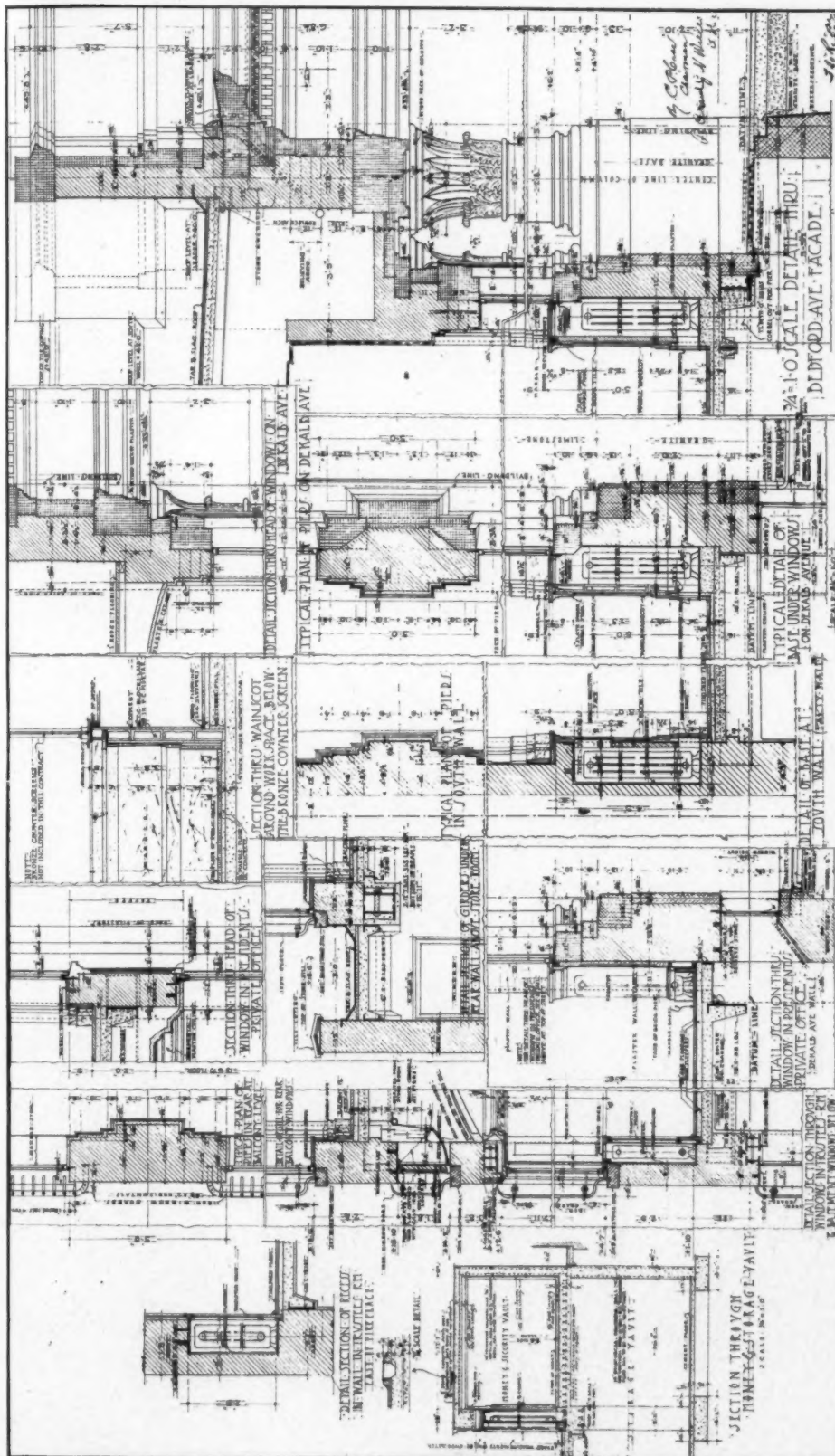
HOUSE OF OTTO ANWILER, ESQ., MONROE, MICH.

MILLS, RHINES, BELLMAN & NORDHOFF, ARCHITECTS





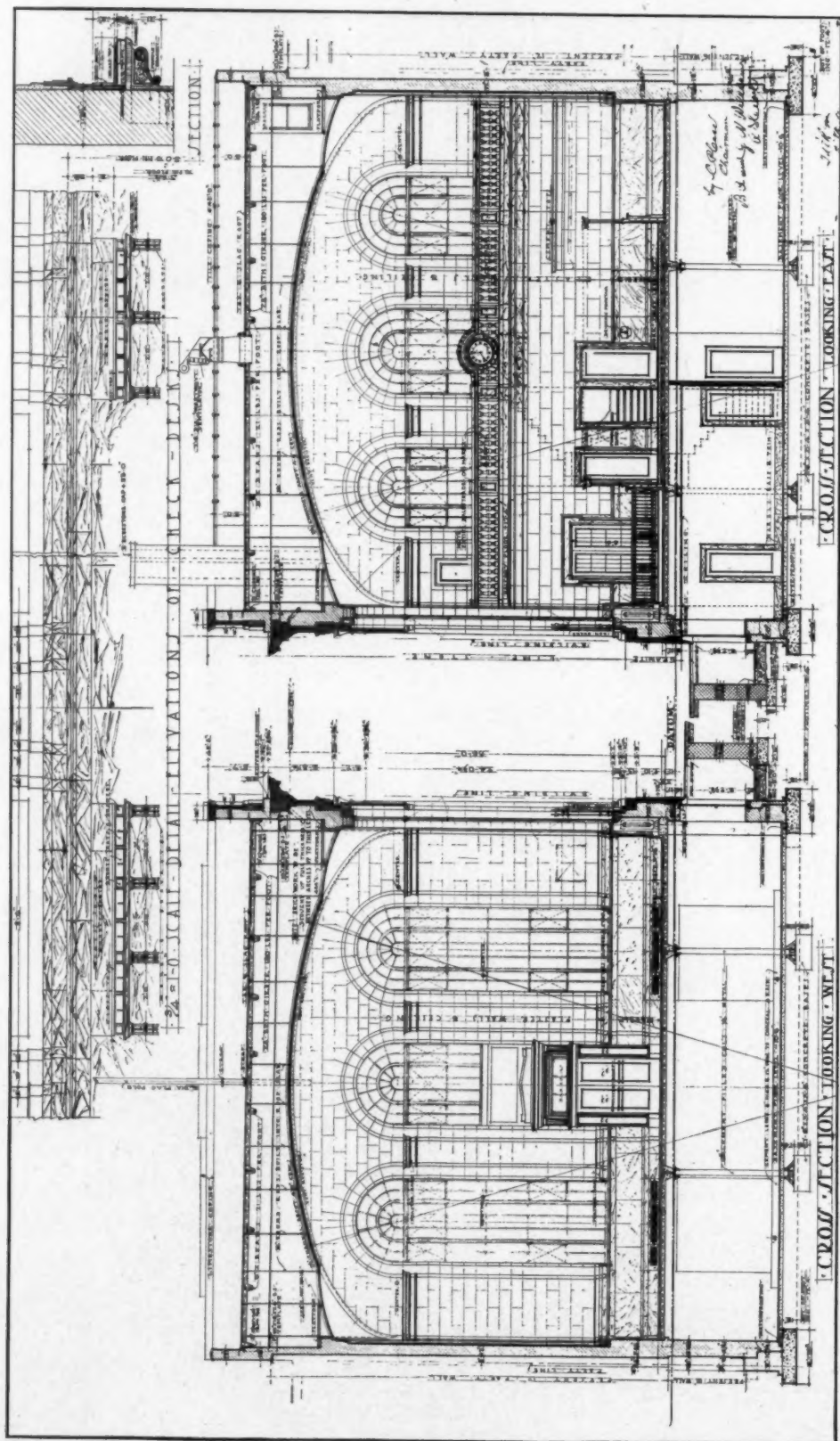
HOUSE OF OTTO ANWILER, ESQ., MONROE, MICH.
MILLS, RHINES, BELLMAN & NORDHOFF, ARCHITECTS



EAST BROOKLYN SAVINGS BANK, BROOKLYN, N. Y.

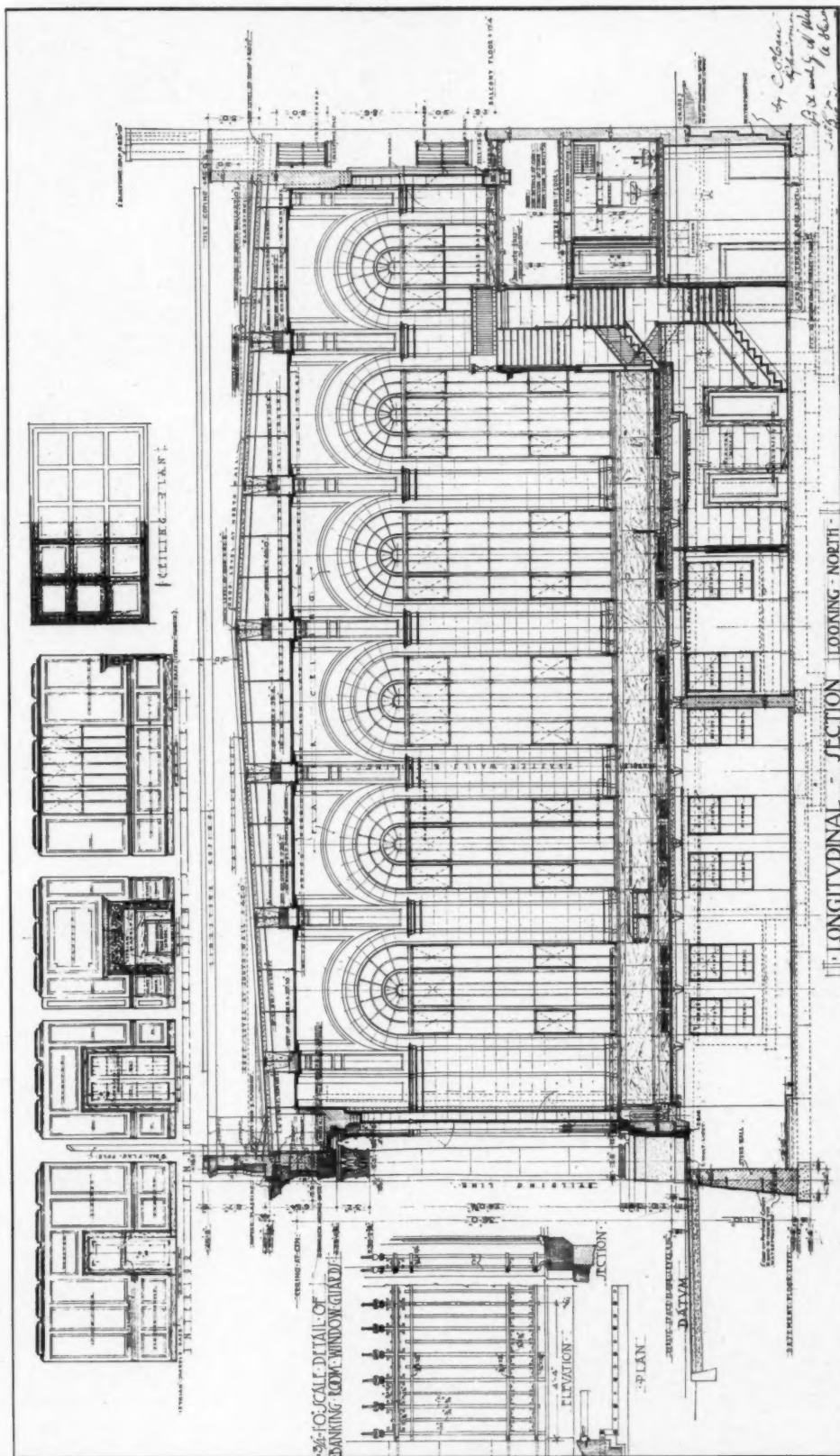
KOCH & WAGNER, ARCHITECTS

(For illustrations of this bank see Plate Section)



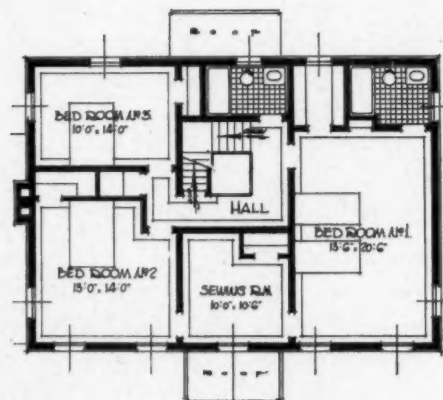
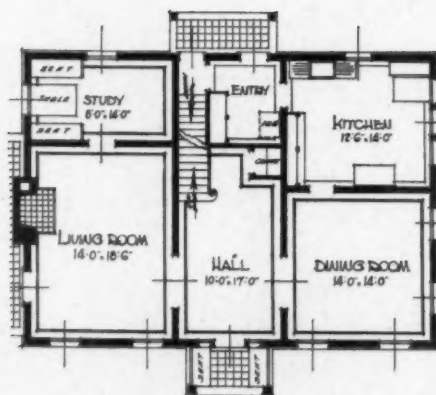
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KOCH & WAGNER, ARCHITECTS



HOUSE OF D. ARTHUR JOHNSON, ESQ., TENAFLY, N. J.

R. C. HUNTER & BRO., ARCHITECTS

BESIDE the Abbey Church of Mont St. Michel is that portion of this group known as the Merveille. To quote Henry Adams in his book "Mont St. Michel and Chartres," "They are almost the only monuments of what must be called secular architecture of the early and perfect period of Gothic art, 1200-1210." The illustration is called the Room of the Knights for it was believed that here the Knights of the church worked. This room has not the grace and lightness one admires so in the Salles des Hotes for its proportions are heavier, its mouldings are larger and the columns thicker and spaced more open. But it was here that sterner work was done. The father of the church worked here and studied, warmed in part by two great fireplaces and with its proximity to the living portion of the abbey and by a stairway to the church, provided an admirable room for its uses.



SALLES DES CHEVALIERS, MONT ST. MICHEL

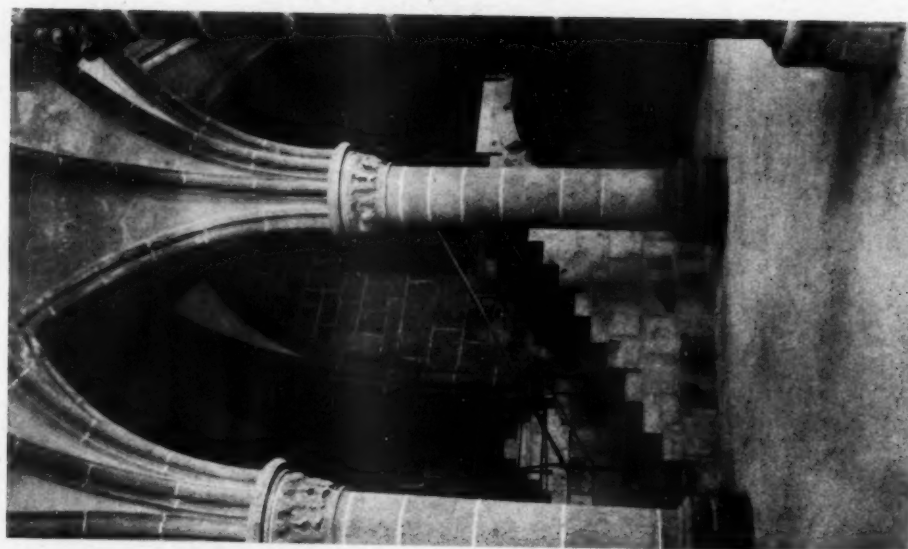
MEASURED AND DRAWN BY ROBERT M. BLACKALL, 35TH HOLDER, ROTCH TRAVELLING SCHOLARSHIP

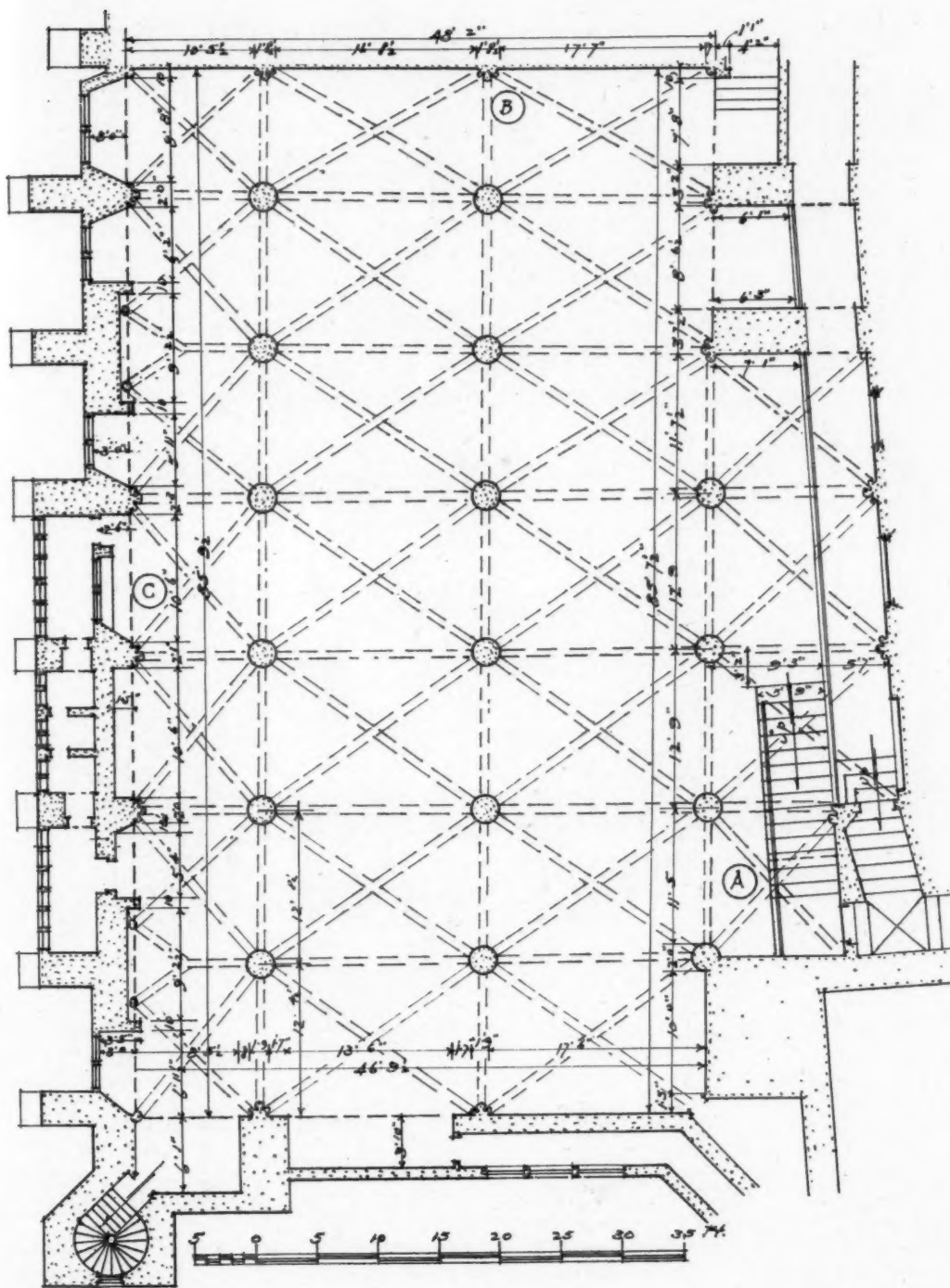
THE AMERICAN ARCHITECT, SERIES II.
FRENCH AND ITALIAN DETAILS



INTERIOR VIEWS
SALLE DES CHEVALIERS
MONT ST. MICHEL

FROM PHOTOGRAPHS BY
ROBERT M. BLACKALL

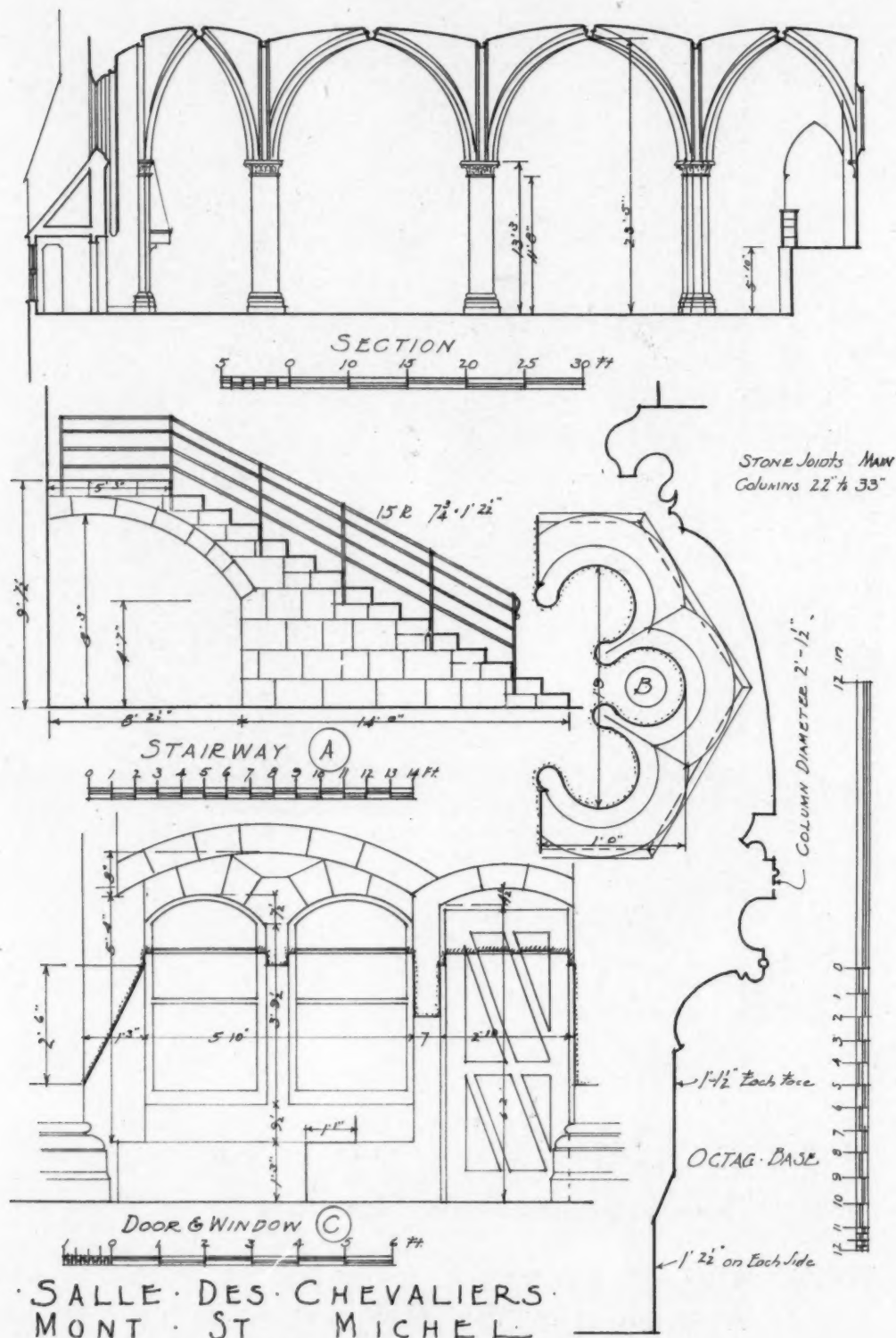




SALLE · DES · CHEVALIERS ·
· M O N T · S T · M I C H E L ·

MEASURED AND DRAWN BY ROBERT M. BLACKALL, 35TH HOLDER, ROTCH TRAVELLING SCHOLARSHIP

THE AMERICAN ARCHITECT, SERIES II.
FRENCH AND ITALIAN DETAILS



MEASURED AND DRAWN BY ROBERT M. BLACKALL, 35TH HOLDER, ROTCH TRAVELLING SCHOLARSHIP

THE AMERICAN ARCHITECT, SERIES II.
FRENCH AND ITALIAN DETAILS

EDITORIAL COMMENT.

FOR ABOUT THE LAST TWENTY years the building, maintenance and repairs of schoolhouses in the City of Boston have been under a Board of Schoolhouse Commissioners, to whom is entrusted the sole supervision and direction of this work. Individual architects are selected by them for the different buildings, the Board retaining under its immediate administration only plans for the domestic engineering. The Board has usually included one member who was a builder, one who was an architect and one at large, all appointed by the Mayor without confirmation by the City Government. The Board has at present something over \$7,000,000 of new work projected and for which appropriations have been made, and the administration of all this work is a task requiring a very carefully selected organization, and one which can be administered wholly in the city's good. The mayor of the city, Hon. James M. Curley, has just appointed on this Board as the architect member, Mr. C. H. Blackall, F. A. I. A., and the fact that the mayor made the selection entirely without solicitation, that it has absolutely nothing to do with politics, that Mr. Blackall's record is such as to insure an honest and efficient administration, is pretty good evidence that politics can sometimes work out for the good of the community, even under our cumbersome city government system. Mr. Blackall, an architect of many years' training, is known to our readers by his contributions to these columns, and by the large practice which has been illustrated in this journal from time to time. He brings to his work an experience of many years in handling large enterprises, and he takes up the office absolutely free from any political affiliations which would in anywise interfere with the work. He enjoys a distinction not shared with many of those who are called upon to render public service, in that he is now an official in two cities, being chairman of the Board of Appeal in Cambridge and Schoolhouse Commissioner in Boston, and that the mayor, who is a democrat and a politician, should have seen fit to appoint to such an important office a man who is not a citizen of Boston, has never been in politics and has not sought or asked for the job, certainly reflects great credit upon the mayor's willingness to procure the best service possible for the Department. The Schoolhouse Commission in the past has been ably administered by Mr. Blackall's predecessors. R. Clipston Sturgis, who organized the Department in the beginning, left a splendid record that his successors have striven to follow. The volume of work handled by the Department has greatly increased and

there is a large accumulation of demands for new schoolhouses held in abeyance during the war which call for immediate attention. The City of Boston is to be congratulated on the action of its chief executive in making a deliberate choice in the profession of architecture of a man who is so thoroughly fitted to fill this responsible position.

* * *

AN EXHIBITION OF ARMENIAN architecture from the 6th to 13th centuries, the first of its kind ever shown in America, has just closed at the Avery Library, Columbia University. This display, a collection of water colors and drawings by Archag Fetvadjan, which represents a work of twenty years, and is the most complete study of Armenian relics ever undertaken, has been previously shown at the Musée Des Arts Decoratifs in the Louvre, the Victoria and Albert Museum in South Kensington and the Institute of British Architects in London.

These fragmentary relics, the survivals of Turkish conquest, are fair indications of the possible fate of the Byzantine monuments of Constantinople, should the Kemalists be allowed to have their will, according to William B. Dinsmoor, Avery librarian, under whose direction the exhibition was arranged. "In any case," he added, "the monuments of Constantinople have been fully delineated and studied; the records necessary for the study of the history of architecture are nearly complete.

"But the monuments representing the provincial development of Byzantine architecture in far-away Armenia—a development of such strength that even Constantinople had to call upon an Armenian architect to rebuild the dome of Saint Sophia—perished centuries ago and have been lost in obscurity."

Mr. Fetvadjan began his studies of Armenian architecture in 1900, already well equipped as a painter, after a decade of studies at Constantinople and Rome and lengthy sojourns in other European Capitals. He was not an architect and therefore concerned himself less with problems of planning and construction than with motives of design.

But this was all the more valuable, because it was a subject previously neglected, his immediate predecessors, Strzygowski and Rivoira, having investigated rather the general form and structure of the buildings. As a result of the work of twenty years Mr. Fetvadjan accumulated about two thousand careful pencil drawings of architectural motives, forming, it is said, the

most complete corpus of Armenian ornament ever undertaken.

Nearly five hundred of these small drawings were shown in the exhibition, classified under the heads of capitals, panels, doorways, niche-heads, arches, mouldings, etc., for the most part carved with intricate patterns in relief. While these formed the major portion of the exhibition, atmosphere was lent by a series of twenty-seven views in water color, executed with the clarity of photographs, and representing the most important of the ruined buildings in their entirety.

In these larger views the general distribution of the ornament shown in the small drawings was to be seen, as well as the forms of the churches and the palaces, and the methods of construction. To assist in the interpretation of the designs, some of the more important illustrated books, giving plans and photographs, were selected from the scanty literature dealing with the subject, and were placed at the disposal of the visitors. A dozen of Mr. Fetvadjian's drawings of women in native costume are included in the exhibition, because of their decorative value.

In commenting on the scientific value of Mr. Fetvadjian's researches, Mr. Dinsmoor said: "Last year some of us had the opportunity to hear the Austrian archaeologist, Strzygowski, lecture at the Metropolitan Museum on the subject of Early Christian Art, and in the plans which he then showed, reproduced from his recent book on Armenian architecture, appeared designs which he regarded as forerunners of the Romanesque and Gothic styles.

"Perhaps his enthusiasm led him too far; probably the analogies were chance results of the undeniably fertile invention of the Armenians; but in any case the problem is one which demands thorough investigation. This investigation should be based not only on plan and structure, but also on decoration and ornament.

"To gather the facts required years of patient study and difficult travel; most of the investiga-

tors, such as Lynch, Strzygowski and Bachmann, have had to be content with a single tour and the examination of the major problems. Now comes a native artist to supply the details."

* * *

THE INTERNATIONAL COMPETITION

now going forward for "the finest office building in the world" for the Chicago Tribune, is one of the most interesting International Competitions since the University of California.

Many International Competitions like those for Australia and New Zealand have been handled from England and are apt to mean an English architect. In the case of the Tribune Competition, owing probably to the fact that there is a Paris edition of the Tribune, The French Government Society of Diplomés has applied for fifty copies of the program, and many of the New York offices are apparently also undertaking the work.

The large size of the drawings will, however, set a natural limit to the number of competitors.

The program is straightforward, simple and well turned out. It is unlike many of the programs for competitions in the past. For instance, those issued by the Secretary of the Treasury, which are obliged to carry long lists of the exact necessities of many departments. There is nothing of this sort in the Tribune Competition, which states frankly within its limits it desires "the most beautiful office building in the world."

The program has been issued under the approval of the Illinois Chapter of The American Institute of Architects. The invited and paid competitors are:

Bliss & Faville, San Francisco; Bertram G. Goodhue, James Gamble Rogers, Benjamin Wistar Morris, and John Mead Howells, all of New York City; Holabird & Roche, Jarvis Hunt, D. H. Burnham & Co., Schmidt, Garden & Martin, and Andrew Rebori, all of Chicago.

One association has since been announced, that of Mr. Raymond Hood with Mr. Howells.

DEPARTMENT OF ARCHITECTURAL ENGINEERING

SHORT METHODS FOR FOUNDATION DESIGN

BY MERRILL M. BUSH, Reg. C. E.

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MANY sincere workers in the field of concrete engineering have realized the lack of short comprehensive methods for solving modern problems in structural design. The result of engineering experience is at our disposal but it must be put into a workable form.

By the use of auxiliary units it is proposed to reduce our calculations to the simplest mathematical form, and in this article the writer has shown the various steps by which he has derived the short methods for designing square concrete foundations.

No attempt has been made to add to the theory of the subject, or to champion the use of any particular stress or material, the sole object being the attainment of a method which insures speed in design, economy in construction and safety in operation.

At the outset, the writer has accepted as sufficient for his purpose the schedule of stresses and assumptions shown in Plate 1, which are in accordance with the new Detroit Building Code.

To form a guide in selecting concrete sizes it is necessary to introduce what the writer calls a hypothetical column. This is merely a square stayed concrete column having a sectional area of X^2 reinforced with $\frac{1}{2}$ of 1% of vertical steel but with not less than 4-5/8 bars. With $\frac{1}{2}$ of 1% of steel this column will sustain an average stress of $675 + [675 \times .005 (10-1)] = 705.37$ pounds per square inch, but this stress will be increased to 710 pounds per square inch to accommodate small lightly loaded columns with minimum vertical steel. Supporting this ideal column whose side is X will be a footing cap having a width, say, of $1\frac{2}{3} X$ and a depth of $\frac{2}{3} X$ thus giving a projection beyond the column in the ratio of one to two. The proportions of the footing cap just mentioned are purely empirical, but justification for their use will be discovered not only in the fact that the load, column, footing cap, and the footing base can all be expressed in terms of each other, but also in the fact that adequate resistance to punching shear is obtained.

The effective depth of the footing base, being the critical dimension in the design of the

footing, deserves special consideration. Referring to the schedule of calculations for depth d as shown in Plate 2, it will be observed that the ratio of column pressure to soil pressure gives the comparative size of the footing base in terms of the hypothetical column. Extracting the square root of the footing base area, the side of the footing is obtained which varies from 3.575 to 5.85 times the side of the column X , depending upon the value of the soil. The schedule of stresses in Plate 1 specify that the allowable shearing stress on a vertical plane at a distance d out from the cap is forty pounds per square inch. But forty pounds per square inch on jd is equivalent to $0.88 \times 40 = 35$ pounds, on d which is reduced to thirty-four pounds to accommodate lower values of j . The total shear on the vertical plane GH , at a distance d from the cap is equal to the soil pressure on the trapezoid $AGHB$, and this pressure is balanced by the shearing value of the concrete over the area GH times d at thirty-four pounds per square inch or $34 \times 144 = 4900$ pounds per square foot. Following out the consecutive steps in Plate 2 a simple quadratic equation in d is arrived at of the form $ax^2 + bx + c = 0$, the roots of which are

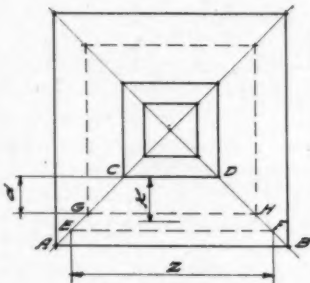
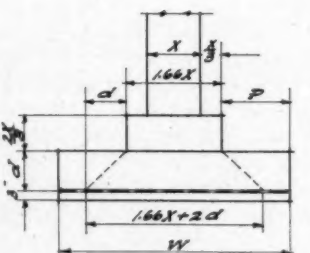
$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Solving the quadratics corresponding to the various soil values d is found in terms of our hypothetical column, to be approximately $17\frac{1}{2}\%$ of the width of the footing base w , excepting in the case of a 3000 pound soil value which is about $15\frac{1}{2}\%$ of w . For the sake of uniformity d is adopted as being equal to $17\frac{1}{2}\%$ of w for all soil values.

The derivation of constants for use in design is shown in Plate 3. The center of gravity k of the trapezoid $ACDB$ has been calculated for each of the various soil values and expressed in terms of the footing projection p . But since this center of pressure only varies from 56.2% to 59.5% of the projection, it will err on the side of safety by accepting for practical purposes a value of k equal to 60% of p . The bending moment at the edge of

the cap is equal to the soil pressure against the trapezoid $A C D B$ times 0.6 of the projection p . This bending moment in foot-pounds divided by the arm of the resisting couple $0.88 d$ gives the value of the total tensile or compressive force acting at the point in question. Dividing this force by the allowable unit tensile stress the required one way steel area in square inches is obtained in terms of the hypothetical column. But, since this column will sustain a load L equal to $X^2 \times 710 \times 144 = X^2 \times$ approximately 102000 pounds, we can

may be regarded as performing the same function as the rivets in the flange of a plate girder. In the latter case, it can be stated that the "shear times the pitch is equal to the rivet value times the arm." In the case of a square footing this is equivalent to saying that the shear on the line $C D$ times a distance of one inch is equal to the total bond value, $150 A$, of the bars in one direction times the arm jd . Referring to Plate 3, this calculation for bond area is shown for each of the several soil values and results in A being equal

SCHEDULE OF ALLOWABLE UNIT STRESSES				FOOTING NOTATION	
	stayed column (gross area)	hooped column (net area)	footing cap	footing base	
Ratio - n	10	10		15	
concrete mix	1:1:2	1:1:2	1:2:4	1:2:4	
concrete stress (direct)	675	1050			
concrete stress (bending)				750	
intensity of punching shear			130 to 200	130 to 200	
shearing stress at distance d from cap				40	
steel stress (bending)				20,000	
bond stress 1:2:4 mix				120	
bond stress 1:1½:3 mix				150	
arm of re- sisting cou- ple jd				$.88 d$	
percentage of hooping		1%			
thickness of fireproofing	1½"	1½" min. (see note)			
Note	fireproofing for hooped columns to be increased according to diam. of core and gauge of hooping wire				
PLATE 1					

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Assumptions used for Designing Footings

substitute $X^2 = L \div 102000$ in the expression for steel area A_s . By this operation X^2 is eliminated entirely and an equation with A_s and L as the only variables is obtained. This equation which is in the form $x = my$, is a straight line passing through the origin of co-ordinates, m being the tangent of the angle which the line makes with the Y axis.

Having shown that the tensile steel area in one direction for any square footing is equal to the product of the load times a constant, it remains to be seen how this steel area should be distributed in order that the bond stress on the perimeter of the bars used will not exceed the safe working stresses allowed. With respect to bond, the reinforcing bars in one direction across the footing

to a constant times the square root of the load L . This expression for bond area is a parabola with its axis parallel to the axis of Y . The ratio of bond area to steel area gives the relation which the superficial surface of the footing reinforcement per lineal inch must bear to its cross sectional area. A high bond steel area ratio is a property possessed only by bars of small cross-section, and while their use can be avoided by using a deeper footing base, the cost of the extra concrete and excavating offsets the advantage gained by using larger rods. In meeting the requirements for bond, especially when using the higher soil values, it will be found necessary not only to use small bars but also to exceed the minimum steel area A .

CALCULATION FOR EFFECTIVE DEPTH OF FOOTING BASE						
Soil Value	3000	4000	5000	6000	7000	8000
Soil pressure per sq. inch	20.8	27.0	34.7	41.7	49.7	55.5
Gross column pressure per sq. inch	710.	710.	710.	710.	710.	710.
Footing area in terms of column	$\frac{710 \times 2}{20.8} = 34.1 \times$	$\frac{710 \times 2}{27.0} = 25.5 \times$	$\frac{710 \times 2}{34.7} = 20.45 \times$	$\frac{710 \times 2}{41.7} = 17.0 \times$	$\frac{710 \times 2}{49.7} = 14.53 \times$	$\frac{710 \times 2}{55.5} = 12.8 \times$
Side W of footing in terms of column	$\sqrt{34.1 \times} = 5.85 \times$	$\sqrt{25.5 \times} = 5.05 \times$	$\sqrt{20.45 \times} = 4.53 \times$	$\sqrt{17.0 \times} = 4.12 \times$	$\sqrt{14.53 \times} = 3.82 \times$	$\sqrt{12.8 \times} = 3.57 \times$
Projection P beyond cap	2.095X	1.695X	1.435X	1.23X	1.08X	.9575X
Area on GH @ 4900 per sq. ft. Equation ①	$8900d(1.66 \times 2d) = 8400d \times 9800d$	$8400d \times 9800d$	$8400d \times 9800d$	$8400d \times 9800d$	$8400d \times 9800d$	$8400d \times 9800d$
Average width of trapezoid A-C-H-B	$\frac{751 \times 2d}{2}$	$\frac{671 \times 2d}{2}$	$\frac{619 \times 2d}{2}$	$\frac{578 \times 2d}{2}$	$\frac{549 \times 2d}{2}$	$\frac{524 \times 2d}{2}$
Soil pressure on trapezoid A-C-H-B Eq. ②	$\frac{8000(5.85 \times 2d)(P-d)}{2}$	$\frac{8000(5.05 \times 2d)(P-d)}{2}$	$\frac{8000(4.53 \times 2d)(P-d)}{2}$	$\frac{8000(4.12 \times 2d)(P-d)}{2}$	$\frac{8000(3.82 \times 2d)(P-d)}{2}$	$\frac{8000(3.57 \times 2d)(P-d)}{2}$
Equating and combining ① and ②	$12800d^2 - 13090d^2 = 23600d^2 \times 0$	$13800d^2 - 14770d^2 = 22650d^2 \times 0$	$14800d^2 - 16460d^2 = 22200d^2 \times 0$	$15800d^2 - 18200d^2 = 21300d^2 \times 0$	$16800d^2 - 19770d^2 = 20750d^2 \times 0$	$17800d^2 - 21490d^2 = 20060d^2 \times 0$
Solving quadratic equation for d	d = .902X	d = .855X	d = .792X	d = .72X	d = .667X	d = .618X
d in terms of W	d = .154W	d = .17W	d = .175W	d = .175W	d = .174W	d = .173W
Making d 17 1/2% of W for all soil values	d = .1025X	d = .08X	d = .792X	d = .72X	d = .67X	d = .625X
PLATE 2					COPYRIGHT	M. M. BUJAH 22

Tabulation of Factors used in Designing Footings

DERIVATION OF CONSTANTS FOR USE IN DESIGN						
Soil value	3000	4000	5000	6000	7000	8000
Center of gravity K of A-C-D-B from cap	1.245X	.99X	.828X	.703X	.611X	.538X
Distance K' in terms of projection P	K' = .595P	K' = .584P	K' = .577P	K' = .572P	K' = .566P	K' = .562P
Average width of trapezoid A-C-D-B	3.75X	3.355X	3.095X	2.89X	2.74X	2.617X
Soil pressure on trapezoid A-C-D-B	23530X ²	22800X ²	22220X ²	21400X ²	20700X ²	20000X ²
Bending moment about cap	$23530X^2(6)(.089) = 29600X^3$	$22800X^2(6)(.089) = 23200X^3$	$22220X^2(6)(.089) = 1900X^3$	$21400X^2(6)(.089) = 15800X^3$	$20700X^2(6)(.089) = 13400X^3$	$20000X^2(6)(.089) = 11500X^3$
One way steel area in terms of X	$\frac{29600X^3}{20000} = 1.64X^2$	$\frac{23200X^3}{20000} = .86X^2$	$\frac{1900X^3}{20000} = .095X^2$	$\frac{15800X^3}{20000} = .079X^2$	$\frac{13400X^3}{20000} = .067X^2$	$\frac{11500X^3}{20000} = .058X^2$
Substituting X = L ÷ 12,000 steel area deems	$A_s = .00001607L$	$A_s = .00001468L$	$A_s = .00001343L$	$A_s = .0000122L$	$A_s = .0000112L$	$A_s = .00001024L$
Band area A required @ 150 per sq. inch	$\frac{.00001607L(12,000)}{150} = .0012857L$	$\frac{.00001468L(12,000)}{150} = .0011744L$	$\frac{.00001343L(12,000)}{150} = .0010744L$	$\frac{.0000122L(12,000)}{150} = .000976L$	$\frac{.0000112L(12,000)}{150} = .000896L$	$\frac{.00001024L(12,000)}{150} = .0008192L$
Ratio of A ÷ A _s	$\frac{3500}{7L}$	$\frac{3500}{7L}$	$\frac{4140}{7L}$	$\frac{4025}{7L}$	$\frac{5480}{7L}$	$\frac{6120}{7L}$
Size of cap in feet	$\frac{166X + 166L}{7L} + 320$	$\frac{7L}{192}$	$\frac{7L}{192}$	$\frac{7L}{192}$	$\frac{7L}{192}$	$\frac{7L}{192}$
Depth of cap in inches	$\frac{(66X)(12) + 8X}{7L} + 320 = \frac{7L}{40}$	$\frac{7L}{40}$	$\frac{7L}{40}$	$\frac{7L}{40}$	$\frac{7L}{40}$	$\frac{7L}{40}$
Size of footing in feet	$\frac{(3.85X)(7L) + 320}{7L} = \frac{7L}{547}$	$\frac{(3.05X)(7L) + 320}{7L} = \frac{7L}{633}$	$\frac{(2.53X)(7L) + 320}{7L} = \frac{7L}{706}$	$\frac{(2.12X)(7L) + 320}{7L} = \frac{7L}{776}$	$\frac{(1.82X)(7L) + 320}{7L} = \frac{7L}{838}$	$\frac{(1.52X)(7L) + 320}{7L} = \frac{7L}{895}$
Effective depth of footing in inches, d	$\frac{1025X(12)(7L) + 320}{7L} = \frac{7L}{26}$	$\frac{88X(12)(7L) + 320}{7L} = \frac{7L}{30.4}$	$\frac{792X(12)(7L) + 320}{7L} = \frac{7L}{33.7}$	$\frac{72X(12)(7L) + 320}{7L} = \frac{7L}{37}$	$\frac{67X(12)(7L) + 320}{7L} = \frac{7L}{39.7}$	$\frac{625X(12)(7L) + 320}{7L} = \frac{7L}{42.7}$
PLATE 3	Note: Add 3" to effective depth for steel protection			COPYRIGHT		
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The Derivation of Constants used in Designing Footings

Referring again to Plate 3, it will be seen that all of the dimensions of the cap and footing base can be expressed directly in terms of the square root of the load L . The particular advantage of this lies in the fact that with only one setting of the slide rule the various concrete sizes can be read, merely by varying the denominator.

An examination of the footing design with respect to punching shear is most necessary before it can be given final approval and for this purpose the various steps in Plate 4 have been prepared. The soil pressure against any footing base diminished by the area of its cap, $2.76 X^2$, is balanced by the shearing resistance of the concrete base over the length equal to the perimeter of the cap. Carrying out this simple calculation, it is found that the shearing stress at the cap has a constant value for each soil pressure and ranges from ninety-six pounds to one hundred and thirty-five pounds per square inch. In like manner, the punching shear at the hypothetical column is found to be of nearly equal intensity to that found for its corresponding cap.

In the lower half of Plate 4 is indicated the values of punching shear at the perimeter of columns having various percentages of vertical reinforcement. For large hooped columns the values given for shear will be found somewhat conservative, but this is due to the fact that in conforming to the best practice a thickness of fire-proofing has been assumed that varies according to the size of the column. In this connection it is worthy of note that the increase in shear at any column is small as compared with the increase in vertical steel.

In deriving the constants for use in design the writer realizes that he has followed a schedule of stresses that may differ from that used by other engineers, but in spite of this, it is believed the constants given will, with one exception, meet all requirements. The exception refers to the steel area A_s when a lower tensile stress is used. But since j changes but little, it is only necessary to multiply the given area by the ratio of the stresses to obtain the new and larger area.

Up to this point the discussion of square footings has been entirely analytical, but judging from the character of the expressions for steel areas, bond areas and concrete sizes, it is quite evident that they can be plotted as straight lines and parabolas thereby giving not only a graphical representation of this analysis, but also a fairly accurate means of determining the entire footing design. Referring to Plate 5, it will be recognized that the first six curves represent the results of the last two steps in Plate 3, namely, the width of the footing base w and the effective depth d . By projecting any load against

these curves from the left hand scale and tracing upward from the point of intersection, the values of d and w can be read on the upper and lower scales respectively. In like manner, the width of the footing cap can be read on the middle scale by using the last curve $\sqrt{L} \div 192$. In reading the depth d it should be remembered that this does not include the three inches which must be added for protecting the reinforcement. The thickness of the footing cap is obtained from the upper scale by projecting the load against the second curve from the left and thence tracing upward. The reason for using this curve for the cap thickness will be understood when the similarity between the curve $\sqrt{L} \div 40$ and $\sqrt{L} \div 39.7$ is considered. In the portion of the plate entitled "Steel and Bond Areas" lines and curves will be found for determining the tensile reinforcement required. Using the same load scale as before and tracing upward from the intersection of load and curve, the steel area A_s at twenty thousand pounds per square inch and the bond area at one hundred and fifty pounds per square inch, can be read on their respective scales.

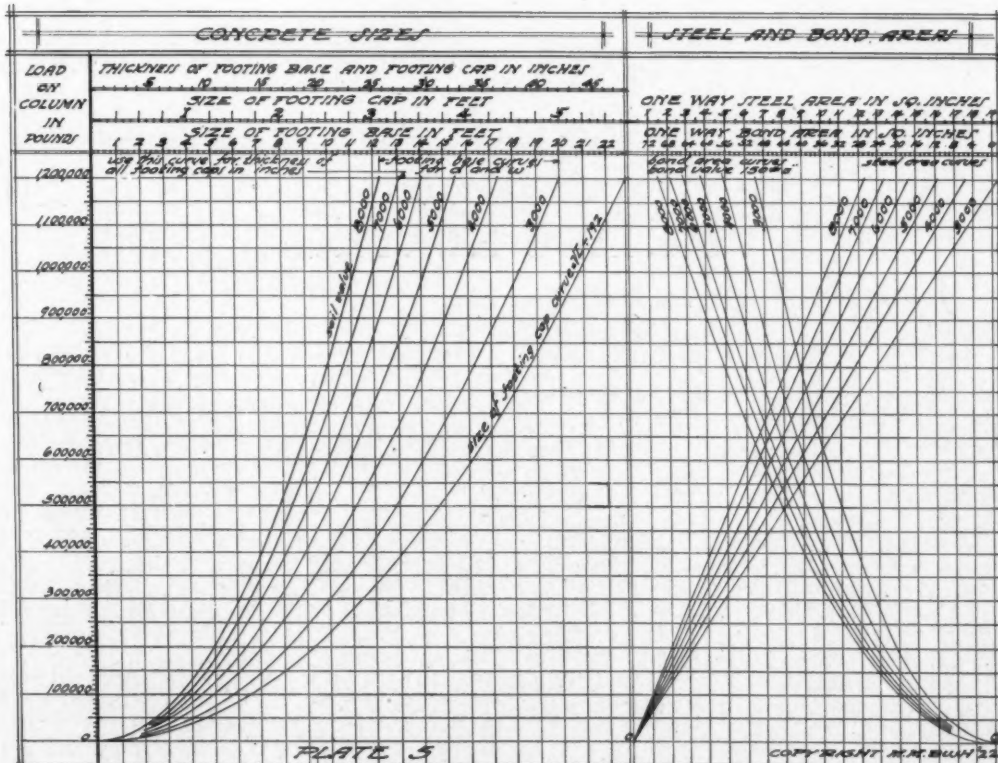
In the above paragraphs the two course footing only has been considered, but in many cases the single course or capless footing is equally desirable, especially for interior columns sustaining medium loads, or for columns in close proximity to tunnels, trenches and elevator pits. The derivation of constants for designing such footings is similar to the methods given for the two course footings, the only difference being that the column replaces the cap as the starting point of all calculations.

In order to give a complete plate of reference for designing either type of foundation, Plate 6 has been prepared, which, with a slightly different notation, contains in addition to all the constants derived above, a schedule of constants for designing the capless or single course footing. In the central part of Plate 6, is scheduled under each soil value a pressure in pounds which is called the critical load. This critical load marks the point of transition from a footing design based on bond stress at 150 pounds per square inch, to a footing design based on tensile stress at 20,000 pounds per square inch. In other words, a column footing sustaining a load less than the critical load will have its reinforcement determined by bond stress, while a column footing sustaining a load greater than the critical will have its reinforcement proportioned according to the tensile area required. By first observing the critical load, the elements controlling the design of any square footing are known in advance.

Entering Plate 6 with any column load and

CALCULATION FOR PUNCHING SHEAR AT CAP AND AT VARIOUS COLUMNS						
Soil value	3000	4000	5000	6000	7000	8000
Shear around footing cap	$(3.4 \times 1^2 \times 2.76 \times 208) = 652 \times^2$	$(2.5 \times 1^2 \times 2.76 \times 278) = 632 \times^2$	$(2.0 \times 1^2 \times 2.76 \times 347) = 615 \times^2$	$(1.70 \times 1^2 \times 2.76 \times 417) = 593 \times^2$	$(1.45 \times 1^2 \times 2.76 \times 487) = 574 \times^2$	$(1.20 \times 1^2 \times 2.76 \times 555) = 559 \times^2$
Concrete area around footing cap	$(.025 \times (4 \times 166 \times)) = 6.8 \times^2$	$(.08 \times (4 \times 166 \times)) = 5.83 \times^2$	$(.79 \times (4 \times 166 \times)) = 5.26 \times^2$	$(.72 \times (4 \times 166 \times)) = 4.79 \times^2$	$(.67 \times (4 \times 166 \times)) = 4.45 \times^2$	$(.625 \times (4 \times 166 \times)) = 4.15 \times^2$
Punching shear at cap	$652 \times^2 \div 6.8 \times^2 = 96 \text{ per sq. in.}$	$632 \times^2 \div 5.83 \times^2 = 108 \text{ per sq. in.}$	$615 \times^2 \div 5.26 \times^2 = 117 \text{ per sq. in.}$	$593 \times^2 \div 4.79 \times^2 = 124 \text{ per sq. in.}$	$574 \times^2 \div 4.45 \times^2 = 129 \text{ per sq. in.}$	$559 \times^2 \div 4.15 \times^2 = 135 \text{ per sq. in.}$
Shear around column	$(3.4 \times 1^2 \times 2.76 \times 208) = 688 \times^2$	$(2.5 \times 1^2 \times 2.76 \times 278) = 680 \times^2$	$(2.0 \times 1^2 \times 2.76 \times 347) = 615 \times^2$	$(1.70 \times 1^2 \times 2.76 \times 417) = 667 \times^2$	$(1.45 \times 1^2 \times 2.76 \times 487) = 660 \times^2$	$(1.20 \times 1^2 \times 2.76 \times 555) = 655 \times^2$
Concrete area around column	$(.025 \times (4 \times 166 \times)) = 6.75 \times^2$	$(.08 \times (4 \times 166 \times)) = 6.16 \times^2$	$(.79 \times (4 \times 166 \times)) = 5.8 \times^2$	$(.72 \times (4 \times 166 \times)) = 5.52 \times^2$	$(.67 \times (4 \times 166 \times)) = 5.32 \times^2$	$(.625 \times (4 \times 166 \times)) = 5.12 \times^2$
Punching shear at column	$688 \times^2 \div 6.75 \times^2 = 102 \text{ per sq. in.}$	$680 \times^2 \div 6.16 \times^2 = 110 \text{ per sq. in.}$	$615 \times^2 \div 5.8 \times^2 = 116 \text{ per sq. in.}$	$667 \times^2 \div 5.52 \times^2 = 121 \text{ per sq. in.}$	$660 \times^2 \div 5.32 \times^2 = 124 \text{ per sq. in.}$	$655 \times^2 \div 5.12 \times^2 = 128 \text{ per sq. in.}$
Punching shear at stayed col with 2% of vert. steel	○ 122.5 □ 108.5	133. 117.8	140. 123.7	145.2 128.5	149.5 132.3	153.5 136.
Punching shear at stayed col with 3% of vert. steel	○ 127. □ 112.5	138.5 122.5	146. 129	152. 134.3	156. 138.	160.5 142.
Punching shear at stayed col with 4% of vert. steel	○ 132. □ 116.7	143. 126.7	151. 133.5	157.5 139.4	161.5 143.	166.8 147.5
Punching shear at hooped col with 2% of vert. steel	○ 136.5	148.	156.	162.	167.	172.2
Punching shear at hooped col with 3% of vert. steel	○ 141.2	153.	161.5	167.5	173.	178.
Punching shear at hooped col with 4% of vert. steel	○ 146.5	158.5	167.2	173.5	179.5	184.5
Special note	The above intensities of punching shear at hooped columns are only approximate and based on an external column diameter that exceeds core by 13 percent.					
PLATE 4					COPYRIGHT	M.M. BULLIVANT

The Effects of Punching Shear in Designing Footings



Curves to Simplify Footing Design

CONSTANTS FOR DESIGNING ONE & TWO COURSE FOOTINGS						
Soil value	3000	4000	5000	6000	7000	8000
A in ft.	$\sqrt{L} \div 54.7$	$\sqrt{L} \div 63.3$	$\sqrt{L} \div 70.6$	$\sqrt{L} \div 77.6$	$\sqrt{L} \div 83.8$	$\sqrt{L} \div 89.5$
B in in.	$\sqrt{L} \div 26.$ $\sqrt{L} \div 23.8$	$\sqrt{L} \div 30.4$ $\sqrt{L} \div 25.2$	$\sqrt{L} \div 33.7$ $\sqrt{L} \div 27.$	$\sqrt{L} \div 37.$ $\sqrt{L} \div 28.6$	$\sqrt{L} \div 39.7$ $\sqrt{L} \div 30.1$	$\sqrt{L} \div 42.7$ $\sqrt{L} \div 31.7$
C in ft.	$\sqrt{L} \div 192$	$\sqrt{L} \div 192$	$\sqrt{L} \div 192$	$\sqrt{L} \div 192$	$\sqrt{L} \div 192$	$\sqrt{L} \div 192$
D in in.	$\sqrt{L} \div 40.$	$\sqrt{L} \div 40.$	$\sqrt{L} \div 40.$	$\sqrt{L} \div 40.$	$\sqrt{L} \div 40.$	$\sqrt{L} \div 40.$
A_f one way	.00001607L .0000184L	.00001468L .0000159L	.00001343L .00001455L	.0000122L .0000134L	.00001112L .00001265L	.00001024L .00001195L
band area A_f one way	.0453 $\sqrt{L}$.0444 $\sqrt{L}$	.0513 $\sqrt{L}$.0462 $\sqrt{L}$	.0556 $\sqrt{L}$.0487 $\sqrt{L}$	.0589 $\sqrt{L}$.0507 $\sqrt{L}$	.061 $\sqrt{L}$.0531 $\sqrt{L}$	.0633 $\sqrt{L}$.0533 $\sqrt{L}$
critical load	134,000 100,000	204,000 140,000	282,000 188,000	397,000 245,000	507,000 298,000	650,000 334,000
total wt. of steel for A_f	.00000195L $\sqrt{L}$.00000220L $\sqrt{L}$	.00000154L $\sqrt{L}$.00000167L $\sqrt{L}$	.00000126L $\sqrt{L}$.00000137L $\sqrt{L}$	.00000104L $\sqrt{L}$.00000114L $\sqrt{L}$	.00000088L $\sqrt{L}$.0000010L $\sqrt{L}$	.00000075L $\sqrt{L}$.00000086L $\sqrt{L}$
total wt. of steel for B	.000715L .0007L	.000697L .000625L	.0006775L .000594L	.000657L .000567L	.000627L .000546L	.000608L .000512L
cu. ft. of concrete	.0000013L $\sqrt{L}$.00000135L $\sqrt{L}$	.00000085L $\sqrt{L}$.000000955L $\sqrt{L}$	.00000063L $\sqrt{L}$.00000072L $\sqrt{L}$	.00000050L $\sqrt{L}$.000000575L $\sqrt{L}$	.000000435L $\sqrt{L}$.000000475L $\sqrt{L}$	.000000365L $\sqrt{L}$.000000398L $\sqrt{L}$

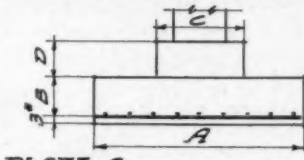
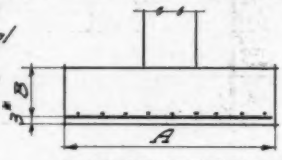


PLATE C.

Note:
Add 3" to B for total
depth of footing.
Where two values are
given in schedule,
the first is for a
two course footing.



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Constants For Special Cases in Footing Design

substituting in the various expressions for steel and concrete sizes and quantities, the architect, with minimum effort, commands a wide range

of results without the use of tables, proper allowance being made for stresses other than those assumed in this article.

RECENT DEVELOPMENTS IN WARM AIR FURNACE HEATING*

BY F. R. STILL, Mem. Am. Soc. H. & V. E.

SOME FACTS ABOUT CIRCULATION STIMULATORS

WHEN the occupant of a house finds it impossible to heat his place, he does a little experimenting on his own account; he then calls in the furnaceman who does some more, usually without producing any marked effect on the job. Finally somebody suggests that "the only way to make this job work is to put in a blower." Usually that is the wrong way to go about it.

Installing a blower for no other purpose than to overcome a defect by force, is an extravagance. Rightly applied, a blower will effect economies that cannot be duplicated in any other way, and they are not recommended for any other purpose.

*Continued from page 337 of our October 11 issue

Applying a blower to a furnace, should be for no other purpose than to remove the film of air in immediate contact with the heating surface more rapidly than it can be moved by gravity. As the film of air becomes heated, it carries away heat from the heating surface as it moves forward, and the more rapidly it moves, the faster the heat is removed because of a continuous film of cool air coming in contact with the hot surfaces. The capacity of a furnace which is operating under the most favorable conditions, can be increased from two to three times by using a blower. At Urbana this was demonstrated after alterations were made which had already increased the capacity by gravity circulation 1.8 times.

With a limited height of chimney and a rea-

sonable limit to the flue gas temperature, the draft is fixed within rather narrow limits. The amount of draft fixes the rate of combustion, and the rate of the combustion fixes the amount of heat obtainable from the fuel per unit of grate area. Therefore, with a fixed ratio of heating surface to grate surface, when the maximum heat transmission from a given amount of heating surface has been reached by gravity circulation, the only way to get more heat is to increase the air movement over the surface, by a blower device of some kind, or install a larger furnace with larger flues, etc.

The available pressure head is so slight in gravity work, that it needs but little resistance to stop the flow and sometimes completely reverse it. It does not require much additional pressure in many cases to set the air in motion and as soon as the ducts and flues become thoroughly heated, they will continue to operate satisfactorily.

Wherever long horizontal or crooked ducts prevail, a blower must be installed which is large enough to handle all the air that will be required to convey the maximum amount of heat into the building. Unless one is prepared to have such a blower operate continuously when heat is required, he may be disappointed in the results, as it becomes rather costly to pay for electric current as well as coal for continuous operation.

The reason why such a blower must operate continuously and not occasionally, as a circulator can be operated, is this: Some of the leaders offer very little resistance to the flow of air, whereas some of the others offer a great deal. Therefore, dampers must be inserted in such leaders offering but little resistance, so as to make them equal the resistance of the others. If this is not done, the bulk of the air will blow through the leaders having the least resistance, with the result that little would be gained in the delivery of more air or more heat to those rooms requiring a greater amount.

By making such adjustments of the dampers to equalize the flow, it introduces so much resistance to the whole plant that the furnace is unable to heat any part of it by gravity circulation alone. That is why the blower has to run all the time, when one is installed with the expectation that all of the air required by the building will have to pass through it.

All kinds of devices have been developed to stimulate the flow of air from furnaces without having to handle all the air required properly to

heat a building. Many of such devices have long since passed out of existence, and have been forgotten. During the past two years, a new crop has sprung up, one of which, Fig. 4, was recently tested at the University of Illinois and reported to the last meeting of the *National Warm Air Heating & Ventilating Association*.

This particular device is intended to make it possible to heat a building by circulating air at low temperature instead of at high temperature, thus avoiding hard firing with its inevitable waste, repairs and renewals to the furnace. Higher efficiency can be obtained under all weather and operating conditions and less attention will be demanded by the furnace to get satisfactory results.

Tests made on this device show that at a register temperature of 120 deg. it is possible to induce 60 per cent more air to flow than by gravity and at the same time get an overall efficiency 20 per cent higher. As the register temperature rises, the gain becomes gradually less; thus, at 180 deg., the amount of air induced to flow over and above what would flow by gravity is 35 per cent more and the overall efficiency is but 3 per cent more. Please bear in mind that this gain was effected after alterations had been made in the furnace so as to get the

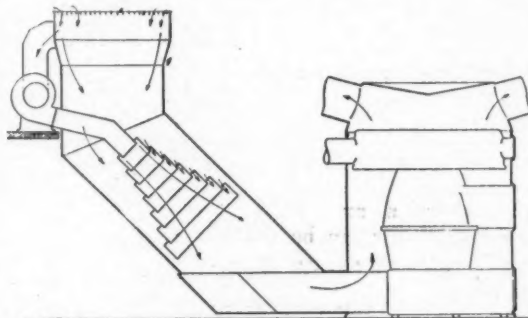


Fig. 4. Device to Stimulate Flow of Air from Furnace

best possible results by gravity circulation. The comparative results obtainable are shown in Fig. 5.

This circulator was designed to induce the flow of several times the volume of air that the blower of itself will handle. It, therefore, consumes so little current that the cost of the fuel and the electricity combined, even if the circulator is run continuously, amounts to less than the fuel alone would amount to when similar results are produced, if such a thing could be effected.

It offers no obstruction to the flow of air in the recirculating pipe, so that the furnace can be operated without the blower running just the same as though nothing were there, and the result will in no way be different. When more heat is wanted, the circulator can be started, and without opening the drafts, the same volume of heated air can be obtained as can be obtained by gravity at temperatures 60 to 80 deg. higher. If the same velocity could be produced by gravity as with the circulator at low temperatures, this device would be unnecessary. The only other way to accomplish corresponding results, would be to make the leaders large enough to convey the required volume at the low temperatures. In most cases this would

be impracticable for lack of space, and besides, the efficiency of a furnace falls off so rapidly under such conditions that nothing like the same economy could be attained as with the circulator.

Some day circulators of some kind will be considered as necessary as any other part of a furnace

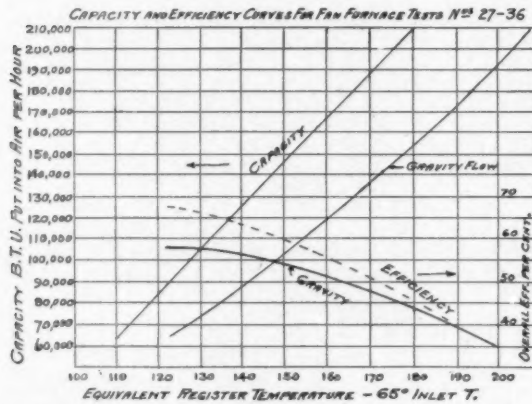


Fig. 5. Chart showing comparative Results on Furnace tested with Forced and Gravity Circulation

plant. They will not be looked upon as something to fall back upon to make a defective plant acceptable, but they will be considered as an economical necessity, by means of which air can be circulated at more healthful temperatures, regardless of weather conditions.

The work done by Professor Willard and his staff at the University of Illinois, under the direction of the *National Warm Air Heating & Ventilating Association*, is a wonderful accomplishment. It means more to the future success of the furnace business than most of those who have had direction of this work fully realize. In the adoption of the code, herein referred to, a foundation has been laid for progress and improvement. As previously stated, the code is not perfect, but with a good foundation on which to build in the future, amendments can be made to correct and improve the code as progress and further knowledge seems to indicate.

Better furnaces will undoubtedly be designed, as they are certainly needed. None of the furnaces on the market are what would be considered a first-class design for a convector. Too much of the heat generated in a furnace is now wasted by radiation. There is no reason why a furnace cannot be designed which will show an efficiency ranging between 80 and 90 per cent. There is no furnace on the market today which will show better than about 60 per cent.

It is estimated that there are about 10,000,000 homes without furnaces in this country in climates where heat is necessary, and it is also estimated that 80 per cent, or 8,000,000 of these homes could be equipped with furnaces so that if this business could be developed it would amount to over two billion dollars, not including replacements. Thus one gets an idea of the importance of the work being done to standardize furnace practice. It has been further estimated that if those who have inefficient and ancient equipment could be induced to install modern furnaces it would be sufficient to keep the present industry busy for five years.

Owing to the poor success so frequently attending the installation of warm-air furnaces in homes of moderate size the furnace business has gradually gotten down to the stiffest kind of competition and about the only thing that recommends it to the average man is its low cost in comparison with steam or hot-water heat. Undoubtedly if it is put on a more scientific basis better installations will be the result and the public will gather confidence and will be willing to pay more money for a properly installed furnace, as it has many attractive features to recommend it. In some classes of buildings it is preferred to the complicated steam or hot-water systems and the expense necessary to install this type of apparatus.

Standard Roofing Materials

MR. GARDNER C. COUGHLIN, Secretary of The American Specification Institute, 19 South La Salle Street, Chicago, Ill., informs THE AMERICAN ARCHITECT that the Institute has in the course of preparation a specification on what is commonly termed "Composition Roofing," including in this class the ordinary tar and gravel roofings and the more modern smooth surfaced coatings.

It might be well for those who are interested in standardizing roofing materials to get in contact with the Specification Institute.

Standard Suspended Ceiling Specifications

THE Associated Metal Lath Manufacturers, Edison Building, Chicago, Ill., have adopted standard minimum safe specifications for suspended ceilings.

In announcing the fact that copies of these specifications may be had free on request, Mr. Wharton Clay, Commissioner for the Association, says, "It is to be regretted that much suspended ceiling work is being erected in a sub-standard manner, and if failure occurs, it will be through no fault of the manufacturers."

DEPARTMENT OF SPECIFICATIONS

OUTLINE FOR CONCRETE SPECIFICATIONS

(CONTINUED)

XXXI. WALKS

- A. Walks may be placed on earth sub-grade or on structural slabs. For walks placed on earth the sub-base must be prepared as noted under XXVIII, Floors, paying particular attention to spaces that have been filled recently. The importance of insuring sufficient puddling, tamping and general solidity of the sub-base cannot be over-emphasized
- B. For walks placed on structural slabs such as slabs over excavated spaces, under street walks, it is essential only to make sure that the structural slab will be leveled off sufficiently to assure the minimum thickness that is most desirable for the sidewalk base course under such circumstances
- C. Where walks are to be placed on structural slabs and extending over earth fill, make sure that reinforcing noted in previous articles will be supplied
- D. Walks that are to be placed on structural slabs cannot be expected to be made absolutely watertight, therefore, specify waterproofing to be placed on top of the structural slab, extended up on intersecting surfaces such as foundation walls and where necessary, down on curb or retaining walls so as to prevent seepage of water through joints in work or between walk and adjoining surface. If felt membrane is used, the finished waterproofing course should be protected immediately with a coat of cement mortar, mixed one to three to prevent breakage of the membrane during the placing of walk base course. Where other systems of waterproofing are used such as surface applied materials, either in liquid form or in the form of troweled coatings, protective measures must be specified as the specific case may require
- E. For large walk areas and especially for areas on structural slabs over finished basement spaces, provision must be made for expansion joints. For

such joints provide thin, wedge-shaped strips of a width of the thickness of the walk base and topping. The climate must be considered so far as the placing of expansions joints is concerned, but it usually may be considered sufficient to provide such joints not less than six feet on centers, longitudinally and laterally. If side-walk lights are used, the facings of expansion joints over walk slabs will be controlled to a large extent by the positions of the units. In other cases the locations of joints may be determined by center lines fixed by architectural features. For expansion joints in walks on earth, the location probably will be determined more by arranging the walk in rectangles of pleasing forms with controlling features of expansion only

- F. Where walk lights are to be provided, specify whether they are to be precast or cast in place. Each type has its advantages, although as a general principle, it may be assumed that any product finished as far as possible in the shop will excel in general character a similar article made up in the field. Specify kind of glassware to be used. There are several available types, any one of which may be preferred for particular uses. If the strength of the finished walk light slab is equal in all cases, common sense considers that glassware permitting the greatest area per square foot of surface to be the best. A new feature in the testing of glassware is the examination by a polariscope or scleriscope. Either of these tests will reveal visually defects that should condemn the glass. A test of this nature should be specified, and as testing apparatus is simple the specification writer should feel assured that tests may be made in the field as well as in the shop. The glass should, of course, be tough but not brittle, should be standard in form, and should be of a type permitting replacement with ease. Although it is customary to provide a waterproofing or expansion joint between glass and surrounding concrete work, the specification should include such requirements. Where

slabs are cast in place, the topping will be provided as specified below. The precast slabs should have the top finish specified to be similar to the topping for the general walk surfaces especially in those cases where granite chips or one of the abrasive aggregates may be used. For precast slabs, the specifications must require the building-up of foundations under the slabs to raise them to the walk level, as they very rarely are of equal thickness with the walk. For slabs cast in place, such foundations will be provided when the slab is being poured

- G. It is often necessary to build curbs in connection with sidewalks. Where local ordinances or regulations govern, the specification writer must be familiar with them. Where no control is had, the curbs should be formed directly with the walk and carried down at least twelve inches below the level of the paving at the curb. If the old curb, or its adjoining curbs have flaggings, new flagging must be provided in concrete. Provide curb bars in the corners of the curbs where it is possible that traffic will be sufficient to wear down the corners, especially at street intersections. Several special types of curb bars are available, or if desired, a protecting bar may be formed out of a tee with the stem laid horizontal. No matter what curb bar is used, anchorage must be substantial, and at the ends of curbs, it is better to bend the bar at a sharp angle into the curb if the weight of the bar will permit, or to grind the bar down to a feather edge to prevent steel tires from digging into the bar and breaking it away at the ends

- H. Placing of concrete should be conducted generally in accordance with suggestions laid down previously. Where waterproofing has been placed over structural slabs, care must be exercised not to break through the protecting membrane. The concrete must be leveled off at the proper distance below the finished level to receive the topping, and only so much base should be laid as can be finished with topping before the end of the working day. Where expansion joints are being formed, require that care be exercised not to displace the joint strips, and to work the concrete tight

up against the strips to insure smooth edges for later calking. Where walks are being laid against buildings having granite or limestone or similar bases, or even against brick surfaces where splashing would be undesirable, require that suitable means be provided to prevent splattering of cement for concrete. This may be accomplished by means of ordinary building paper or canvas strips, either of which may be removed immediately after concrete base is placed

- I. Unless local ordinances govern, it is generally sufficient to provide base course for walks on earth five inches thick, and for walks on structural slabs, the base may be four inches thick

XXXII. TOPPING

- A. Topping for floors within buildings and for walks or other exterior surfaces, should be specified together, as the operations in either case are similar. For floors that are to receive certain types of finished floor covering, such as cork tile, the composition of the topping should be such as to permit the penetration of nails for holding the finished flooring while the adhesive is setting. Several compositions are available that are of such a nature as will permit the penetration of nails, holding them with sufficiently strong grip. The specification writer should be familiar with these compositions. The topping should be composed of one part cement to two parts clean, coarse sand of grade that will permit perfectly smooth troweling but not so small that fine hair cracks will develop. It is not advisable to use more sand in proportion to the cement as the proportion given should be changed more in favor of cement rather than sand
- B. Hardeners for cement topping are coming into vogue to a very great extent. While it is possible to secure a perfectly hard floor or walk topping without the use of hardeners, it is highly improbable that satisfactory results can be obtained under usual working conditions in the field. The specification writer must determine by his own investigation the desirability of using hardeners, and whether hardeners will be integral or surface applied. Every manufacturer of hard-

eners will furnish specifications for the use of his material

- C. It is believed that the maximum thickness for cement topping is $1\frac{1}{2}$ ". It may be said that this thickness is used only in rare instances, as 1" is generally sufficient for wearing surfaces receiving the hardest wear, while $\frac{3}{4}$ " is quite customary for the average floor, walk or roof surface. It is not so much the thickness of the topping as laid down that counts, but rather the intimate contact that is had between the topping and the base concrete
- D. Topping should be placed immediately after base concrete is placed to insure intimate contact and bond. Where it is impossible or not practical to lay topping almost simultaneously with the base, some bonding agent should be used. This bonding agent may be thin cement grout spread over the wetted surface of the concrete base or it may be some special bonding medium manufactured for the specific purpose. It will be well if the specifications called for the use of some sort of bonding medium where the contractor neglects to lay topping immediately after the base has been laid and before the concrete has taken initial set
- E. Only so much topping should be laid in one day as can be finished before the end of the working day. Where floors are being laid in rooms or spaces in which joints will be objectionable, the work should be so laid out that topping will be placed up to door thresholds or saddles, or other lines of demarkation that will be hidden by later construction or finish
- F. The topping should be troweled smooth to a glossy finish where direct traffic is to be borne, unless uses require preference for a rougher surface, in which case the topping may be screeded and floated with wood floats
- G. Expansion joints in floors may be formed on column center lines or otherwise as may be desired. The location of expansion joints generally should be studied in connection with the structural concrete work where the frame work is of concrete. It is difficult to suggest hard and fast rules for these joints, as they are usually provided through the topping only, and since the expansion of the base is of more moment, the joints in the topping practically serve one purpose—that of providing cleavage planes that will not be as apparent as they would be if appearing in the general floor surfaces. For expansion joints in walks, the topping should be carried up to the joint strips. Wherever joints are provided, they should be finished rounded
- H. Non-slipping surfaces may be provided in topping for floors, walks, or other uses. The non-slip properties may be obtained by use of granite or other hard stone chips of fairly small size, or by use of a manufactured abrasive, such as an electric furnace product. This aggregate may be placed in the topping while it is being mixed, but a cheaper way is to sprinkle it over the topping immediately before troweling is done, as only the aggregate on the upper surface exposed to wear is of economic value
- I. Where risers and treads are to be provided, they may be placed either on the concrete structural work or on steel pan construction. For concrete stairs the usual procedure is similar to that followed for floor and walk work. For steel pan stairs, it is customary to provide a concrete base of sufficient thickness to leave $\frac{1}{2}$ " for topping
- J. If it is desired that the cement topping be of the best quality, the use of sawdust blankets should be specified. These blankets should be about two inches thick and should be kept wet for a period of from seven days to fourteen days, depending somewhat on the humidity of the atmosphere and the temperature. Specifications must require that sawdust is non-resinous and contains no other ingredients that may stain the topping. After the period for maintaining the sawdust blanket has expired, the sawdust must be entirely removed
- K. When surface applied hardeners are used they will be applied after the sawdust blanket has been used. As suggested above, the specifications of the manufacturer of the material used will be so drawn in practically every

(Concluded on Page 388)

Technique in Clay Products*(Continued from Page 360)*

into pieces of extreme monumental size which its nature is not capable of readily yielding.

Quite apart from any aesthetic standards there is a practical advantage in the reduced expense of construction which would follow development of a more appropriate technique for terra cotta. Wide projections in cornice and other features of relief depending for support upon hanging devices of iron and steel not only require the most careful detailing for security but illustrate an expense in the total for construction as now encountered that might often be dispensed with. Moreover, they are in themselves not motives best adapted for color treatment. A flatter treatment for a material like terra cotta not only conduces to that absolute durability which is so well attested by early Italian and other uses of it in examples of over 500 years' standing, but is more suited to the spirit of a clay material and in many cases enables a sufficient interest to be introduced in

varied coloring to dispense with costly formal construction and its enrichment with expensive detail.

Recognition of this has already produced some recent examples which contain the promise of a very interesting development. In the city of Honolulu, for instance, there has lately been erected an important building covering an entire city block where an attempt appears to have been made to follow a distinctively terra cotta technique in the treatment of jointing, if not, perhaps, so noticeably in other aspects of design. Throughout the entire exterior, which is all in terra cotta, and illustrates an immense use of this material, not a single joint was ground, leaving the soft edge natural to a clay piece instead of the knife-sharp edge given by a rubbing bed as commonly demanded in terra cotta. A frankly appropriate design and treatment conducing to economy in the production of any material has a practical advantage in a time of high building costs, especially where it carries an artistic improvement in the result.



Base of arcade pier in a modern building for Theodore H. Davies & Company, Ltd., Honolulu, T. H.

Louis Christian Mullgardt, Architect

Showing the soft edges of unground Terra Cotta pieces with slightly raked out joints, glaze being allowed to return over the edges. Color, a variable brown glaze verging to shades of olive green

LEGAL DEPARTMENT

Conducted by

CLINTON H. BLAKE, Jr., of the New York Bar

AT the conclusion of my article last month, I suggested various questions which were then left open, and stated that I would treat of them in succeeding articles. These questions related to the right of the architect to damages or compensation, where he is discharged or the work is abandoned or suspended and then the work is later proceeded with to completion. I suggested several variations of the problem, involving the case of an abandonment merely, followed by a subsequent completion; the case where the building is completed in accordance with the original plans, and on the other hand, in accordance with new plans prepared by another architect; the case where the architect is discharged, without cause, as distinguished from the case where his employment is simply terminated by the suspension or termination of the work. I also referred to the question of the right of the architect to continue to act as the architect of the work, after the suspension is terminated and the job proceeded with.

In a previous article, referred to in the article last month, I discussed various phases of these situations, in those cases where no contract between the architect and client existed. In the present discussion, I am assuming that a contract does exist substantially in the form of the standard contract of the American Institute of Architects, embodying especially the provisions of articles five and six of the Institute Contract and the ordinary provision that the plans, as instruments of service, remain the property of the architect.

Assuming these facts, if the building be abandoned, the architect, as we saw last month, can only recover, under the Institute contract, the proportionate amount of the fee under the terms of articles five and six. If the work be again started, however, and completed after the suspension—in other words, if there is a suspension simply, and no permanent abandonment—it would seem that the architect should be entitled to recover for his additional compensation on the cost of the completion of the building, providing the building is completed in accordance with his original plans. Inasmuch as the plans belong, under the contract, to the architect and remain his property, the client, if he proceeds with the completion of the building under the plans, is making use of the services and property of the architect to that extent, and the architect should be entitled, accordingly, to proper compensation therefor.

If, after a suspension, the work be proceeded with, but under new plans, prepared by another architect, manifestly a different situation is presented. The standard contract does not, either in paragraphs five or six, or elsewhere, provide, in effect, that the client can dispense with the service of the architect, on payment of the proportionate amount due at that time, under the above articles, or provide what the rights of the architect may be, where the work is proceeded with after it has been suspended. It seems to me, however, reading these articles together and the contract as a whole, that the general intent of the contract is, that, if the work is suspended, the architect, on receiving his proportionate amount under articles five and six, is paid in full up to that point in the building operation, and that, unless, when the work is proceeded with, his plans are used, his interest in the work is at an end. The effect of this is, as a practical matter, to give the client the right to dispense with the services of an architect, simply by declaring a suspension of the work, and then proceeding again under new plans prepared by another architect.

As I have had occasion to point out before, the contract between the architect and the client is a contract of personal employment, and sound policy, based on the professional relationship, demands that the architect cannot force the client to continue to employ him, if the client desires otherwise. On the other hand, we have seen that, if the client elects to dispense with the services of the architect, the architect may have a claim for damages in a case where he has been definitely employed as the architect of the whole job under an agreement which does not follow the form of the standard contract. Personally, I believe that, in fairness to the architect, the standard contract should be modified to the extent of definitely providing that, if the work is continued after suspension and completed in accordance with the original plans, the architect shall be paid the full amount due on the completed job, and that, if, after suspension, the client elects to complete the building, but to have a new architect and new plans, he must, nevertheless reimburse the original architect for the full amount of his fee on the basis of the cost of the building under the original plans.

It might be a fair modification of this last provision to insert a clause that, in the event that the cost of the completion under the modified plans is less than the cost would be under the original plans, the original architect is limited,

in his recovery, to the total cost under the modified plans, and cannot compel the client to pay him a larger compensation, on the basis of a more expensive building than that actually erected. The general proposition, however, that the architect should have definite specified rights to additional compensation, where the building is completed after suspension, seems to me clear and eminently just. An architect does not undertake the work on the theory that it will not be completed, and that he will be paid merely a portion of his fee, but on the theory that the job will be proceeded with to a final conclusion and the full fee paid accordingly. It is quite conceivable that an architect would not take up the job and go to the trouble and expense of preparing the preliminary sketches and the details and working drawings and specifications, if he knew that he were not to be allowed to complete the building or that the building was to be completed, after a temporary suspension of the work, under other plans and under the direction and supervision of another architect.

There remains the question whether, where an architect is discharged without cause, the provisions of articles five and six apply, and are the measure of the amount of his recovery. It seems clear that this should not be the case. Article five refers specifically to a "suspension" and to an "abandonment." It does not mention a discharge, and I see no reason why its scope should be enlarged by construing it as including the discharge of the architect. It seems consistent, therefore, with recognized legal principles and fair dealing alike, that in the case of a wrongful discharge, the architect should be entitled to recover for the loss of his profit and not be limited to the proportionate amounts specified in article five. Certainly, this should be the case where the building is completed in accordance with the plans which he conceived and the specifications which he prepared.

LEGAL DECISIONS

ONE who enters into a contract in good faith does not fulfill the full measure of obligations under the contract, unless he fully performs the contract. An omission, however, which is trivial in its character, will, under certain

circumstances and in special cases, be considered as compensated for by the allowance of the resulting damage, and will not necessarily in every case be construed as the breach of a condition of the contract which will result in the forfeiture of the contractor's rights. As a general rule, in case of the failure to perform, the cost of the replacing of the work which does not comply with the contract is the measure of damages, and the owner is entitled to an amount of money which will permit him to complete, in accordance with the contract, unless the cost of completion is grossly and unfairly out of proportion to the good resulting to the owner. When that is the case, the measure of damages will be the difference in value of the work done and the work which should have been done. A contractor put in a different brand of pipe for plumbing in some instances from that called for by the specifications. It was found that the change in the character of the pipe was neither fraudulent nor intentional, but was the result of an oversight on the part of the sub-contractor. The contractor offered to show that the pipe which was installed was of the same quality, appearance and market value as the pipe specified in the contract, that the two kinds of pipe were, in fact, the same thing, though manufactured in another place. The Trial Court excluded the evidence. It was held that this was error, that the evidence should have been admitted, as it would have supplied some basis for holding that the defect was insignificant and not vital, and that, under the circumstances of the case, the measure of the damages should not be the cost of replacement, which would be grossly out of proportion to any real damage suffered, but the difference in value between the two pipings, which would be either nominal or nothing.

Jacob & Youngs, Inc., v. Kent, 230 N. Y. 239.

A CONTRACT to erect a building for a City provided that there should be paid the sum of \$50 per day as liquidated damages for the delay in the completion of the work, if the work extended over two hundred working days from the date when the notice to commence was given. Defendant claimed that this was a penalty and void. The court held that it was not a penalty, but a proper liquidated damage clause, and that it would be enforced.

Wells v City of Philadelphia, 112 Atlantic 867.

LIGHT AS AN ELEMENT IN DECORATION*

THE important part played by artificial light in decorative schemes is apt to be overlooked. The point has often been emphasized at meetings of the Illuminating Engineering Society. It has also been pointed out that lighting effects in turn are much influenced by the system of decoration. A white ceiling, when new, may be expected to reflect as much as 80 per cent of the light it receives; very light grey, green, or pink papers may reflect 60 to 70 per cent; intermediate colors, 30 to 50 per cent; the darker shades much less, while very dark papers may return only 5 to 10 per cent of the light they receive.

Undue loss of light through absorption not only diminishes the available illumination but has the drawback of suppressing the valuable "diffused" light coming from all directions that helps to soften shadows. In semi-indirect lighting colors of walls and ceiling play an exceptionally important part. It is inadvisable to use this method of lighting unless good white ceilings are available and can be maintained clean. In a recent test it was shown that refinishing some discolored walls and ceilings alone increased the available illumination by 50 per cent.

In rooms panelled in very dark wood lighting needs to be executed with special care. At a recent discussion of the Illuminating Engineering Society some interiors of public buildings decorated in this way were described. One Council Chamber, finished in very dark walnut, was lighted by a central cut-glass chandelier fitted with imitation candles and gas-filled electric lamps. Whatever one may think of the merits of such chandeliers their use amidst such dark surroundings should not be encouraged, as the contrast becomes too glaring. Another room, similarly panelled in dark walnut, was illuminated by concealed cornice-lighting, so that all light was received by reflection from the white ceiling. This effect also struck one as peculiar. It is doubtful whether total indirect lighting gives a good effect when the walls are so dark. It seems to accentuate the height of the room, and gives one the feeling of being imprisoned at the bottom of a well.

The nature of the painted surfaces, *i.e.* whether matt or glossy, is also of interest from the lighting standpoint. Illuminating engineers prefer that walls with a dull finish should be used; otherwise reflections of light sources are apt to be distracting. A committee of the Illuminating Engineering Society which inquired into the lighting of schoolrooms some years ago recommended that schoolrooms should be finished with warm white ceilings, that walls above the dado should be

light in tint, and that glossy and polished surfaces should be, so far as possible, avoided.

Good lighting, doubtless, should be unobtrusive. Yet the lighting units may themselves play a part in the scheme of decoration. The first requirement is obviously that the source of light should be so shaded as to be of mild luminosity, agreeable for the eye to rest upon. Silk shades, either of a tint similar to the surroundings or of a color forming a pleasing contrast to them, give a pleasing effect, but are apt to harbor dust. If semi-indirect lighting is used this difficulty can be overcome by enclosing the silk within two concentric clear glass bowls, the inner globe of prismatic glass, so as to reflect the majority of the light upwards.

A point that has been much debated by lighting experts is the treatment of interiors decorated in some distinctive style of the past. It is usually held that the fittings should also conform to the general period of design. Yet the mere introduction of gas or electric lamps in a fitting originally designed for use with candles is an anomaly. The best that one can do is to screen the lights in such a way that their nature is not evident. But in modern buildings it may justly be contended that we should not continue to perpetuate styles of fittings intended for use in the age of candles, but should develop new fittings designed in accordance with the requirements of the present age—the age of electricity.

There are many possibilities in lighting which did not exist in the past. Amongst these is the use of "artificial daylight"—*i.e.* electric lamps equipped either with special tinted bulbs or with suitable screens, such that the light is converted into a close resemblance to normal daylight, revealing colors in their natural tints. Small units of this kind may be used to illuminate pictures, cabinets of china, and other objects whose delicate colors might be imperfectly revealed by ordinary illuminants. Alternately one might construct an artificial skylight, flooding the room with artificial daylight, and imitating more completely the conditions of natural lighting.

There is another possibility in the use of artificial light for decorative and artistic effects that seems to have been strangely overlooked, namely, the illumination of pictures and other surfaces by *transmitted* light instead of light falling on them from the front. The artist painting a picture on canvas in opaque colors, illuminated from the front, is at a great disadvantage. The greatest variation in tone possible with ordinary pigments does not exceed about 20 to 1, whereas in natural scenes and landscapes a range of brightness of 100 to 1, or even 1,000 to 1, is probable. A sunset,

*Reprinted from a recent issue of *The Architect*, of London.

with a range in brightness that is very great in comparison with fields, trees, or other objects in the foreground, can be only imperfectly rendered by conventional methods. Moreover, even such contrasts as the painter can execute are apt to be lessened and masked by a mist of scattered, reflected light from the surface. This occurs especially with oil paintings, while in pictures framed in glass reflections of surrounding objects are particularly tiresome. The restrictions imposed by the limited tones of pigments have been acutely realized by certain artists in the past. Thus it is recorded that Turner, seeking to increase the darkness of a foreground in one of his pictures, pasted on some figures cut out of black paper. Yet artists today have not seriously considered the possibility of securing a much greater range of brightness by painting with translucent pigments on silk or semi-transparent linen. An artist to whom the writer offered this suggestion contemptuously dismissed it with the remark that it was not art. In using this method one would construct behind the picture frame a shallow box, with white interior, fitted with electric lamps and giving a uniform illumination. In front of this would be a sheet of glass on which the translucent picture to be illuminated is placed. Some Japanese paintings on silk would appear to great advantage if lighted in this way. If desired, one could use "artificial daylight" lamps to obtain natural appearance of colors.

The idea is familiar in some of the highly artistic hand-painted lamp shades. It has also been used with success in the pictorial advertisements used outside cinema theatres, etc., and there is now no great technical difficulty in getting pigments and linen of the desired translucent properties. But it has not yet been studied in the higher fields of art. There seems no doubt that the method would give a much greater impression of depth and preserve more completely the illusion that one is looking at an actual scene or landscape. If paintings so illuminated could be fitted into recesses in the walls of a room one would obtain a pleasing substitute for the real windows, by receiving the impression that one was looking out at an orchard, a river view or mountain scenery—an impression that is only very imperfectly conveyed by a painting illuminated in the ordinary way from in front. We should thus have a new decorative method, which would add greatly to the artistic possibilities of an interior, and enable effects to be secured that cannot be achieved at present. A particularly interesting development would be the selection of scenes in keeping with

the period of the interior, giving the impression that not merely the contents of the room but the things outside of it also belong to a bygone age.

Department of Specifications

(Continued from Page 383)

case that they will be copied verbatim. As surface hardeners are generally applied after plastering has been done and other finish materials are in place, specifications should require precautions to prevent the splashing of the solution or of washing water on all finish surfaces other than cement topping.

XXXIII. PROGRESS PHOTOGRAPHS

- A. On the assumption that concrete specifications cover reinforced concrete framework, the specifications should require progress photographs to be taken at certain intervals and to be of a size and obtained from varying points so as to provide a complete history of the operation from start to finish. If the specifications cannot be so written as to fix definitely the number of photographs in any other way, it is suggested that they require two photographs for each month of contract time, the photographs to be taken at intervals to be determined by the architect. Photographs should be mounted on linen and provided with a binding edge affording a loose hinge

Seventy Year Old Wooden Gas Pipe

THE common impression is that iron is more durable than wood, but the fact is that under certain conditions wood often outlasts iron. In reconstructing the gas system at Canandaigua, N. Y., which was installed seventy years ago, it was necessary to take up 1,800 feet of wooden trunk line pipe. The engineers were amazed to discover that there had been no leakage from it. Although it had been lying submerged in water, it appeared to be as sound as when laid. The inside of the pipe was as intact as the outside. Nevertheless, an iron band which made a joint, was so badly rusted that it had to be removed. Not only was this ancient pipe intact, but chips from the borings showed that there had been no seepage of gas, the wood fibre not even being impregnated with gas odor.—*National Lumber Manufacturers Association Information Bureau.*

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Member of The American Society for Testing Materials

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THE Board of Governors represent memberships in the following national societies: American Institute of Architects; American Society of Civil Engineers; American Society of Mechanical Engineers; American Institute of Electrical Engineers; American Society for Testing Materials; American Concrete Institute; American Iron and Steel Electrical Engineers; which indicates the scope of activities of The American Specification Institute.

THE AMERICAN ARCHITECT AND THE ARCHITECTURAL REVIEW has gratuitously set apart this section for use by The American Specification Institute. The Editors and Publishers assume no responsibility for any statements made, or opinions expressed.

The purpose, simply stated, is to afford an organization which, it is believed, will become a most important element in architectural practice and building operations, a medium through which it may, without expense to itself, reach a class of readers that are most intimately identified with the field of the activities of The American Specification Institute.

Publishers, THE AMERICAN ARCHITECT AND

THE ARCHITECTURAL REVIEW.

ANNOUNCEMENT

THE Board of Governors announces that Mr. Ralph W. Yardley has tendered his resignation as member of the Board of Governors and the resignation has been accepted with regret. Mr. Yardley's work while Chairman of the Board of Governors as well as during his term as member, has been an inspiration to the remaining members of the Board and much of the work that has been accomplished has been due to his earnest attention to fundamental details.

Mr. R. E. Gilmore, of the office of Richard E. Schmidt, Garden & Martin of Chicago, has been elected to succeed Mr. Yardley on the Board of Governors.

EXPLANATORY NOTES IN REFERENCE TO THE FORM OF SPECIFICATIONS TO BE ISSUED BY THE AMERICAN SPECIFICATION INSTITUTE

As stated in the note immediately following the title of the Tentative Specifications for Reinforcement Steel Bulletin No. 16 the form of this bulletin conforms to the arrangement of Elements of a Specification as given in Bulletin No. 5 Analysis of a Specification. The form of all succeeding bulletins on specifications will be in accordance with the same rules.

Bulletin No. 5 may properly be termed a "yard stick" for specifications. It is not to be understood that use of this "yard stick" infers a blind adherence to the exact form suggested. Although the specifications to be issued by the Institute will be prepared insofar as possible in accordance with the form of the "yard stick," the individual is expected to exercise his own ingenuity in fitting the general arrangement of a specification to conform with the arrangement of his own specifications unless in his opinion The American Specification Institute form seems more desirable.

It is the belief of the Board of Governors that insofar as a standard form is concerned that which has been adopted in Bulletin No. 5 cannot be improved upon. The separation of a specification into eight main elements is a most logical separation. All of these elements are present in any specification regardless of its length or scope or of the nature of its text. This applies with equal force to any document that lays down conditions that are to surround the purchase and delivery of any thing that is the subject of barter and trade.

It will be noted in Bulletin No. 16 that a number of captions appear without text of any kind. It is presumed that the members will find it possible to insert text peculiar to the specific case

and that because of the variety of solutions it would not be possible to evolve a standard form for such captions at the present time. As the work of The American Specification Institute develops, it may prove to be of benefit to formulate standard paragraphs for some of these captions. In this connection it may be well to state that it is the belief of the Board of Governors that efforts toward the standardization of specifications should be directed only toward those acts and things that can just as well be done in one standard form or manner as in any one of the various forms or manners now followed by individuals.

It is believed that when the form of specifications becomes fixed to a certain extent, contractors in various parts of the country will be pleased to recognize specifications prepared by The American Specification Institute and will feel sure of receiving fair and equitable treatment under the terms of the document. It is to be expected that a particular form of specifications used by various persons throughout the country eventually will have the effect of placing a "Hall Mark" on specifications that will immediately lift them far above the plane occupied by the average specification that is the rule today.

Members are requested to study the specification given in Bulletin No. 16 and in succeeding bulletins as well as to analyze the subject matter of Bulletin No. 5 and earnestly endeavor to formulate criticisms that occur to them so that the Board of Governors will feel assured that the consensus of its members is reflected properly by these documents.

TENTATIVE SPECIFICATION FOR REINFORCEMENT STEEL

(The form of this bulletin conforms to the arrangement of Elements of a Specification as given in Bulletin No. 5, Analysis of a Specification.)

I. CONTRACT AND LEGAL

1. Parties:
2. Agreement:
3. Terms of Payment:

4. General Conditions:
5. Regulations and Codes:
6. Standards:
7. Patents:

II. ECONOMIC

SCOPE OF CONTRACT:

8. Drawings:
9. Work Included:

METHOD OF ANALYSIS AND COMPARISON OF BIDS:

10. Method:
11. Basis:
12. Conditional Payment:

III. GENERAL DESCRIPTIVE

13. Characteristics, Service Conditions and Ultimate Requirements:

IV. PRELIMINARY PREPARATIONS

14. Shop Drawings:

V. MATERIALS

PROPERTIES, CHEMICAL AND PHYSICAL:

15. Bars:
16. Wire:
17. Sizes, Weights, Gauges:
18. Quantities:

VI. METHODS

PROCESSES:

19. Spirals:
20. Bending:
21. Workmanship:
22. Co-operation with Other Contractors:

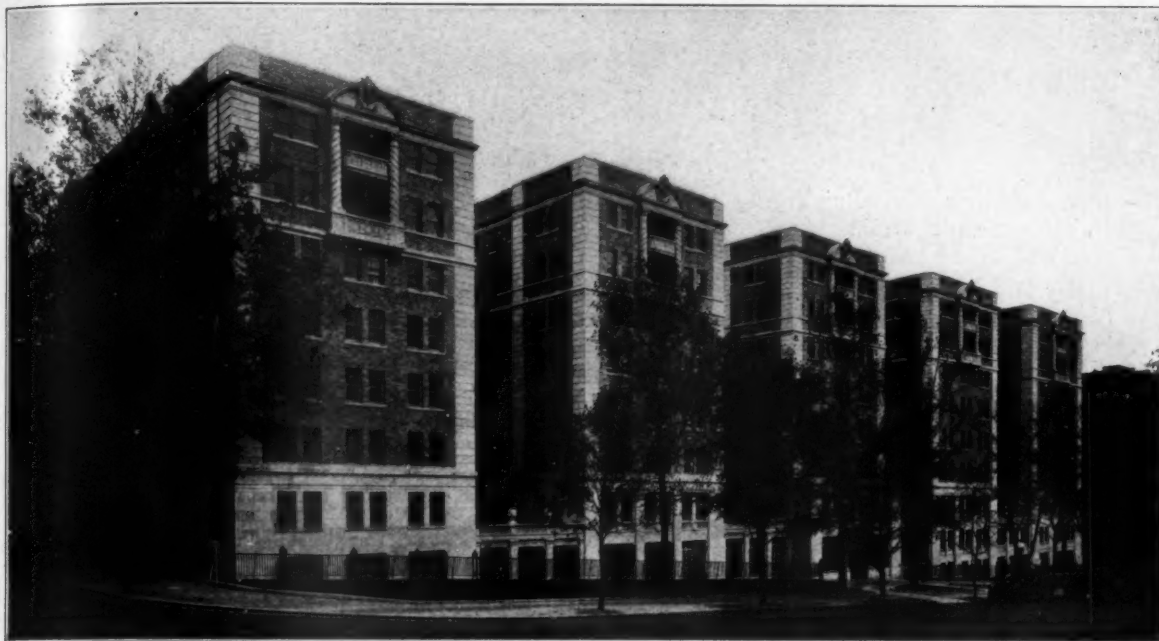
VII. SCHEDULES

23. Schedules of Operation:
24. Delivery and Completion:
25. Marking and Shipment:

VIII. RESULTS

26. Inspection and Tests:
27. Approval or Rejection:

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W. G. CORNELL CO., Heating Engineers

BOYLE-ROBERTSON CO., Builders

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PERSONALS

W. J. Jones, architect, has moved his office from 422 New York Building to 4078 Arcade Building, Seattle, Wash.

Roy L. Jones, architectural designer, has moved his office from 5893 Moneta Avenue, to 311 South Western Avenue, Los Angeles, Cal.

Charlton & Birnbach, architects, have moved their office from 837 San Fernando Building to Room 833 in the same building, Los Angeles, Cal.

Carl Werner, architect, has moved his offices from the Humboldt Bank Building to the West Coast Life Insurance Building, San Francisco, Cal.

H. P. Knowles, architect, has moved his offices from 21 West Forty-ninth Street to the Straus Building, 9 East Forty-sixth Street, New York City.

Robert H. Orr, architect, announces the removal of his office from 1301 Van Nuys Building to Suite 1300-1305, 724 South Spring Street, Los Angeles, Cal.

Word is received of the death on October 1 last, of Dudley McGrath of the architectural firm of Davis, McGrath & Kiessling, 220 Fifth Avenue, New York City.

The Watson Engineering Company, architects and engineers, 11 Trumbull Building, Warren, Ohio, are desirous of receiving manufacturers' catalogs for their files.

G. E. Strout, architect, has opened an office at 201 Braley Building, Pasadena, Cal. Mr. Strout comes from Boston, Mass., where he practiced architecture for thirty years.

It is announced that Claude N. Freeman, architect, formerly of Silverton, Oregon, has moved to Salem, Oregon, and the firm with which he is associated is now known as Freeman & Struble.

Francis Chiaverini, formerly at 117 Broadway, Providence, R. I., and Wesley H. Blank, of Boston, Mass., have formed a partnership for the practice of engineering and architecture under the firm name of Chiaverini & Blank, with new offices at 32 Broadway, Providence, R. I.

The Seattle Chapter, A. I. A., recently gave a luncheon at the College Club in honor of W. R. B. Willcox who takes up his duties as head of the School of Architecture at the University of Oregon.

C. C. and E. A. Weber, architects, formerly in the Miller Building, are now located on the fourteenth floor of the Ingalls Building, Northeast corner of Fourth and Vine Streets, Cincinnati, Ohio.

Fay Spangler, architect, formerly of Santa Maria, and later with G. Albert Lansburgh, architect, of San Francisco and Los Angeles, is now practicing the profession of architecture in Santa Ana, Cal.

John Tempest Walker, as an associated partner in the firm of Samuel H. Pitcher Company, Inc., civil engineers and architects, 44 Front Street, Worcester, Mass., will in the future direct the architectural activities of the company.

Niels P. Larson, architect, of Salt Lake City, Utah, has reopened offices for the practice of his profession at 220 Community Building, at which address he will be pleased to receive manufacturers' samples and building material literature.

Charles H. Bebb, James Schack and B. Marcus Priteca, architects, of Seattle, Wash., have been named to represent the Washington State Chapter of The American Institute of Architects in formulating plans for the proposed B. P. O. E. \$1,000,000 building competition.

We are advised that Robert Murray Blackall, well known to readers of this journal by reason of his measured drawings of French and Italian details, has associated with Stanley Bruce Elwell, formerly of Grandgent and Elwell, for the practice of architecture under the firm name of Elwell and Blackall, with offices at 44 Bromfield Street, Boston, Mass.

Frank V. Mayo, architect of Stockton, Cal., announces the formation of an association for the general practice of architecture and engineering under the firm name of Mayo, Cowell & Bissell, architects and engineers. Offices have been established in the Bank of Italy Building, Merced, and the Williamson Building, 21 South San Joaquin Street, Stockton, Cal.

Architecture and Finance

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BOOK NOTES

Estimating Building Costs

A NEW edition of a book so standard that twelve editions were issued between 1904 and 1913 seems hardly to call for comment by a reviewer. A simple announcement that a 1922 edition, completely revised, reset and enlarged, is ready would appear to be sufficient.

The work of Mr. Arthur does not seem, however, to be known to all who should prize it and a world war was fought after the twelfth edition was placed on the market. The period of adjustment following the war has just now shown sufficient signs of stability to make a new edition worth while. For the reasons mentioned the 1922 edition, we notice the author and publishers do not refer to it as the thirteenth edition, is deserving of notice.

The author is a building contractor of many years' experience but for several years past he has been busy on cost estimating, quantity surveying, appraisals, adjustments and arbitrations, for which work he is well fitted by temperament and experience. Not the least enjoyable features of the book are the dryly humorous, at times sarcastic, comments scattered through the pages. Only a Scotchman is capable of adding such a flavor to a working manual. For example "The rule is simple, get the exact weight and multiply by the exact price. The trouble is in getting both."

How to get both is clearly shown. There is a refreshing absence of dogmatic statements. Under nearly every class of work are found estimating rules and practices of leading contractors. Where conflicts appear the author advises on the selection to make and shows himself generally opposed to averages. He has evidently published the better parts of his scrap book of private notes, collected from many sources, interspersed with the sage counsel of a veteran estimator who has staked his bank account many times on his own figures.

The book has thirty chapters full of data. Modern methods of measurement are given side by side with trade rules and old practices sanctioned in many places. To make the book of greatest value, and allow for differences in rates of pay, all work is given whenever possible in terms of output per hour. There is a wealth of tables together with many cuts to illustrate the text. This new edition keeps up the standard of older editions and deserves like popularity.

New Building Estimators' Handbook, A Handbook for Architects, Builders, Contractors, Appraisers, Engineers, Superintendents and Draftsmen. By William Arthur. 1922 Edition, Revised and Enlarged. New York: U. P. C. Book Company. Fabricoid; Ill.; 4½x7 in.; 1002 pp. \$6.00.

Modern Plumbing Illustrated

IN the year 1899 Mr. R. M. Starbuck put on the market a set of fifty small blue print plates, known as "The Starbuck Plumbing Charts." They were remarkable for the small amount of text they contained, the idea of the compiler being to teach by illustrating methods of doing work. It was a new idea in giving instruction in plumbing and practical plumbers everywhere bought the plates. The following year they were enlarged and printed in book form with the title "Modern Plumbing Illustrated."

Proof that plumbing is an advancing, or at least a changing art, is shown by comparing the first edition of 1900 with the second which appeared in 1906; this in turn with the third edition issued in 1915 and it in turn with the fourth, revised and enlarged edition brought up to date in 1922. It is not a text book on plumbing, as such a term is generally understood, but is a collection of 67 well drawn plates illustrative of modern plumbing practice in American cities. The accompanying text is clear and free from technicalities and long theoretical discussions. It is a book to recommend to inspectors serving on the staff of architects, as well as to health inspectors and all who must supervise plumbing installations.

Modern Plumbing Illustrated. By R. M. Starbuck. Fourth revised and enlarged edition. New York: The Norman W. Henley Publishing Company. 407 pp. Ill. 7¼x10½ in. Cloth. \$5.00.

Engineering Drawing

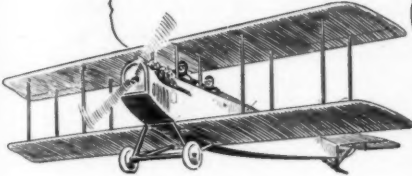
IN spite of the annual crop of books on drawing, some long time favorites show wonderful vitality. One has come in for review which has been a standard for many years in England. It is conventional in type and takes up the thousand and one things a draftsman should know, in 28 chapters and an Appendix containing 5 chapters.

The title, Engineering Drawing, may be proper for England but for America the title should be Mechanical Drawing which is the science and art of drawing with mechanical aids, as distinguished from Freehand Drawing. Only the most simple elements are given of machine drawing and nothing on the subject of machine design. The chapters on the projection of shadows are very good.

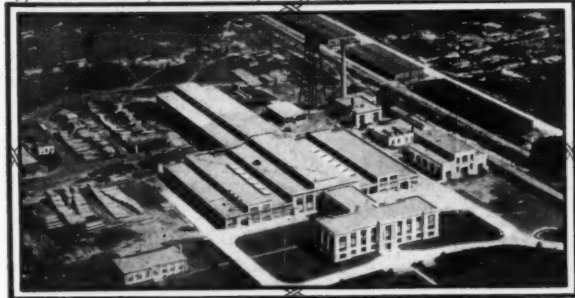
Engineering Drawing. By John Maxton. New edition revised with additional matter by Lieut-Commander G. C. Malden, R. N. 251 pp., 313 figs. in text, 4 folding plates. 5x7½ in. Cloth. New York: D. Van Nostrand Co., \$3.00.

Barrett Specification Roofs

Bonded for
20 and 10 Years



Barrett Specification Roofs on Curtis Engineering Corp. buildings, Garden City, N. Y. Arch.: Bley & Lyman, Buffalo, N. Y. Gen. Cont.: John Cowper Co., Buffalo, N. Y. Roofer: Aug. Kuhnle, Brooklyn, N. Y.



The Aircraft Industry is housed under Bonded Roofs—

TODAY great permanent structures are devoted exclusively to the development and manufacture of aircraft. The three buildings pictured on this page—the big factory of the Curtis Engineering Corporation, Garden City, N. Y., the brick and glass Airplane Building at the Philadelphia Navy Yard, and the substantial Research Building at Langley Field, near Hampton, Va.—offer graphic evidence of the amazing development of this new industry.

And these buildings, like many of the plants that house the other great industries of the country, are covered with Barrett Specification Bonded Roofs. These roofs, composed of successive layers of roofing pitch and felt, with a thick wearing surface of gravel or slag, combine proved durability with guaranteed freedom from upkeep expense. They also afford unequalled fire protection.

Barrett Specification Roofs are bonded against roof repair expense—Type "AA" for 20 years, Type "A" for 10 years. The Surety Company Bond, absolutely protecting the owner from maintenance expense, is issued free of charge on roofs of 5,000 square feet or larger, in towns of 25,000 or more, and in smaller places where our inspection service is available.

Copies of the Barrett Specification sent free on request.

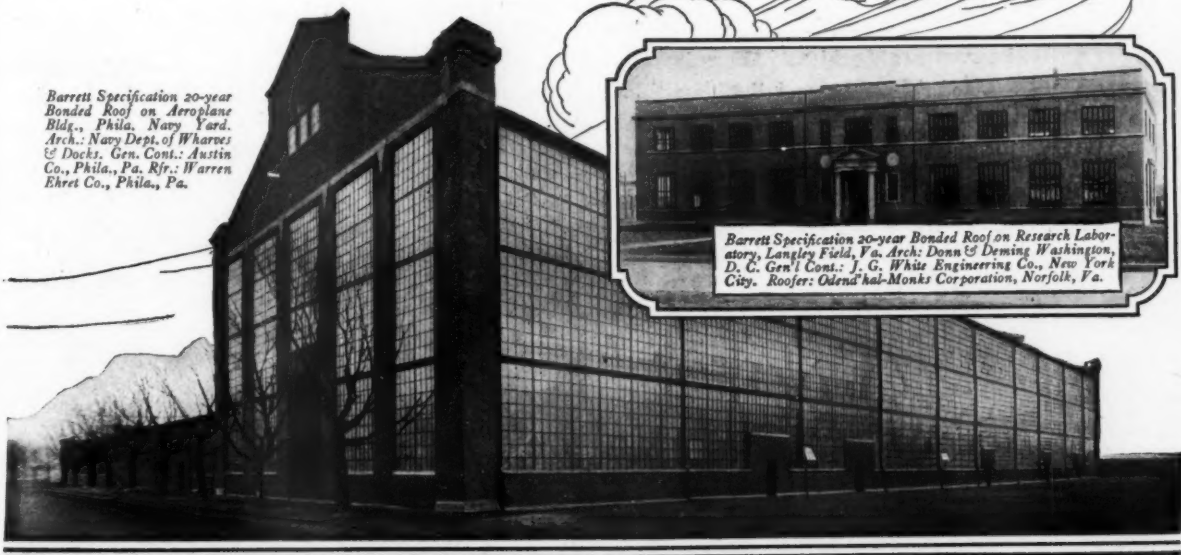
The Barrett Company



New York	Chicago	Philadelphia	Boston	St. Louis
Cleveland	Cincinnati	Pittsburgh	Detroit	New Orleans
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Barrett Specification 20-year Bonded Roof on Aeroplane Bldg., Phila. Navy Yard. Arch.: Navy Dept. of Wharves & Docks. Gen. Cont.: Austin Co., Phila., Pa. Rfr.: Warren Ehret Co., Phila., Pa.



Barrett Specification 20-year Bonded Roof on Research Laboratory, Langley Field, Va. Arch.: Donn & Deming Washington, D. C. Gen'l Cont.: J. G. White Engineering Co., New York City. Roofer: Odend'hal-Monks Corporation, Norfolk, Va.

Safety of Non-Slipping Surfaces

THE plan, inaugurated some years ago, to set apart a week in each year to well conducted propaganda, stressing safety and the measures to secure it, has proven to be a wise one. Results thus far achieved have exceeded even the hopes of those who are most optimistic in this matter.

Not only has the public become better informed as to proper measures to assure safety to life and limb, but inventive minds all over the country have been stimulated to providing devices and accessories that would contribute to the safety of those who are employed in large manufacturing institutions throughout the country.

Nor has the safety of the general public, both out-of-doors and in large interior gatherings, been overlooked. Regarding but one matter alone, there is the provision of the safe footing for that large number of people who are abroad each day and who travel in our subways, on the surface cars or in the elevated structures overhead.

The necessity for the provision of the non-slipping surface on stairways, ramps, sills and platforms, has always been apparent, and when we know the many millions of people who are constantly about our streets and through our large buildings, and learn of the comparatively few accidents that occur through slippery surfaces, it would seem that in one direction progress has been made, and the safety of the pedestrian insured by the introduction of the many non-slipping surfaces that are everywhere provided and which we constantly walk over without even noticing their presence.

Chicago to Have Aquarium

THE city of Chicago is to have a municipal aquarium and fish hatchery erected in Lincoln Park. It will be one of the largest municipal aquariums in the country and will cater especially to fresh water fish.

Sacramento Architects Organize

THE Allied Architects and Engineers Club of Sacramento, Cal., has recently been organized with an initial membership of over 100. Mr. George Adams of the State Department of Architecture was elected temporary chairman and Mr. D. E. Godfrey temporary treasurer. The following committee will draw up a charter and by-laws: T. E. Stanton, R. A. Herold, Leonard Stark, T. E. Tempest and George Calder.

Fire Hazards of the Fuel Shortage

MANY new fire hazards are being introduced by the fuel shortage. Much soft coal is being stored in the basements of dwellings, apartment houses and mercantile buildings and on the premises of factories. Spontaneous combustion in this is likely to start fires, and great care should be shown in the selection of coal and in its storage and use.

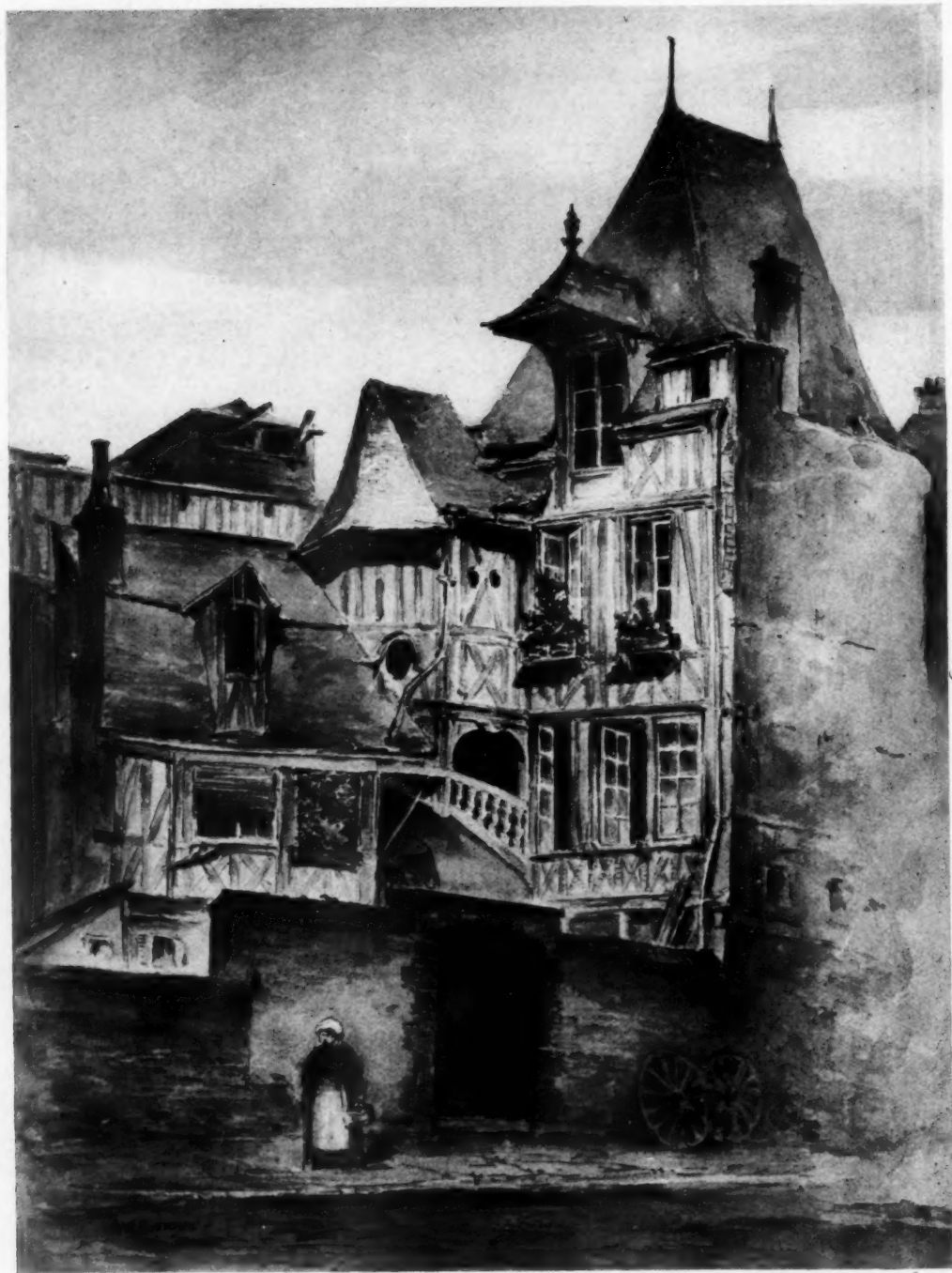
The West will not receive its usual amount of anthracite this year, and soft coal must be used in stoves and furnaces constructed for other fuel. The large amount of soot deposited by soft coal is apt to clog the smoke pipes and chimneys and cause forcing of the furnaces, while the fumes and gases from soft coal will have a deteriorating effect upon the mortar in chimneys and thus lead to defective flue fires.

Many householders are investigating the possibility of using fuel oil and kerosene burners in their furnaces, because of the difficulty in securing hard coal and their unwillingness to use soft coal because of the dirt and soot. This also will introduce serious fire hazards, because of the storage of oil on the premises, and the danger of feed pipes bursting and starting fires. No such appliance should be considered without ascertaining whether it complies with the underwriters' requirements.

Fire hazards which endanger the homes should be watched with special care, as the mothers and children run the greatest risk. All heating appliances should be installed and operated with constant attention to the unusual risks due to the changes in fuel, as well as to their ordinary dangers. Careful inspection should be made of all stoves, furnaces and flues before using them in the fall.

LeBrun Traveling Scholarship for 1923

THE LeBrun Scholarship Committee of the New York Chapter A. I. A., Julian Clarence Levi, Chairman, announces the holding of a competition for the award of this scholarship for the year 1923. The application and nomination blanks can be had of the Secretary of the various Chapters, A. I. A., or the LeBrun Scholarship Committee, New York Chapter, A. I. A., 215 West Fifty-seventh Street, New York City. The program will be issued the end of December and the competition drawings will be rendered about March 1, 1923.



ROUEN

(From the original water color by Arnold W. Brunner)

THE AMERICAN ARCHITECT