THE ARCHITECTURAL FORUM

AN ILLUSTRATED ARCHITECTURAL MONTHLY DEVOTED TO THE ART, SCIENCE AND BUSINESS OF BUILDING

ROGERS AND MANSON COMPANY, Publishers

NEW YORK BOSTON CHICAGO

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Villas of the Veneto

I. THE VILLA EMO AT FANZOLO

By HAROLD DONALDSON EBERLEIN AND ROBERT B. C. M. CARRÈRE

"The . . . fabric is at *Fanzolo*, a village in the *Trevigiano*, three miles distant from *Castelfranco*, belonging to the Magnificent Signor Leonardo Erno [sic]. The cellars, the granaries, the stables, and the other places belonging to a villa, are on each side of the master's house; and at the extremity of each of them is a dove house, which affords both profit to the master, and an ornament to the place; and to all which, one may go under cover; which is one of the principal things required in a villa, as has been before observed.

"Behind this fabric there is a square garden of eighty *campi trevigiani;* in the middle of which runs a little river, which makes the situation very delightful and beautiful. It has been adorned with paintings by Messer Battista Venetiano."

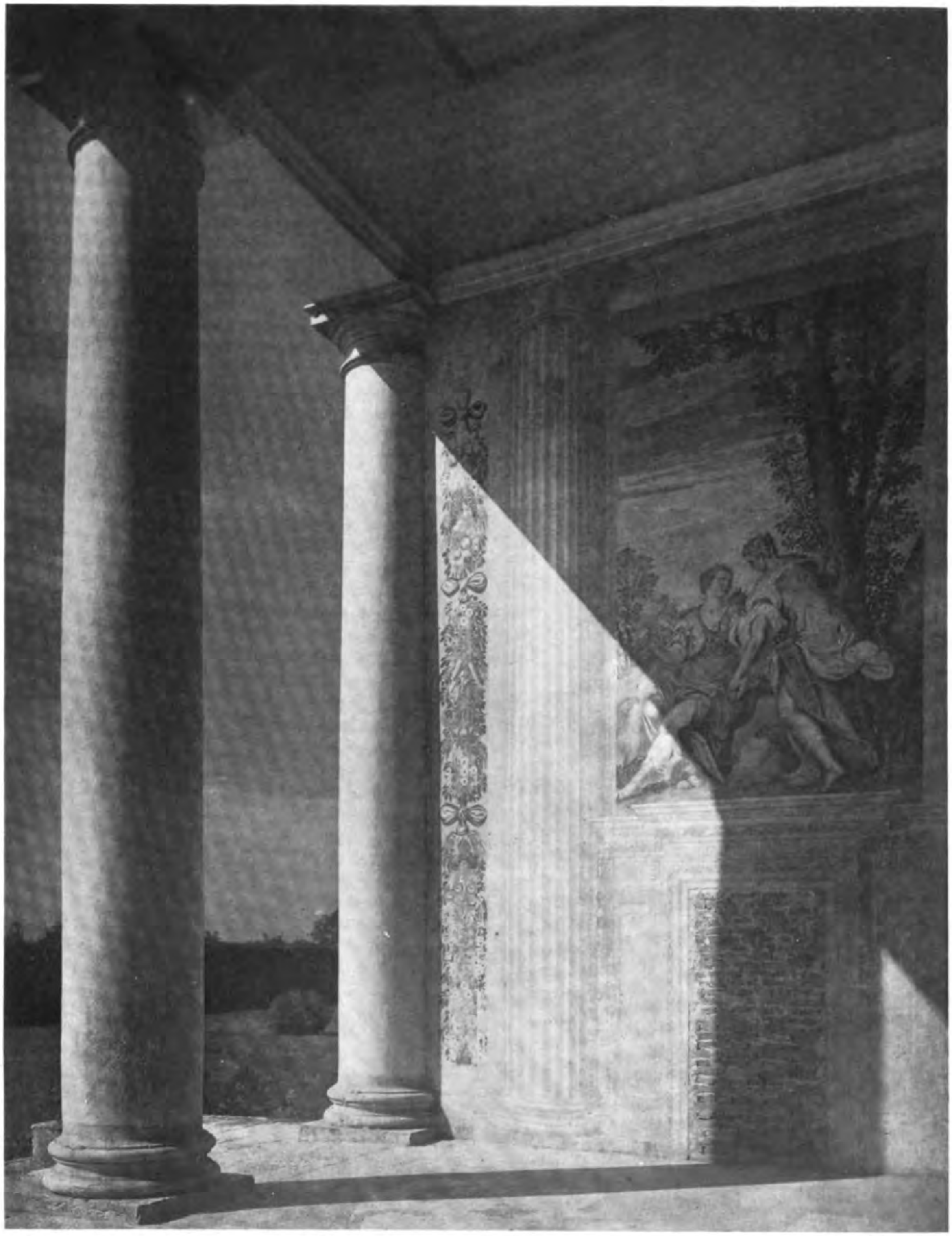
Book II, Chapter XIV, p. 50.

SUCH is Palladio's own description of the Villa Emo at Fanzolo, given from Isaac Ware's translation of the *Quattro Libri dell' Architettura*, published in London in 1738.

The villa in its present state differs somewhat in arrangement from the scheme set forth in Palladio's account. The wings, which Palladio designed to house the dependencies of the villa—the stables, the granaries, the cantine or storage place for wine, the hay lofts and all the other appropriate farming accommodations—were altered internally at an early date to make provision for a chapel and a large number of rooms for guests, besides servants' quarters. Externally no appreciable change was made in these parts of the fabric. A slight deviation from the original design occurs at the rear, where the steps descending from the great hall to the garden, instead of being in one straight run, divide into two flights running in opposite directions.

Otherwise the villa today is substantially as Palladio designed it to be. Apparently it is exactly the same; the word "substantially," however, is used advisedly because of certain variations between the measurements in the plans

Garden Front and Loggia of the Main Building



From a panchromatic photograph by Harold Donaldson Eberlein

The walls of the Loggia are enriched with tresco painting applied direct to the plaster and remain to-day in a remarkable state of preservation

SOUTH LOGGIA, VILLA EMO, FANZOLO, ITALY

and elevations, as designed by Palladio, and the measurements as actually executed.*

These departures from the architect's measurements are characteristic of all Italian buildings, as anyone familiar with the measuring of them is well aware. So universal is the phenomenon that Scamozzi, in his large edition of *The Buildings and Designs of Andrea Palladio*, appends a little table of these variations at the end of the description of each building. The master builders and their workmen presumably felt it their prerogative to take liberties with the measurements within certain limits. If they observed the spirit of the design, they assumed license to make minor variations in the letter as the work progressed.

Detail of Interior Fresco

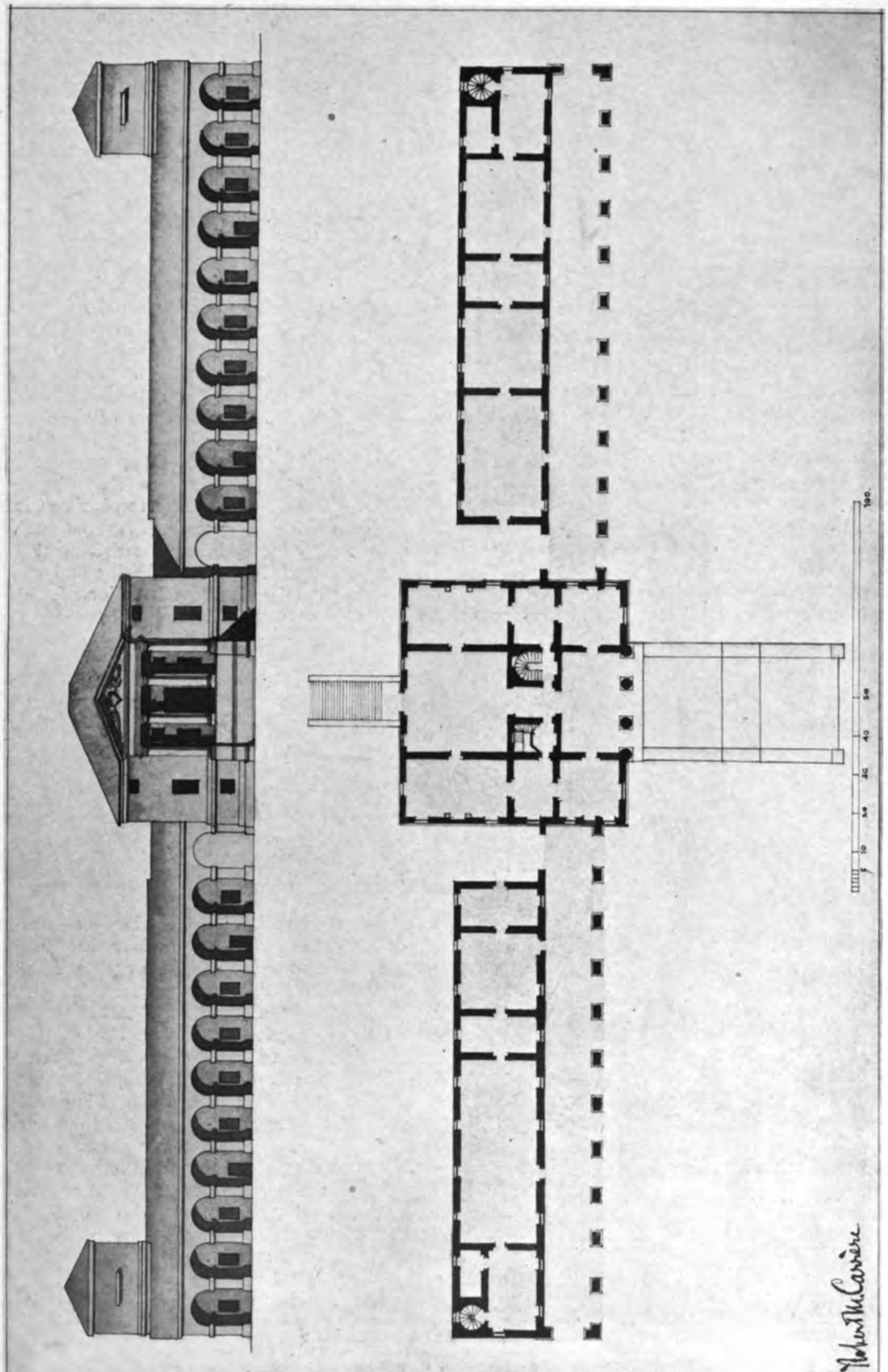
The setting of the Villa Emo is exceedingly impressive. No site more ideal than Fanzolo could be imagined for the display of a stately Palladian structure to the fullest advantage. The great Trevisan plain, flat as a table, is bounded on the north by mountains that rise abruptly, affording a background of soft greens and blues. Against this foil stands forth in crisp relief the incisive, formally ordered contour of the villa, its buff body and white trim adding contrast of color to the already striking emphasis of its presence. Nothing could be more satisfying than the simplicity and dignity of the long façade viewed from the entrance. To the north, or rear, of the villa, a geometrically disposed park stretches

Palladio's Measurements	*As Executed*
Square great hall—27'	26' 3" x 26' 7"
Length, large rooms—27'	26' 7"
Width of wing loggias—15'	13'
Diameter of columns—2' 6"	2' 4½"
Height of columns—20'	19' 4"
Entablature—4'	4' 4"

The ground floor plan, the elevation, the capital detail and the entablature detail are given according to Scamozzi's measurements and are reckoned by the Vicenza foot. The other details are given according to the regular English foot.

The Vicenza foot equals 1' 1¾" or a small fraction more than 1/7 additional. By adding one-seventh to the measurement in Vicenza feet the equivalent is obtained in English feet.

Arcade on Garden Side of West Wing



SOUTH ELEVATION AND FIRST FLOOR PLAN OF MAIN BUILDING WITH GROUND FLOOR OF WINGS

Measured and Drawn by Robert B. C. M. Carrere

VILLA EMO, AT FANZOLO, ITALY. DESIGNED BY ANDREA PALLADIO

MAIN BUILDING FROM AXIS OF GARDEN

WEST WING AND MAIN BUILDING FROM THE GARDEN

VILLA EMO, FANZOLO, ITALY

Detail of Main Stairway

closely, and the joints concentre so exactly, that the pillars appear one entire piece, shewing how in truth we want rather *art* than *stuff* to satisfy our greatest fancy." Such expedients were so usual in stucco loving Italy that we may seriously question whether Palladio was much disturbed by the lack of what some of us would be disposed to regard as more worthy materials.

In plan the villa consists of a central block, about 70 feet square (English measure), flanked by a long straight wing on each side. These are apparently one story in height but really contain both ground and first floors, as one may see from the rear, and in front of them are arcades. The rooms in the high basement of the central block are vaulted and here are kitchens, sculleries and other domestic offices, while above the lofty first floor, the capacious attic story contains sleeping rooms.

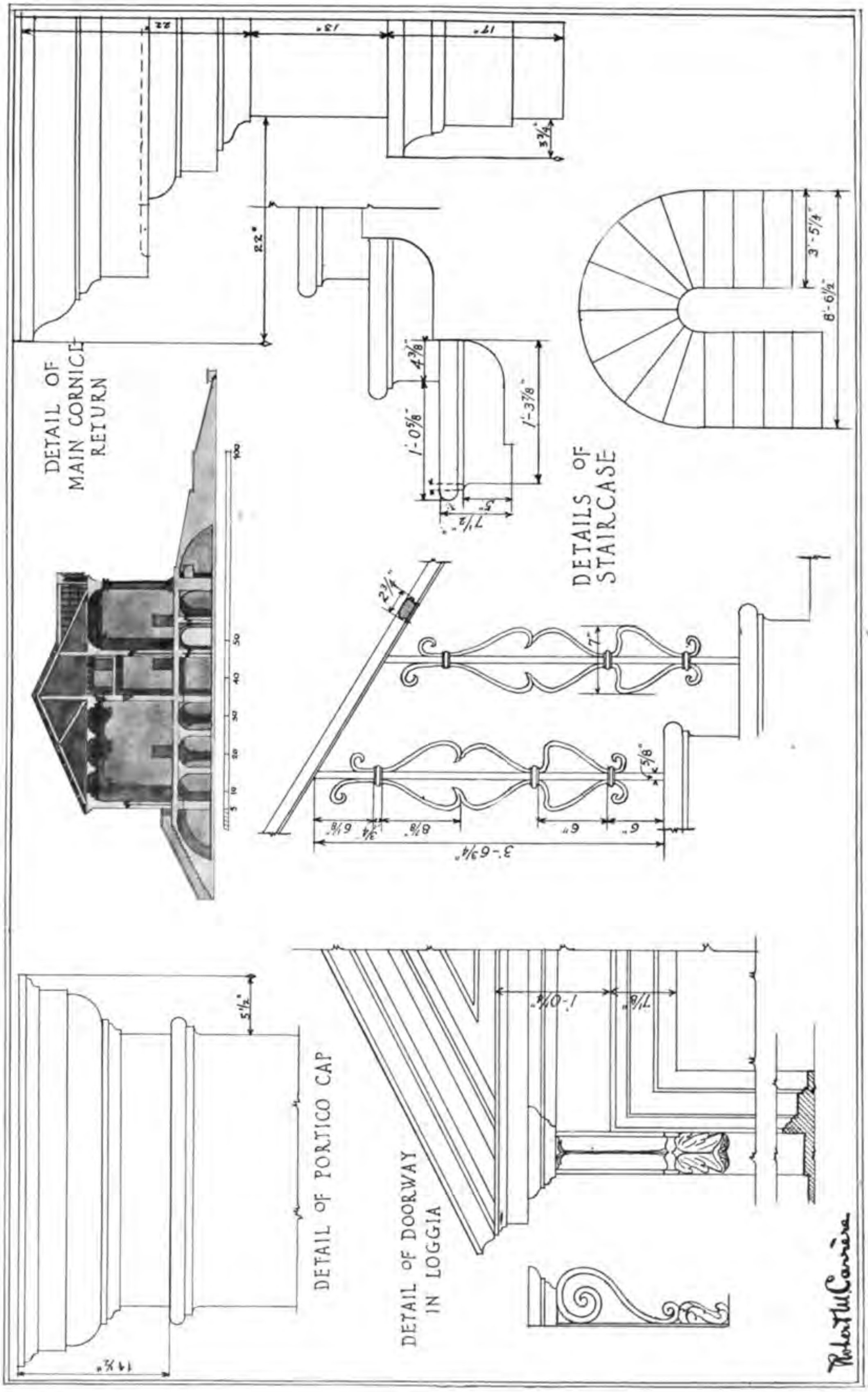
On the plan the arrangement of rooms shown is for the first floor of the central block, and for the ground floor of the wings. The plan of the interior discloses the wonted arrangement of a great hall with smaller rooms opening from the sides. The previous allusion to Palladio's nobility of design applies with equal propriety to the imposing proportions of all the rooms which impress one forcibly by their dimensions. The subject of Palladio's theories in this respect will be more fully dealt with in a subsequent paper. Save the very simple fire-

away in the distance. Of gardens, in the sense of the intimate enclosures to be found in so many other parts of Italy, there are none.

The structure is of brick coated with stucco and painted. The columns of the loggia have white stone bases and caps, while the shafts are of shaped brick coated with stucco and carefully smoothed with a *marmorino* finish. This is a common Palladian method of pillar construction, the bases being usually of stone and the caps either of stone or of moulded terra cotta painted.

No matter what the materials with which he was often obliged to execute his work, Palladio succeeded in impressing the beholder with only the nobility of his design while the quality of the substance is lost sight of. His mastery in this particular calls to mind the words of Sir Henry Wotton upon viewing the entrance of Palladio's church at the Conventa della Carità in Venice: "Mine eye hath never beheld any columns more stately of stone or marble; for the bricks having been first formed in a circular mould, and then cut before their burning into four quarters or more, the sides afterwards join so

Dovecote at End of West Wing



SECTION THROUGH MAIN BUILDING AND GENERAL DETAILS

Measured and Drawn by Robert B. C. M. Carrere

VILLA EMO, AT FANZOLO, ITALY. DESIGNED BY ANDREA PALLADIO

View of North or Entrance Front

places, the interior boasts no features of architectural adornment. The great hall was designed with a beamed and coffered ceiling, with painted embellishment, but if this part of the design was ever carried out it was covered over by a flat vault of plaster.

In lieu of moulded door trim, cornices and other items of interior architectural amenity, the rooms of the first floor are fully adorned with frescoes which include, besides the pictorial subjects displayed upon the walls of the great hall and the two adjoining long rooms at the sides, a full complement of *painted architecture*—door trim, paneled dados, pilasters, cornices and the like—very cleverly executed. The small vaulted rooms next the stairways, and the vaulted passage from the door to the great hall, are covered with arabesques after the manner of Giulio Romano.

The Messer Battista Venetiano whom Palladio credits with the painting was Giovanni Battista Farinati, sometimes called Battista Zelotti and also Battista da Verona. Battista was responsible only in part for the work and wrought as assistant to Paolo Veronese, to whom the commission had been entrusted. Upon the strength of Paolo's authenticated authorship of the frescoes, the Villa Emo has been declared a national monument.

The staircases in the Villa Emo, as in so many of Palladio's villas, are good but inconspicuous. The staircase was still, to a great extent, a utilitarian feature to be treated, it is true, with due consideration and planned for comfort and convenience, but to be kept more or less in the background and not made the vehicle of important design in a prominent position. Palladio did, as we know, design some wonderful staircases, and the treatment of the staircase, by his own testimony, was a subject in which he was deeply interested and which he deemed worthy of the utmost consideration on the score of design. It was chiefly left, however, to the architects of a later generation—especially the masters who worked in the baroque style—to develop the magnificent staircase in the villas and palaces of Italy.

If we are tempted to criticise unfavorably the lack of domestic quality in the villas of the Veneto as compared, for example, with the villas of Tuscany, or to condemn the placing of farming dependencies close to the master's quarters, we must remember two things: First, the villa was usually the center of a great agricultural estate, and it was the ancient custom of the land to concentrate all the farming activities under the eye of the master or his bailiff. Second, so far as the villas belonging to the Venetian nobility were concerned, they were usually occupied by their masters only a small part of the year. Palladio draws an alluring picture of country life when he writes:

"The city houses are certainly of great splendour and conveniency to a gentleman who is to reside in them all the time he shall require for the administration of the republic, or for directing his own affairs. But perhaps he will not reap much less utility and consolation from the country house; where the remaining part of the time will be passed in seeing and adorning his possessions, and by industry and the art of agriculture, improving his estate; where also by the exercise which in a villa is commonly taken, on foot and on horseback, the body will the more easily preserve its strength and health; and, finally, where the mind, fatigued by the agitations of the city, will be greatly restored and comforted, and be able quietly to attend the studies of letters, and contemplation.

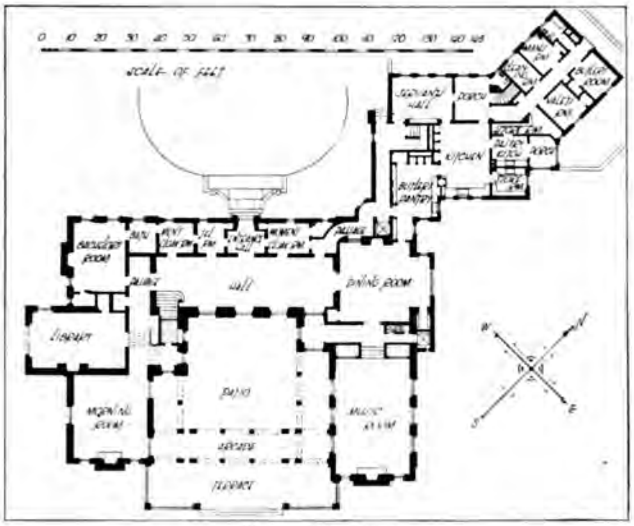
"Hence it was the antient sages commonly used to retire to such like places; where being oftentimes visited by their virtuous friends and relations, having houses, gardens, fountains, and such like pleasant places, and above all, their virtue, they could easily attain to as much happiness as can be attained here below."

As a matter of fact, however, "the administration of the republic" and "the agitations of the city" engrossed most of the noble Venetians' time, and if they spent as much as six weeks or two months of the year at their villas they were giving their "virtuous friends and relations" a good opportunity to come and visit them there. Under such brief occupancy, therefore, the atmosphere of domesticity did not assert itself to the utmost. This fact we must accept and be content to admire Palladio's villas as superb pieces of composition.

"Casa Dorinda," a California Country House

CARLETON MONROE WINSLOW, ARCHITECT

MANY interesting possibilities attend the development of a large and important country place in Southern California where extensive grounds include a primeval growth of live oaks and where the various buildings are to be sufficiently ample for an adequate interpretation of the type of architecture which is best adapted to the locality. An unusual opportunity, therefore, was presented in the planning of the California home of Mrs. William H. Bliss at Montecito, near Santa Barbara, and the architect, Carleton Monroe Winslow of Los Angeles, has made wise use of unusual possibilities.



Plan of Main Floor

At the main entrance from the public road the grounds are screened by a high stucco wall. A gate lodge stands just within the gates and the red Spanish tiles of its low pitched roof are visible over the stucco walls. Within the grounds the driveway crosses masonry bridges over several "arroyos" or little streams and ends in a broad sweep before the residence itself. The house which is the center of this important estate is a large rambling structure designed in a highly developed version of what has come to be known popularly as the Spanish mission style with an interesting arrangement of large apartments grouped about a patio—a type of building which has always been identified with the development of this region and which is particularly well suited to the climate of California.

The effect, to a visitor, is that of a picturesquely disposed country place which might have been the result of gradual growth or development during a long period. Much of the appearance of age has been given the house by the use of antique gates and grilles of wrought iron from an old church in Mexico and by the presence of many old live oaks. The entrance façade is a broad expanse of brick masonry covered with buff stucco with many small windows screened with iron grilles to the right and left of the main doorway, the door itself being of oak studded with old Spanish nail heads. Above there are five large windows which open from a loggia, these windows and the main doorway being adorned with richly sculptured decoration carved from Boise sandstone of a warm gray which affords an interesting contrast with the buff, rough surfaced stucco of the walls.

The opposite side of the house, facing toward the south, is planned with a broad terrace upon which open the arches across one side of the patio. These arches are filled in with wrought ironwork, many of the grilles being from old buildings and others made by present day craftsmen from the old patterns.

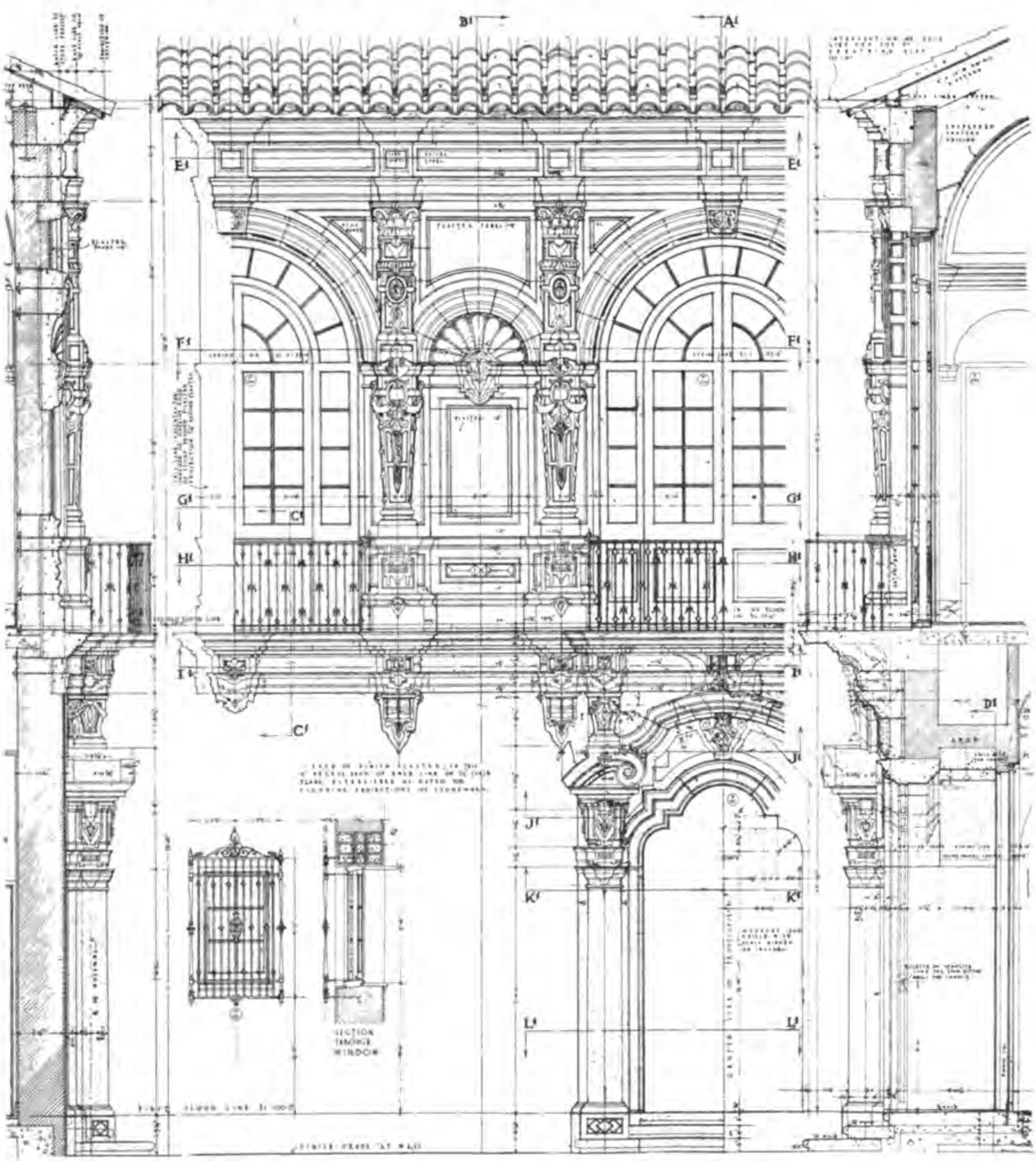
The interior arrangement of the house fulfills the promise made by the exterior for it presents a number of large, dignified rooms placed, in Spanish fashion, about a central courtyard which is floored with square paving quarries. The interior treatment, as will be seen from the illustrations, is exceedingly simple. Walls, for the most part, are of slightly roughened plaster, painted, and some

Baroque Mantel in Music Room

of the ceilings are vaulted while others show the use of wooden beams. Most of the woodwork throughout the house is of American walnut.

From the tower is had a view such as only California could offer with vineyards, villages and mountains spread out in panoramic form. To reach the tower an elevator is provided, the shaft being hidden by the low gable at one corner of the tower which may be seen in one of the illustrations.

A great part of the success of this house is due to the careful selection of materials. Care was taken to choose stone and stucco for the exterior which produced the effect which the architect meant to create and roofing tile was specially burned to give the color and texture of old weathered tiles. Ironwork plays an important part in Spanish architecture and in this instance much has been used, suitably austere or elaborate as its purpose seemed to demand. Equal care has been given to the details of the interior and such accessories as lighting fitments and grilles of wood and metal and such details as the laying of floors have received careful study, and the result is seen in their harmonious fitting into their surroundings.



Detail of Entrance Doorway and Central Feature of Main Front

Architectural Expression in Concrete

By FRANK J. HELMLE

IN this article Mr. Helmle states some of the fundamental principles underlying the development of architectural design suited to reinforced concrete construction. He is a member of the firm of Helmle & Corbett, architects of the Varick Building illustrated herewith, which is notable as an example of design in concrete. The plates following illustrate other recent buildings and on page 37 will be found brief descriptions of them. In a later issue we will present an article describing interesting industrial work in concrete of Lockwood, Greene & Co., Architects and Engineers.—THE EDITORS

RECENT years have seen a constantly widening field for the development of architecture; the greatest evidence of this is no doubt in industrial building and in meeting the special demands which this type of work imposes upon the architect there is presented an opportunity to not only devise new forms of architecture but to greatly increase the power and prestige of the profession if the real character of the conditions is recognized and an honest, straightforward solution sought.

It has been proved beyond question that there are definite advantages accruing to any manufacturer who has the foresight to erect buildings of good architectural design that will be a stimulus to the pride of local citizens and a satisfaction to the workers employed in the buildings. It has likewise been definitely proved in many cases that no large additional expense is involved when an industrial building is given an architectural value by means of a well considered scheme in which the architecture is supplied by good proportions and massing of the structural features.

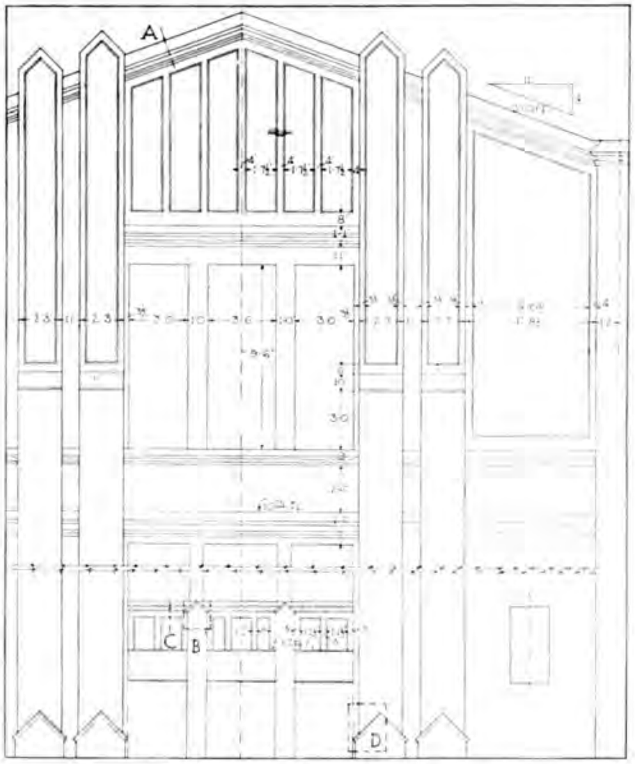
The particular opportunity that the industrial building presents to architects is the development of a form of architectural expression that will be in accord with the characteristics of special materials and types of construction that are well suited, from the standpoint of service and economy in both first cost and maintenance, to industrial buildings.

Of the types of construction suited to industrial buildings there is probably none better than reinforced concrete. The development of this form of construction has been rapid in spite of a great many handicaps placed in its way, but its now well recognized advantages of permitting speed in construction, use of low priced labor, fireproofness, low maintenance costs and its adaptability to the varying conditions of industrial requirements have made it a factor that must be recognized by architects in designing not only factories but loft buildings and many other types where large floor space must be provided at a low cost.

Ever since it passed the experimental stage reinforced concrete has been valuable as an economical material. Just before the war the margin in its favor as against structural steel fireproofed was hardly more than 10 or 15 per cent of the cost of the structural frame of the building, or about 5 per cent of the total cost of the structure. Early in 1920 this margin had risen to approximately 40 per cent of the cost of the structural frame due, of course, to the excessive cost of structural steel, and the margin at the present time is about 25 per cent.

Detail of Connecting Bridges at U. S. Army Supply Base, Brooklyn, N. Y. All Detail in Structural Concrete
Cass Gilbert, Architect

Economy in construction through the use of concrete is not the least of its advantages; it is readily adapted to the varying requirements of plan and does not impose such rigid conditions as many suppose. The usual size of bay in a concrete building is 20 x 20. Smaller bays down to say 16 x 16 would be a little more



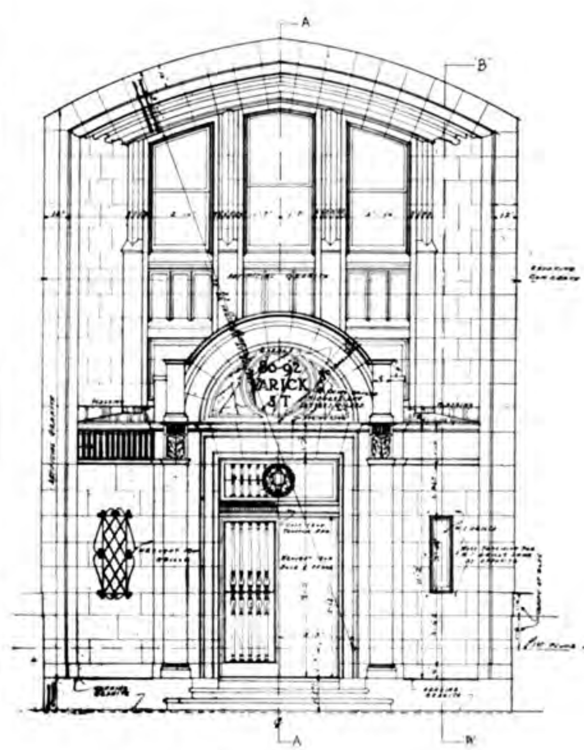
Detail of Upper Stories, Varick Building

economical, but the saving is so slight that as a rule the usefulness of the building with 20-foot bays is enough greater to warrant the slight additional cost. Bays can, of course, be made considerably larger than 20 x 20 if the use to which the building is to be put requires it.

One of the objections long brought to the use of concrete in structures of more than a few stories has been the fact that it was thought necessary to make reinforced concrete columns in the lower stories of great size. While it is true that the size of a reinforced concrete column increases with the increase of load to be carried more rapidly than does the size of a steel column, this increase is not detrimental except in rare instances. A reinforced concrete column in the first story of a 12-story building having 18-foot spans in both directions and designed to carry live loads of 150 pounds per square foot would be a round column 30 inches in diameter. If for some special reason it would be necessary to make the columns in the lower stories smaller than this, structural steel cores could be used at a comparatively small additional expense. This would use up only a small part of the saving effected by the use of reinforced concrete for the rest of the structural members.

It sometimes happens that it is necessary

Construction Progress View of Varick Building
Helmle & Corbett, Architects

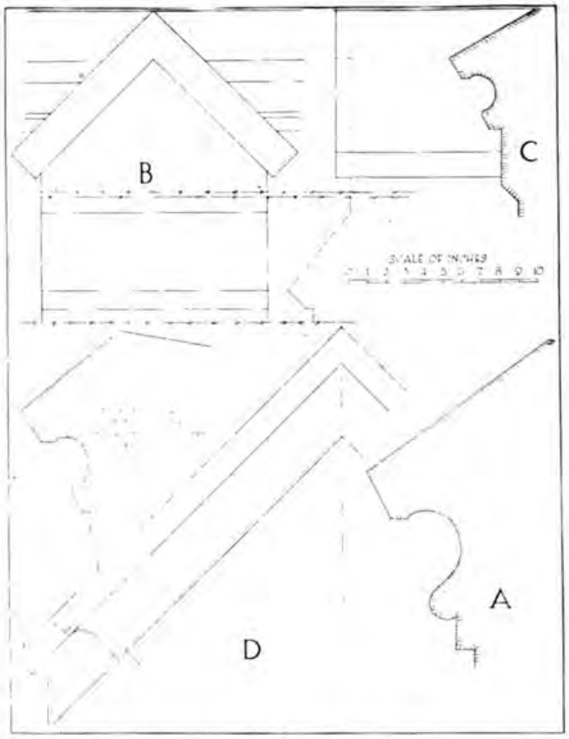


Entrance Detail in Artificial Granite

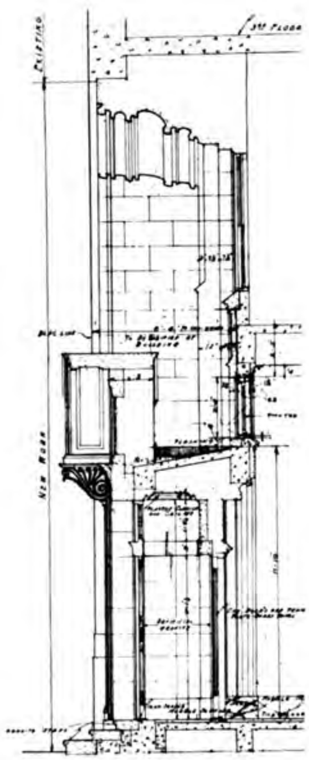
to construct a long span girder in a building carrying a heavy load. The most common cause for this in industrial buildings is the existence of railroad tracks on the ground floor which disturb the column spacing on that floor and over which girders have to be constructed to carry the regularly spaced columns in the stories above. Sometimes reinforced concrete can be used for these girders, but in cases of extreme loads where headroom is limited, steel plate girders carried on steel columns can be introduced without affecting the economy of the surrounding reinforced concrete structure.

There are three types of floor construction in more or less frequent use: the beam and girder type, the flat slab type and the method which involves the combination of hollow tile and concrete. Each of these types has certain advantages that best fit it to particular conditions.

The beam and girder type is one of the early methods of floor construction and has simplicity to recommend it. The newer form flat slab construction has a number of advantages over it and in cases where flat ceilings or where the greatest number of stories are wanted in a given height it is invariably used. The flat slab construction occupies much less vertical height for floors owing to the absence of girders and beams and it also requires the minimum number of sprinkler heads.

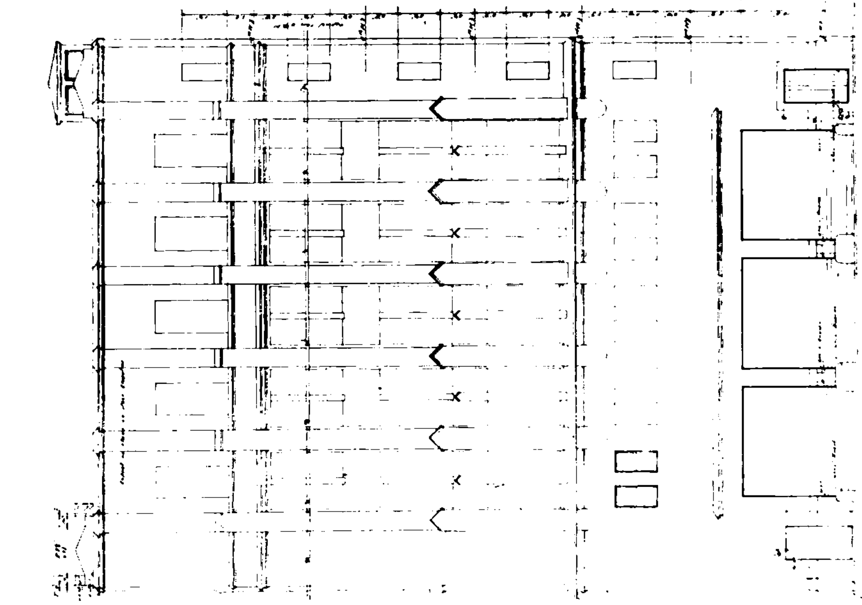


Detail of Concrete Buttresses and Mouldings

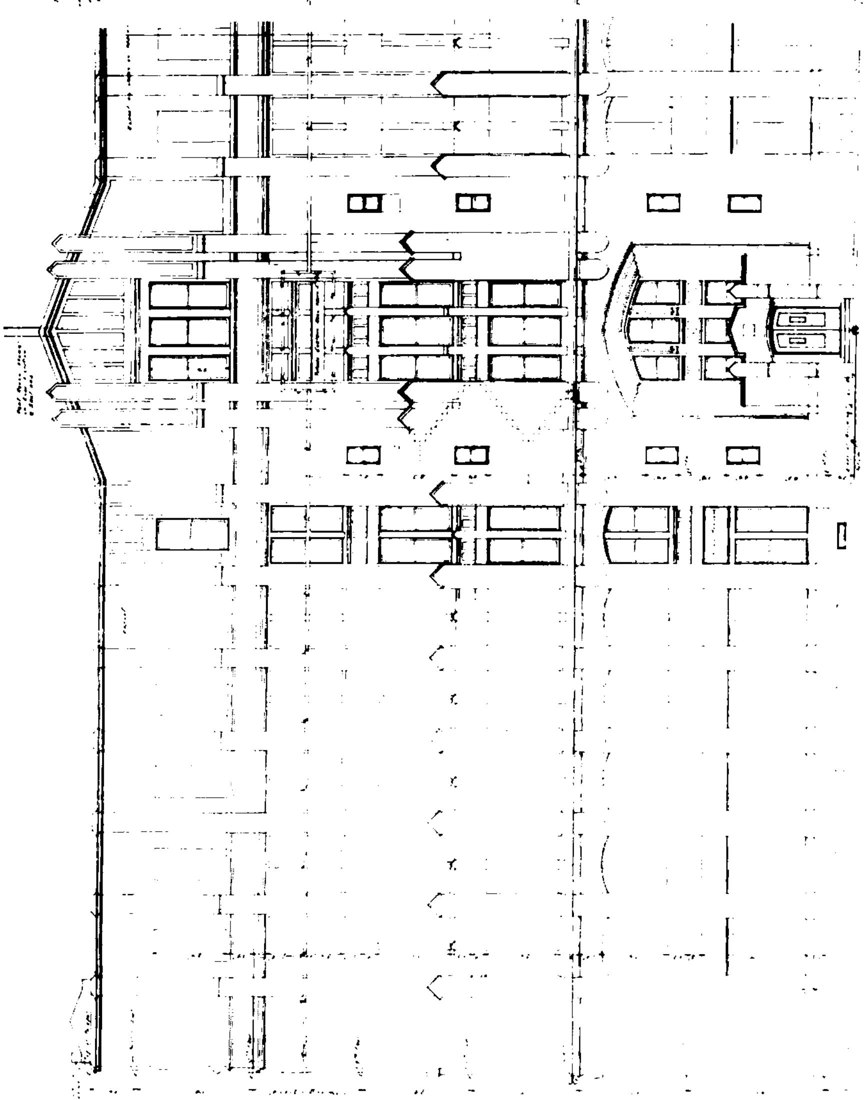


Section through Entrance

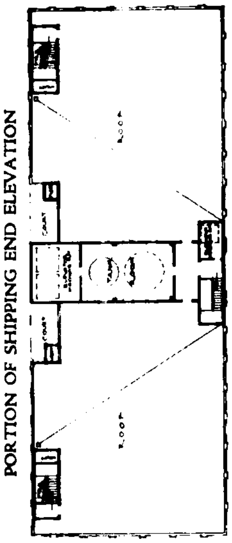
Perspective of Completed Varick Building
Helmle & Corbett, Architects



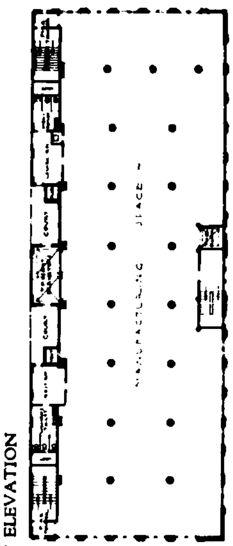
PORTION OF SHIPPING END ELEVATION



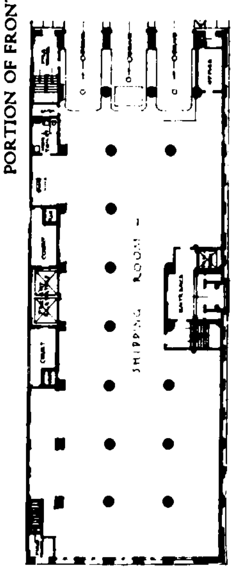
PORTION OF FRONT ELEVATION



ROOF PLAN



TYPICAL FLOOR PLAN



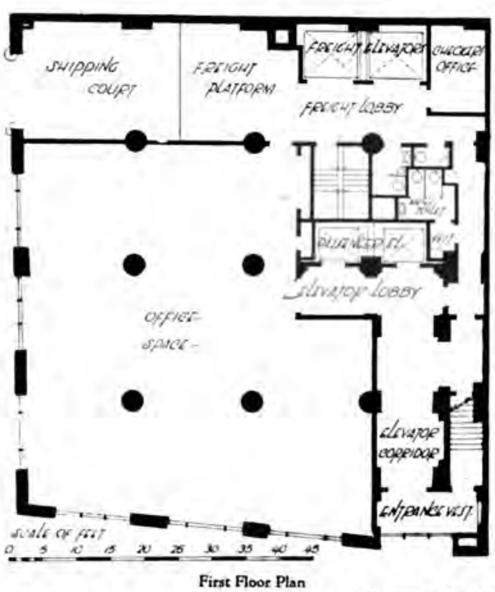
FIRST FLOOR PLAN

VARICK BUILDING, NEW YORK, N. Y. (All Concrete Construction)
HELMLE & CORBETT, ARCHITECTS

There is little precedent which we may follow in designing concrete structures. In the case of any building it is supposed that it has a definite purpose and it is the architect's duty to interpret this purpose through his design and in conformity with the character of the materials in which it is executed. In designing a concrete building in which the architecture will be had by means of pleasing forms of the structural parts there is demanded of the architect a full knowledge of the physical properties of the material and the practical and economical methods of construction which are employed in using it.

Architectural treatment and ornamental detail should be carefully considered on any building. Most of our buildings are very much over decorated. Simplicity should be the watchword in architecture. If architects designing in concrete would give a little thought to proportion in their design, we would have some very creditable buildings in this material. The architectural treatment best adapted to reinforced concrete is that which depends upon broad lines and proportions rather than upon fine detail. It is almost impossible to obtain in reinforced concrete which is cast in place on a building the absolute perfection of texture and alignment which can be obtained with cut stone or brick. Such excellence of workmanship can, however, be obtained as is required by the great majority of buildings. In designing mouldings and cornices it must be remembered that these are constructed in most cases from wood forms and their character should be of the simplest so that the construction of the form work may be handled without great expense or difficulty. The variety of mouldings should be kept to the absolute minimum because the construction of many differing forms becomes an expensive item. Moulding sec-

In this 17-story, all-concrete building a feature has been made of the treatment of the surface of the lower floors giving them the appearance of granite. Expanded metal with the smallest available mesh is wired to the outside surface of the steel. In the two inches between this mesh and the form is placed ¼-inch aggregate of pink and white quartz, feldspar and olivine, mixed one part of white cement to two of aggregate. After it had been built up to a height of two feet the balance of the form was filled with common structural aggregate. There was immediate fusion and perfect bond but it was necessary to keep the outside concrete about one foot higher than the structural concrete to prevent mixing. After the forms have been stripped, the surface is patched where necessary, washed with white cement, and then allowed to stand, when it is bush hammered to give the completed granite appearance. The remainder of the building is surfaced with electric surfacing machines and coated with a waterproofing compound providing a uniform color.



First Floor Plan

Perspective View

Concrete Building for Hide and Leather Realty Company, New York, N. Y.

Thompson & Binger, Inc., Engineers

Testing Room in Central Wing of Bureau of Standards Industrial Laboratory

cheaper. The pre-cast method of construction is called upon when the fineness of the detail is such that satisfactory results could not be obtained by casting in place in wood forms.

There are no advantages from the standpoint of economy in combining other materials such as brick, terra cotta or tile with concrete. Concrete is always the cheapest. From the point of view of architectural effect, however, there are often excellent reasons for combining other materials with concrete and there are endless possibilities in this direction. Efforts to provide finish of surface by varying the composition of the concrete, using one mixture for the facing and another for the body of the walls, have not as a rule been successful. It has seldom proved practicable to use a different aggre-

tions should also be designed so that the forms can readily be removed after the concrete is set without doing damage to the finished work. Full use should be made of simple forms of ornament such as recessed panels which are easily had by slightly increasing the thickness of the forms where such a panel is desired.

The manufacture of pre-cast ornament has been well developed and competes, in many cases, with terra cotta. It is not often that pre-cast ornamentation competes with structural ornament for the reason that where the detail of the ornamentation is such that satisfactory results can be obtained by casting in place, this method is much

gate for the exterior surface of concrete work from the aggregate used for the body of the walls. In the case of a building where there is a considerable amount of reinforcement two inches from the surface and where there are many corners and angles the attempt to use two different kinds of aggregate seriously impedes the progress of the work and greatly adds to the expense.

The usual type of surface treatment at the present time is rubbing, with or without the application of a coating on the rubbed surface. Hammering of surfaces is not usual except for small areas for architectural effect. Rubbing costs about 10 cents per square foot, coating 5 cents and hammering 20.

Construction Progress View of Bureau of Standards Laboratory Showing Concrete Frame Completed and Brick and Stone Facing Being Applied
Donn & Deming, Architects

DECORATION & FURNITURE

Jeanne Taylor, *Associate Editors*, Leland W. Lyon, R.A.

The Architect's Control of Furniture and Decoration

ANY subject on which widely diverging opinions have developed strongly in a professional fraternity is at best difficult to approach from an editorial viewpoint. Complicate such a problem with the conflicting interests of professional and contractual service, the business interests of manufacturer, wholesaler and retailer, indeterminate ethical standards and predetermined policies based on erroneous conclusions,—and one may obtain a fair conception of the inter-related complications involved in the subject of interior decoration in its business phases.

When Gordius, the peasant king of Phrygia, had tied the Gordian knot, no man seemed able to unloose it, even for the promised reward of rulership over all Asia. Alexander the Great in his characteristic manner solved the problem by cutting this knot in two with one sweep of his sharp sword—and later fulfilled the prophecy. The methods of the great Alexander sometimes lacked finesse but usually they were productive of immediate results. Recognizing in this question of the business factors involved in interior decoration a very complicated knot, we can take precedent from Alexander and approach the subject most directly by cutting it through and carefully examining the cross section. Only by understanding conditions as they really exist can constructive comment and suggestions develop into the ultimate establishment of standards of practice in this field, fair to all who wish to be fair, and based on sound merchandising principles.

We shall therefore consider in some detail the present conditions and practice in furnishing and decorating under the definite divisions of: (*a*) The consumer field; (*b*) Merchandising and distributing; (*c*) Production. These fields are represented: (*a*) By architects and interior decorators who purchase for, or sell direct to, clients; (*b*) By the wholesale furniture and decoration trades; (*c*) By the manufacturer who sells this trade or who maintains an independent distributing organization.

The Viewpoint of the Architect

As a result of contact with various phases of furnishing and decorating service through architects' offices, we were led to realize early in this analysis that many conflicting viewpoints were held and that practice has been in no manner standardized. In order to be certain that the chaotic conditions disclosed by preliminary analysis of this subject applied generally, THE ARCHITECTURAL FORUM has recently carried out an investigation covering over 1,000 offices of architects. The purpose of this investigation was to determine: (1) Whether or not the

RAISON D'ETRE

THE publication of the January 1921 issue of THE ARCHITECTURAL FORUM marks the first appearance of the Decoration and Furniture Department. From time to time during past years consideration has been given in the editorial pages of THE FORUM to various subjects which properly come under this heading, and the actual creation of a special department to cover this subject has consequently been a matter of evolution.

Before this step was taken careful analysis was made covering a large number of architects' offices to determine the exact interest of the profession in this subject. The letters which were sent out evoked a strong response and showed definite interest greater than had been anticipated. Naturally, many opinions were expressed regarding the business phases of this question and much general information was obtained. In this first article, therefore, an outline of such phases of interior decoration is given. The attention of readers is particularly directed to a careful analysis of points brought out in the article and suggestions and constructive criticism are invited.

The Decoration and Furniture Department will of necessity cover a variety of subjects coming naturally under this heading. It is the intention of the editors, however, largely to confine articles which will appear in this Department to suggestions and descriptions regarding furniture and materials available in stock rather than those made from special design. It is a well known fact that furniture manufacturers are successfully producing not only modern furniture of excellent design but are following closely the desirable period designs which have created interesting and artistic precedents. In the production of fabrics and other decorative materials, evolutionary steps have been taken in the past few years and today there is available a vast selection of furnishings and decorations with which the architect may carry out interiors suitable for every type of building. It will be the purpose of this Department, therefore, not only to urge certain necessary reforms in business practices and relationships, but to describe in text and plate illustrations successful examples of interior design and composition. It is also proposed to bring to the attention of architects interested in pursuing this branch of the profession information as to available furniture and materials, market conditions, and the general attitude of the wholesale decorators' trade toward co-operation with the architectural profession.

architect furnishes interior decoration service for his clients; (2) What the architect charges for such service; (3) The architect's present relations with the dealer and manufacturer; and (4) The architect's method of handling furnishing and decorating projects.

The results of this analysis showed an interest in this subject far beyond that which had been expected. Hundreds of letters now in our editorial files show not only that the architect does this work and is interested in doing it, but that he feels the need of standardized service charges and improved relations with the dealer and manufacturer. He resents the intrusion by certain classes of interior decorators, as will be discussed in later paragraphs.

One of the most frequent complaints which have been made by architects in the course of this investigation is that the wholesale trade discriminates against the architect in the matter of discounts, allowing interior decorators a much greater discount and in many cases refusing discounts entirely to the architect. There is no question that this condition exists, but as there are two sides to every story it is only fair that these be presented because of their bearing on later conclusions in this series of articles.

We have been informed that some two or three years ago in New York a meeting was held including members of the wholesale decorators' trade and interior decorators. At this meeting it was decided to cut down the discounts allowed architects. While it may be true that interior decorators used their collective purchasing power in urging this course, it is also true that the manufacturer and distributor who refuses to allow an equal discount to the architect has at least businesslike grounds for so doing. The conditions on which this attitude is based are thus explained by manufacturers:

The interio decorator is essentially a contractor who purchases on his own account at wholesale prices and resells to his clients at the retail figure or in some cases the highest price he can get. On the other hand, the average architect purchases in behalf of his client and allows all discounts to accrue to the benefit of the client or, in other words, through the present system in the average architect's office, wholesale prices are available to the retail consumer. The manufacturer claims fairly that in any industry this condition is not sound. The reason that the architect does not usually retain discounts is because he feels that for his services in interior decorating he can charge on a percentage or hourly basis only and that he cannot be placed in the position of a contractor, or take payment from two parties in the transaction. Consequently, with the stopping by many furniture and decorative material houses of the practice of giving equal discounts to the architect, the interior decorator is placed in a position where he can offer his services at lower cost to the client than can the architect. The possibility of meeting this situation will be discussed in later paragraphs.

Meanwhile it is interesting to note that the large volume of furnishing and decorating now controlled by architects is being handled in various ways:

(1) The architect employs an interior decorator in the role of a professional buyer to carry out detail work of selection of materials and furniture. The architect controls the principal elements of design; the client pays the retail prices so as to provide the decorator's profit. The architect is paid by receiving a commission approximating 10 per cent on total cost or by remuneration on an hourly basis.

(2) The architect is called upon in consultation on the work of an interior decorator who is dealing directly with the client, for which he receives a service fee.

(3) The architect maintains an interior decorating department which takes advantage of all discounts in lieu of commissions.

(4) The architect purchases at the best possible prices, including all available discounts, and bills his client exactly at cost, receiving a commission on the work. In this manner he takes advantage of those distributing organizations which are still willing to allow him full discounts.

It was found in the course of this investigation that furnishing and decoration in all types of buildings were almost without exception controlled directly by architects and that many architectural firms contract for the complete design and supervision of a project, including all furniture and decorations. The volume of this business controlled by architects will be discussed in later paragraphs under comments on the Manufacturer and Dealer aspect.

What the Interior Decorator Thinks and Does

Interior decoration carries with it all the attributes of a profession, a trade, a contracting activity and a buying service. This branch of the building field includes many earnest workers of varying degrees of ability and in practice there seem to be approximately three classes of interior decorators:

(1) The professional interior decorator, highly skilled in design and general knowledge of the subject, and capable of carrying out intricate projects involving the expenditure of large sums of money.

(2) What we deem the "merchant class" of interior decorators, dealing principally in antiques and unusual furniture and fabrics and often maintaining shops. An interior decorator of this class does not as a rule work on any standard retail price basis but buys wherever possible at the lowest prices and sells wherever possible at the highest prices. Here many unfortunate practices have developed and it is due to the questionable and sometimes directly dishonest policy of some members of this class of decorators that many charges are unfairly lodged against the entire fraternity of interior decorators.

(3) A third class of interior decorators might well be termed "professional shoppers." Individuals

in this class have of course developed a certain knowledge of color, texture and design. This is the type which usually works with the architect on smaller projects, purchasing through the wholesale decorators' trade and selling at the retail price. A decorator of this type has a number of valuable assets in actual practice, including a quite complete knowledge of the market covering available furniture and materials. This type of decorator is usually called to work under the direction of the architect and to combine with the architect's broad knowledge of design an intimate knowledge of detail in fabrics, colors and furniture. Apparently there are no standard qualifications necessary to become a decorator and consequently to be favored by the wholesale trade.

We find that among the ranks of interior decorators there are many individuals of recognized ability who are in every sense professional, but as we pass down the scale we find within the ranks graduate house painters, curtain makers, furniture salesmen, and of course many who consider their activity more or less as an avocation.

It is not necessary to discuss the fact that there is much dissension in the ranks of this fraternity, as well as a strong feeling on the part of many against the handling of furniture and decoration by architects. Similarly, there exists among the architects a strong feeling against certain classes of interior decorators, particularly those who are called in without consideration for the architect and who make suggestions not only out of keeping with the design as the architect has visualized it, but often involving interior structural changes entirely contrary to the spirit of the design as it has been developed by the architect.

We realize, of course, that in treading this maze of interior decoration we must touch some dangerous spots and some sore ones, but we realize also that as the interests of architects in this field are growing rapidly it is necessary to develop a clearer mutual understanding—at least between the architectural profession and the wholesale decorators' trade, if not between architects and the entire decorating fraternity. We can visualize very definitely certain standardized methods which will give satisfactory results to all who are following their business in a logical manner and it is hoped that some of these points will be clearly developed through this and later articles.

Facts About and For the Manufacturer and Dealer

Having in a general manner pictured conditions relating to interior decoration in the architectural profession and the interior decorating fraternity, it is necessary to give consideration to the viewpoint of the manufacturer and dealer and perhaps to bring to their attention facts as yet only dimly realized.

It is indeed a coincidence of unusual interest that as this article is being written there comes to our attention the December, 1920, issue of *Good Furniture*, a well known manufacturer and dealer periodical. In order to show the exact editorial policy of this publication regarding the subject under consideration we quote from one of the advertisements of *Good Furniture:*

"We especially appreciate our position as a recognized medium of information between manufacturer and dealer during this evolutionary period. The signs of the times, the unfoldment of the greater purpose for 1921, can be clearly seen from cover to cover in this issue."

In the copy of *Good Furniture* mentioned we find an interesting section which has been running for some months under the general heading "Upbuilding a Great Industry," and we note that Chapter 7 is headed "The Kinship of Architecture and Furniture." Reading through the article there are to be found several significant paragraphs from which we quote:

"What is the matter with the architect? Does he consider that he has done his full duty to himself and his client when he plans a fine building suited to grounds and environment? Is he merely an engineer, an expert on proportions, stains, form and superficial coloring? Does he stop with supervision of construction because his profession is so lofty that he is above consideration of the home in its finished state? Why does he not finish what he has started, and suggest the colors of walls and ceilings, the kinds of rugs and pictures and the types of furniture that should go into the structure his brain has developed?

"It seems clear enough that the architect, who is a student of periods and styles of all ages, owes it to art and posterity as well as to the present generation, to apply his knowledge to perfection of interior as well as exterior.

"There seems little enough reason why the architectural profession should hold itself aloof from the problems of interior decoration, or consider itself above such work. You would think little of a surgeon who performed a difficult operation and then ignored the subsequent welfare of the patient.

"People who are able to *pay* are not always capable of discrimination. This is particularly true in the selection of home plenishings. Very often one sees the most deplorable taste exhibited in furnishing a new home, a splendid hotel or a public building.

"Buyers who seek the advice of trained decorators avoid this fault; but there are those almost without number who buy without professional aid, and having no real conception of actual fitness, make a sad fiasco of their selections when these are finally placed."

These are indeed interesting and constructive suggestions, particularly as they emanate from channels advisory to the manufacturer and dealer. In turn we may state that the results of our investigation in the architectural field show that the purchase of millions of dollars' worth of furniture and decorative materials is controlled directly today through the offices of thousands of architects and that interest is growing in this subject to a point where such co-operation as that suggested in the quoted paragraphs is indeed necessary.

Recognizing the architectural profession as a definite and powerful buying unit, constantly increasing in its control of expenditure in this field, it is evident that the wholesale decorators' trade backed by the manufacturers should now give serious consideration to the creation of a more equitable and friendly relationship with the architectural profession.

It must be realized that architects will work in one of three ways:—first, directly controlling all design and purchase; second, utilizing the professional buyer class of interior decorators to carry out detail purchases; third, in some cases, recommending the employment of high class professional decorators to co-operate in the solution of special problems.

It is evident that in this field the architect is to be limited only by his own ability and experience and that he will seek the services of interior decorators only in proportion to the difficulty of the problem and to the amount of knowledge which he may possess on the subject. We do not claim that all architects are fully equipped by experience or knowledge to handle the problems arising in this connection. Is it not logical to believe, however, that the average architect even without special training is more capable of rendering service to this end than the average interior decorator?

We have endeavored to give a fairly comprehensive outline of present conditions in this field, particularly as affected by activities of the architectural profession. The letters which we have received in the course of this investigation show a marked interest, not only in receiving all possible information on the subject, but in encouraging some activity which will bring about standardized conditions in this field.

While we have formed certain fairly definite conclusions regarding the possible relationship of the architect to the manufacturer and the interior decorator, together with suggestions regarding dealings between the client and the architect in the matter of furnishing and decoration, we shall withhold these suggestions as the subject of an article to be published in the February or March issue of THE FORUM. By readers who have not already expressed their opinions it is hoped that suggestions will be made freely and frankly in order that all opinions may be correlated and some definite action taken to bring about better understanding and better practice.

Dining Room of House in New Haven, Conn.
Ewing & Chappell, Architects

MINOR ARCHITECTURE
EXEMPLIFIED IN MODERATE COST BUILDINGS

A Country House Alteration

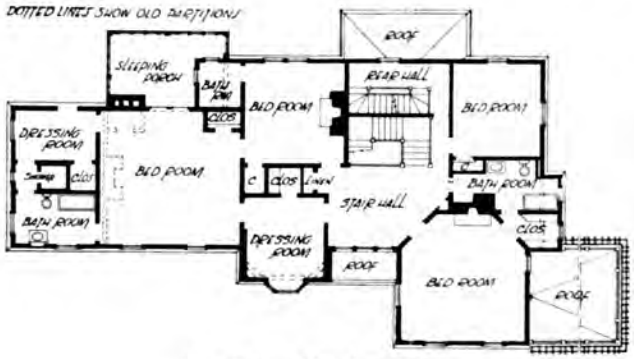
LUCIAN E. SMITH, ARCHITECT

SOME of the most interesting work being done today consists in the remodeling and adapting to modern conditions of old city or country residences. With all of its defects in the way of design and its shortcomings in planning building a generation ago was apt to be well done. It was before the era when prices for materials of every sort had soared to such figures that substitutions of various kinds were resorted to, and builders of that period worked with the idea of producing structures which would endure. With a building structurally sound and well built to begin with alterations are frequently well worth while, often resulting in improvement out of all proportion to the cost involved.

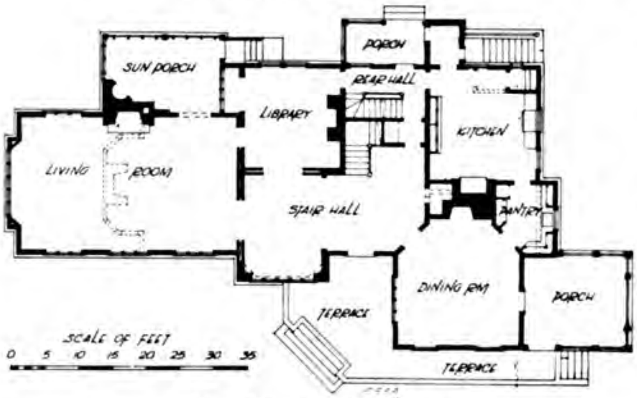
Entrance Front of Original House

The illustrations show the original appearance of a house on Llewellyn road, Montclair, N. J., built about 40 years ago, and its greatly changed exterior after being successfully altered by Lucian E. Smith, architect. In this instance much of the entirely transformed appearance of the building is the result of removing an unnecessarily large veranda and considerable

Entrance Front Showing Alteration of House



Plan of Remodeled Second Floor



Plan of Remodeled First Floor

superfluous ornament, the correcting of the most glaring architectural faults of the clapboarded house and the coating of the entire exterior with rough coated stucco applied on metal lath. The use, to a moderate extent, of trim to simulate half timber in an instance of this kind would seem to be quite justifiable since it is obviously employed merely as decoration or ornament and makes no pretense of being anything else.

The exterior has gained a certain unity of expression by the placing of the windows in groups and by the use of casements which are especially suited to a house of this kind. An added character is given by the use of brick for steps and for the floors of terrace and veranda. All the exterior woodwork has been stained and the roof is covered with shingles of green and brown laid irregularly. The chimneys are whitewashed.

The interior alterations consisted chiefly in the removal of various partitions to correct the proportions of certain rooms, the addition of several bathrooms and the enlarging of the living room which, in its altered form, is 20 x 32, paneled with wood from floor to the ceiling of slightly roughened plaster, having incised ornament. The living room has a stone chimney piece and the casement windows are filled with leaded glass having silhouettes of grotesque animals and birds.

The plan of the house which has remained practically unchanged is interesting in the spaciousness it shows in contrast to modern planning, where the architect is forced through conditions of cost to economize in area and cubage. There is, therefore, a definite advantage to-day for the client in solving his problem of a modern house in following this method of procedure. The increased value of the house greatly exceeds the cost of improvements and in cases where the location is desirable it can later be sold at a profit when new construction is contemplated. Considerable skill is required for planning successful alterations and their results often prove their importance.

Extended End of House Showing New Porches

An Efficient School of Economical Type

McLAUGHLIN & BURR, ARCHITECTS

By G. HOUSTON BURR

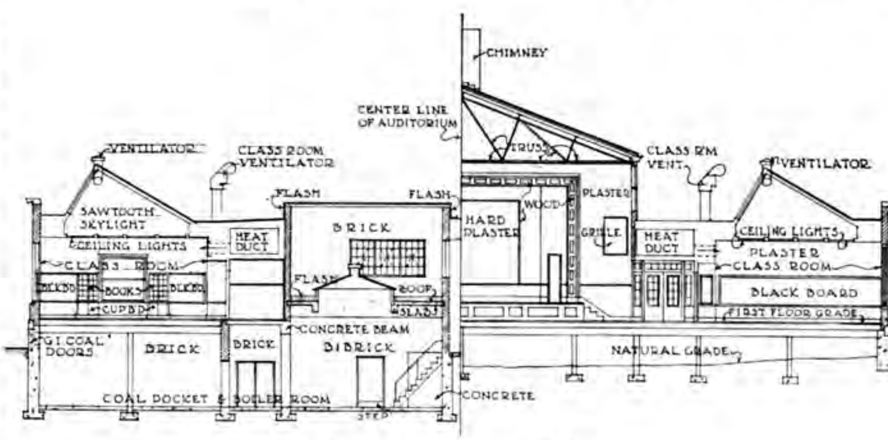
THE erection of houses at Quincy, Massachusetts, to accommodate 450 families soon brought before the school authorities the problem of how the children of these families were to be accommodated in schools that were already crowded. This condition was met by the United States Housing Corporation agreeing to erect an elementary school which would eventually become the property of the city.

The requirements of the school were left to the local authorities with final decision as to construction and architectural treatment vested in the architectural department of the Corporation. It was decided that a building of 18 classrooms would accommodate the additional pupils in the district where the government houses had been erected and that the building should be a one-story school with the classrooms lighted by overhead light. Two of the rooms were to be fresh air rooms and one a domestic science room. In addition, the building was to contain an assembly hall to seat about 600 and a small library, both of which could be used for community purposes, administrative offices, toilet rooms and teachers' room.

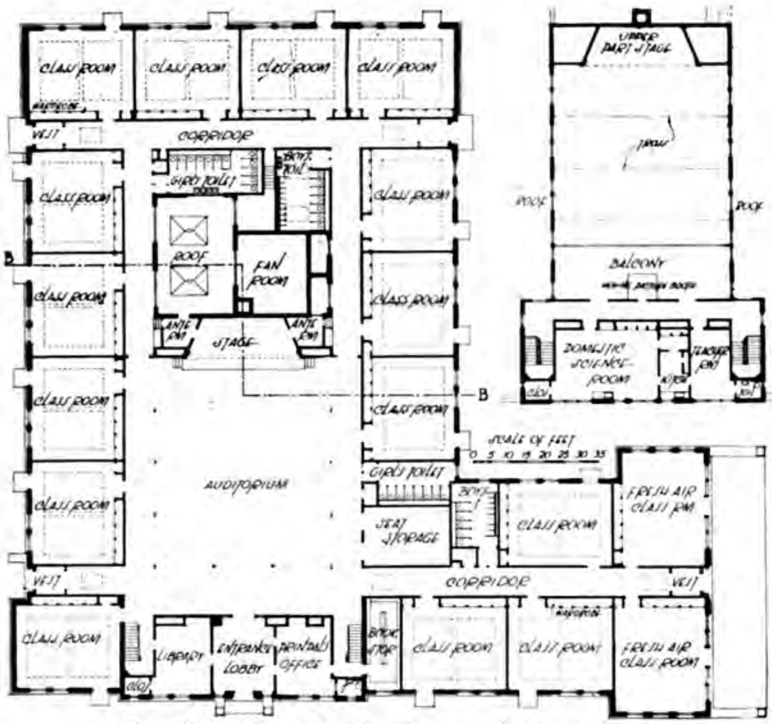
The Quincy school authorities had visited a one-story school in the western part of the state lighted by overhead light and were very enthusiastic about this method of lighting, but in this school the classrooms were without side wall windows and the architects raised the question as to the psychological effect on pupils being shut up all day within four walls with only overhead light. In order to get further information on the subject several cities where one-story schools are being constructed were visited, and the information obtained from this visit was very instructive.

Everywhere the school authorities were agreed that it was very essential to have at least some side wall light in order that pupils might relieve the monotony by being able to look out of the windows. In one city it was felt that the psychology of this was important enough to discard the unquestioned merit of overhead lighting and to light the rooms entirely from the side walls. After considerable study it was finally decided to light the rooms with saw-tooth skylights facing the north and with fairly large windows in the side walls. This solution proved very satisfactory and the classrooms have excellent light even on dark days Study of the plan soon developed that 12 classrooms naturally grouped themselves around the assembly hall and boiler room portion, thus leaving six rooms to be accommodated elsewhere. The first thought would be to arrange the six rooms either by extending the building to the rear or on each side of the front so as to make a symmetrical front elevation. The first plan was impossible because the lot was too shallow and the second was hardly feasible by reason of the natural conditions of the lot which, although fairly level, had an outcropping of ledge at the interior angle. Therefore to save expense the building was designed with five classrooms on one side, making an L shaped plan, and the center

Typical Classroom



Section on "B-B" Shown in Plan



Floor Plan and Upper Part of Auditorium with Adjacent Rooms

portion of the front of the main building was carried up two stories to accommodate the domestic science classroom and a teachers' room with a small kitchenette. This kitchenette was added because it was found that the majority of the teachers came considerable distance to school and did not return home for the luncheon hour. Therefore some arrangement was made so that they could prepare their own lunches in the school.

Each classroom is arranged for 42 pupils and has sliding blackboards and bookcases at the teacher's end and Chicago type wardrobes along the corridor side. The rooms are heated by direct radiation controlled by automatic thermostats and are supplied with fresh air through ducts carried above the ceilings of the corridors from a central fan system; the classrooms ventilate under the sliding doors of the wardrobes causing a constant current of air to pass up through the clothes and they are quickly dried in wet weather and without odor in the classroom. Foot warmers are placed at convenient points and unlike the usual type, these are raised to form a platform.

Every classroom has an emergency exit opening directly outdoors so that in case of fire no pupil is sent back into the building. The floors of the classroom are of maple, but the floors of the corridor and assembly hall are of rubber tile about ¼ inch thick and 18 x 24 cemented to the underfloor. This makes a very excellent surface as it is practically noiseless. The assembly hall is equipped with a fair sized stage and moving picture machine booth.

When working drawings were started on this school definite instructions were given the architects that every item must be fully covered in the plans and specifications and that on no account could there be any extras. In this connection it may be interesting to know that not only was the building erected without any extras, but at the completion of the work an allowance of $24 was returned to the Corporation due to not having used all the amount allowed for temporary heating. The school was erected in 1919 at a total cost of approximately 31 cents per cubic foot, or about $275 per pupil, including grading and landscape work.

Experience in every type of schoolhouse construction has convinced the architects that the one-story school is the most economical type to erect in localities where land is inexpensive. The safety of having every classroom exit directly to the outside in case of fire makes this type of school superior to a two-story building, even if it is of fireproof construction. A building of this kind makes for simplicity in school administration and with proper study can be made very pleasing architecturally. Overhead light is the very best means of lighting classrooms but more costly roof work makes a school so lighted slightly more expensive.

Auditorium from the Stage

ENGINEERING DEPARTMENT

Charles A. Whittemore, *Associate Editor*

A Large Concrete Warehouse

By R. E. BRIGHAM

INTEREST in bigness has been called a purely American, modern characteristic. Our largest shows on earth and our colossal buildings have been pointed out as showing that we are interested in quantity sometimes at the expense of quality. However, it is doubtful whether this interest in the largeness of things is either purely American or purely modern. One can easily understand the competition between the builders of early ages who vied with each other in the erection of larger and larger cathedrals and other monuments. Certainly there was nothing modest with regard to the design and construction of St. Peter's and the Emperor Justinian, who was responsible for the erection of Saint Sophia, did not feel that he was building a small or insignificant structure.

There is no doubt but that everyone is and always has been interested in large buildings. It is also true that in most cases where buildings have been erected covering large areas, or extending high above the sky line, they have been well designed from an architectural point of view. Both the Municipal Building and the Woolworth Building in New York are tremendous structures, and both are considered as having distinct architectural merit which has attracted wide attention.

A building totally different in character, but of large size considering its use, is now being constructed in lower New York; this building is known as the 395 Hudson St. Building. It will be used largely for a warehouse but there is a section which will be given over to use as a garage, and certain

The 395 Hudson Street Building, New York
McKenzie, Voorhees & Gmelin, Architects

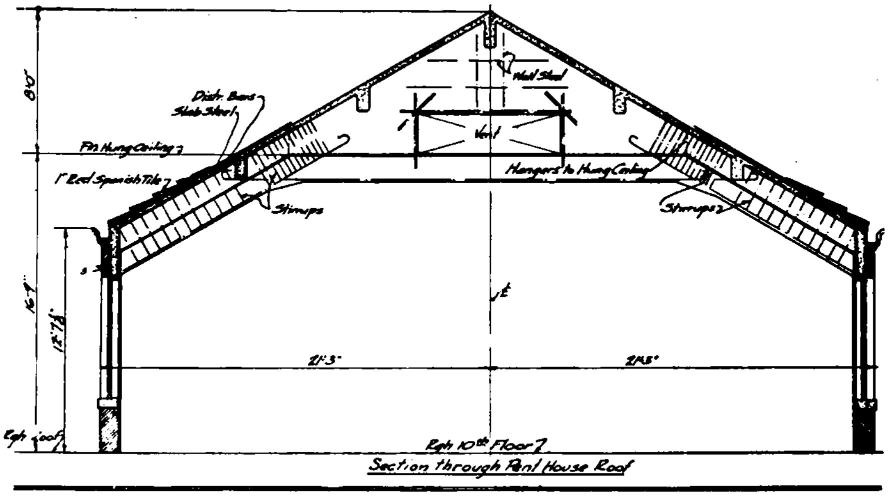


Fig. 1. Section through Pent House Roof

floors will be used entirely for shop purposes and others for offices. The building will cover an entire city block. Its longest dimension will be 339 feet, 9½ inches and it is approximately 200 feet wide. It will be a ten-story building with a basement and with large pent houses accommodating machinery, tanks and other apparatus.

The design of a warehouse presents great difficulties to architects. The firm of McKenzie, Voorhees & Gmelin, who were commissioned to design this building, have confined their efforts to the work of creating symmetry of design and the proper scale of mouldings and cornices. They have approached the problem from a standpoint of maintaining harmonious proportions and they feel that this can be done in a warehouse as well as in any other structure.

The warehouse is after all nothing but a huge box with the walls pierced with as many and as large windows as possible. This presents a checker board pattern on the exterior which is difficult to deal with no matter how it is approached. By careful studying of mouldings, and proportions and positions of band courses, the architects have attained an extremely pleasing appearance for this type of building. They have also done away with the ugly tanks and other roof structures which have so badly marred the skyline of New York, treating the pent houses in such a manner as to make them integral parts of the building and making the design mass up in an interesting manner.

Planning for a building of this kind is influenced to a much greater extent by the requirements of a labor law than by the dictates of the Ecole des Beaux Arts. No wide means of circulation, no accentuated axis dominates the plans. The placing of stairways is determined by the distances to them from points in the building and the locations of elevators are determined by their nearness to the loading and shipping platforms, or to the entrance hallways.

Only on the ninth floor where the offices are located is an attempt made to maintain corridors giving an easy access to all parts of the building, and this is effected by the elimination of certain columns on this floor. On the tenth floor, which might be looked upon as the first floor of the huge pent house (See Fig. 1), will be located the large dining room and kitchen, the rest room for women employes, a conference room and a demonstration room. This plan will cover a fairly large number of square feet, but there will still be left a large area of roof which will be used for recreation purposes. At present it has not been decided whether this roof area will be used for hand ball courts or bowling alleys, but it is certain that recreational features will be added.

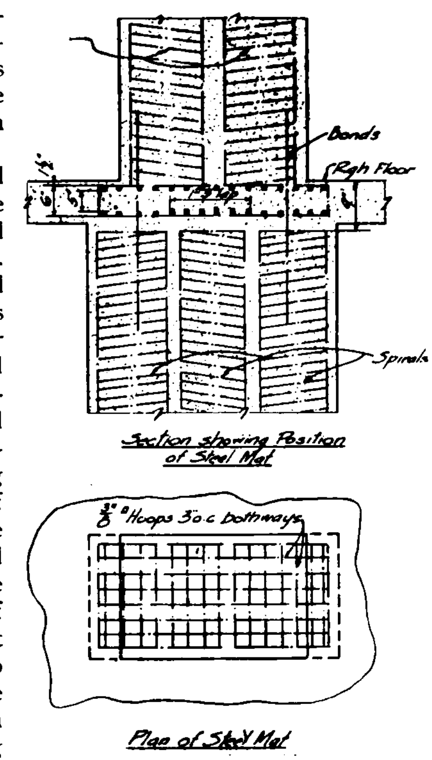


Fig. 2. Transition of Columns

However, the chief interest in a building of this type lies in its construction. This structure will be, when completed, the largest reinforced concrete building in the Borough of Manhattan, and perhaps one of the largest commercial buildings built of this material anywhere in New York. The type of construction that will be used is flat slab construction with no beams showing in the ceilings except in certain portions where beams will not be objectionable. Flat slab construction is known more outside of New York than it is within the limits of the metropolis; in fact, until recently no provision had been made for this type of structure by the building department, and it was not until a special ruling had been adopted on July 8, 1920, by the Board of Standards and Appeals that the engineers' designs for the building could be approved.

In most cases the Chicago Code has been used by engineers designing work of this character. In this building the engineers have had a chance to show the flexibility of concrete construction. Much of the criticism which has been directed against concrete work has been on account of the fact that it was supposed to be limited in its scope and inflexible.

In this particular instance the engineers have shown that a large degree of flexibility can be developed in reinforced concrete structures. As an example of a case of this kind, it might be noted that on two sides there are wagon courts into which trucks will be driven to deliver and receive goods from receiving and loading platforms. It is naturally desirable to have wagon courts as wide as possible and yet in these there must be columns carrying the structure above. In the past it has always been felt that reinforced concrete columns in a building over ten stories high must be of colossal diameters. Such columns would be absolutely out of place in wagon courts.

The engineers have surmounted this difficulty by designing the sections of columns which will appear in the wagon courts as having rectangular sections which change from rectangular to round at the second floor. In some cases a change in section is effected so that instead of having the long dimensions perpendicular to the building line, as in the wagon courts, these are parallel with the street front. This is done so that columns do not project excessively into the second floor but are flat along the wall.

The method used in effecting the change from rectangular to round columns is almost unknown to any but concrete engineers. Use is made of reinforced concrete mats (See Fig. 2) which are large rectangular slabs of concrete reinforced by means of ⅝-inch round rods looped at right angles to each other and spaced approximately three inches on centers in both directions. The mats are practically all steel filled in with concrete. These are placed on top of the rectangular columns, in much the same manner as butt plates are used between sections of steel columns, and the round column is carried on top. Another unusual feature is the use made of columns having oblong sections at elevator shafts. It is desirable to save as much room in the elevator shafts as possible and it would be difficult to bring the partitions of the elevator shafts against circular columns and for this reason these columns have rectangular sections and except on the top floors are much longer in one direction than in the other.

The simple method of constructing most of the columns throughout the building is that in which spirals of steel and vertical rods are used to reinforce the concrete in the column (See Fig. 2). The method of reinforcing the columns at the elevator shafts is that in which two and sometimes three

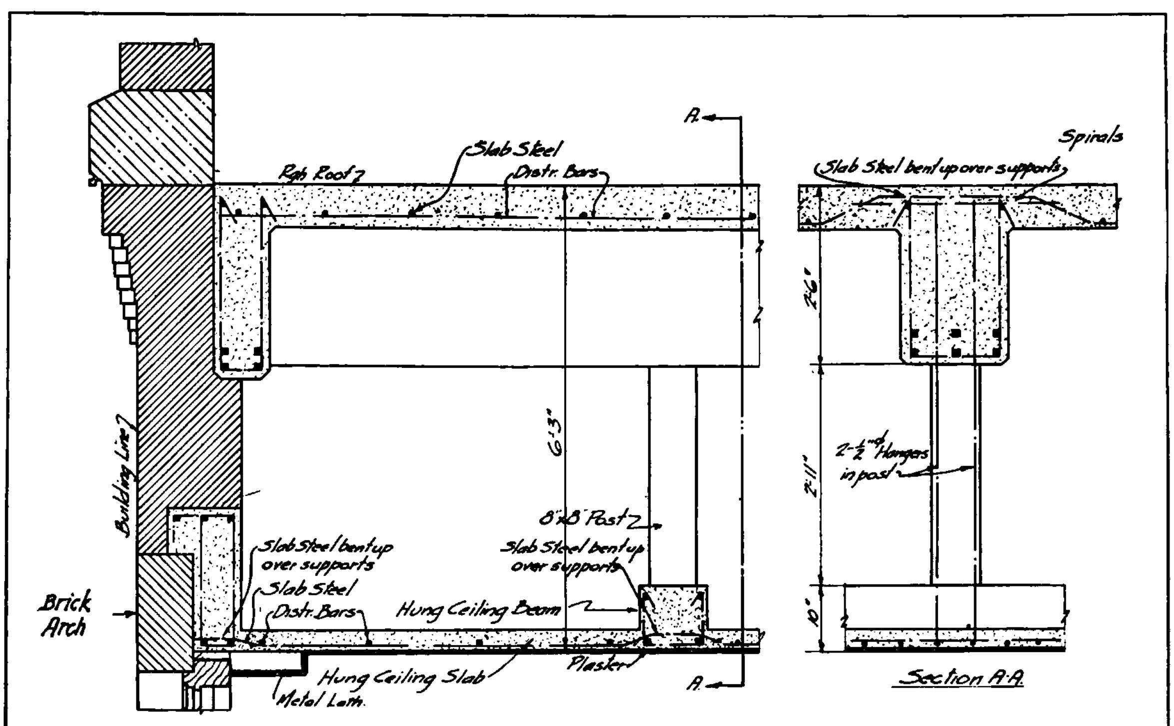


Fig. 3. Section through Hung Ceiling

spirals are used in the reinforcing, and all spirals are then encased inside the rectangular concrete. As the columns reach the upper stories of the building they decrease in size, naturally, and where three spirals were used at the basement and first floors only one spiral is used at the eighth and ninth floors. The changes from the large to the small columns are effected in the same manner as the changes from rectangular to circular columns, that is by means of mats placed between the large and the small sections.

Another interesting detail is the design of a portion of the first floor. In this portion there will be located racks in which will be stored electric conduits and owing to the heavy load of these conduits the floor is designed for a live load of 1,000 pounds per square foot. This floor is supported by means of girders and beams and not by means of the flat slab construction which is characteristic of the rest of the building. Except for the fact that the beams and girders are all designed deeper and wider than those found in other places in the building where this type of construction is used, no special difficulty has been encountered by the engineers.

Footing problems were not particularly difficult as the soil encountered was unusually good. When the excavation was made for a certain section of the basement, however, it was found that the good soil which had been found in the test borings did not extend over the entire area so in this portion the footings were designed to impose a load of three tons per square foot upon the soil, whereas the majority of the footings were designed to impose a load of four tons per square foot. All footings under the interior columns are rectangular, pyramided, reinforced, concrete footings. Under the outside walls the footings are made to be continuous in almost all cases but at one corner a footing was designed in such a manner as to take a load of four columns—one corner, two wall columns and one interior column.

On the ninth floor, which will be used for office purposes, intermediate columns are left out and spans of 40 feet are encountered which must be taken care of by reinforced concrete girders. In order to avoid having these large girders drop down below the ceiling of the ninth floor, a hung ceiling is used which is constructed of light reinforced concrete of sufficient strength so that a small live load can be imposed upon it (See Fig. 3). In this hung ceiling space are distributed the heating mains and the heating supply pipes drop from this space to the basement and return in the basement to the boiler. The hung ceiling space is also used for the distribution of ducts into which are gathered the ventilating ducts from the toilet rooms and shop floors. The use of a hung ceiling of a building of this type is somewhat unusual.

The structural drawings show the concrete construction of the hung ceiling space over the ninth floor, the steel and concrete mats used between sections of columns and the type of roof construction in the pent house roofs.

It might be noted that in this building unusual care has been taken to install first class mechanical equipment. The sprinkler system is very complete. It is supplied by two sources of water supply and in addition there is a fire pump installed capable of delivering 1,000 gallons per minute at the top floor to the sprinkler and standpipe system. This water is lifted to a height of over 151 feet and is delivered at a pressure of 100 pounds per square inch. The sprinkler system will be divided into six systems each fed by an independent riser. In addition there will be dry lines in both wagon courts and these dry lines will be equipped with an accelerator which will enable water to flow to any particular head in the dry system almost as soon as the head opens up.

The heating system for this building is of a type usually found in the better class of office buildings. It is a vacuum system with overhead mains. The theory of the overhead main is that the steam and water of condensation both flow in the same direction, and this does away with water hammer. All branches are taken off above the floor and all radiators are of wall pattern making it possible to clean around them. The plumbing installation will be of a very high standard and all fixtures are hung from the wall in order to secure the highest degree of sanitation and cleanliness.

There will be ice water lines to the drinking fountains on all floors. A small refrigerating plant will be used. The entire system will be equipped with galvanized wrought iron pipe. There will be two compressed air lines to the shop floors, one having a pressure of 65 pounds and the other a pressure of two pounds.

It would seem that this is an unusual building considering the purposes for which it is designed. By reason of its size and also on account of its careful architectural treatment, it is to be classed above the average warehouse. Because of the great care given to the mechanical equipment, the plumbing, heating and electrical work, it will be of the most carefully designed type, and the building will be one of the most complete erected for shop as well as warehouse and commercial purposes in Manhattan.

The building is unusual also as illustrating the possibilities of securing good design in a building which is often neglected and with a material which is seldom used to such advantage. In designing structures to be built of concrete emphasis may well be placed on the note of strength and the building yet be given an appearance of architectural symmetry and dignity.

Truss Design and Details

PART III. HEAVY WOODEN TRUSSES WITH PARALLEL CHORDS

By CHARLES L. SHEDD, C.E.

WOODEN trusses with parallel chords are frequently used in building for long spans and heavy loads. It is more common to use such trusses in railroad bridges of second class roads but the use of them should be understood by one engaged in building work as the principles are fundamental and the knowledge of them will enable the designer to take care of cases where their use is imperative.

In Fig. 10 is shown a wooden truss with parallel chords. The slope of the diagonals should be in the neighborhood of 45° but this may be varied considerably in case of emergency. If they are flatter it makes the horizontal component greater causing the use of greater lugs in the castings or of deeper notches where no casting is used. Besides this a flat diagonal is longer and the additional length might prevent the use of a smaller and more economical piece on account of the possibility of

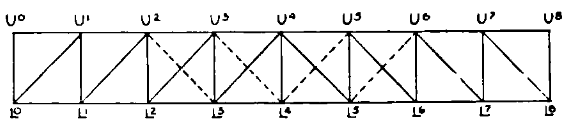


Fig. 10

buckling. The increase in the size of the lugs is the most serious trouble as it causes the waste of more wood in the bottom chord and increases the trouble due to shear as will be described hereafter in dealing with Fig. 13. If the diagonals are made steeper than 45° no serious difficulties are encountered, but the economy may not be as great.

The panel points should also be located with reference to the loads to be applied. These loads should be as near as possible to the panel points. When the load is practically uniformly distributed the panels should be short. Any loading applied to the chords between the panel points causes bending in the chord which increases its required size. A conventional way of marking the panel points is shown in Fig. 10—U^0, U^1, U^2, etc., for the upper chord panel points and L^0, L^1, L^2, etc., for the lower panel points. The members are then denoted by the panel points at their ends; thus the end diagonal is known as L^0, U^1, etc.

The diagonals are of wood and are designed to take compression only as they simply butt at their ends. The verticals are of wrought iron or steel rods and are designed to take tension only as they are too slender to resist buckling and are connected to the truss only by nuts and plates on the outer side of the chords.

If the load on the truss were greater on one end than on the other (as would be the case with a snow load on one side of a roof) the stresses in the diagonals near the center and also in the verticals would be likely to be reversed in character. This would cause the opening up of the joints and bending in the chords resulting in trouble of a serious nature. To avoid this, wooden diagonals are added as shown by the dotted lines in Fig. 10. These are called counters and in the case of unsymmetrical loading a counter would be doing the work instead of the diagonal in the opposite direction. In trusses with broad chords the main diagonals may be made of two wooden sticks and the counter may be placed between them. If the width of the truss will not allow this treatment the counter may be made in two pieces butting against the main diagonal. If the diagonals are at 45° the counter will butt squarely against the diagonal, and they need only be spiked together at this point, but if the counter and the diagonal intersect at an angle other than 90° the counter would have a tendency to slip along the diagonal and thus nullify its effect. This, however, can be overcome by notching the counter slightly into the diagonal, the depth of the cut depending on the angle and the amount of stress which it is possible for the counter to carry. A notch of less than one inch is not very reliable although ¾ inch is used by some designers. When the counter passes between the two members of the main diagonal a small bolt of ½- or ¾-inch diameter is generally used, passing through all three sticks.

The joint at L^1 or L^2 may be designed as shown in Fig. 11. Here a casting is used to transfer the stress

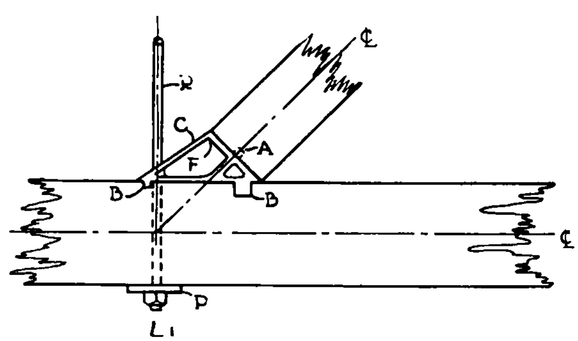


Fig. 11

from the diagonal into the rest of the truss. The ribs, such as C, should not be less than ¾ inch in thickness as the forms used in casting may float a little which might seriously lessen their thickness. In castings, even with ¾-inch ribs, the moulds should be so placed that the openings in the casting will be vertical to minimize this floating. At the intersection of the ribs a slight curve called a fillet of about ½-inch radius is used to strengthen the point and facilitate the casting. A small round projection may be placed at A to project into the diagonal about an inch to keep it from slipping. Some designers prefer to leave a hole in the casting here and insert a short rod. This latter scheme makes the erection somewhat easier.

To keep the casting from slipping along the chord, lugs B are formed, their combined depth being proportional to the horizontal component of the stress in the diagonal. Two are often used to lessen the depth of the cut in the chord which in the case

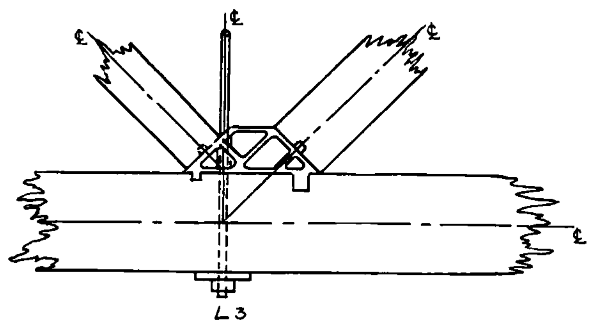


Fig. 12

of the tension chord means just so much larger stick. These lugs should fit tightly into the stick and be reasonably smooth and straight to insure a firm joint. Their thickness should about equal their depth. One of them is made smaller than the other, usually not more than one inch, as its efficiency is limited by the horizontal distance between the lugs. This must be long enough to transfer in shear the portion of the stress transferred in bearing by the larger lug above the bottom of the smaller to the main, unbroken portion of the chord. The lugs are placed a short distance from the ends of the casting to make the ribs in the corners less liable to fail. Failure at this point in poorly designed castings is not at all uncommon. The rods R in the case shown pierce the casting and are held at the ends by a plate P bearing against the chord. Where the rod pierces the casting a thin sleeve is cast about the hole and rod to strengthen this point.

The joint at L^3 is shown in Fig. 12. It should be noticed that while the center lines of chord and vertical and the main diagonal intersect at a point that the center line of the counter does not intersect at this same point. This is done to avoid the use of too large a casting and as the stress in the counter can only be small this eccentricity will not be serious. This point was mentioned in the first article of this series in the November number of THE FORUM.

The joint at L^0 is shown in Fig. 13. The vertical stick at the end transfers any load which may be applied at the end of the truss to the bearing and it, together with the vertical rods, binds the two chords together making a firm structure. The vertical rods are frequently countersunk into the lower chord so as not to interfere with the bearing. The plate at the end of these rods does not need to be very large. It is at this joint that the most difficult problem in the design of the truss is often encountered. This is the problem of taking care of the shear in the lower chord due to the horizontal component of the stress in the end diagonal. The end diagonal carries the greatest stress of any of the diagonals and it meets the lower chord so near its end that frequently little space is available to take care of this shear if no other provision is made than at the other joints. The distance D, Fig. 13, should be at least 12 times the combined required depth of the lugs otherwise the upper part of the lower chord would shear off from the right hand lug to the end of the truss.

If there is room to extend the lower chord to provide for this it is the most economical way of designing the joint, but where space does not permit, some other means has to be provided. One way is to omit the lugs on the casting and to place under the casting a steel plate with a lug riveted to its top for the casting to bear against and extend the plate back far enough so that other lugs may be put on its under side, notching into the lower chord. When this is done bolts should be placed through the plate and passing through the chord. These bolts should be just to the right of the lugs to prevent the plate from buckling up.

Another way of providing for this shear is to design the casting as shown in Fig. 13 and then run a bent plate around the end of the lower chord

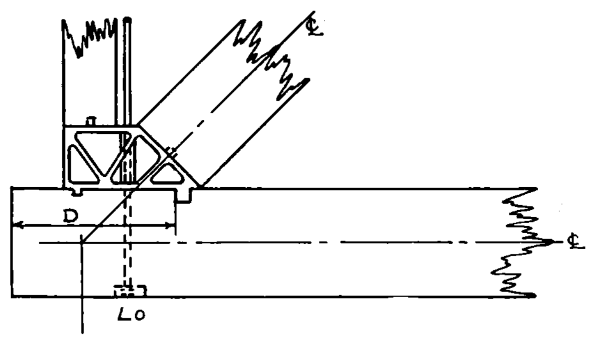


Fig. 13

and along either vertical face of it far enough back to allow vertical lugs to be placed on the plate engaging the bottom chord in a similar way to the top plate already described.

In some trusses it has been found that the chord stress was so great that wood could not be conveniently used for the lower chord which is in tension. In such cases a stick is chosen large enough to take care of the details properly and plates run along the vertical faces of the stick for the entire length being merely a continuation of those described in the preceding paragraph. Channels may be used to advantage instead of plates and sometimes rods have been used passing through angles at their ends, these angles having their outstanding legs reinforced by stiffener angles.

BUSINESS & FINANCE

C. Stanley Taylor, *Associate Editor*

Business Elements in an Architect's Office

ALMOST invariably the preface of anything written on the subject of business from an architect's viewpoint consists of a sweeping apology to art, followed by the more or less thinly disguised accusation that the average architect is an artist and consequently a helpless entity in the business world. Even where groups of architects meet there is no lack of disparaging criticism as to the average architect's ability to make money, to hold his clients, to manage his organization and to take his logical position in the economic structure of the community.

So much has been said, in fact, that there is no need of additional criticism. We believe that every progressive architect possesses the spirit of the progressive business man and that he is interested in every suggestion and idea which may help in bettering his service and his business methods. We propose, during the year 1921, to give no further editorial consideration to any form of direct criticism but to confine our efforts to the development of constructive suggestions for the architect, individually and collectively. If every member of the profession will also adopt this attitude and seek to place his service and his profession in its rightful position in the business of the community it is logical to believe that architecture will soon stand in public estimation not only as a great art but also in its rightful position as one of the important forms of modern business.

Will there be any sacrifice of art in this development? Think of an artist who produces, in three dimensions of beauty, a building which also functions with machine-like perfection in accordance with the desires of those for whom it has been produced! This is what every architect should strive for—to develop through organization and personal equipment the ability to create buildings in which the elements of art, practicability and economy have been finely considered to produce satisfaction on the part of the client and to form a direct contribution to the community.

Necessity of Organization

It is evident that to achieve this result a number of business elements must be introduced into the daily work of the architect and that his organization should be developed accordingly. At this point it may be noted that practically all types of business have more or less standardized forms of office organization. The average architect's office, however, has never been developed on a scientific plan. The result, as everyone knows, is an unstabilized form of organization with crowded offices in busy times and the payroll cut to the bone when business is slack. It is the purpose of this article, therefore, to correlate and present a few conditions and methods which may offer a constructive contribution toward solving this question of developing an organization for architectural work and maintaining it on a well stabilized basis. Let us remember also that an architectural organization may well be primarily of the one-man type. Here one person may be responsible for many business activities which in the cases of larger offices engage the full time of individuals. It will therefore be of interest to consider the business elements which have a rightful place in the architect's organization rather than to establish functional or personnel charts.

We may commence, therefore, with a broad analysis of modern business requirements from the architect's viewpoint. In setting forth these ideas no claim is made on the score of originality nor are there expressed any fine theories. It has been our pleasure not only to have worked actively in the architectural field during the past few years, which have been years of great change in the profession, but to have discussed these subjects with many successful architects in various sections of the country. Consequently such information as may be set forth here consists of the personal opinions and experiences of men active and successful in their application.

The business elements which affect the development of an architectural organization and its service may be broadly divided into two classifications: (*A*) The business interests of the client; (*B*) The architect's personal business interests. We may, therefore, continue our analysis under these subdivisions.

Taking Care of the Client's Interests

There is one certain way of solving the broad problem of retaining and developing a clientele: to so protect the business interests of the client that he will invariably return when he wants additional work done and will readily recommend the architect who has given such service. What brings the client back—art or business? We know of thousands of cases of disgruntled clients who never questioned the artistic merit of work done by their architects, but we have never heard of a case of dissatisfaction where all of the business elements of the project had been properly and efficiently handled by the architect. The answer seems to be that the organization and the personal capacity of the architect must be developed to a point where the artistic production of the office is of a high standard (for this the client expects), and where each of the requisite business functions is recognized and properly provided for.

The first, and perhaps the most important, of these elements has its application in the early or interpretative stage when first designs in the form of sketch plans are being prepared. Here it is necessary, perhaps, to create designs which will have artistic appeal from the client's viewpoint, or which at least will be accepted by him on the architect's recommendation. Of far greater practical importance, however, is the interpretation of the functional requirements of the structure in such a manner that the designer shall produce a building or a building group which will be efficient in purpose—that is, a veritable machine in the form of a building which, whether it be for investment, manufacture, storage or some form of commerce, will achieve the maximum of production at the minimum of investment and maintenance costs. Right at this point may be found the stumbling block which has impeded the development of many architects—failure to properly grasp the building requirements of the client.

Certainly an architect cannot be expected to have the capacity of a jack of all trades—he cannot be expected to possess full knowledge of specialized industries and commercial activities. It is not necessary to be a banker in order to design a bank—or a manufacturer in order to plan a factory. It *is* necessary, however, to be possessed of an analytical mind in order to determine and correlate the problems peculiar to the building in question. It is necessary to be possessed of an acquisitive mind, ready to study the problem not only from the architectural standpoint but from the viewpoint of the client's business. In many cases architects fail to appreciate the value of the services of specialists. For instance, how many architects in connection with the designing of office buildings have consulted the renting and managing agents *before* preparing the plans? We were told the other day of the case of one large office building where, after plans had been completed, no fewer than 43 recommendations for practical changes were made by the building managers, necessitating the preparation of an entirely new set of drawings. Again, we may cite the question of insurance rates in a large office building. How many architects ever submitted sketch plans to an insurance engineer for suggestions? Yet when the plans for a large New York office building were taken from the architect's office and submitted for insurance rating the cost given was approximately 24 cents. The owner himself submitted the plans to an insurance engineer under whose recommendations for certain changes, with slight additional structural cost, the rate was reduced to approximately six cents—about one quarter of that quoted from the architect's original plans.

Importance of Analysis

Summing up these points we find that one of the first requirements of an architect's organization, from a business viewpoint, is possession by some individual in the organization of the capacity to see each problem from the client's business point of view. This individual, whether he be the architect himself or someone brought in as part of his organization, must constitute a veritable requirements department, functioning in consultation with the owner and the designer, engineer and other experts to determine through inquiry the business requirements of the design. Only when these practical considerations are fully understood should sketch plans be prepared and presented to the owner—and there should be a definite reason for every detail of the design presented. Naturally, the relative importance of aesthetic and practical elements may be said to vary in direct ratio to the importance of these elements in the ultimate functioning of the building.

Architects who have become specialists in industrial construction have not achieved this result because they designed beautiful factory buildings, but rather because through special design they have cut down the dead load of floors—substituted ramps for elevators—cut manufacturing costs by reducing handling distances and through good design increased lighting facilities, provided better working quarters and recognized the value of properly housing the human, as well as the inanimate, machinery.

We have made a particular point of the importance of having in the organization an individual of quick business perception who will recognize the business requirements of a project and in so doing protect one of the important business interests of the owner. This individual may often have the promoter's turn of mind and can act gracefully as the architect's representative when preliminary discussions of a large building project are under way. Usually the architect who is personally possessed of such ability is highly successful. Just as often, the architectural organization which lacks in this respect continues its work in a small way.

Having discussed the fitting of design to the business requirements of the client, we may recognize another business problem in fitting the ultimate cost of the building to the amount of money available for such investment. Here again we strike a sore point—a reason why many good clients have been lost. This condition has had particular application during the last few years of fluctuation in building material and labor costs. Fundamentally, we recognize here another direct need which exists in almost every architect's office—more direct field experience—a more practical and direct knowledge of building costs and building methods.

Importance of Cost Estimates

The average owner knows certainly about what amount he is willing to spend on a given building project. It is the duty of the architect, as a building expert, to show him what kind of a building he should have and how large a building of this type he can get for the money he is willing to spend. It is the important function of the architect *to disappoint the client immediately rather than ultimately*, at least as far as the cost of building may be concerned. We are reminded of the famous advertising slogan, "Eventually, why not now?" This certainly applies to building costs and the architect who may gain a reputation of "building within his costs" is also building for the future in no uncertain way.

Of course the reason that ultimate costs so often overrun is largely because insufficient care is given to the important question of estimating. Certainly in the organization, or available to it, there should be an individual, preferably a practical builder, who can really analyze costs. It is true that no man can estimate accurately these days, particularly on sketch plans, but it is equally true that there is no excuse for glaring misstatements of cost. If the architect's organization is not equipped to give preliminary estimates there will always be found dependable and experienced builders whose services may be retained to assist in preparing preliminary estimates. Such services should be paid for on a consulting basis.

Many a successful architect's organization has acquired as a regular staff member a practical builder who acts as field superintendent, estimate checker, purchase order checker, follow up and practical utility man.

Thus far we have considered an architect's organization which has the ability to turn out good design, the capacity for adapting the business requirements of the clients to units of design and the ability to limit the sizes of the buildings to the purses of the owners. All the service an owner can ask in addition to these points is that he shall get the best of materials and workmanship available for the money he entrusts the architect to expend in his behalf.

Organization and Team Work

Here again we find not only a question of organization but of team work within the organization. While the architect, except under unusual conditions, is not called upon to carry out the direct purchasing of materials and hiring of labor, he is of course responsible for the kinds of materials and labor that go into the building. It is his duty to keep thoroughly abreast of developments in the material markets and with new ideas in sanitary and utility equipment. Under his specifications, and subject to his approval, the materials and equipment for the building will be purchased and installed. To show how important one of the larger offices considers the activity of keeping abreast of developments in the way of available materials and equipment we may say that a small department is maintained, the sole business of which is to know of every new idea offering convenience to a guest in a hotel room. Of course this organization specializes in the designing of hotels, but one reason why it has become a great organization has been its close attention to the materials, equipment and methods which the market has to offer for the benefit of its clients.

Every architect, large or small, has the opportunity of studying the market before him at all times. In terms of organization, this means record and reference file clerks. It means the maintenance of an orderly file of catalogs and advertising information as well as a file of precedent in design. It is safe to say that in no group of business offices entrusted with the expenditure of vast sums of money for clients are reference files and records so carelessly maintained as in the offices of most architects. The average architect passes serenely through the bombardment of manufacturers' catalogs—they fall to the right and to the left and seemingly do not affect him. As a matter of fact, the architect cannot be expected individually or through any member of his organization to read every piece of advertising mail matter sent into his office. What is done in many instances—and always should be done—is that all matter descriptive of materials, equipment and methods should be carefully filed for reference when the subject is under consideration. Every member of the organization should recognize the importance of such reference files and should contribute to their proper maintenance by sending to file valuable data obtained from any source. Thus the control of the purchase of materials and equipment will be placed upon a scientific basis of cost and quality comparison. This is of particular importance on a cost-plus project where the architect approves all individual purchases.

Field Supervision

We come finally to the important question of supervision in the field. The relations between the architect, builder and owner offer a complex subject and one affording opportunity of lengthy discussion. For the purpose of this article we may say that one definite need of a practical architect's organization is a dependable supervision department the personnel of which consists of individuals who have had broad experience in actual construction work and who are possessed of sufficient diplomacy and tact to expedite rather than block progress on a work. It may be remembered also that the owner is pleased to see the architect himself on the ground occasionally. There is today in the average architect's office too great a separation between the designing department and the actual field work. Wherever possible designers should have an opportunity of checking their own work in the field if only for the practical experience thus afforded.

The Architect's Personal Business Interests

We have considered the business forces which should be properly developed through the architect's organization as a protection for the interests of the client. In developing his business the architect must also give serious consideration to his personal interests which include production and overhead costs, the distribution of profits and the maintenance of an office organization in dull periods.

The architectural organization will take one of three forms: complete ownership by an individual, a partnership or a corporation. After serious consideration of the nature of the business it would seem that the best form of organization for the architect is a partnership. The average architect's office, carrying on a professional service business, represents practically no investment or capital value. Consequently the ownership of the business means only a right to a certain division of the profits, carrying also the responsibility of meeting deficits.

Certainly a successful organization of this nature develops a reputation and good will, sometimes of great value. As a rule, however, this value is of an intangible nature and can be passed on in the form of the architect's estate only in so far as the remaining owners of the business may agree to pay certain sums to the estate as compensation agreed upon during the life of the architect in question.

A partnership constitutes an ideal form of ownership in this business for various other reasons. An opportunity is offered for the development of a business partnership in which one member is the architect in fact, while the other may be the business man, the diplomat and possibly the "mixer." An organization of this kind, with junior partners developing different aspects of the business, is the ideal organization. Invariably such an organization functions successfully, and with here and there an exception it will be found that the really successful organizations are built upon this plan.

The question of profit sharing has often been brought up for consideration and solutions of many kinds have been attempted without any striking success as far as we know. There is probably no business which fluctuates so greatly. A busy building season comes and all offices are rushed, the demand for draftsmen becomes acute, and the architect prospers. In 60 days the whole situation may change. Office forces are reduced and draftsmen seek everywhere for work. The principal reason for such rapid fluctuation is of course the fact that two or three large jobs will keep the average organization very busy. The architect's product must be sold before it is manufactured, if we may compare his business to that of a manufacturer.

Methods of Profit Sharing

It is evident that those who share in the profits should share in the losses which arise from time to time. Profit sharing, except among those who actually own the business, should therefore be limited.

The cleverest manner in which the general situation has been met seems to us to be the plan developed in one large New York office. This is a partnership with senior and junior partners as described in foregoing paragraphs. Instead of profit sharing this office has developed another plan which helps greatly in maintaining a strong organization. A share of all profits (about 25 per cent) is set aside regularly in the form of a sinking fund. This fund is used during lean periods to pay the salaries of draftsmen and other employes carried on the regular force. Consequently a position in this office becomes highly desirable as it is known that work will be regular and that a position can be held even through a long lean period. A maximum annual sinking fund credit is established and if the percentage of profit overruns this amount a division among employes is made at Christmas in accordance with length of time of employment and amount of salary.

Another method of developing added interest among employes is the assigning of certain projects to designers and draftsmen who are to receive a percentage of profit netted on the work. This method has the value of enlisting the full interest of employes in keeping overhead costs down and in following the work to a successful conclusion. In many offices the designer carries full responsibility for inspecting the work in the field as it progresses.

Meeting Fluctuating Conditions

In view of the known fluctuation of the architect's business it will undoubtedly be of interest to describe the method of maintaining a balanced organization which has been used successfully for several years by a well known firm of architects. This organization consists of the two partners, who employ directly about ten draftsmen. At times there is being handled through this office enough work to keep 100 or more men busy but the organization is never increased or decreased. The policy of this firm is to let out a large proportion of its work to smaller offices, particularly of the "one-man" type. Arrangements are made with these offices almost as though the owners were draftsmen employed in the office.

Payment is made on a time basis, likewise, and all plans bear the imprint of the controlling office.

This plan has many merits. It is easy for the owners because they have none of the troubles of the fluctuating organization. They can take on any amount of work on instant notice and are never at a loss to know how to build up the working force quickly. Again, work given out in this manner helps the younger architect to maintain his small organization and gives him the same practical experience that he might receive if he were carrying the work on his own account. The architects who control this business report that the work turned out is in every manner satisfactory and that service to the owner is often quicker.

An Example of Organization

As in every line of business the subject of efficiency is of great interest in the architect's organization. Undoubtedly, in most offices there is a large amount of waste effort. Seeking the cause for this we find that it is primarily a matter of improper organization and assignment of duties, and that much time is wasted because of poor filing and record keeping systems.

In one of the most efficiently managed offices we have come in contact with, all work is carefully but automatically routed. This office is organized in several departments or divisions:

1, Executive
2, Contract Department
3, Auditing Department
4, Production Division
5, Construction Division

The work of each Department is thoroughly defined. The Executive, through a system of memoranda, reports and progress charts, has his fingers at all times on the pulse of the work. The Contract Department would correspond to the sales force of a commercial organization. Here a full record is kept of all contact with clients *until a contract is signed to carry out the work.* Then the responsibility of the Contract Department ceases except to call on the client occasionally, and independently of the rest of the office, to make certain that he is happy in his treatment by the office. The Contract Department, needing rough sketches or any data in connection with the closing of contracts for work, gets it through written request to the Executive. Regular executive meetings of department heads eliminate much running back and forth.

After the Contract Department has closed with a client a written outline of requirements is prepared and the Executive orders the work carried out by the Production Division while the contract is filed with the Auditing Department. The Production Division consists of designers, draftsmen and engineers. In the Construction Division are the estimators, superintendents and field accountants.

Having fixed upon requirements all plans are called for at a certain date, an advance progress work sheet having been prepared and posted. Costs and practical field information are given as required, by the Construction Division, and the first draft of working drawings is checked by this Division for practical suggestions tending toward more economical or quicker construction. Similar specifications are checked. Whenever it is deemed advisable the plans are checked by a specialist and it is found that cost saving and better service often result. For instance, if plans are required for a building such as a large public garage, suggestions are obtained not only from the owner but from a recognized expert in the management and equipment of such buildings.

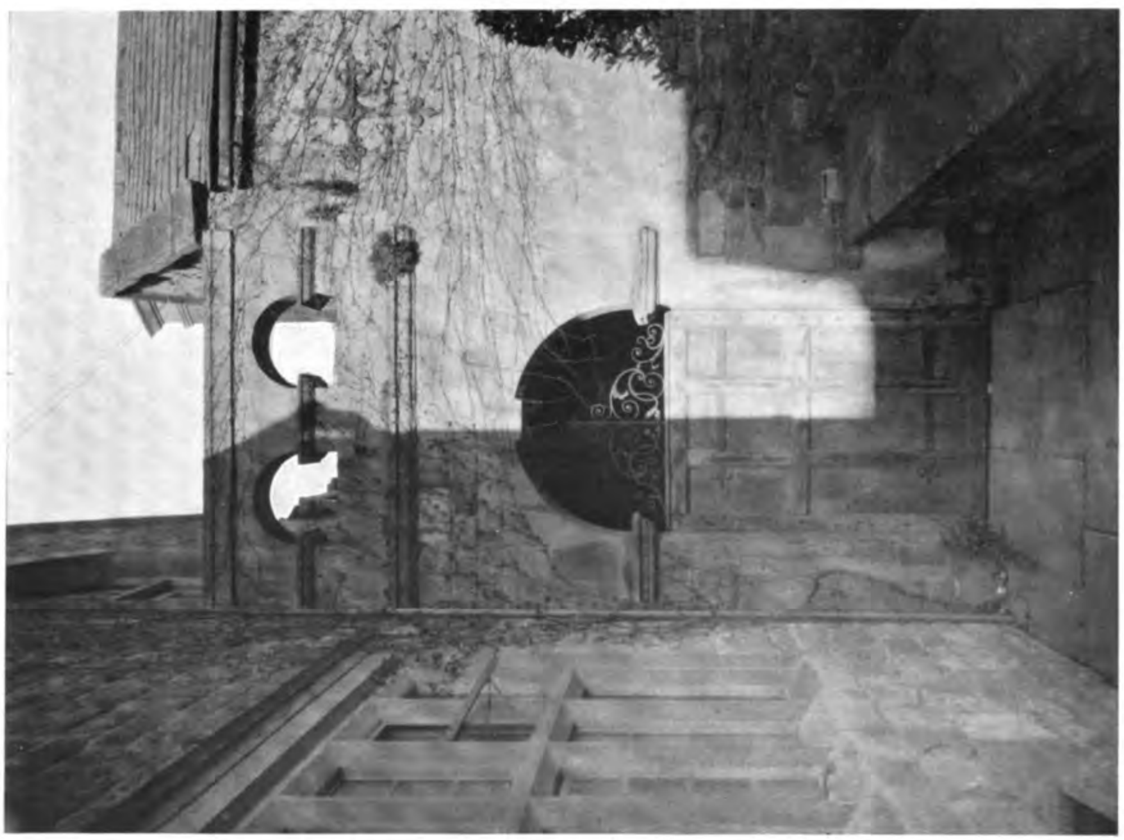
When plans are completed and the work is commenced in the field every assistance possible is given to the builder and to sub-contractors by the practical builders in the Construction Division. Independent progress sheets are maintained and at every point this independent building force is being exerted to save money for the owner. Thus simple, accurate reports can be rendered to the owner as funds are expended and he can at all times have a full record of progress.

The Working of an Office System

In this office all mail is routed by the Auditing Department where the general books and records are kept. The detailed cost records are kept in the Construction Division and audited regularly by the Auditing Department. All manufacturers' literature is sent directly to its classified place in the files and everyone in the office knows that when he is interested in any building material he can find the latest information possessed by the office in its proper place in the files.

This arrangement provides a clean-cut division of authority and responsibility. All business that may come into the office is quickly classified and sent where it belongs. It is either of an executive or a sales nature, has to do with accounts or records, is a matter of design and specification or is relative to a job already under construction. It may be interesting to note here that the Production Division has an inspecting architect visit each project regularly and independently of the Construction Division—thus affording a cross-check on progress.

It must be evident that efficient organization in any architect's office involves a careful study of business requirements and the allocating of various activities in accordance with the size of the organization. The principles of any successful commercial organization may, in part, be applied to that of the architect. Regardless of the size of the organization, if it is to be placed upon a sound, businesslike basis, the first step is to carefully analyze the various responsibilities of the business and to place them with the right individuals, together with sufficient authority to meet them properly.



TWO DETAILS FROM THE COTSWOLD DISTRICT, ENGLAND

PLATE DESCRIPTION

INDUSTRIAL LABORATORY, U. S. BUREAU OF STANDARDS, WASHINGTON, D. C. PLATES 6, 7. In this building, of which Donn & Deming are the architects, is maintained an organization of specialists for research and for the testing of materials and appliances used in various industries. The main portion of the building is 60 x 350 with three wings, each 60 x 104, four stories in height and has the form of a letter E. The two courts are roofed over at the first floor level, forming two one-story shops. The floors and structural frame throughout are of reinforced concrete enclosed with walls of brick with Indiana limestone trimmings. Partitions are of terra cotta blocks plastered on both sides; floors have granolithic finish and terra cotta fillers have been placed between the concrete joists, thus providing for flat ceilings.

The center wing of the three is of special construction, forming an open court from the basement to the third floor for installing various testing machines. The ground floor area of the building is about 1¾ acres. Work was begun in February, 1918, and completed in twelve months and at a cubic foot cost figure of less than 30 cents.

THE U. S. ARMY SUPPLY BASE, SOUTH BROOKLYN. PLATE 8. In planning these buildings the problem was two-fold: to provide for maximum war requirements of direct rail-to-ship movement and of storage and to provide a terminal which could be advantageously operated for commercial uses later.

The vast structures of concrete which were designed by Cass Gilbert embody efficiency of the highest degree. The buildings include two main warehouses known as Warehouses A and B. The illustration shows one view of Warehouse A which is 980 x 200 and eight stories and basement in height. Both these warehouses are entirely of reinforced concrete of the flat slab type. They are of particular interest to architects for their architectural character which has been achieved without the use of a single moulding or cornice.

THE SCHWINN BUILDING, CHICAGO. PLATE 9. This structure, of which Walter W. Ahlschlager is architect, affords a striking example of the successful use of concrete in large commercial buildings. In this building, 80 x 600, not a single brick has been used; the concrete construction consists of the structural mass poured in as small sections as the calculated stresses and strains would allow and while the concrete was still green the forms were stripped and the walls rubbed down with pumice stone. Even the sills are of concrete cast at the same time that the spandrels were poured.

The small squares of ornamentation at the head of the first story windows and also under the coping are of cement colored with a red pigment and were cast in a mould on the site and then nailed to the inside of the forms so that the concrete could be poured around them. Projecting ornament is of terra cotta. The entrance at the end of the building, shown in the illustrations, is entirely of concrete.

BUILDINGS FOR JACKSON MILLS, NASHUA, N. H. PLATES 10, 11. The importance of good design in manufacturing structures is shown in the views of mill and office buildings designed by Lockwood, Greene & Co., Engineers.

The design shows a classic pylon treatment; the lower story has a rusticated surface which gives an appearance of solidity and strength to the mass of the building. All architectural character is the result of studying proportions of the structural parts; the entire building is of reinforced concrete, the exterior finish being had by rubbing with white cement. The lines are extremely simple but to relieve their severity window sashes have been painted an olive green which gives a pleasing contrast to the gray of the concrete. The office building is in keeping with the mill in design but it is of terra cotta blocks stuccoed, inasmuch as this construction proved less expensive in the small building.

OFFICES OF THE NEW ENGLAND POWER CO., WORCESTER, MASS. PLATE 14. This building, of which John Barnard is architect, shows an excellent handling of a problem which is rarely so successfully solved. A structure which is really a business building intruding into a community given up to residences is only too often the entering wedge which begins the process of impairing property values.

In this instance, however, a business structure has been made to resemble a residence which is a distinct asset to the locality and the interior has been planned to offer the maximum in the way of convenience for the purpose in view. Each floor consists of one large open office space with a vault and a toilet upon the lower floor.

BRANCH FIRE STATION FOR CITY OF SALEM, MASS. PLATE 15. Waterstruck brick laid in Flemish bond has been used for the walls of this fire station of which Frank S. Whearty is the architect. The foundation is concrete and construction of the first floor is of steel framing with concrete slabs with steel I beams and wooden joists for the second floor. The roof is of wooden rafters. Sills, imposts, keystones and cornice are of limestone. The hose chute is just outside the front pier and in the basement are the hose drying racks and a drying room for clothes.

HOUSE OF PHILIP P. BARBER, TENAFLY, N. J. PLATE 16. The economy of planning a house of small or moderate size within a rectangle is, of course, well known but it is sometimes difficult to build within a form so restricted and yet avoid a box-like appearance.

The illustrations and plans show a house of which R. C. Hunter & Bro. are architects. Although the house covers an area of only 26 x 40 the plans show nine rooms of excellent size and three baths.

The exterior of the house is treated in a very simple manner, the emphasizing of its strong horizontal lines giving it a somewhat low appearance which brings it into proper relations with its elevated site.

EDITORIAL COMMENT

What Does 1921 Promise for Architects?

THIS question is undoubtedly in the mind of every architect. With each recurring commission laid aside for more favorable circumstances he has visualized the better opportunities of 1921 and taken new courage. Is there reason now to consider his optimism justified? The new year is indeed the hope that has kept the building industry alive through these many months of increasing depression. The new year is now confidently expected to dispel a large measure of that uncertainty which has been a retarding force ever since 1914.

In the last few months we have seen conditions governing general business undergo a vast change. The abnormal period we have passed through was purely the result of the war—and as the war itself was of greater extent than the world had before seen and without precedent, so too was the economic disturbance following it incapable of being judged by the precedents established by other periods of readjustment. The most clever minds of the country were unable to foresee the suddenness with which the change in sentiment and business relations was to take place.

The new year finds us in the midst of readjustment, facing new conditions with the positive assurance that those of the last year will not return. We have by no means reached a period of stabilization; the reaction from absurdly high price levels has been so great and liquidation so rapid that the present market values of many commodities have gone below the actual cost of production. There will without any question be an upward swing to the curve as soon as public confidence is restored but it will be a few years before any permanently stabilized level is reached. The outstanding advantage of the present situation is the entire absence of any fear of a money panic. The only requirements for industrial and commercial prosperity that we lack are adequate purchasing power of the public and the buying spirit resulting from general confidence.

Promise of better things may be taken from the fact that in spite of great inactivity we enter the year 1921 on a sound *deflated* basis. Business of practically any character may now be undertaken with assurance of success whereas in the past years the most careful attention was necessary to provide means of meeting excess costs through immediate and large profits if failure was to be avoided. In building construction very little of that now nearing completion will suffer because in the great majority of instances leases producing enough income to reduce the inflation in a few years were secured in advance of construction.

The country is everywhere, and in all types save possibly industrial work, greatly underbuilt. Housing presents the outstanding shortage and this must soon go ahead under private initiative or the increasing population will make governmental aid necessary. It is estimated that 3,340,000 houses must be built within the next five years if the ratio of 100 houses for 115 families that existed in 1915 is to be regained. In 1890 there were 110 families to every 100 houses; today the average is 121 families to every 100 houses. If residential building in future proceeds no faster than in 1920, at the end of five years there will be 130 families to every 100 houses.

An illuminating index to the amount of building that has been postponed because of unfavorable conditions is given in some statistics prepared by the F. W. Dodge Co. In normal years, the total estimated cost of projected work is about 50% in excess of the amount of contracts actually awarded. In 1919 the excess of contemplated work over actual construction was 68%, and in 1920 the abnormally high figure of 92%. The deficit of building has, therefore, steadily increased.

Active steps to supply this deficiency will be taken when public confidence is restored through satisfaction that a reasonably stable price level has been reached. This condition will not occur immediately. It was several months after the armistice before construction proceeded to any extent. It was delayed until there existed a general feeling that post-war prices were going to remain constant for a period of years. With the start of a construction program in 1920 that promised to eclipse all records prices began to climb. The greed for profits and power by both labor and capital was so great, however, that it proved a boomerang and our inflated prosperity fell of its own weight. The sordid disclosures of the investigation of building practices in New York will have a wholesome influence and we may look for moderation in adjusting prices to demand in the next period of activity.

It is generally expected that the spring months will see prices of building materials stabilized on about the 1919 levels and that with the public realization of stabilized conditions, construction will start in fair volume. With the beginning of activity a healthier tone will be given conditions generally, because prices will become firm and possibly advance slightly, removing the deterrent effects of a falling market. Architects are at the threshold of a period of development in which the extent of their participation will be measured only by their ability to serve.

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Impressions of the Colonial Architecture of Mexico

PART I

By WALTER H. KILHAM

THE south bound train jogs briskly along over a yellow, cactus-sprinkled plain which in the distance sweeps up in vast dull green stretches to a range of towering and jagged mountains, gashed by enormous canyons and circled with floating clouds. Half a mile ahead, intermittently visible around the long curves of the track, is the little train of soldiers—two box cars and an engine—loaded with ragged *Constitucionalistas*, a little short of shoes and uniforms, but long on well filled ammunition belts, who are supposed to protect us from the quite possible raids of the irrepressible roving bandits of the country. Here and there along the track are the adobe or brush-built huts of the native folk, populous with liquid-eyed, brown cherubs, one room for everybody, with possibly an annex for the donkey, and topped with rows of bright orange gourds and squashes. Perhaps in the middle distance a slender, tiled bell tower rises over the white buildings of a *hacienda*, half sunk in masses of green foliage. The stainless sky of perfect azure arches overhead. There is an impression of space and freshness—an almost virgin country ready for exploration and development. Suddenly, as the train rounds a small rise of ground, a magical change of scene is disclosed. Spread closely along a narrow valley lie the huddled pink and blue houses of a populous, old world city. Across one end stride the massive arches of a great aqueduct, while above it, easily dominating the surprising picture, rise the mighty buttresses and domes of an ancient cathedral—massive, timestained and arrogant, defying the inquisitive stare of the Yankee traveler with its air of confident and domineering supremacy. Such, in a paragraph, is a composite impression of Mexico in 1919—a land of dramatic contrasts of old and new, of savagery and civilization, not separated by hundreds of miles, but closely mixed together, the cultivated Latin and the ignorant Indian jostling each other whether in crowded market places or on far spreading plains.

Chapel at Amecameca

Americans who have come to regard Mexico as peopled wholly by roving bands of bandit horsemen, its towns mere collections of adobe huts, without institutions, traditions or history, would do well to remember that while the colonies of Virginia and Massachusetts Bay were nothing but straggling groups of rude log cabins, whose people passed their time in a bare struggle for existence, the royal province of Mexico had been in existence for a good century, and its cities already contained splendid palaces, magnificent churches, colleges, aqueducts and bridges of solid masonry, while the arts of printing, metal working, bell founding and others had long been advanced to a high state of perfection. The Spanish invaders, who effected their conquest in 1519–20, immediately began a systematic colonizing scheme which, like all Spanish colonization, was a model of its particular kind. Ship after ship brought scores and hundreds not only of priests and soldiers, but architects, engineers and skilled artisans of every sort who, utilizing the abundance of native labor which was at hand, razed the cities of the Aztecs and on their ruins began the mighty structures which are now the wonder of every visitor to the Republic of Mexico.

Tower and Buttresses, Mexico City

As has been the case only too often in other places, the country's wealth has been the fateful cause of most of its own misery. Those who deride Mexico's unhappy plight today, free and independent for a century without having ever been able to establish a stable government or take an honored place in the family of nations, ought to remember that never, from the days of Cortez to the present, have any considerable number of foreigners entered Mexico with the idea of helping the country even to the simple extent of becoming useful and industrious citizens; whether the invaders were Spanish, French or American, the basic object was the exploitation of the nation's natural resources of whatever product was most coveted at the moment. Any visitor to a strange land brings away about what he takes in, and one who goes to Mexico for the purpose of enjoying the many delightful features of the country, instead of criticising its institutions, will find much that is pleasing and indeed worthy of imitation, while the architect, with his mind trained to the reception of the pic-

Portal of Cathedral, Mexico City

Church of Vera Cruz, Mexico City

torial and beautiful, will find the country a veritable treasury of brilliant color, exuberant detail, and noble outline and mass.

For a day previous to reaching the frontier the south bound traveler is treated to a panorama of the dejected streets of Arkansas villages, deep in mud, the promenade of inquisitive brown spotted hogs, and the cheap frame shacks of Texas prairie towns—some right side up on their legitimate foundations and others upside down in the distance, wherever they may have been deposited by the playful breezes of the southwest. Once across the river, however, even the rather disreputable border town of Nuevo Laredo is at least built of solid masonry and encloses in its midst a clean, well kept and much used park with the inevitable Mexican tin band stand which even so discriminating a visitor as Flandrau admits one eventually begins to like.

Cathedral Dome and Transept

The intent of this article, as requested by the Editor, was to adhere closely to the technical discussion of Mexican architecture during the viceregal period, but no one with any temperament at all can succeed in keeping the architecture, scenery and people of Mexico entirely separated. Mexico is essentially a pictorial country, not picturesque—for I abhor that word—but a place where everything at all times composes itself into a picture, frequently, perhaps, a chromo with a good deal of "jazz" in the coloring, but still a picture, and even if the inimitable Flandrau says that everybody in the republic looked to him at first like a homemade cigar, he himself immediately admitted that among all classes of Mexicans there is an extraordinary amount of beauty which forms an intensely diverting adjunct to the architecture. For Mexico has a real architecture which is well worth investigation and which, with the now realized advent of peace, must soon become a

Cathedral and Sagrario, Mexico City

favorite study for American architects and designers.

The architecture of the colonial period in Mexico, as might be expected, derives its general style from that of the corresponding period in Spain, the mother country, and in some notable examples follows precedent very closely. The salient features of Spanish renaissance work are in general the sharp, even theatrical, contrast of highly enriched areas with broad expanses of absolutely plain surfaces, and the enclosing of the enrichment around doorways within definite and well defined boundaries. Both of these features are undoubtedly the result of the Moorish influence in Spain, and both were transferred to Mexico in their entirety. The churches and palaces of the new provinces also inherited in full measure the strongly dominating effect of the churches of the old country, combined with a sort of swaggering expression which, in the palaces especially, replaces the cheerful, domestic aspect of a French or English manor house. In fact, the feeling of confidence and strength is everywhere apparent in this early work. Even among all the intricacies of the most rococo designs, the mouldings are firm in scale—never weak or uncertain—and the carving is brilliant and strong. The *cimborio* of the Spanish church develops in Mexico into the dome which, in its half-orange form, was multiplied over the crossings of churches in astonishing numbers. These domes are built of solid masonry, and usually topped with lanterns and charmingly decorated with windows and buttresses. So numerous are they that one begins to think that the builders must have experienced a real pleasure in their construction and preferred them to any other form of roofing. The old church of Atzcapotzalco, for example, has five domes of large size besides various small ones, and this church is not an exception in any sense. From plain and massive bases rise the great church towers, topped with highly enriched belfries, packed with ancient and melodious bells, and capped with little domes of blue and yellow tiles. The decoration of buildings by tiles is peculiarly Mexican and is a beautiful feature which would merit a chapter by itself. The art of manufacturing glazed tiles and faience was brought to Puebla by potters from Talavera in Spain and carried to a high degree of perfection. The blue, yellow and white tiles were used for the coverings of domes, towers and walls of buildings with indescribably charming results which no photograph can reproduce. Even so little known a building as the *Casa de los Azulejos* in Mexico City well deserves to be the subject of an architectural monograph, although its delicate coloring is inimitable by modern "quantity production" methods.

Doorway of Sagrario, Mexico City

The dry vocabulary of technical description fails when one comes to the question of the carved

Tiled Domes from the Roof Tops, San Angel church fronts and palace portals which exist in great profusion. It is true that a family likeness runs through all, that the eye eventually tires of the curls and twists of the mouldings and the eternal corkscrew columns and frequently crude details of the niches and arches which decorate the facades, the offspring of the baroque and Churrigueresque fantasies of old Spain; one begins to formulate lines about "crooked architecture for crooked people" and to draw hasty conclusions as to the morality of the originators of these sinuous designs. But one quickly perceives that the detail of the doorway is only a small part of the picture. The massive buttresses of severest simplicity rise grandly on either side, colored in the most delicate tones of pink and yellow, their plain surfaces contrasting with and emphasizing the enrichment of the center; the ancient stone pavement leads to a richly carved door which alone would repay a day's study; adjoining may be a spacious old arcade or ancient garden wall topped by cypresses three centuries old.

Dome and Lantern, San Angel

The peaceful tide of semi-Indian traffic flows quietly along the narrow street, perhaps to a carved fountain which was flowing when New York was not even a trading post, and any article made of stone, except perhaps an Indian battle axe, would have been non-existent in the English colonies. It is difficult to realize Mexico's age.

The old Spanish architects were strong on line and proportion, and their construction was of the best, but color everywhere becomes the keynote of their work. This color, fresh, brilliant and sparkling in the crystalline air, may be intentional, as in the domes of glazed tiles at San Angel and the walls of tender pink *tezontle* at Guadalupe Hidalgo, or it may be accidental, as in the stucco facade of the old church of Xochimilco, where an undertone of lemon yellow is overlaid by a later tone of most delicate pink, mellowed and seasoned by the weather. Even the peons have a strong eye for color which they manifest, when possible, in their surprising combinations of costume; if they are unable to acquire a magenta scarf or a pair of yellow drawers to wear outside their trousers they will make up for it by carrying a basket of oranges or ripe tomatoes; at any event the color is there in some form.

The most important and probably the best known ecclesiastical building in the country is the cathedral of Mexico City whose size alone (length of inside walls 387 feet, width 177 feet, height 179 feet) entitles it to rank with churches of the first order, and as a matter of fact I think that the style and dignity of its main facade are easily able to qualify it as one of the finest renaissance churches in the world. One may quibble at the great inverted consoles which surmount the buttresses and possibly at the lack of simplicity in the lower portions, but all such minor defects are more than balanced by the two magnificent towers which are not only finely proportioned but convey a certain subtle impression of the spirit of Latin America, which differentiates them from all others. The design of the belfries is most unusual, an octagonal chamber enclosed within a square pavilion-like structure, and is very successfully treated; on days of ceremonial, when a mammoth red, white and green national flag is hoisted on the flagstaff between the yellow masses of the two towers, its drooping folds lazily swaying in the wind against the clear blue sky above the busy square, the effect is as fine as anything I know

Domes, Lanterns and Towers

of anywhere. The interior is rather cold in color, with a glaring light from the high windows of plain glass, but there are several altars of blazing gold and the vista from one of the aisles through the alternating lights and shadows of the passage to the adjoining *Sagrario Metropolitano*, with its groups of black clad worshipers, is pictorial in the highest degree. As in most Mexican churches, the bells with their peculiar hanging are a prominent feature and in this case they are mechanically remarkable, for the largest is 16½ feet high, weighs 27,000 pounds, and was cast in the suburb of Tacubaya in 1792. Its "grave, sweet, and penetrating tones" (Terry) float above the roofs of the city to a long distance.

The Bells of San Angel

The church interiors are apt to be disappointing, for although they are generally carried out in honest and massive masonry, and are frequently well proportioned, the walls are so often covered with rather cheap and gaudy frescoes that much of their good effect is lost; they are redeemed to some extent by the color and heavy gold leaf of the carved wooden rococo *retablos* which succeed in conveying a certain imposing idea of barbaric splendor which is doubtless highly impressive to the simple peon worshipers. Many of the details of ornament in the Mexican churches can hardly be called masterpieces, but depend for their effectiveness chiefly upon excellence of scale, boldness of execution and what might be called their general suitability to the purposes for which they were made. That in design and execution they often fall far short of what would satisfy a discriminating architect today was proved not long ago when one of these Mexican *retablos* from a dismantled church was offered at auction in New York. Huge sections of roughly carved and rather gaudily colored wood exposed amid the dust and debris of an auction room lost much of the impressive splendor which they doubtless had in the original setting.

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City Hall and Cathedral, San Luis Potosi

Tower Hill School, Wilmington, Del.

BROWN & WHITESIDE, ARCHITECTS

IN the designing and planning of a private school an architect is not restricted or limited by many of the considerations which often affect the planning of a public school. The funds for the construction of a private school are usually provided by individuals or supplied by school associations, so that they do not come from the public revenue, and there is not often the resulting necessity for rigid economy which is sometimes so misapplied that much crippling and handicapping of otherwise free and intelligent solutions result. A private school is generally planned to accommodate no more than a given number of pupils and therefore the architect need not consider the necessity of turning to account, for the actual use of pupils, every available foot of area within the building, which is often necessary in the overcrowded condition of the public schools. Designing a private school, therefore, offers an opportunity much broader than is apt to be afforded in planning a public school of any kind.

Art Room over Master's Office

The Tower Hill School was designed to provide for 500 pupils and when it was opened about half that number were in attendance. It is a day school and therefore many of the problems met in the planning of residence or boarding schools were not considered. The building, with its furnishings and equipment, was the gift of several donors and it was their desire that the school be complete in every respect and that without the sacrifice of anything in the way of utility the building should possess distinct architectural merit and be such as would favorably impress the pupils at ages when ideas and standards of values are usually formed.

The buildings, which occupy a plot of considerable area, constitute a group of three structures—a central building of two stories and two one-story pavilions which are connected with the main structure by corridors or enclosed arcades. One of these pavilions contains the kindergarten while in the other is the assembly room or auditorium. The semi-isolation of these two buildings from the main structure makes possible their being operated independently and removes two possible sources of disturbance to the rest of the school life. Piano recitals, lectures or moving picture performances may be given in the auditorium without in any way causing interruption to the general routine.

East Arcade Looking toward Kindergarten

In the central or main building there are 9 class rooms, library, gymnasium, chemical and physical laboratories, study rooms for elementary and high school work, instructors' retiring rooms and first aid department, together with rooms for special courses such as model kitchens, domestic science laboratory, practice dining room, manual training room and refectory, and such utilities as laundry, kitchen, heating plant and refrigeration rooms. One part of the manual training room, which contains moving machinery, is shut off from the rest of the department and the refectory, where luncheon is served

Manual Training Room in Basement

daily on the self service or cafeteria plan, is managed by the domestic service department.

The wisdom of placing certain rooms of school buildings in basement portions which are necessarily at least partially below grade is a question upon which much might be written, but it may be observed here that the decision in such an instance should never be made without duly considering all the values at stake. Where such rooms would be badly lighted and insufficiently ventilated use of basement space would obviously be a mistake, but in this instance it has been found entirely practicable to place here such rooms as domestic science laboratory, manual training department, laundry and the kitchen, practice dining room and refectory with their various offices. The ground upon which these school buildings have been constructed falls abruptly in such a way that large windows and areaways of considerable width on one side of the buildings have made possible the use of such space in the basement.

The planning of the school has been done with the idea of securing the utmost in the way of convenience, both as to arrangement and equipment. The buildings are so grouped that the kindergarten, with three sides exposed, receives sunshine almost all day while the class rooms receive the sun throughout at least a large part of the school day; no shadows can be cast upon walls through which light enters the class rooms. Apparatus for heating and ventilating has been carefully planned and the type of windows used for the class rooms is such that they afford either the minimum or the maximum amount of outdoor opening. This type of window was found to be fairly expensive but it was thought advisable to install them as giving the widest flexibility in the way of lighting and ventilation and providing direct ventilation in seasons when the entire heating and ventilating systems would not be in use. Vacuum cleaners have proved to be advantageous and economical.

Due provision has been made for such details as electric illumination and electric power in the manual training rooms and mechanical plant. Program clocks, operated from the headmaster's office, are installed and a complete inter-communicating telephone system, operated from a switchboard at the information desk, brings the various departments into close touch.

In design the buildings follow what might be called the sentiment and feeling of the later English renaissance and they possess a high degree of scholastic merit and architectural consistency. The exterior walls are of brick laid up in Flemish bond and trimmed with limestone. The buildings, with the exceptions of doors, door trim, panel work in some rooms and wood floors in certain instances, are of non-combustible materials. Foundation walls below grade are of concrete, floors are of combination tile and reinforced concrete and the partitions are of tile.

The covering of floors throughout the building has been given particular attention. For certain rooms, such as auditorium, kindergarten, gymnasium, and in some other instances, wood floors seemed to be both necessary and desirable. Other rooms, and the corridors throughout, are floored with American quarry tile and sanitary bases of this material are placed around all the class rooms, where a linoleum tile floor is laid. This treatment, while fairly expensive, has been found to be practical for it is readily cleaned, practically noiseless and its color and design add to the attractiveness of the class rooms. Glass slides are used on furniture to prevent scarring the linoleum.

View in Kindergarten Wing

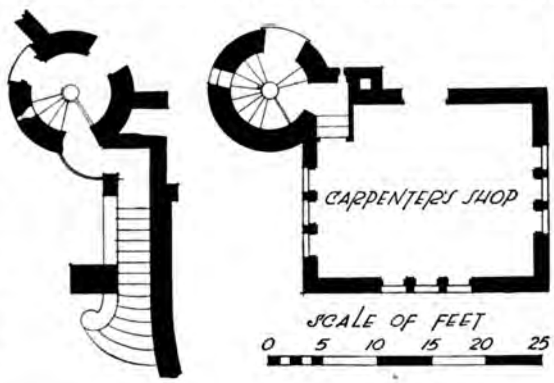
Farm Buildings of Arthur Curtiss James, Esq.
Newport, R. I.

By W. F. ANDERSON

GROSVENOR ATTERBURY AND STOWE PHELPS, ASSOCIATED ARCHITECTS

TO those familiar with the Rhode Island coast line in the vicinity of Newport but small introduction is needed concerning the natural beauties, which the architect finds as a setting for his proposed buildings. For the benefit of those unacquainted with this stretch of coast, it may not be amiss to say that generally it is a rocky shore with small beaches, and bays formed between projecting points. Such in general are the conditions at this estate, and such a hollow facing toward the water was chosen as the site for the farm group. The land contours favored placing the buildings in a curved line, not entirely regular but sufficiently so to give, from a bird's-eye view, a rough horseshoe shape.

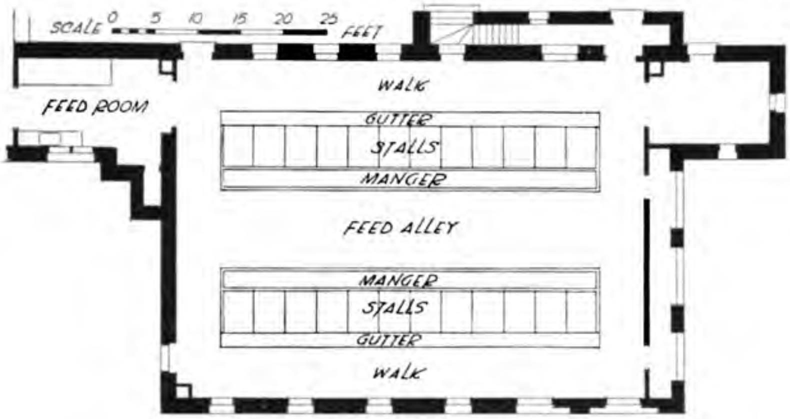
The visitor's first impression is that he has entered a village of Northern Italy. There are the same stone walls laid with wide flush joints in light mortar, the old moss colored tile, the irregular roof lines of higher buildings and the home-like cottages against the hillside. The eye follows the curving road around the little valley between the hills, and as the visitor actually travels the road, he crosses, on the top of the bridge, over the road by which he entered, and thence by a higher level on and up the hills to other parts of the estate.



As might be expected the ground provided all the stone needed for the masonry work, and a fair sized quarry was developed in the process of excavation. The stone is of granite formation, and where exposed to view is laid in random ashlar with the joints slushed full. In many places the mortar has been spread out and resembles a stucco surface. The stones framing all openings were cut to a line but not dressed. The voussoirs of arches were roughly formed to shape, no two of the same size. The general wall thickness is 20 inches.

Roofing tile used are unusual and follow an old hand made tile in design and finish; they are of mission shape, hand combed and sprayed with

Carpenter Shop from Plaza of Cow Barn

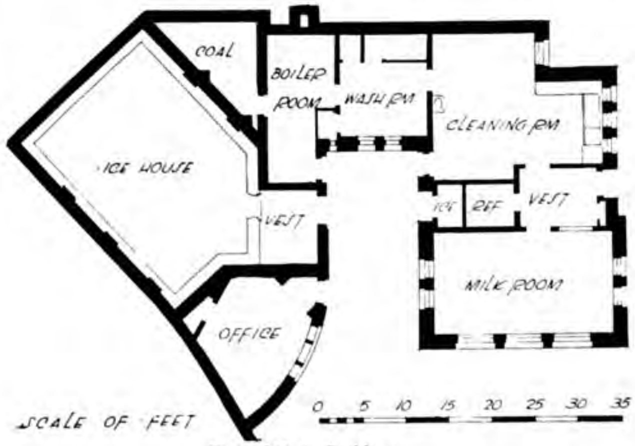


Plan of Cow Barn

pigments before firing and the color effect is that of a surface covered with moss and lichens. Comparatively little woodwork is exposed to view and this is partly painted and partly stained.

The farm group proper is composed of a cow barn, accommodating 24 cows, and an L shaped extension in which are located the feed and hay storage spaces besides a maternity building, bull pens, dairy and ice houses, two cottages accommodating one family each, carpenter shop and work building, garage and storage sheds. The natural ground level permitted construction of a stable with six horse stalls and a wagon shed beneath the cow barn which stands at one end of the bridge over the main drive.

The carpenter shop stands on high ground at the opposite end of the bridge. Here, beneath the roadway, were constructed storage sheds and coal pockets. The exposed walls of these structures are of stone, matching all other stonework and blended into the ensemble in a very pleasing manner. In the buildings where the stock are quartered, the walls are damp-proofed on metal lath.

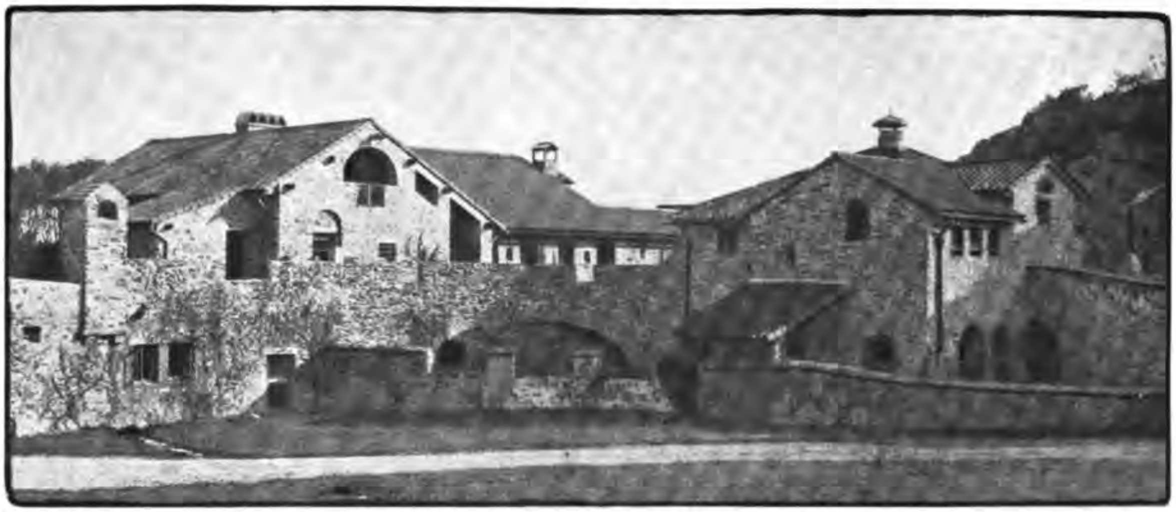


Plan of Dairy Building

Entrance to Bull Pens in Maternity Building (G)

In the cow barn the floors of the stalls are laid in cork brick and other floors are of cement.

In the dairy one finds white ceramic tile floors throughout, with white glazed tile walls from floor to ceiling in vestibule, milk room and cleaning room, and tile wainscots in wash room and toilet. Everything in connection with the dairy is arranged to promote cleanliness and purity of the milk products. The receiving tank is located in the vestibule and discharges through a pipe into the cooler located in the milk room. Here are installed a cooling apparatus operated by electric pump and water circulating system, a separator,



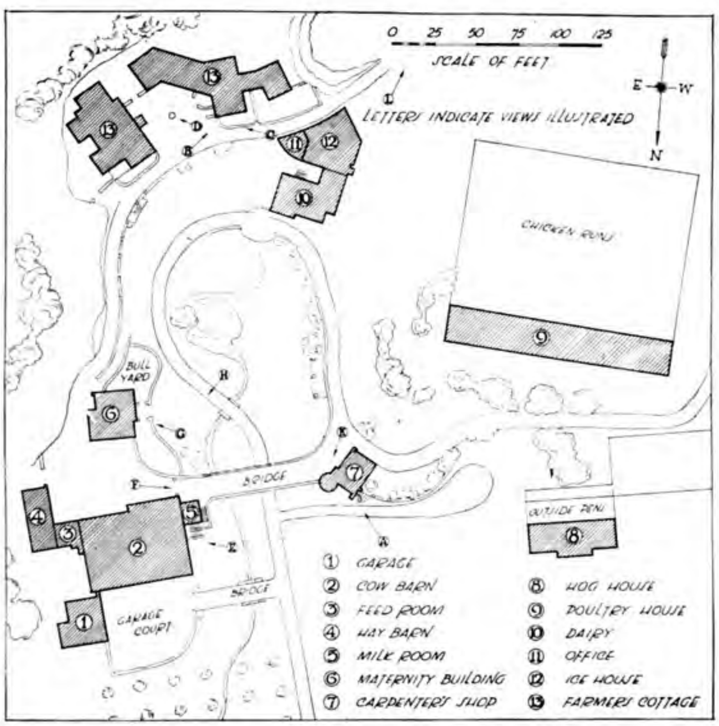
Cow Barn (Left) and Maternity Building (Right) with Bull Pens in Lower Story (H)

bottle filler, churn and other devices of like character. So far as possible all machinery is driven by electric motors.

A complete high pressure steam boiler is provided to supply live steam at the various points needed. The washing room contains the steam bottle washers and sterilizers, and just beyond are shower baths for the men, a washing machine to wash white working clothes and a hot room for drying them.

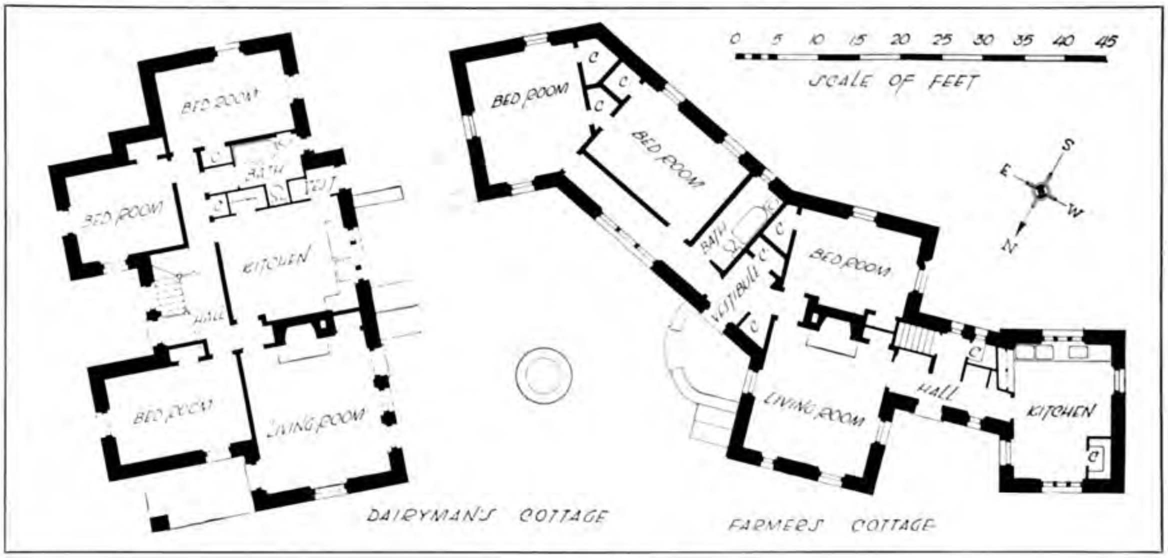
One very interesting feature of the dairy is the refrigerator. This has the ice chamber at the back, so that it can be easily filled, and the front portion is of tile and fitted with glass shelves. It is lighted by electricity and, particularly when illuminated, makes an attractive exhibit. The ice house is built directly against the cliff wall and the roof is covered with earth in which trees and shrubbery are growing. It is connected directly with the dairy building, for ease of access, and is constructed of masonry matching the other buildings. The walls are insulated with mill shavings behind sheathing boards.

The carpenter shop and the farm office buildings presented opportunities for architectural effect.



Block Plan (Arrows and Letters Show Angles at which Views are Taken)

Upper Part of Carpenter Shop (K)



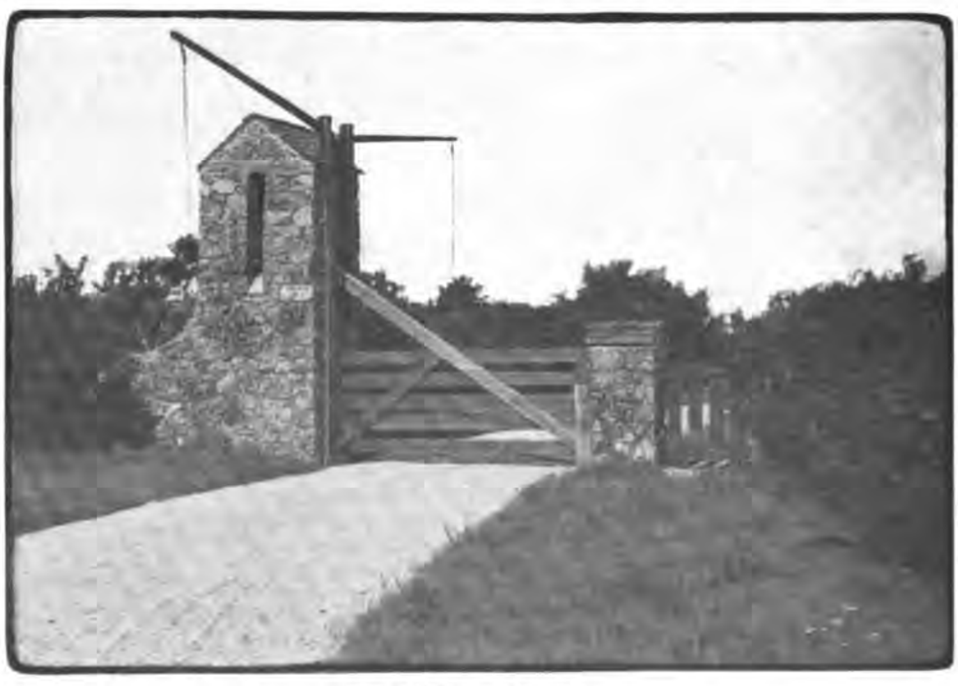
Plan of Cottage Group

The shop is built with stone walls pointed up and left exposed on the inside. The outside stone stairs and the weather vane supply attractive bits of detail. As far as possible all lumber used was obtained from old buildings with natural weathered surfaces. Rafters, beams and floor boards are laid to show the weathered surfaces. The doors are of pecky cypress; new stock was stained and antiqued.

The farm office follows the same general scheme but has the inside of the walls finished in rough Portland cement. The fact that this building is erected against the side of the cliff which forms one wall determined this finish.

The cottages in their inside arrangements for living accommodations conform to the plan of the best buildings of their class. The interiors of these cottages and of the farm office are as thoroughly Italian in color scheme and detail as the exteriors. By means of the large fireplaces, heavy beamed ceilings, and bright colors used in the decorations, the old world atmosphere is faithfully preserved.

The piggery with its adjoining yards must not be overlooked, nor the smoke house. Here in rooms devoted to killing, dressing and smoking, the young porker is converted into his ultimate form of ham and bacon in the most approved manner.



South Entrance Gate (L)

ENGINEERING DEPARTMENT

Charles A. Whittemore, *Associate Editor*

Terra Cotta Roofing Tile

PART I

By ALFRED LO CASCIO

THE subject of terra cotta roofing tile has been discussed from time to time from almost every angle but, notwithstanding this, the fact remains that in some sections of the country roofing tile is but seldom used. There is no question but that vitrified shale tiles are highly artistic in color and form, and are practical for use with almost any type of building. Many opportunities have presented themselves to owners, architects and builders for making very artistic structures out of work in hand, where the finishing touches could have been given by the use of tile, but for some reason or other these opportunities have often been neglected.

The question naturally arises whether the owner, architect, builder or manufacturer is at fault. In this age of progress and selection of materials from the standpoint of durability instead of that of first cost, it would seem as though the use of terra cotta tiles at present should far exceed their use in the past. It may be that many architects fully intend to use roofing tile in their projects but that stress is laid so frequently on economy that some other form of roofing is adopted; this economical turn gains the day from the standpoint of first cost, although in the course of a few years the maintenance cost of the other material may far exceed the increased initial expenditure if tile had been used.

If the manufacturer is at fault, it may be that he has not sufficiently advertised, or his salesmen have not sufficiently emphasized, the essential durability and practicability of roofing tile, and also the ultimate economy which will inevitably result from its use. If the architect is at fault it may possibly be because he has not taken time to investigate the great merits and the adaptability of the various kinds of roofing tile, and the attractive and pleasing variations in textures and artistic color schemes which may be worked out with these products—color schemes which will last indefinitely and be mellowed with the passing of time.

The owner may be a trifle at fault, perhaps, due to false impressions of price and first cost, and also because the material is not often presented in the light of its true and lasting values. Undoubtedly it would be beneficial to many of our fine buildings and residences, if all of the people interested in the production and

House at Brookline, Mass., with Red French Tile Roof
Newhall & Blevins, Architects

House at Philadelphia, Pa., with Red Shingle Tile Roof
E. Allen Wilson, Architect

the use of tile roofing would investigate a little more fully the field of its possibilities and would co-operate with each other. This would effect a decided change in the attitude of the general public towards this material which, undoubtedly, in the course of time, will be more generally used because of its merit, and in spite of the present lack of tendency to more general use.

In this product, as with most manufactured materials, the cost of the pattern is a considerable factor. Few factories are equipped with machinery for special pattern work, and the manufacturers frequently place all sorts of obstacles in the way of using special forms, shapes and sizes, and urge, instead, the acceptance of stock products. The time has come, however, when some manufacturers are paying special attention to individual treatment and design, special colors, special surfacing and other details which make for individuality. They are also glad to work to the best of their ability with architects, experimenting without end to get the desired effects, providing there is a sufficient interest to stimulate their endeavors.

Fig. 1. Spanish or Old Mission Roof Tile

Fig. 2. French Type Tile, Hip and Ridge

Architects should realize that factory conditions are frequently such that the manufacturer may not be able to produce special tile in the time allowed, no matter how keen his willingness and desire to do so may be. The cost of such a product does not deter the manufacturer, provided his time allowance or other factors permit his producing the special work. It is obvious that when special work is ordered the architect or owner must be prepared to find slight variations in the completed product. A knowledge of kiln work, firing and other process details would immediately demonstrate the impracticability of expecting each tile to exactly duplicate in color and marking the sample submitted. The variations are slight, however, and are due only to the manufacturer's earnest endeavor to produce perfect results. Just such efforts as these bring forth the moss covered tile, the hand roughened surfaces and various antique sprays, all of which contribute to the general aged appearance so that many roofs in which these materials have been used have the appearance of being far older than they actually are, often adding largely to the appearance of the finished buildings. Color schemes and textures may be used in certain constructions so that tiles wonderfully resemble those toned by nature's processes, and will produce such effects as are so often seen in foreign countries—roofs aged, with the hard lines lost, even to the valleys being rounded, the surfaces swinging gracefully from roof to roof with mitered hips.

Fig. 3. Closed Shingle Tile with Hip and Ridge

There are three general forms of roofing tile now in common use: the Spanish or old mission, (Fig. 1) French, (Fig. 2) and closed shingle, (Fig. 3). Each type illustrated here has an appropriate setting and

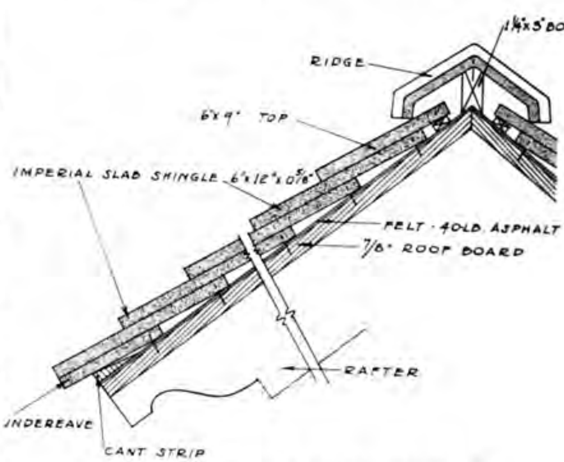


Fig. 4. Section Showing 6-inch Slab Shingle Tile

each type has its particular use. The Spanish tile would be obviously out of place in the small cottage, but in the monumental building it adds far more to the general appearance than would the closed shingle tile. It also adds "scale" to the structure and this feature must always be considered. A large, unbroken expanse of roof requires some texture, character or lines to add interest to the surface. In a small, broken up roof, on the contrary, the Spanish or French tile would only create an appearance of restlessness, due to the small surfaces.

In connection with the installation of each kind of tile there are differences in the preparatory carpenter work which must not be overlooked when planning for their use. The principal difficulty in the use of tile for roofs probably lies in the fact that until recent years the architect and contractor were not familiar with the necessary construction and details of their use, which differ materially from the details adapted for use in any other form of roofing.

Fig. 5. Yale College Memorial Quadrangle, New Haven, Conn.
James Gamble Rogers, Architect

It is very simple to arrange the construction as may be necessary to take care of the different points, but in order to make clear the preparatory work which should be done, before the tiles themselves are used, it would be well to study carefully some details regarding their use.

Fig. 4 shows the construction used in both eaves and ridge where shingle tile is used. This tile usually comes about 6 inches wide, 12 inches long and ⅜ to ⅝ inch thick. In connection with this shingle tile it is necessary to provide at the eaves of the roof a cant strip of wood approximately 1¼ inches high, beveled to nothing on the roof. Over this the roofing felt is placed, then a hip and ridge board approximately 1¼ inches thick and 3 inches high is used at all hips and ridges to receive the hip and ridge tile. It makes a far better construction to place the hip and ridge boards over the felt after the roof has been papered in, and these boards should be placed when the tile man arrives on the job to begin his work, and under his direction. Besides using elastic cement for both constructions, the hip and ridge tile are nailed in place to the hip and ridge boards.

Fig. 5 is a photograph illustrating the use of this shingle tile, with the eaves and preparation for ridge board clearly indicated.

Figs. 6 and 7 show the type of construction with the flat deck roof joining the tile sloping roof over the tile. This construction is very simple and practical, and yet it is perhaps not so well known as some of the other methods of roofing. After placing a 2 x 6 board all around the top of the deck, 3 x 4 openings about 10 feet apart are made, forming cutouts, which are thoroughly flashed, and over this the ridge tile is placed, giving a finished appear-

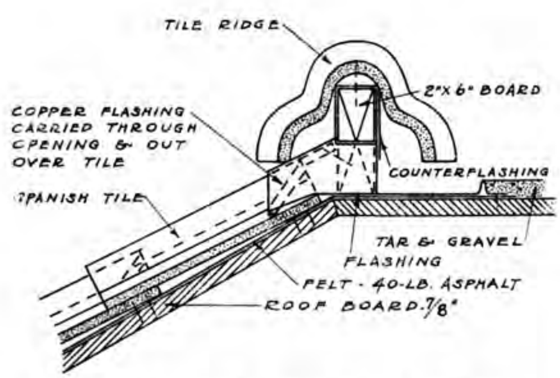


Fig. 6. Method of Flashing at Deck to Carry Water over Tile

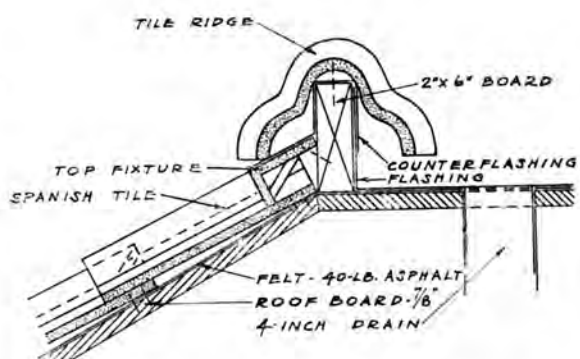


Fig. 7. Method of Flashing at Deck When Inside Drain Pipe Is Used

Roof of Spanish or Old Mission Tile Showing Usual Practice in Sloping from Vertical Walls

ance and indicating the flat roof in back of the original board. This construction can also be applied even though the water is taken down through the building somewhere on the flat roof; the same counter and under flashing in connection with the 2 x 6 board will give a perfect construction. If flat tile is used, in place of the Spanish roll tile, and if the ridge is angular instead of round, the same construction applies with the exception that the height of the ridge board is changed, and a 2 x 3 instead of 2 x 6 is used, depending, of course, upon the pitch of the roof and the kind of tile used.

Fig. 8 shows a method of flashing a valley with copper or other metal. In this case, the copper used is 20-inch stock, 10 inches turned up on each side and turned up 1 inch along the edge the full length of the valley, and cleated with a small strip of copper to the board roof in a manner to prevent nailing through the copper valley itself. Care should be taken that the roofing paper is placed over the metal valley. This, of course, is a construction

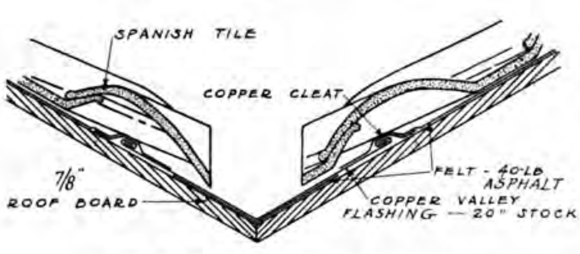


Fig. 8. Section Showing Valley Flashing

where only a few inches of the copper on each side of the valley are exposed. If a rounded valley, such as is used with heavy shingle tile, is desired the flashing must be over and under every course of tile. Valley tiles, meaning the finish on each side of the valley itself, are specially made to fit the pitch of the roof, which is far better than attempting to cut the valley tile. This would leave openings in every course, while the specially made tile is closed throughout the length of the valley.

In connection with the different types of tile installations, it is well to call to mind again one of the uses of roofing tile which has frequently been neglected; that is, for parapet covers. Fig. 9 shows two methods of using the stock tile for this purpose. There is also a special terra cotta tile made for the express purpose of covering parapet walls. Wherever these walls are covered, especially in the cases of low parapets, copper should be carried up on the inside of the wall and flashed in under the tile.

The methods of application and conditions under which tile are used in the old world countries are well recognized to have very little in common with the roofing problems encountered in central North America. It is common knowledge that many were the dismal failures where English or Mediterranean methods were followed for the exclusion of the elements when American roofing tile was in its infancy or when importations themselves were employed.

With unsatisfactory tile roofs in many architects' minds a decade ago, the manufacturers have built

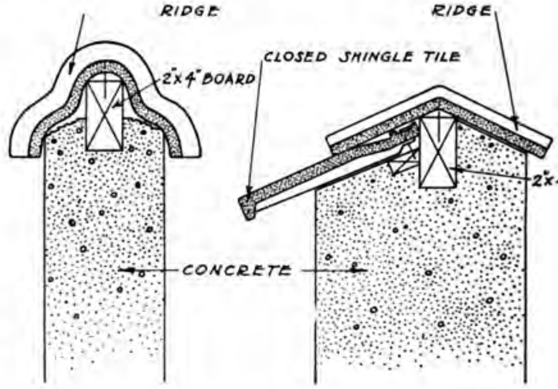


Fig. 9. Example of Tiling for Parapet Walls

up a tile suitable to our requirements. Styles which were considered "unique" at the time were abandoned and forms which fulfill the ideals of students of European work of merit are incorporated with the substantial clay body now used—a truly uphill task and a commendable piece of progress.

With the plastic materials at hand it is desirable that the effects produced should not deviate from those conceived within the limits of the ceramic arts.

Truss Design and Details

PART IV. WOODEN ROOF TRUSSES

By CHARLES L. SHEDD, C.E.

IT IS common in wooden buildings to have an inclined roof and when such is the case and the span is great enough to require a truss, one of such shape as shown in Fig. 14 is frequently used.

In this diagram the wooden members are shown by heavy lines and the steel or wrought iron rods by light lines. All of the wooden members resist compression except the bottom chord. Some designers have constructed this too of steel, espe-

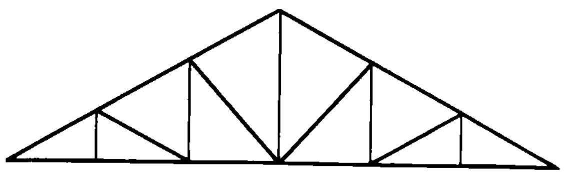


Fig. 14

cially in heavy trusses where the framing of notches in this stick together with the area required for direct stress necessitated an unusually large stick of timber. All of the rods resist tension except the short vertical rods near the end which do not resist any stress unless there is a load on the bottom chord such as a ceiling or a hung balcony. When there is no stress in this rod it may be omitted unless the span of the lower chord from the support to the first panel point is so great that the member would sag too much under its own weight.

A detail of one of the interior joints is shown in Fig. 15. Here is also shown the manner of constructing the roof purlin and timbers to rest on the truss.

The boards run at right angles to the truss and are nailed to rafters running parallel to the truss and on the incline. These rafters are fastened to purlins under them which, in turn, run at right angles to the truss. The rafters are notched slightly over the purlin, say about one inch, to prevent

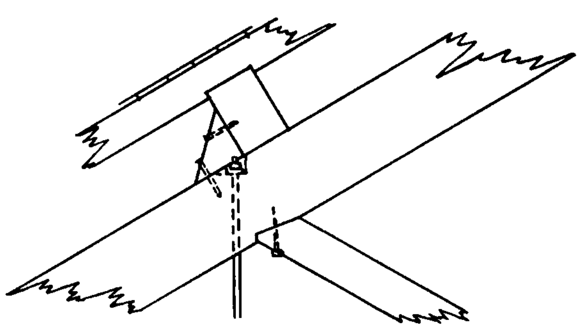


Fig. 15

slipping and to aid in accuracy of framing. These purlins act as beams. Their principal loads are from the dead load of the roof and from snow. These of course, due to gravity, are vertical. In addition to these loads they resist a horizontal force due to the wind. In case the wind is considered as acting normal to the roof it may be resolved into its two horizontal and vertical components. In any case the horizontal component is small compared to the vertical, as a general thing. The purlin is framed at right angles to the slope for convenience in making the truss and rafter connections and not, as might at first glance appear, for greater strength. On this account it should be made broad as well as deep, otherwise it would deflect except as the rafters, when in place, might stiffen it if fastened at the bottom in such a way as to resist thrust.

A block of wood may be used as shown to brace the purlin and attach it to the truss. The location of the purlins should be at or near the joints of the truss to prevent bending in the top chord. The rod passes through the top chord and its stress is transmitted to it and the diagonal by a plate countersunk into the top chord to allow for direct horizontal bearing. The diagonal is notched into the chord and held in place by a screw or spike.

In making this notch there is an opportunity for some variation in design. It will be remembered that a previous article of this series pointed out

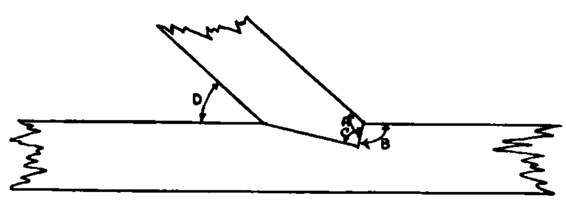


Fig. 16

that the allowable stress in bearing is much greater on the end of the grain in a wooden stick than across the grain. It follows that the allowable bearing on a surface inclined at an angle varies between these two extremes. This is frequently taken as a straight line variation which is probably good enough. In a standard engineering text book a formula was included giving a curve for this variation. A year or two ago in one of the professional publications the accuracy of the derivation of this formula was questioned. However, in the opinion of the author, this formula remains, in its final results, as good as has been proposed by anyone up to the present time.

When two sticks, as shown in Fig. 16, are framed into each other in a truss a notch is made one side of which is considerably longer than the other. The short side resists the greater part of the stress in the diagonal. If the angles A and B are not equal it follows that a different allowable stress is obtained according to which stick is investigated and that the least allowable governs and determines the length of this short side. It is evident that the smaller this notch can be made the better it is as less material will be wasted in the lower chord. To obtain a minimum notch it is therefore necessary to make these two allowable stresses equal, which means that the angles A and B should be equal. It will be found that if the angle C is made a right angle this condition will be very nearly fulfilled for all ordinary cases. Also, if C is made a right angle, it is easy for the carpenter to lay out this joint when the length of the short side of the notch is given. This is the method preferred by the author but various designers vary this practice from making A a right angle to making B a right angle. When the angle D is not too great, or the unit stress in the diagonal too great, this notch is designed very simply by a curve adapted from the formula just mentioned.

As in all wooden trusses the end joint gives the greatest opportunity for study and it results in a great variety of design by different engineers. In Fig. 17 is shown the design of an end joint which is frequently used. Here two plates are used, one on either side of the truss. To these plates are riveted smaller plates—four in the drawing to each large plate. These smaller plates fit into

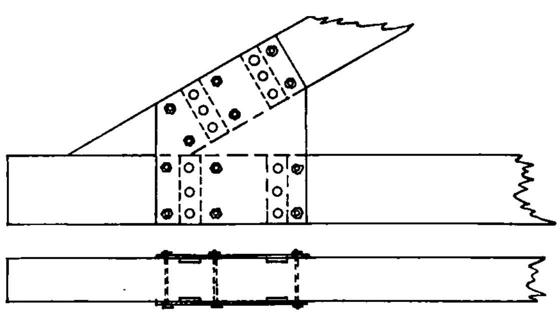


Fig. 17

notches in the wooden sticks. The heads of the rivets are countersunk into these small plates so that a good joint may be made easily. These plates are held in place on either side of the truss by bolts passing through the sticks.

The thickness of the small plates is determined by the stress in the two sticks. Sufficient area must be provided for the plates to bear against the ends of the grain in the sticks without over stressing the wood. The number of rivets to fasten the small plates to the larger are determined by these same stresses and the rivets are limited by their strength in shearing. The bearing will be sufficient for the rivets against the plates if the plates are 5/16 inch or more in thickness and ¾-inch rivets are used.

The bolts do not take any figured stress but merely hold the plates in position. They can be made quite small, say ½ inch in diameter. The chief stress which actually comes on them is tension due to the tendency of the large plates to buckle and they must be so placed as to resist this buckling to the greatest advantage. For example, the lower chord is in tension tending to pull it away from the joint toward the center. If this stress should be increased until the joint failed, and if it failed by the buckling of the plate, the end of the plates nearest the center would fly out from the lower chord allowing the small steel plates to come out from the notches. To resist this the bolts are placed just to the right or left of the small plates. This kind of failure was witnessed by the author a

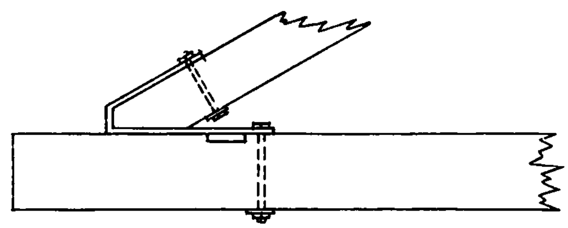


Fig. 18

few years ago when an unexpected stress was applied to a truss which otherwise, due to the factor of safety in the design, would have resisted this condition without serious injury.

In Fig. 18 is shown an end joint of a wooden truss where the stresses and sizes are smaller than would be required for a joint such as shown in Fig. 17. The principle is substantially the same for both types of design. Considerable variation in practice is found among different designers, especially in the placing of the bolts; some designers have inclined the bolts so that they would be normal to the diagonal member and have figured them to take direct stress. The author does not use this type of design for a truss of any size, due to uncertainties in the division of the stress between the notch and bolt.

When this type has been used a short stick has sometimes been added under the lower chord between it and the bearing. This member reinforces the lower chord where much material is cut out for the lugs and also helps to take care of eccentricity in the stresses at this joint. This stick has small plates inserted between it and the lower chord and notched into it to prevent slipping and the two should be securely bolted together.

In long trusses it is frequently desirable to splice the lower chord. If the splice is made properly it will often be found to be more economical to pay the higher price of one long stick; it can be accomplished more economically than in the case of a shallower truss with parallel chords, by choosing a point to splice somewhere near the middle where the stress is small.

MINOR ARCHITECTURE
EXEMPLIFIED IN MODERATE COST BUILDINGS

An Automobile Sales and Service Building

PRESTON J. BRADSHAW, ARCHITECT

THE improvement in the design and planning of sales and service buildings, as well as of structures of various kinds connected with the automobile industry, has been repeatedly noted in architectural publications during recent years, and countless instances where such structures have been given a distinctive architectural treatment prove that their owners, as well as their occupants, appreciate the fact that good architecture has a definite advertising and sales value which must be reckoned with.

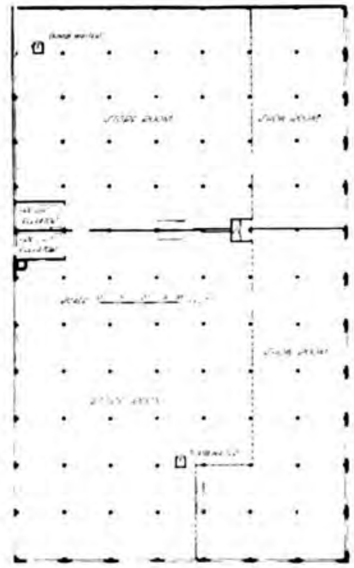
A recently constructed building which possesses considerable merit from this viewpoint is the one occupying the north side of Locust street between 18th and 19th streets in St. Louis and occupied by the Weber Motor Car Co. and the Weber Implement and Automobile Co. The building is used for the sale of both new and used cars and it also contains departments for giving service and making repairs as well as work shops for the complete overhauling, painting and upholstering of cars.

The building is a three-story structure of reinforced concrete skeleton, flat slab construction, the first story of which is of terra cotta and the upper stories of kiln run red matt brick, the capitals of the pilasters and the frieze about the top being also of terra cotta. The necessity of having such a structure well lighted has resulted in its being, like Hardwick Hall, "more glass than wall," but the excellent handling of the brick pilasters between the large windows and the use of steel sash at the upper floor windows, with their surfaces well broken up into small panes, have given a pleasing effect. The building is heated by steam and every part is fully protected against fire by an automatic sprinkler system.

The arrangement of floor area in the building and the planning of the different departments have

Sales and Service Building for the Weber Motor Car Company, St. Louis, Mo.

View of Main Show Room

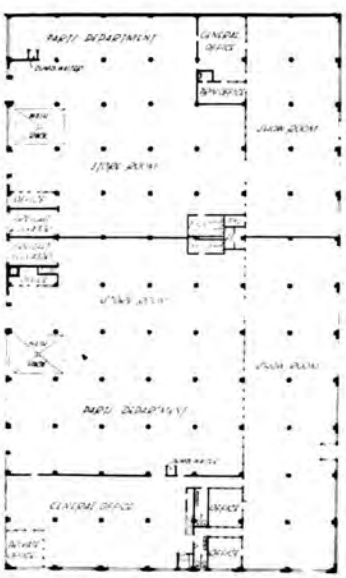


Second Floor Plan

proved to be economical of space and satisfactory for the various purposes which the structure serves. The front of each of the three floors, facing south and therefore well lighted, is given up to show rooms. The bays are 21 feet square and therefore but one row of columns extends through these departments. An elevator, entirely apart from those which serve the other parts of the building, connects the three show room floors and in both the first floor show rooms are several private offices which are often useful for receiving customers. Space on the 19th street side of the main floor is given up to general offices and a private office; this department has its own entrance from the street and is provided with two sets of toilets.

What might be called the service rooms, including the store rooms, parts department, repair rooms and other similar departments are entered directly from the alley at the north side of the building. Here are freight elevators to all floors, wash racks and dumb waiters to the different floors while at each of the motor entrances there is an office for the checking of vehicles entering and leaving.

The floors of the show rooms are of ceramic tile; clear maple has been used for the floors of the office portions and throughout the shop and factory sections the floors are of cement, monolithic with the reinforced concrete slab and hardened by the application of a liquid hardener. The building was erected entirely under the supervision of the architect's office from which sub-contracts for work of different kinds were placed.



First Floor Plan

General Office on First Floor

The Industrial Arts Exhibit at the Metropolitan Museum

NEW YORK, DEC. 15, 1920 TO JAN. 30, 1921

THE Metropolitan Museum of Art recently presented for public information an exhibit of furniture and decorations, consisting of stock reproductions and specially designed decorative fabrics based on originals from various collections at the Museum. With the co-operation of various manufacturers and dealers there were shown a number of types of period and modern furniture, tapestries, stained glass, screens and other decorative units of particular merit. A section of this exhibit is illustrated herewith.

An exhibit of this nature should demonstrate the particular value of good collections of art objects which are made available for public information. Manufacturers, in following the well established precedents of recognized periods or in modernizing and combining the artistic elements of the furniture and decorations of past centuries and decades, are also performing a valuable public service. With this help even modest homes may be given distinction in furnishing and decoration.

We have already discussed the advisability of an increased interest on the part of architects in this subject of furnishing and decoration. With the realization of the availability of an infinite choice of reproductions and well designed modern furniture and decorative units, it is evident that the architect has directly at hand an unusual means of expression which should encourage him to complete his work of building design by indicating the furnishing of at least the principal rooms of structures of various types, and particularly of dwellings. It must be discouraging to an architect to design an attractive dwelling with rooms in which the interior architecture is of excellent taste, and see owners place in these rooms either chromos and relics of the past having no artistic merits, or purchasing unattractive modern types of furniture which ruin the entire

View in a Section of the Industrial Arts Exhibit at the Metropolitan Museum, New York effect which the architect has so carefully planned.

During the past few weeks we have had occasion to inspect interior photographs of different dwellings designed by a number of architects. It has been found that where the architect has taken little or no interest in the question of furnishing, practically every interior has been spoiled by the owner unless he has been possessed of sufficient means to call in a decorator who may or may not have carried out a scheme in keeping with the architect's conception. Where the architect has made a practice of following his structural design with either service or general advice on the subject of furnishing, almost all interior views in his office prove to be attractive. It would seem evident, therefore, that the architect's policy has much to do with the ultimate result of his work, and that architects have it within their power to do much toward encouraging owners to furnish their homes sensibly and artistically.

An Adaptation of Early American Design in the Morgan Wing of the Museum

In many instances the owner of a new dwelling or building of almost every type turns to the architect for advice on furniture if he wishes advice; and the architect, in turn, has his choice of carrying out the work or advising as to the employment of an interior decorator who will work under his supervision or in co-operation with him. For the present there is no generally standardized method of handling the business phases of such a transaction. This seems to be entirely a matter of judgment on the part of the architect. This work may be carried on by charging for time, by commission arrangement similar to that under which building plans are prepared, or by special arrangement with the owner through which an amount equal to the discount allowed by some dealers may be paid to the architect for service.

An Italian Reproduction

An English Reproduction

From Original Furniture in the Collection of the Metropolitan Museum of Art

Interesting Rooms of a Remodeled Colonial Dwelling

WILLIAM JOHN CHERRY, ARCHITECT

IN the development of domestic architecture probably no period has created such a definite impression on the mind of the American public as that which has resulted from the work of the architects and craftsmen of the English colonies. In successive waves, during the past 30 or 40 years, we have turned to other periods for inspiration in the design of homes, but always there remains the impress of the colonial precedent, based as it is on the simplicity which was the spirit of the times—devoid of elaborate ornamentation but artistically true in line, mass, unity and proportions.

A Corner of the Dining Room

Thus it is that new dwelling designs of the so-called colonial period or any project involving the restoration of early American architecture meets with unusual interest, particularly if the designer has developed new features in restoration methods or a new and logical application of old ideas.

There are presented here several illustrations of interesting rooms in the recently remodeled colonial dwelling of E. M. Bull, at Blooming Grove, New York. This project is of particular interest in that the old estate was a direct grant from King George III and in the course of the alterations many of the fine old features of the house, built in 1804, have been preserved. The entrance hall is typical of the colonial period and the stairway is that of the original house and offers an interesting suggestion for modern planning in this period with its easy wind half way up.

View of Stair Hall

In the dining room the mantel with its lighting fixtures is of particular interest. The furnishings are of modern type, not colonial, but carefully chosen because of their graceful lines to form a harmonious composition. This room, while preserving colonial simplicity, has a more modern atmosphere than any other room of the house.

Other illustrations show views of a particularly interesting room; this is the study in which particular care was taken to create an atmosphere of comfort while still preserving the elements of the old colonial dwelling. Among the unusual features which the architect has incorporated in this design may be noted the use of weathered timbers and lumber

Fireplace in the Study

sult. The walls of this room were carefully hand plastered in imitation of old stone plaster and an interesting note is added by the preservation of the old andirons and other fireplace fittings. All the furniture used could be duplicated from stock. The pieces were selected for comfort and because of the low, broad lines so in keeping with this restoration of a room of the early American period.

The bookcases shown in one of the illustrations are made up with specially designed hardware. The glass in the doors is of the hand pressed type, originally imported, and was in old buildings on the premises. Various pieces were collected and built into leaded panels. On the floor is a braided rag rug such as may be had in various sizes, and its use

from an old barn, which was on the premises, to form the beamed ceiling of the room. These hand-hewn timbers are a weathered gray and have not been stained or painted but left in the natural condition, providing an unusually attractive re-

goes far toward carrying out the type of furnishing which the architecture of the old house demands. In furnishing a house of any definite period it is wise to select pieces such as were used at that time, and many pieces based on old models may be had.

Old Leaded Glass in Bookcase and Windows of Study

BUSINESS & FINANCE

C. Stanley Taylor, *Associate Editor*

The Owner's Duty to the Architect

AT the present time practically every industry and every business is passing through a period of reconstruction. Old ways and methods pass. In the commercial world we have the long-heralded return to a buyers' market. Conservative financial institutions are developing and advertising the "service" resources of the financial world. In the architectural profession also a period of reconstruction is evident. As never before the value of sound business administration is recognized and its principles are being applied, not in a manner detrimental to the upholding of the dignity inherent to the profession but in a way which enables the architect to take his rightful place in the business world and to assume the responsibilities which broaden and become more intricate from year to year as the art or science of building progresses in almost unbelievable strides.

With intense interest and full appreciation of its value at this time we note the publication by the American Institute of Architects of a thorough treatise on business administration entitled "The Handbook of Architectural Practice." The opening paragraphs of the Handbook so clearly define and allocate business administration as an important factor that we quote briefly:

"It is as a fine art that architecture has established itself in the hearts of men. If it had been merely the science of building or even of building well, its appeal would not have brought to it minds such as those of Ictinus and Michael Angelo. To good building architecture adds high qualities of the imagination . . . but to treat of architecture as an art this Handbook does not aspire.

"The architect, though primarily an artist, must still be the master, either in himself or through others, of all the applied sciences necessary to sound and economic building . . . but it is not with construction nor engineering, nor with the choice of materials that this Handbook deals.

"The architect, by expressing his ideas in forms and words of exact contractual significance, by controlling machinery for their embodiment, by giving just decisions between conflicting interests, by bearing himself as worthy of his high calling, gives to his art the status of a profession. It is with that aspect of the architect's work, professional practice and its servant, *business administration*, that this Handbook is concerned."

Thus clearly does the Institute emphasize the importance of applying proper business methods and procedure in the conduct of the architect's affairs. Much has been said and more written on the subject of the architect's duty to the owner, but the owner's duty to the architect has never received sufficient consideration. In many instances the failure of the owner in this respect has led to direct financial loss or to the development of unnecessary misunderstandings and failure to establish that active co-operation so necessary for the successful completion of a building project. The "Handbook" expresses full realization of this fact. It is the purpose of this article, however, to correlate suggestions made therein and to add such facts as may have been gathered through experience and contact with various architectural projects and organizations.

Realizing What the Architect Does

The first duty of an owner who is about to engage an architect is to learn fully what is included under the term "architectural service." The American Institute of Architects thus defines the professional services of the architect:

"Necessary conferences; the preparation of preliminary studies (sketch plans and reports); working drawings; specifications; large scale and full size detail drawings; the drafting of forms of proposals and contracts; the issuance of certificates of payment; the keeping of accounts; the general administration of the business and supervision of the work."

It is evident therefore that the work of the architect is far more than that of an artist, and that in paying the fees charged by architects the owner is paying not only for design but for a vast amount of detailed work involving every part of the building and its equipment; cost estimates; arrangements with contractors; accounting and numerous other activities involving a high degree of skill and special knowledge.

An owner will do well also to realize that the architect's fee is not all profit nor are his expenses on a project trivial in nature. What proportion of an architect's fee is profit depends entirely on the volume of his business and his organization methods but we venture the assertion that the average net profit on architectural work is less than that of the real estate broker who may sell or lease the building after it is finished. Full information as to standard charges and documents may be obtained from the American Institute of Architects or by addressing the Editor of THE ARCHITECTURAL FORUM. It is important therefore that the architect should explain to an owner the full nature of his work in order that understanding may be clear on this point.

A Definite Agreement before Work Progresses

We may pass briefly over the point of selecting the architect. This is done by the owner either as he would select a lawyer or a doctor, by competition, or because some architectural organization actually "sells" its service to him. The important point is that the owner should be satisfied before closing an agreement that the architect he has selected is capable of carrying out the work to his satisfaction. "Swapping horses in midstream" is the poorest kind of policy in connection with a building operation and is always expensive to the owner.

An architect is entirely within his rights in requiring a definite written agreement before he starts work on the design of a building of any type. This is simple and sound business practice and it is the owner's duty to sign such an agreement for his own protection. The agreement need not bind the owner to proceed with the building operation, but it should:

1 — Definitely employ the architect to carry out such work as may be authorized in writing by the owner from time to time.

2 — Specify the amount and method of payment for architectural service (*a*) As the work proceeds; (*b*) If project is abandoned.

Note. See standard form of agreement between owner and architect prepared by American Institute of Architects.

3 — Define such expenses as may be reimbursed to the architect by the owner: travel, special engineering service, etc.

At the present time many projects are undertaken by architects without any definite agreement of legal value. Much misunderstanding results from this condition. The architect who insists on an agreement shows only good business judgment which in turn will prove of benefit to his client.

A Clear Understanding of the Project

When a client takes a case to his lawyer, or when a doctor is called in to prescribe for illness, every possible fact and condition is presented in order that this professional service may be successful in its application to the immediate problem. Similarly, when an owner calls upon an architect to undertake the solution of a building problem it is his duty to acquaint the architect with all possible details which may affect the design and construction.

Unless an owner has special knowledge of the subject he should not interfere with the artistic elements of the design. This is one of the problems which he presents to the architect, who presumably has more knowledge of the subject. The owner should think of his proposed building more as a machine than a work of art. The architect will provide the artistic elements, but he cannot guess at the actual functioning of the machine as required by the owner. Whether it be a dwelling, hotel, office building or factory, it is the duty of the owner to outline completely his major requirements before sketch plans are made, and to have these clearly in mind as he studies the preliminary drawings and the working drawings as the architect's work proceeds.

This is a point which cannot be too strongly stressed. The wise owner will therefore enter into the work of the architect in a spirit of co-operation. For the time being they are business partners, mutually interested in achieving the best results obtainable. Consequently there should be no hesitation on the owner's part in calling into consultation any of his associates, employes or special technical advisers who may be directly interested in the functioning of the building *after* it is completed. The architect cannot be fairly expected to know the details of every business or menage. He is expected to know how to translate these requirements into building terms and plans after he is made aware of them and to seek (at the owner's expense and with his permission) advice on such highly technical details as may not lie directly within his province.

Necessity of Co-operation

If the building in question is a hotel, it is the owner's duty to call for advice from those who will actually manage or lease it upon completion. In the case of an office building the rental agents or building managers should be called upon to approve the plans while in preliminary form. This idea extends to all types of service buildings including even the larger residences.

The architect, therefore, should recognize this as a duty which the owner owes to him. If he does not do so there may be several unpleasant results. The plans after completion may reach an associate of the owner who because of his relation to the project may severely and justly criticise details expensive to alter. In an investment project the managers or real estate brokers may, as they have in thousands of cases, point out costly mistakes in planning after the building is completed and blame the architect with consequent injury to his reputation. So too the owner's refusal to allow the architect to call in special engineering advisers on important problems may prove expensive in the end. It is the owner's duty to expect neither superhuman knowledge nor achievement from the architect and to realize that the architect's advice on the employment of consulting service is not given if such service can properly be expected as part of his organization equipment. On the other hand it is fair for the architect to advise the owner in advance (or when preliminary plans are completed) what special consulting service will be necessary.

Duties of the Owner

As to the provision of all facts and conditions affecting the land involved in a given project, this is the duty of the owner. We may turn to the Handbook for definite advice in this matter:

"The owner shall furnish the architect with a complete and accurate survey of the building site, giving the grades and lines of streets, pavements and adjoining properties; the rights, restrictions, easements, boundaries and contours of the building site, and full information as to sewer, water, gas and electrical service.

"Many instances of trouble and expense due to the failure of the owner to furnish complete and accurate information might be cited, but one will suffice. In a recent case the owner furnished the architect with a survey covering all the usual data and such restrictions as were *of record*. The property, however, did not belong to the company erecting the building, but had been leased in three parcels for 99 years. The leases had not been recorded. They provided that in the event of the improvement of any parcel in conjunction with another the columns were to be so located on the dividing line as to form "party columns." The architect prepared sketches and working drawings in ignorance of these restrictions and it was not until the contract had been awarded that he was casually notified that the columns must conform to the lines of the several parcels. The owner had to bear the cost of re-making the drawings, $5,000, and of the necessary changes in the building, $84,000."

The architect, of course, is responsible for making certain that the design and all details of plan are in accordance with all building laws, codes and departmental rulings having application to the location in question.

The Question of Cost Estimates

One of the contact points at which most of the misunderstanding between owners and architects is started is to be found in this question of preliminary and detailed cost estimates. Usually an owner has clearly in mind the amount of money which he is able and willing to spend on a project and it is his duty to inform the architect definitely on this matter rather than to approach the subject vaguely. On the other hand, it should be more generally realized by architects that in regard to this question of cost the owner is almost entirely dependent upon the architect.

During the past few years it has been unusually difficult to estimate costs owing to the disturbed condition of the labor and material markets. Perhaps it will be found, however, that many architects have made cost estimates without sufficient care. Certainly a great many owners have been disappointed in the comparison of ultimate costs with estimated costs, and in many cases part of the fault may be charged to the architect.

When an architect is commissioned to draw the plans for a building and has received from an owner an approximate figure as to the cost which he is willing to bear, it is the duty of the architect to gather all possible information on recent costs of buildings of this type, not relying entirely on experience in his own office unless it has been extensive, but seeking advice of builders and other architects who have designed structures of a similar nature. The owner, however, should realize that owing to the conditions which have been referred to there may be considerable difference in the architect's estimate and the contractor's bid (the ultimate cost of the work) due to conditions beyond the control of the architect, such as transportation difficulties, labor troubles and other expensive delays, as well as to the failure of material dealers and sub-contractors to live up to contracts and agreements, an experience common under present conditions. The owner should consider carefully the nature of the building market and realize that the architect is trying to give the best possible service.

Importance of Preliminary Figures

There have been cases where architects have given preliminary estimates much too low which have had every appearance of attempts to encourage construction. This policy, which is both dishonest and unbusinesslike, is always attended by unfortunate results, and the profit which may be made through such an operation is more than lost in damaged reputation and unpleasant advertising. Cases of this type are few and it will invariably be found the best policy to apprise the owner fully of all facts and conditions relative to the cost. In making estimates both the architect and the owner should allow a liberal safety factor to cover unexpected costs. In this matter the owner can do much toward co-operating with the architect if he will but take an intelligent interest in the subject such as is warranted by its importance to him, and allow the architect any necessary preliminary expenditures which may be required to develop dependable cost estimates.

In this connection we may note the fact that there will be published occasionally in the Service Section of THE ARCHITECTURAL FORUM a tabulation of cubic foot costs of various types of buildings in different sections of the country which is intended to serve as a guide to architects in making preliminary estimates for sketch plans or, inversely, in determining the approximate allowable number of cubic feet in accordance with the amount of money which the owner is willing to spend on a project under consideration.

As the Work Proceeds

The owner, for the protection of his own interests, should follow all important points brought out in working drawings and specifications as the plans are being developed. It is not difficult to follow these details with the architect's explanation and the owner will be in a position to know exactly what materials, methods, equipment and details of planning will be incorporated in his building before it is constructed. By following these matters closely and by visualizing in a practical manner, the owner may prevent results which are not satisfactory to him. This is an important point as the owner is called upon to approve all working drawings and specifications, and such approval applies to every detail indicated therein. It is unfair to the architect for an owner to criticise important details of finished work if the owner has not given fair consideration to the plans while in the stage of development. If it necessitates models to carry a preliminary point, their secondary function is to eliminate future differences.

It is self evident that another of the owner's duties is to carry on all business relative to the equipment and construction of the building, through the architect. There have been many instances of an owner negotiating direct for the construction of a building or on sub-contracts, issuing orders on the job or in other ways interfering with the regular schedule of the work. Sub-contractors and others who may have arranged definite agreements through the architect are naturally placed in a position to charge for extras, ordered by the owner, and any issuing of contradictory orders or approval in changes of plans and specifications by the owner tends to confuse the issue and to increase building costs.

This does not mean that the owner should not examine the job as it progresses or that he is precluded from finding fault with conditions which do not meet with his approval; but it is his duty to carry out all changes and to make all complaints to and through the architect rather than directly in contact with builder, sub-contractor or supply dealers.

In arranging building and sub-contracts the owner will find that he has much to gain by keeping somewhat in the background and in carrying on negotiations through the architect. In one sense this situation is similar to that of a real estate transaction where the principals do business through brokers who are in a better position to negotiate and to know when the principals should be brought together.

The Architect's Responsibility

If the contract is to be let on a service basis (cost plus a fixed fee), the architect's duties and responsibilities are greatly increased. Similarly, if the project is carried on through the letting of several contracts for various parts of the work the architect practically occupies a position of general contractor, in which case his fee and expenses will naturally be increased. If the work is let on a straight contract basis it is well for the owner to realize that the lowest bid may not be the best bid, and that the architect's opinion, gained through inquiry as to the work of various contractors, or through knowledge of their work, is of importance. Many owners make the fatal mistake of insisting on bringing in contractors, met through a social or business relationship, who may not be well fitted by experience or knowledge to carry out the type of work involved.

There are, of course, many instances which arise as the work progresses in which the owner may show a fair minded spirit which will be appreciated by the builder and by the architect. The owner must realize also that as between the building contractor and himself the architect is really an arbitrator whose duty it is to see that the various agreements are carried out in fairness to both parties and who will not hesitate to tell the owner that he has taken an unfair position if this be true. Therefore, the owner must not expect the architect to exhibit any false loyalty in dealings with the contractor and sub-contractors. The owner should realize also the importance of making all payments when and as agreed and that if this is not done the architect is placed in a difficult position, expensive delays often developing as the result of any slow payment policy.

It is evident that the owner who fully realizes his duties and who strives to develop and maintain the proper spirit of co-operation with the architect has much to gain. It is very difficult for an architect to work enthusiastically if he is forced to worry about the attitude of the owner. It may be readily understood that without enthusiasm an architect cannot do his best work.

For the period during which the structure is being planned and built the architect is in practically every sense a business partner of the owner. He is working for the same results, and if the owner will but consider his duties as the duties of one associate to another he will not only fully appreciate the work and responsibility of the architect, but he will do much toward expediting the work and guaranteeing his own satisfaction.

PLATE DESCRIPTION

Memorial Tablet to John Pierpont Morgan. Plate 21. Against the northwest pier supporting the central dome of the main hall of the Metropolitan Museum has been recently erected a sculptured tablet in memory of the late President of the Museum. In 1914, shortly after Mr. Morgan's death,[1] this important commission was entrusted by the Trustees to Paul Manship, sculptor, and upon its execution he has spent the last six years. The memorial tablet takes the form of a stone slab, 11 feet 2 inches in height by 5 feet 4 inches in width, with a projection from the wall of 6½ inches. Champville stone, which comes from France, has been used. This material, which belongs to the limestone family, possesses a fine grain and lends itself well to detailed sculpture in relief.

House of A. Leo Everett, Esq., 70th Street, New York, N. Y. Plates 31, 32. Many of the most successful alterations of city houses involve the removal of old fashioned high stoops and the placing of the new main entrances upon what was previously the basement level. The advantage of this, as is well known, is that it makes possible a dignified entrance, using valuable space which was often practically wasted, and leaves the entire width of the building upon the front of the main floor available for a drawing room or a living room. The residence shown here, of which Walker & Gillette are the architects, is an interesting case of this kind. A new facade nearer the sidewalk gives ample hallway and the removal of old partitions has given opportunity for spacious stair hall, living and dining rooms upon the main floor, and for a library and a master's bedroom, the full width of the house, upon the floor above.

The design of the facade has been worked out with brick laid in Flemish bond, with trim of limestone and sheet metal for the uppermost floor.

House of Rev. William M. Crane, Richmond, Mass. Plates 25, 26. This residence in the Berkshire Hills shows an advantageous use of plastic materials, cream gray stucco on terra cotta block having been used for the walls of the structure, reinforced concrete for foundations and for the retaining walls of pergola and terrace, and red Spanish tiles for the roofs, while the floors of vestibule, loggia, stair hall and pergola are laid with dark red domestic tiles. One interesting detail of planning is the placing by the architects, Kilham & Hopkins, of all the service rooms in one part of the building where pantry, kitchen, servants' dining room and four sleeping rooms, with a bathroom, are installed upon the main floor which makes the entire upper floor available for the family and guests.

Building for C. C. Whittemore, Caterer, Boston, Mass. Plate 28. This structure, of which Allen & Collens and J. Lawrence Berry are architects, was carefully planned for the exclusive use of a caterer and the result is a building which includes every convenience. Since show windows, in this instance, are neither necessary nor desirable, the facade has been given a treatment which does not suggest a shop. Cast stone is the material used with rondels of verde antique marble at the sides of the Palladian window which is the dominating architectural feature of the front.

Plans show a main floor arranged for the business of a caterer while the entire second floor is given up to bakery and kitchen, well equipped with refrigerator, ovens, sinks and other necessary details and connected by lifts with the ice cream department in the basement. Here every possible provision has been made for efficient service and this department is equipped with refrigerators, ice cracking machine, salt bin, mixing bin, steam kettle, mould room and freezing machinery and complete facilities for prompt delivery service.

Jefferson School, Syracuse, N. Y. Plate 29. In this building, planned by James A. Randall, architect, considerable attention has been paid to providing complete equipment in a school of moderate size. The plates show an exterior of brick, simple and direct, two full stories and basement in height. Upon the basement floor are placed two sets of playrooms, lockers and toilets, one for boys and another for girls, with the necessary showers and boiler room and a fan room to provide adequate ventilation. Besides a large kindergarten room there are nine class rooms, a clinic, a rest room for teachers, office and reception room for principal, and a large auditorium and gymnasium the height of two full stories.

The class rooms, it will be noted, are so planned that light falls upon the students' desks from the left. This school will accommodate 400 pupils and was built during 1917 and 1918 at a cost of $147,950 which included complete furnishings.

Edward Smith School, Syracuse, N. Y. Plate 30. An unusually large plot in a new district afforded the architect, James A. Randall, an opportunity of planning a school of fair size upon one floor. Here there are 12 class rooms besides auditorium and gymnasium, kindergarten, rooms for manual training, sewing and domestic science, fresh air room with porch and such conveniences as teachers' rest room and offices for medical director and principal.

All of these departments being on one floor, the architect has placed the large open space of the auditorium and gymnasium at the center of the building with class rooms grouped around it, thus minimizing the extent of corridors, otherwise necessary in a building covering such large area. The boiler room is placed in the part of the building least valuable for other purposes. The school presents a pleasing appearance and is built of brick with certain parts coated with stucco. It provides for 550 pupils and was built during 1917 and 1918 at a cost, entirely furnished, of $203,000.

EDITORIAL COMMENT

ARCHITECTS AND ORGANIZATION

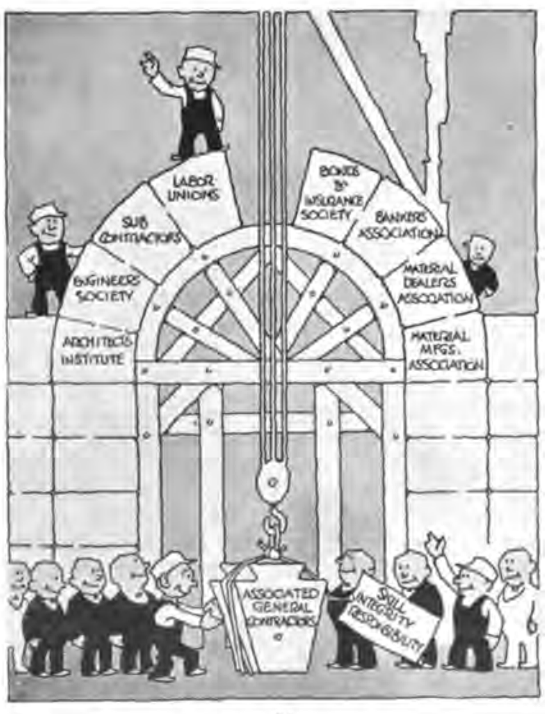
THE value of organization was demonstrated beyond question during the war and it is, therefore, to be counted a real and active factor in our present social, business and professional affairs. Without it little can be effectively carried out where the interests of a group are involved. Organization, unfortunately, may at times be wrongly used; we have seen as the result of various investigations the power that organization may exert to the detriment of the public when that power is used in a business sense to restrict competition and production and to fix prices. The existence of organizations that are inimical to public interests does not, however, condemn the organization idea; it merely indicates that group action is a present day factor and that organizations with evil intent must be opposed by other organizations guided by higher principles.

The practice of architecture presents an example where organized effort is eminently desirable and necessary. Architects constitute a profession that holds the highest ideals of service to the public; their ethics, unfortunately, are not generally understood or appreciated by the public at large and without proper explanation wrong conceptions of the architect's function and service are inevitably formed. The movement for licensing the practice of architecture creates a condition in which the individual architect has little opportunity to express approval or disapproval on a matter of vital importance to his welfare. These and many other reasons make the association of architects necessary, if only from the viewpoint of protecting professional status.

Architects have, however, a larger incentive for association. It is the advancement of architecture as a fine art. Upon this ideal the American Institute of Architects was founded many years ago when the profession in this country was in the early stages of development. The unselfish, high principled ideals built into the Institute by its founders have assured its continued growth and it presents today a firm foundation upon which a really great Institute should be raised.

A greater Institute is not suggested in any criticism of past efforts for one has only to reflect on the practice of architecture today and conjecture what conditions might be with respect to competitions, professional fees and the code of professional ethics were it not for the work of the Institute, to realize its worth. New problems, however, continually arise that demand careful and deliberate thought and we should not rest content with past endeavors. In these days of reconstruction influences are at work that will require of the Institute greater activities in the future than in the past. These activities will be in scope and effectiveness in proportion to the support accorded the Institute by the profession.

The effectiveness and prestige of an organization may be judged by the measure of recognition accorded it by others. It is of interest to note, therefore, in the cartoon reproduced below, the relative position accorded the Institute by one of the newest organizations to be established within the building industry. This appeared in *The Bulletin of the Associated General Contractors* for January, 1921 and indicates the function which this new organization, scarcely two years old, feels called upon to fill. If it appears that a dominant organization is lacking in the building industry credit only must be given those who seek to eliminate the deficiency. We believe, however, that the Institute should represent to the building industry generally a higher importance than this cartoon accords it. It has the dignity and impressiveness of age back of it; it is composed of men who should be by nature of their profession the acknowledged leaders of the construction world. Still, something is lacking; it does not function in the public eye as it should.



The reason is not far to seek; the Institute, while representative of the profession in a general sense, does not represent the whole body of architects because its members are only a minority of practicing architects. It should be made truly representative so that it may have the support to which it is entitled; and it can be made truly representative only if every architect makes the welfare of his profession a matter of personal interest.

The ARCHITECTURAL FORUM

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Villas of the Veneto

II. THE VILLA CERATO AT MONTECCHIO PRECALCINO

By HAROLD DONALDSON EBERLEIN AND ROBERT B. C. M. CARRÈRE

THE Villa Cerato, at Montecchio Precalcino, is an admirable example of a small house in which Palladian formality and dignity are quite as carefully embodied as in a structure of far greater extent. The villa is only 50 feet in breadth by 38 feet in depth. The elevation discloses a basement, a main floor, raised about eight feet above the ground, and an attic or top story, all of them very clearly expressed externally. There are none of the usual dependencies or farm buildings that were apt to be grouped closely around the master's house or to connect with it by an orderly arcaded scheme in Palladian fashion, so that it stands quite alone and unaided by any of those structural adjuncts calculated to dignify the composition. Nevertheless, despite its inconsiderable extent, the villa possesses a character that compels attention and respect.

The villa is close to the road and is approached by a short, straight drive through an unpretentious courtyard to the entrance. This consists of a flight of steps ascending to a shallow loggia entirely without the columns, entablature, or other formal features of architectural embellishment that were customarily employed as accessories in larger Palladian structures. The building is of brick

General View of Main or West Front

CENTRAL PORTION OF WEST FRONT SHOWING BASEMENT ENTRANCE

VILLA CERATO AT MONTECCHIO PRECALCINO, ITALY

Attributed to Andrea Palladio

jacketed with stucco and painted a light yellow, which is now very much faded and weather-stained. All the details are fashioned in stucco save the balustrades in the loggia openings, the architrave, frieze and pediment of the doorway, and the sills and architraves of the front windows, which are of stone and, for the most part, delicately wrought. The balusters on the low projections beneath the front windows of the main floor are painted on the plaster, and within the loggia are the half-obliterated remains of frescoes and painted pilasters, fluted and topped with Corinthian caps.

"I approve," wrote Palladio, "that in the lowest part of the fabric, which I make somewhat underground, may be disposed the cellars, the magazines for wood, pantries, kitchens, servants' halls, wash-houses, ovens, and such like things necessary for daily use. From which disposition follow two conveniences, the one, that the upper part remains all free; and the other, no less important, is that the said upper apartments are wholesomer to live in, the floor being at a distance from the damps of the ground; besides, as it rises, it is more agreeable to be looked at, and to look out of." Agreeably to this dictum, all the sundry domestic offices of the Villa Cerato are contained in the basement which, however, is light and airy enough not to cause any serious apprehension on the score of "the damps."

Through the whole depth of the main floor there runs a broad hall, a doorway at the opposite end from the entrance giving on a balcony at the rear, while rooms open out from each side, as will be seen upon examining the plan which has been arranged according to the usual scheme of Palladian design. At either side of this large hall are two lofty and spacious apartments, those upon the front being the larger. Between the two rooms upon the right are two tiny *gabinetti*—possibly intended for sleeping closets—a passage, and a small, insignificant stair leading down to the domestic office in the basement and up to the attic story. The ceilings of the hall and of the other rooms are beamed and painted.

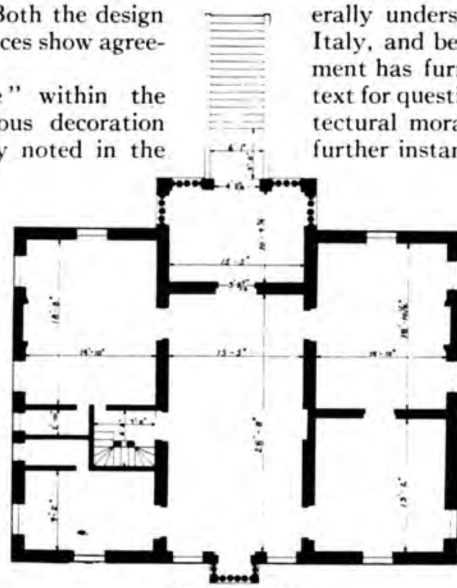
The obvious insignificance of the stair seems attributable to the purpose for which the attic story is said, in this instance, to have been designed—a granary and storage place, and not for occupancy by members of the household. The Palladian dictum that "the staircases will be commendable if they are clear, ample and commodious to ascend, inviting, as it were, people to go up," was plainly disregarded in this instance, and there is not any of that degree of seemliness which it was the Palladian habit to accord even to staircases that were not meant to figure as conspicuous features in the architectural composition.

The fireplaces in the two front rooms are of an unusual and striking design that cannot fail to elicit interest. The fact that the chimney-jamb assumes a bulbous form, which narrows and recedes upward until it is absorbed in the wall surface, yields a certain degree of decorative function in the contour and, indeed, almost precludes the possibility of further applying any appropriate ornament. The painting of the walls and of the stone fireplaces is, of course, a modern defacement, perpetrated since the villa has been tenanted by two

Stucco Detail and Painted Architecture on Main Front or three *contadini* families. Both the design and the execution of the fireplaces show agreeable delicacy and restraint.

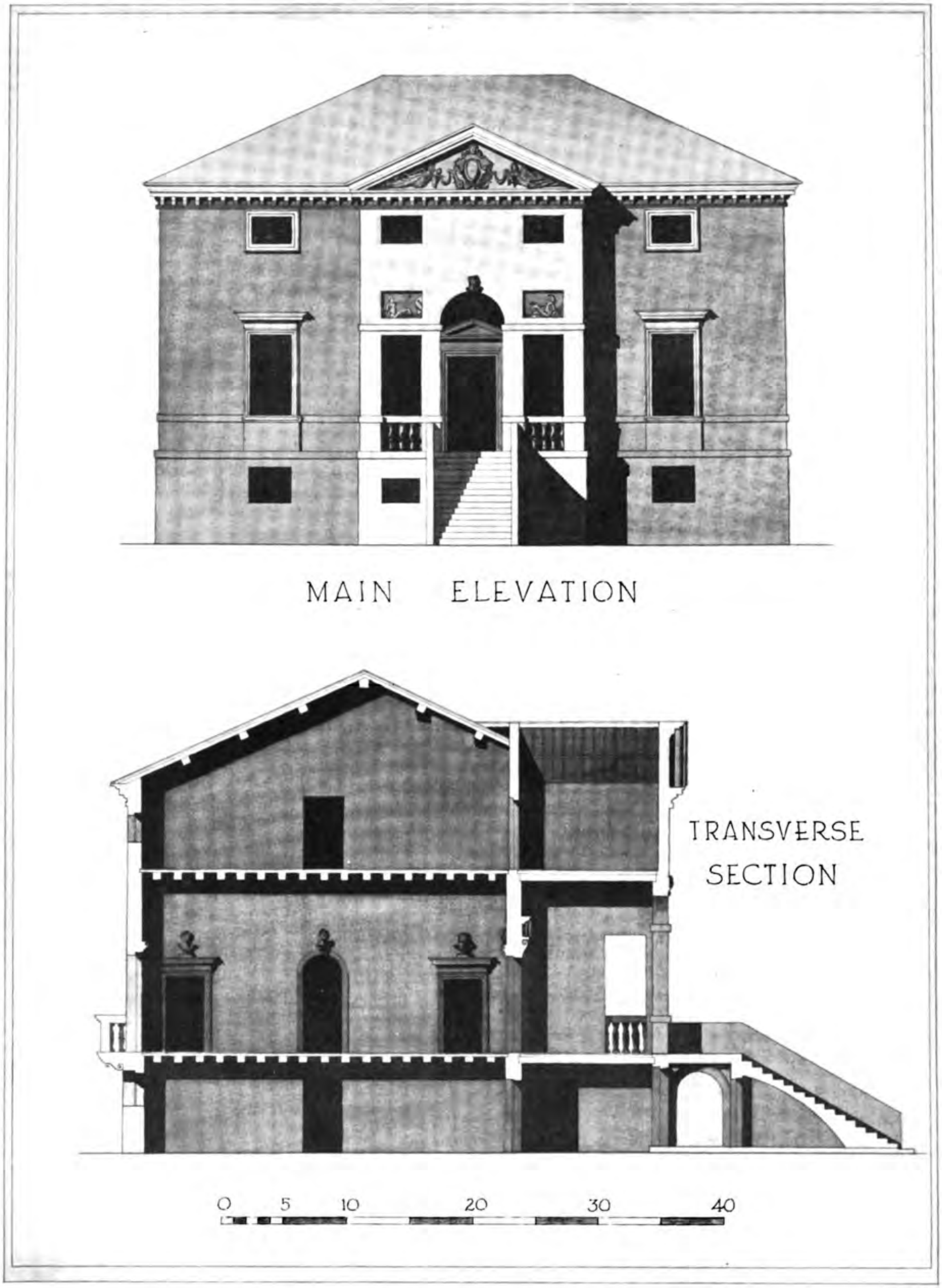
The "painted architecture" within the loggia is a much less ambitious decoration of the sort we have already noted in the loggia and in the *sala* of the Villa Emo at Fanzolo, executed by Paolo Veronese and "Messer Battista Veneziano," and shown in THE FORUM for January. The "painted architecture" of the Villa Cerato, both in loggia and the balusters indicated beneath the front windows of the main floor, is almost obliterated, but it deserves to be noticed because its presence involves a principle that is not generally understood or appreciated outside of Italy, and because this method of embellishment has furnished hostile critics with a pretext for questioning Italian sincerity and architectural morals. As we shall frequently meet further instances of this same thing, the moral significance may as well be dealt with now, even at the risk of giving the subject relatively undue importance so far as the amount of painting in the Villa Cerato is concerned.

Few, it is true, at this late day would subscribe without reservation to Mr. Ruskin's fulminations against the "foul torrent of the renaissance" or agree with him that renaissance architecture "is base, unnatural, unfruitful, unenjoyable and impious." Nor would they listen with much patience or sympathy to his rhetorical invective when he prophesies that "whatever has any connection with the five orders, or with any one of the orders; whatever is Doric, or Ionic, or Corinthian, or composite, or in any way Grecised or Romanised; whatever betrays the smallest respect for Vitruvian laws or conformity with Palladian work—that we are to endure no more." Nevertheless, there are those—and they are far more numerous than one might at first imagine—who profess admiration for Palladian work in the aggregate, pride themselves upon a discriminating taste in the niceties of Palladianism, and are given to practicing Palladian principles, but who take occasion to carp at certain practices of the Palladian age because they have inherited — perhaps without knowing it — something of Ruskin's mental bias. Into their canons of criticism they inject an "ethical" element and evince an animus against this, that, or the other particular practice which they stigmatize as "immoral" and attack it with a bitterness



Main Floor Plan

Balcony on Rear or East Front



VILLA CERATO AT MONTECCHIO PRECALCINO, ITALY
MEASURED DRAWINGS BY ROBERT B. C. M. CARRÈRE

that savors of theological rancor. "Painted architecture" is one of the favorite objects of this *odium theologicum.* Having introduced moral judgment and moral values, they proceed to brand "painted architecture" as deception and falsity, when no deception was intended or even thought of.

It takes two parties to create a deception—the deceiver and the deceived—as Geoffrey Scott puts it, in his stimulating "Architecture of Humanism":

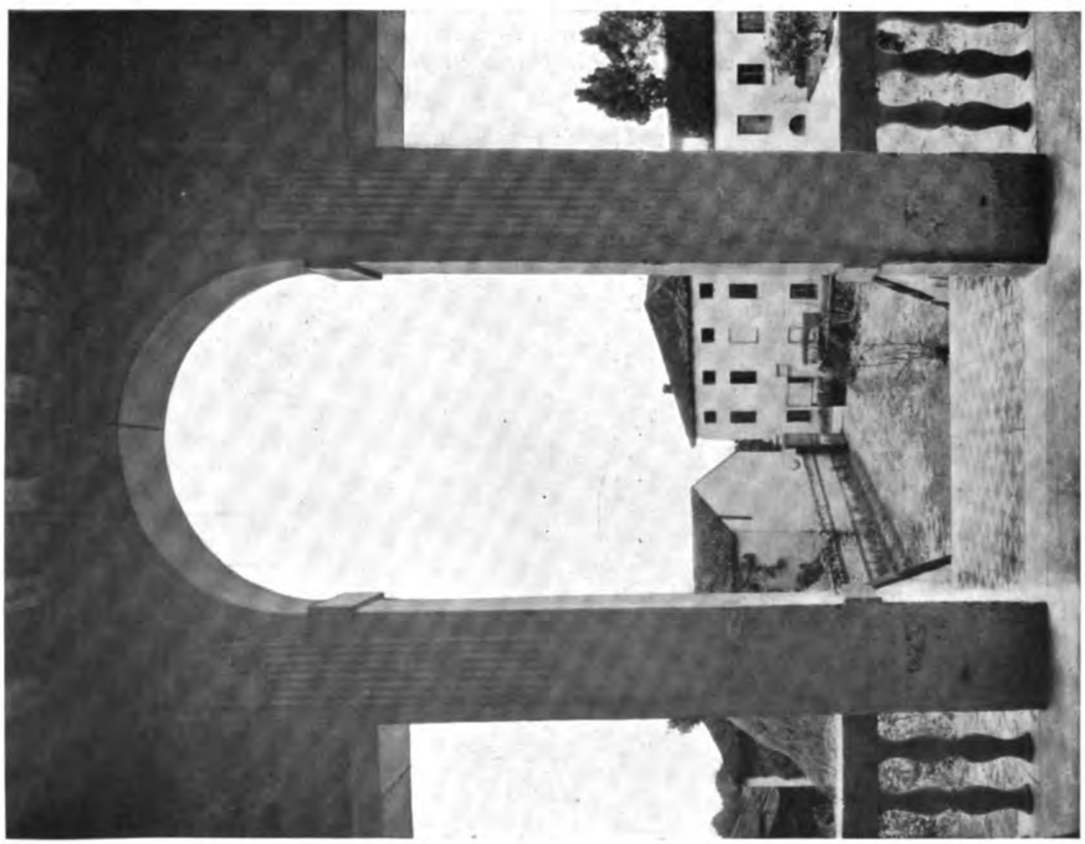
"The harmfulness of deceit lies, it must be supposed, either as a quality in the will of the deceiver or in the damage inflicted by the deceit. If, in discharge of a debt, a man were to give me instead of a sovereign a gilded farthing, he would fail, no doubt, of his promise, which was to give me the value of twenty shillings. To deceive me was essential to his plan and the desire to do so implied in his attempt. But if, when I have lent him nothing, he were to give me a gilt farthing because I wanted something bright, and because he could not afford the sovereign and must give me the bright farthing or nothing bright at all, then, though the coin might be a false sovereign, there is evidently neither evil nor injury. There is no failure of promise because no promise has been made. There is a false coin which, incidentally, may 'deceive' me; but there is no damage and no implied determination to deceive, because what I required in this case was not a sovereign but the visible effect of a sovereign, and that he proposed to give—and gave."

Hallway on Main Floor

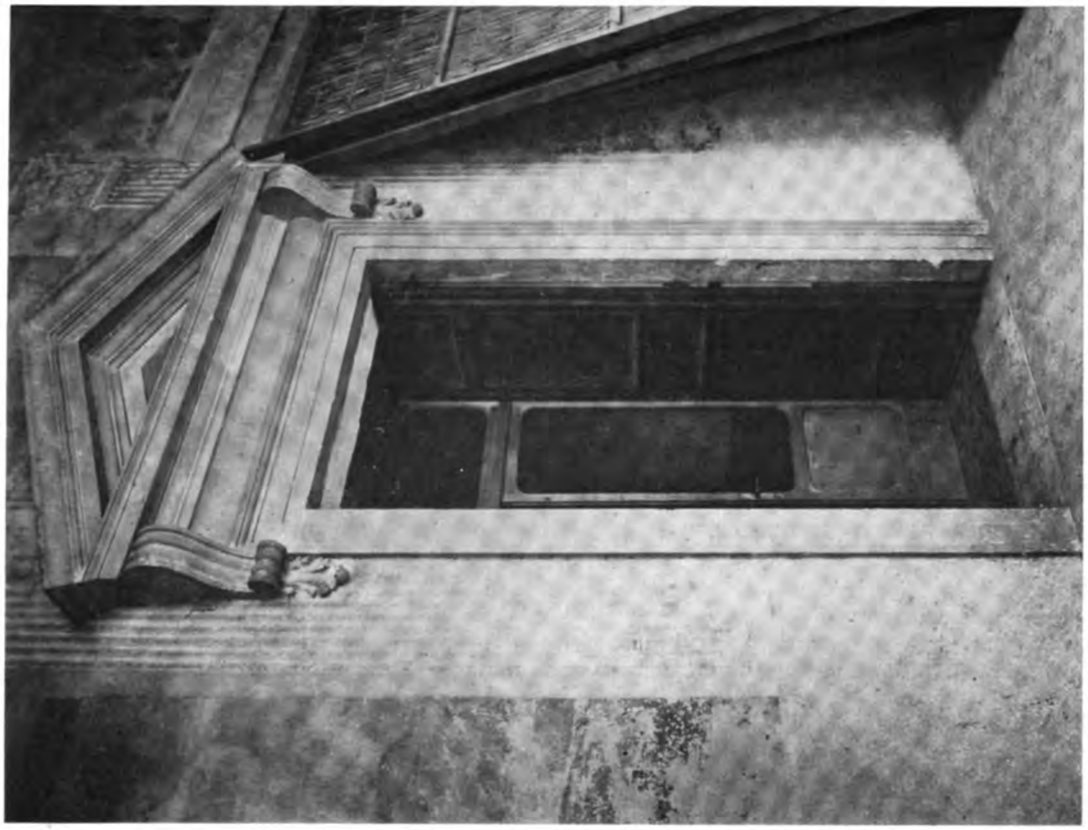
Fireplace in Northwest Room

Probably no man is persuaded into believing that the false window of a renaissance front is real, and the more familiar he is with renaissance architecture the less likely is he to believe it; but neither does he wish to believe it, nor does it matter if, by chance, he is persuaded. The window is wanted for the sake of the balance it can give to the design. Deceit is absent because the facts are patent and easy to discover. "Ruskin was not more disappointed than Palladio that the palaces of Vicenza are of stucco." Few generations were more fully aware of the valuable qualities of rich material, but the architects of that period set values "in the scale of their importance, and when economic or other barriers stood in their way, preferred at least, and foremost, to indicate *design.*" This brave impressionism satisfied the eye, and if the mind was deluded at all, it was merrily and only for a moment.

An ingenuous spectator who finds so much naively devised for his delight



PAINTED ARCHITECTURE ON WALL OF ENTRANCE LOGGIA



DOORWAY TO HALL FROM ENTRANCE LOGGIA

VILLA CERATO AT MONTECCHIO PRECALCINO, ITALY will no more complain of all these "substitutes—these false perspectives and painted shadows"—than grow indignant because, in the Greek cornice, he is shown false eggs and darts. Imitation runs through art; when we have imitated in one way long enough, our convention is accepted as such. The egg and dart moulding is a convention.

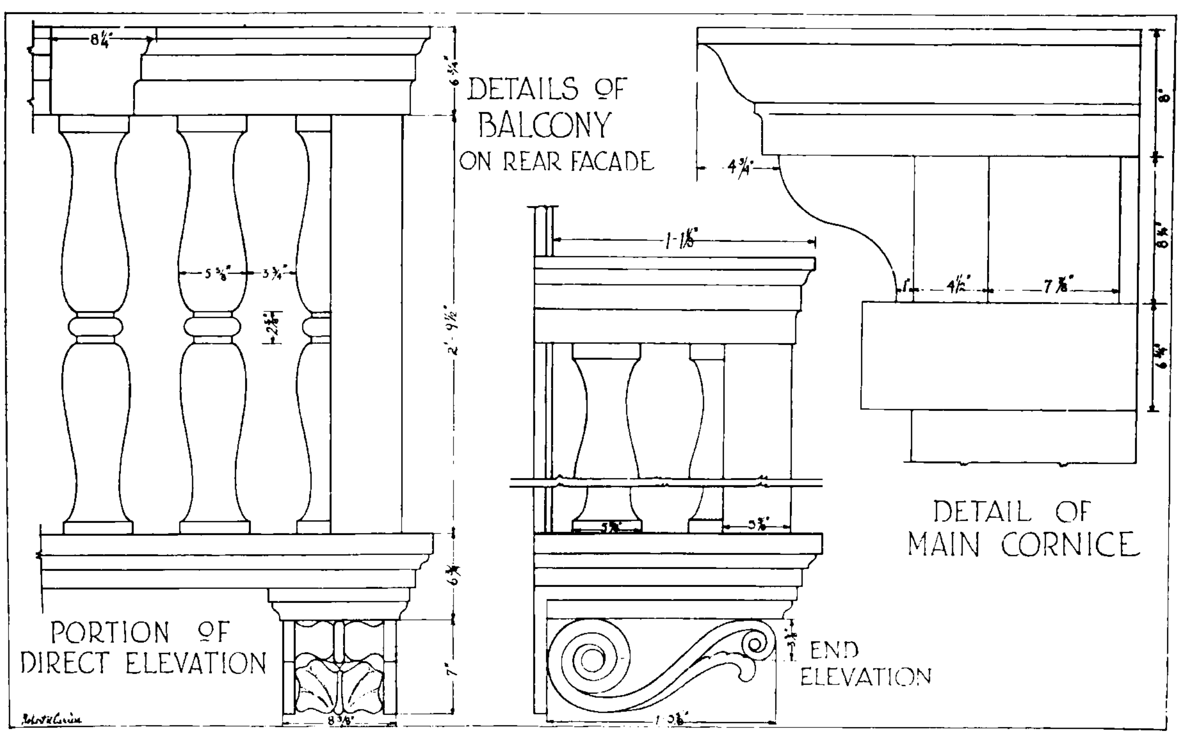
All of this applies directly to the case in point. The pleasant architectural features and adjuncts that conditions made it impossible to realize in the round, the architects of the period contented themselves with indicating in the flat—executed in paint. When they could not have the palpable, three-dimensional reality, in lieu of it they grasped the two-dimensional substitute.

In other words, "painted architecture," and the accompaniments that often went with it, are to be reckoned a conventional amenity that ministered to a sense of composition and to the imagination, often as an earnest of the architect's intentions unfulfilled and, for various reasons, unfulfillable. The fact of its existence deceived nobody. Whether we like it or not is a matter of taste, not morals. As such, our countenance or our disapproval must rest on the score of taste, not on the score of morality. Furthermore, the metamorphosis from three to two dimensions places the subject of contention in the realm of decoration and virtually removes it from that of architecture, in its strictest interpretation, so that it is manifestly inappropriate to apply to it strict architectural standards. And the fact remains, from whatever angle we choose to view it, that the "painted architecture" in the loggia of the Villa Cerato affords an element of interest and concrete imaginative suggestion; without it the loggia would have been dull and barren.

There is no documentary proof that the Villa Cerato is the work of Palladio. If not, it is nevertheless unquestionably the work of a careful adherent of his school. But the presumptive evidence in favor of its being Palladio's own work is strong. It is known that Palladio was working in the immediate neighborhood and designed a small house for Count Schio at Montecchio, between which and the Villa Cerato there is a marked similarity, although the points of difference are quite sufficient to give each its own strongly individual character.

In alluding to the lack of documentary proof of its being Palladio's personal work, Scamozzi points out that in going from the *sala* "to the stairs, one passes through an arched door without impost which does not seem . . . in the taste of Palladio." Nevertheless, "struck by the air of grandeur which shews in all its parts, and which one always observes in the buildings of our Architect," he adds that "the simplicity of this *palazzino*, along with its elegance, and its commodious internal arrangement, make it so admired of the connoisseurs that many of them without hesitation regard it as one of the many products of Palladio." To this attribution his own personal belief inclined him.

If the villa be really one of Palladio's own compositions, as seems more than likely, it is interesting to note in the lintel and arch treatment of the loggia an approximation to the so-called Palladian motif—which Palladio did not originate, and which he employed only rarely.



Impressions of the Colonial Architecture of Mexico

PART II

By WALTER H. KILHAM

THE size and architectural importance of the secular buildings erected by the Spaniards during the colonial period come as a surprise to most Americans.

These palaces are not unworthy to rank in many ways with corresponding buildings in Toledo or Burgos. They generally consist of two lofty stories, the walls being faced with the pink and porous lava scum known as *tezontle* and trimmed with a hard but well-textured light gray stone which around the main doorways is carved in intricate and imposing detail. The window trim of the second stories is continued to the cornice, enclosing a sort of transom panel which becomes a typically Mexican motif and in the cases of palaces of the high nobility the parapet is surmounted by heraldic turrets which proclaim the rank of the master. Projecting spouts throw the roof water clear of the walls, and here and there an almost forgotten Captain general has availed himself of the privilege of his rank and carved them in the form of a cannon, sometimes complete with wheels and trunnions. The great portal with its amazingly carved wooden door opens into the patio which is surrounded by imposing stone arcades which lead to a magnificent stone stairway at the rear. The skill of the ancient masons is attested by the remarkable *tour de force* in the patio of the building now used as the National School of Medicine in Mexico City where the corner pillars of the lower arcade are entirely omitted, the upper gallery being carried by stone arches concealed in the groining. Another skillful piece of masonry is the self-supporting stone stairway in one of the courts of the National Palace, which if it stood in Spain or Italy would long since have been measured and published a dozen times over.

Mention should be made, though the subject deserves a longer discussion, of the curious and frequently beautiful stucco decoration in diaper patterns of the outside walls of many of the older buildings, possibly a survival from the Aztec, but more probably of Moorish origin. This work survives in many of the older houses, but in the more costly palaces it was superseded by the *tezontle* facing which became very popular.

The broad causeways which lead southerly across the level valley from Mexico City reach the foothills of the Ajusco range after ten or twelve miles. The seeker for architectural interest as well as local color will find the walk along the old highroad which skirts the base of the hills from San Angel through Coyoacan and Churubusco to Xochimilco a continual delight as it winds between groves of towering cypress and eucalyptus which overtop the long perspectives of time stained walls, and through the shady plazas of ancient villages full of one-story villas overgrown with yellow roses and purple bougainvillea. Past these antique mansions and over this same road where the patient little donkeys trudge with their pack loads of raw hides, maize or brushwood, once fled the disorganized troops of Santa Anna and Valencia before the terrible artillery of Scott and Pillow.

In the nearby convent of San Pablo of Churubusco, where massive rose and yellow belfry now looks out over the peaceful cornfields and pleasant village gardens, General Rincon made his desperate but ineffectual stand. It is

Ancient Shrine, Mexico City

Convent of San Pablo, Churubusco

related that the white haired old General, watching the struggle from the bell tower, had his professional admiration so aroused by the splendid way in which the American troops carried the *tete de pont* a short distance away that, forgetting the desperate plight of his own men, he waved his cap and actually cheered the invaders—a truly story book example of Latin chivalry. Here at Coyoacan is a fine example of the Mexican idea of a "village" church—many domed, solid and eternal. From its roof you can look into the dark, glossy foliage of old walled gardens, watered by gurgling rivulets and across flat roofs where very likely you will spy somewhere a houseboy imitating a bull fight

Corner Treatment of a Spanish Palace

The Lower Steps at Guadalupe Hidalgo

with a red table cloth, to the snowy Popocatepetl or the frowning Ajusco. Or, if one follows the northern causeway out of the great square of the city, one comes in three miles to Guadalupe Hidalgo, the scene of a miraculous apparition of the Virgin, the resort of thousands of pious Indian pilgrims from all over Mexico who at any and all times turn

Patio in School of Medicine, Mexico City

A Street in San Angel

its streets into a panorama of color that would be the despair of any opera producer in the world. Here is the finest jewel of colonial architecture, the *Capilla del Pocito*, the Chapel of the Little Well, with its elliptical pink walls and blue and white domes, its windows blazing in brilliant detail like military decorations, and faced across the little

The Market Place at Guadalupe Hidalgo

square by blue and yellow *pulquerias* at the base of the famous steps of Tepeyac. The great church of Guadalupe, *La Colegiata*, is a real masterpiece for any country, with a fine interior, which even the unfortunate frescoes cannot quite spoil, and a highly impressive array of towers and domes, although the genuine silver railings of the altar and balconies probably carry a more direct message to the unsophisticated devotees.

"In liquid syllables the cries
Of far fruit vendors faintly rise;
And under thick palmetto shades,
And down cool covered colonnades,
The tides of traffic gently flow,
In Mexico."

One will look in vain for any important vestiges of Aztec influence on the more important examples of Mexican architecture; in fact the imported signs of Moorish influence in Spain are by far more numerous. The spiral terminations of parapets and sometimes of water tables must recall the serpent like carvings of the native work, and here and there a detail of window or finial dimly suggests an Aztec origin,but in general Spain was contented,in Mexico at least, to bring to the new country "her cross and her sorrows" and, rather than adapt the native architecture to her uses, was content to utilize the existing types of the already beautiful and dignified Spanish renaissance of Leon and Castile.

Doorway of the "Capilla del Pocito"

"Capilla del Pocito" (Chapel of the Little Well) at Guadalupe Hidalgo

An account of Mexican architecture would not be complete without mention of the celebrated sculptor and architect, Manuel Tolsa, who after achieving high distinction in Madrid sailed for Mexico in 1791. His most important work, the vast pile of the *Mineria* or School of Mines, is a good and simple design, but began soon after its erection to crack and sink into the oozy subsoil which underlies the entire city. A more successful, and in some ways more remarkable, work is his great equestrian statue of Carlos IV, known locally as the "Iron Horse," which weighs 30 tons and was cast in one piece in Mexico in 1802, long before anything of the sort had been attempted in the United States. This statue, which stands at the junction of three important avenues, is really fine work, judged by any standard, and is appreciated by the Mexicans who, as good republicans and in order that no mistake be made, have added to the inscription the words, "Mexico preserves it as a work of art." Tolsa is an important architectural asset in the art gossipof Mexico, and any particularly good minor object of art, from a candlestick to a centerpiece, is generally credited to him.

The stormy history of the Mexican republic since its independence has prevented, except during the administration of President Diaz, and perhaps that of Maximilian, as much important work being carried out as would otherwise have been the case. Under the brilliant sway of Don Porfirio, however, a good many very important buildings were begun and some were finished, which may perhaps form the subject of a later article. From the earliest times, however, the treacherous subsoil under the capital, the old bed of the partially drained lakes of the valley of Mexico, has proved a stumbling block in the way of all building operations. All the ancient buildings which were not built on the original islands have settled to a considerable extent, in some cases even as much as two meters, which results in some amusing effects which can scarcely be equaled elsewhere. It is a local saying that the principal downtown theater of Mexico City stands on top of two others which have disappeared from view, while the unfinished National Theater, which was designed to be approached by an imposing flight of steps, has settled from six to eight feet so that a sort of sunken garden will have to be devised for its main entrance at the time of completion.

In case these papers have so fired the imagination of any architectural confrere as to make him want to seize his water color box and three-legged stool and start for the Rio Grande, I will add that a train leaves the frontier every day, that the people are courteous and entertaining, the oranges and *frijoles* are perfect, and *cerveza* (beer) of excellent make is at once available, not to mention more fiery and less wholesome beverages. Terry's Guide, made in the exact image of Baedeker, is invaluable, but Flandrau's "*Viva Mexico*" should be read and re-read for its inimitable local color. The delicious memoirs of the sprightly Madame Calderon de la Barca (what an asset she must have been to any country!), written in 1839–40, are exactly as fresh now as when first put on paper. Perhaps I cannot better terminate this article than by a liberal quotation from one of her letters:

"If anyone wishes to try the effect of strong contrast, let him come direct from the United States to this country; but it is in the villages especially that the contrast is most striking. Traveling in New England, for example, we arrive at a small and flourishing village. We see four new churches, proclaiming four different sects; religion suited to all customers. These wooden churches or meeting houses are all new, all painted white, or perhaps a bright red. Hard by is a tavern with a green paling, as clean and as new as the churches, and there are also various smart stores and neat dwelling houses; all new, all wooden, all clean, and all ornamented with slight Grecian pillars. The whole has a cheerful, trim, and flourishing aspect. Houses, churches, stores, and taverns, all are of a piece. They are suited to the present emergency, whatever that may be, though they will never make fine ruins. Everything proclaims prosperity, equality, consistency; the past forgotten, the present all in all, and the future taking care of itself. No delicate attentions to posterity, who can never pay its debts. No beggars. If a man has even a hole in his coat, he must be lately from the Emerald Isle.

"Transport yourself in imagination from this New England village to that of . . . . it matters not which, not far from Mexico. 'Look on this picture, and on that. The Indian huts, with their half-naked inmates, and little gardens full of flowers; the huts themselves either built of clay or the half-ruined *beaux restes* of some stone building. At a little distance a *hacienda*, like a deserted palace, built of solid masonry, with its inner patio surrounded by thick stone pillars, with great walls and

"La Colegiata" at Guadalupe Hidalgo

iron-barred windows that might stand a siege. Here a ruined arch and cross, so solidly built that one cannot but wonder how the stones ever crumbled away. There, rising in the midst of old, faithful looking trees, the church, gray and ancient, but strong as if designed for eternity; with its saints and virgins, and martyrs and relics, its gold and silver and precious stones, whose value would buy up all the spare lots in the New England village; the *lepero*, with scarce a rag to cover him, kneeling on the marble pavement. Leave the enclosure of the church; observe the stone wall that bounds the road for more than a mile; the fruit trees overtopping it, high though it be, with their loaded branches. This is the convent orchard. And that great Gothic pile of buildings, that stands in hoary majesty, surmounted by the lofty mountains, whose cloud-enveloped summits, tinged by the evening sun, rise behind it; what could so noble a building be but the monastery, perhaps of the Carmelites, because of its exceeding rich garden, and well chosen site, for they, of all monks, are richest in this world's goods. Also we may see the reverend old prior riding slowly from under the arched gate up the village lanes, the Indians coming from their huts to do him lowly reverence as he passes. Here, everything reminds us of the past; of the conquering Spaniards, who seemed to build for eternity; impressing each work with their own solid, grave, and religious character; of the triumphs of Catholicism; and of the Indians when Cortez first startled them from their repose, and stood before them like the fulfillment of a half-forgotten prophecy. It is in the present that seems like a dream, a pale reflection of the past. All is decaying and growing fainter and men seem trusting to some unknown future which they may never see. One government has been abandoned, and there is none in its place. One revolution follows another, yet the remedy is not found. Let them beware lest, half a century later, they be awakened from their delusion, and find the cathedral turned into a meeting house, and all painted white; the railing melted down; the silver transformed into dollars; the Virgin's jewels sold to the highest bidder; the floor washed (which would do it no harm), and round the whole, a nice new wooden paling, freshly done in green—and all this performed by some of the artists from the wide-awake republic farther north."

Let us hope, however, that the day is far distant when the skyscraper and the "5 and 10," not to mention the soda fountain and the armchair lunch, invade these quiet old streets, and that the work of the Mexican builders may long remain as an example, inspiration and delight to the northern "artists" who may find their way across the Rio Grande in search of things pictorial.

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Old Church at Churubusco

The Arlington Memorial Amphitheater

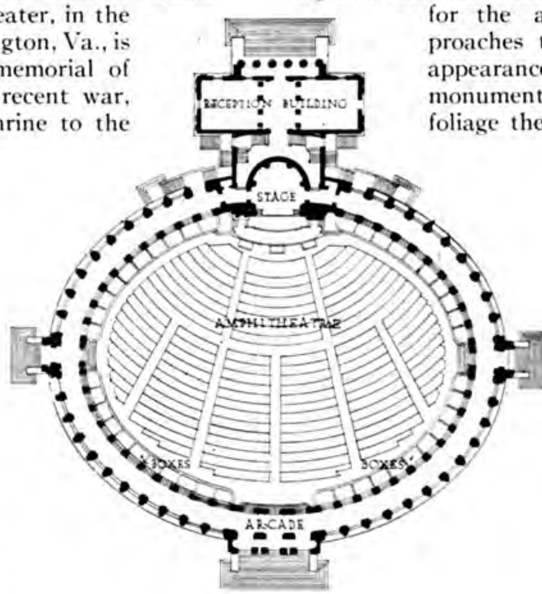
A TRIBUTE TO AMERICAN SOLDIERS AND SAILORS IN THE NATIONAL CEMETERY

CARRÈRE & HASTINGS, ARCHITECTS

THE discussion of war memorials for commemoration by state or nation of those who fell in the world war has not thus far produced much which would indicate the form which such memorials may be expected to take, or the tendency of popular taste in work of such a nature. Such monuments as have already been instituted are chiefly of a private or local character which would give but little indication of what might be expected of a memorial of a very much broader nature.

The Memorial Amphitheater, in the National Cemetery at Arlington, Va., is something more than a memorial of those who fought in the recent war, being rather a national shrine to the memory of all Americans, whether soldiers or sailors, who have fallen in the various wars in which the United States has been engaged. This memorial, as is fitting, has been placed in the cemetery which possibly more than any other one spot is associated with the memory of the nation's sons who, whether on land or sea, have died in its defense. The monument has taken the form of a great amphitheater in which gatherings of an appropriate patriotic or commemorative nature may be held, together with such accessory buildings and other adjuncts as the use of such an amphitheater would naturally involve.

The memorial has been given an excellent setting not far from the Maine monument and is approached from the Potomac River by a wide roadway which divides immediately in front of the building and surmounts the terrace which forms a base for the amphitheater. As one approaches the memorial it presents an appearance which is impressive and monumental. Against a background of foliage there stands the retaining wall of the terrace and just above appears the reception pavilion with its classical portico at the sides of which appear the columns and arches which surround the amphitheater proper and which are united at the opposite side by a monumental entrance from which leads a flight of marble steps.

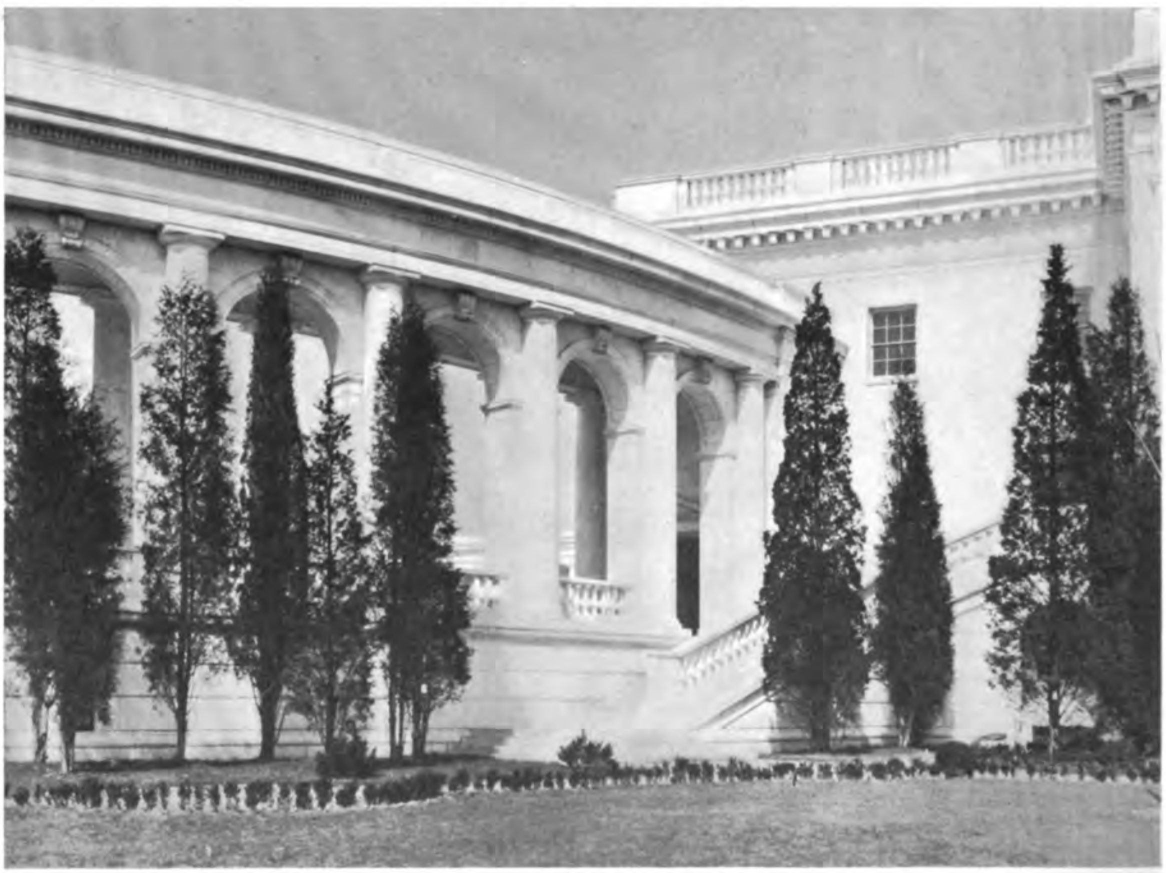


General Plan

Within the entrance portico is a sculptured frieze showing trophies of war and other symbols. The interior of

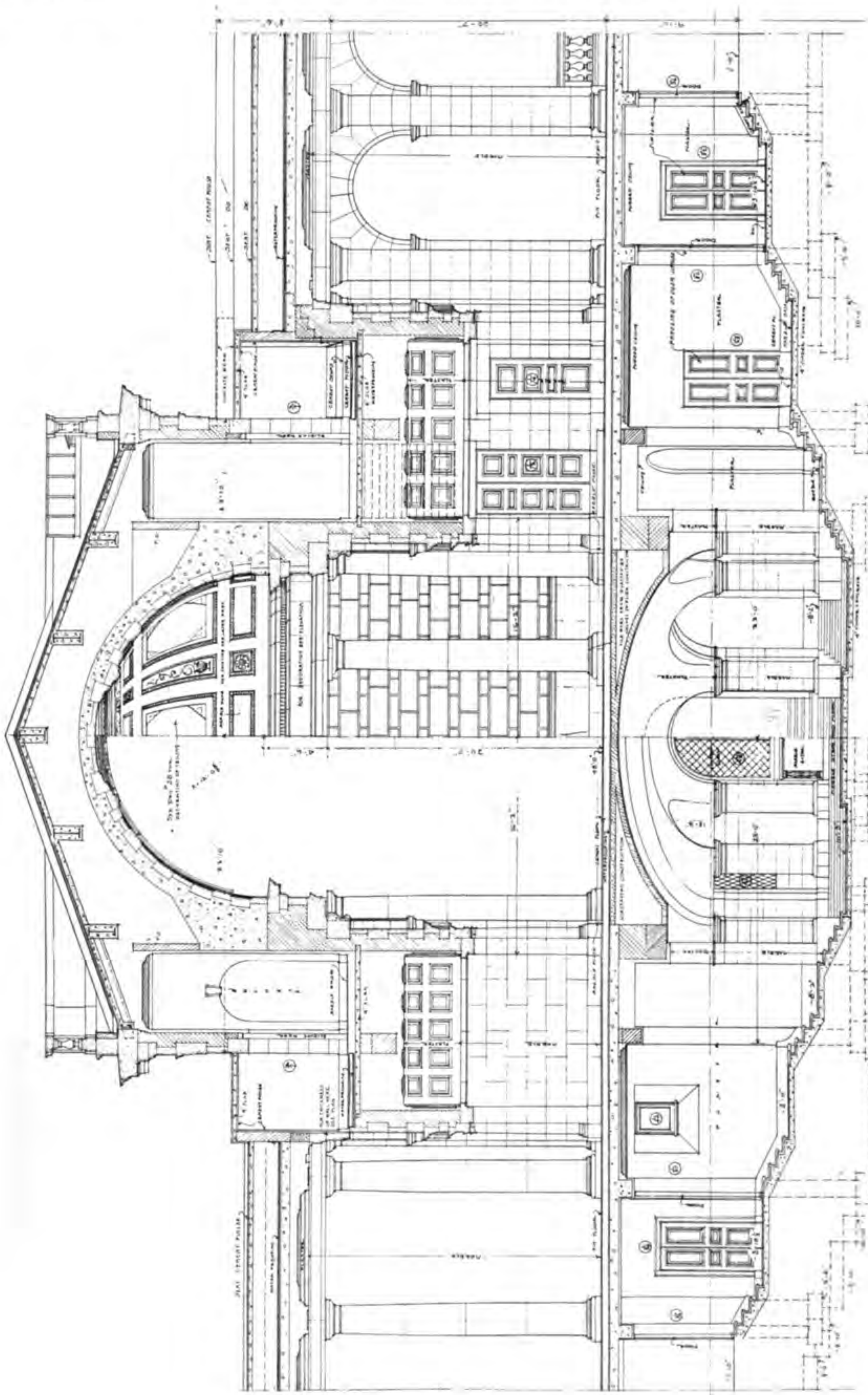
Arcade and Amphitheater Entrance Opposite Stage

DETAIL OF FRONT OPPOSITE STAGE

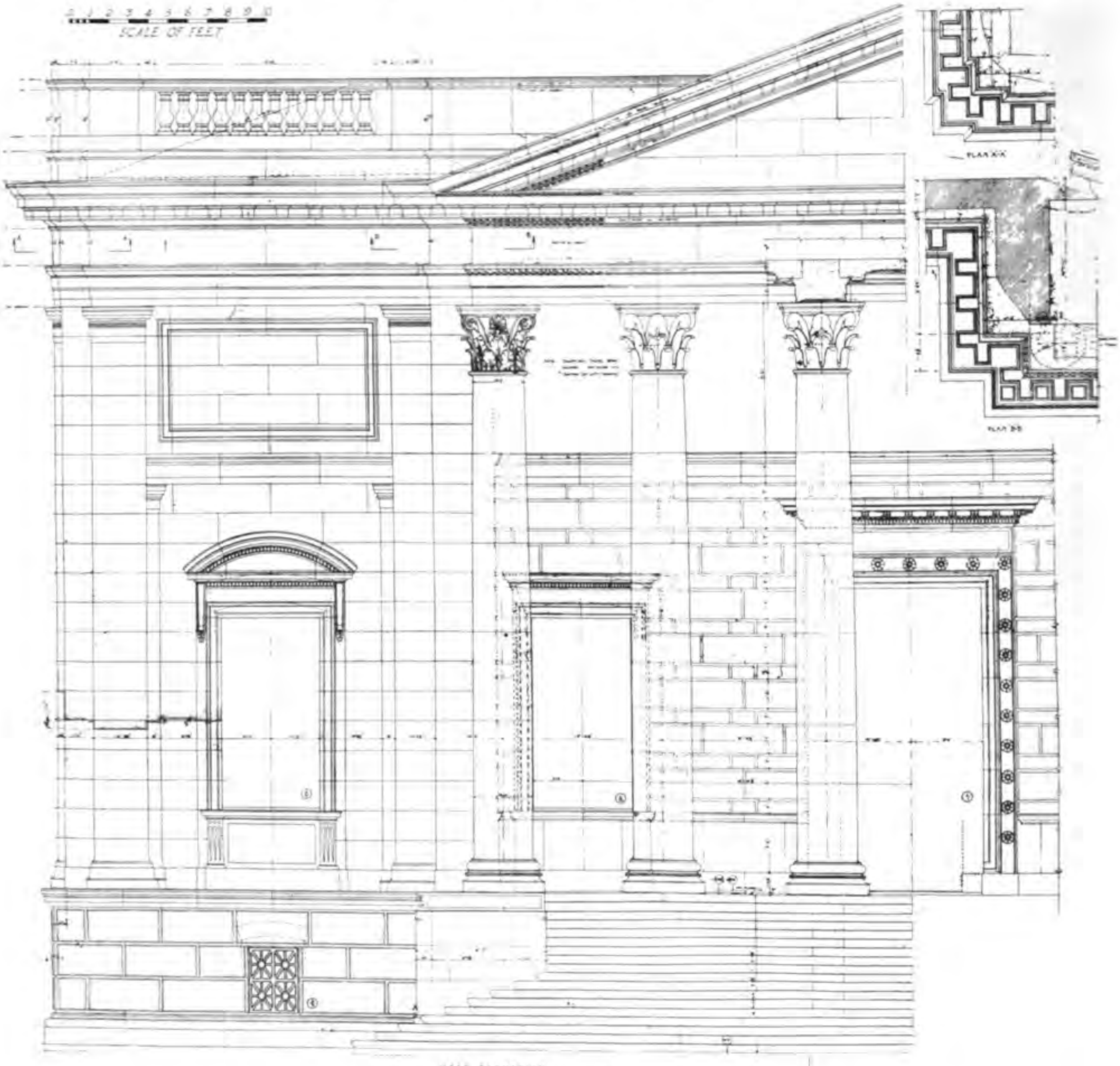


JUNCTION OF ARCADE AT STAGE

THE ARLINGTON MEMORIAL AMPHITHEATER, ARLINGTON, VA.



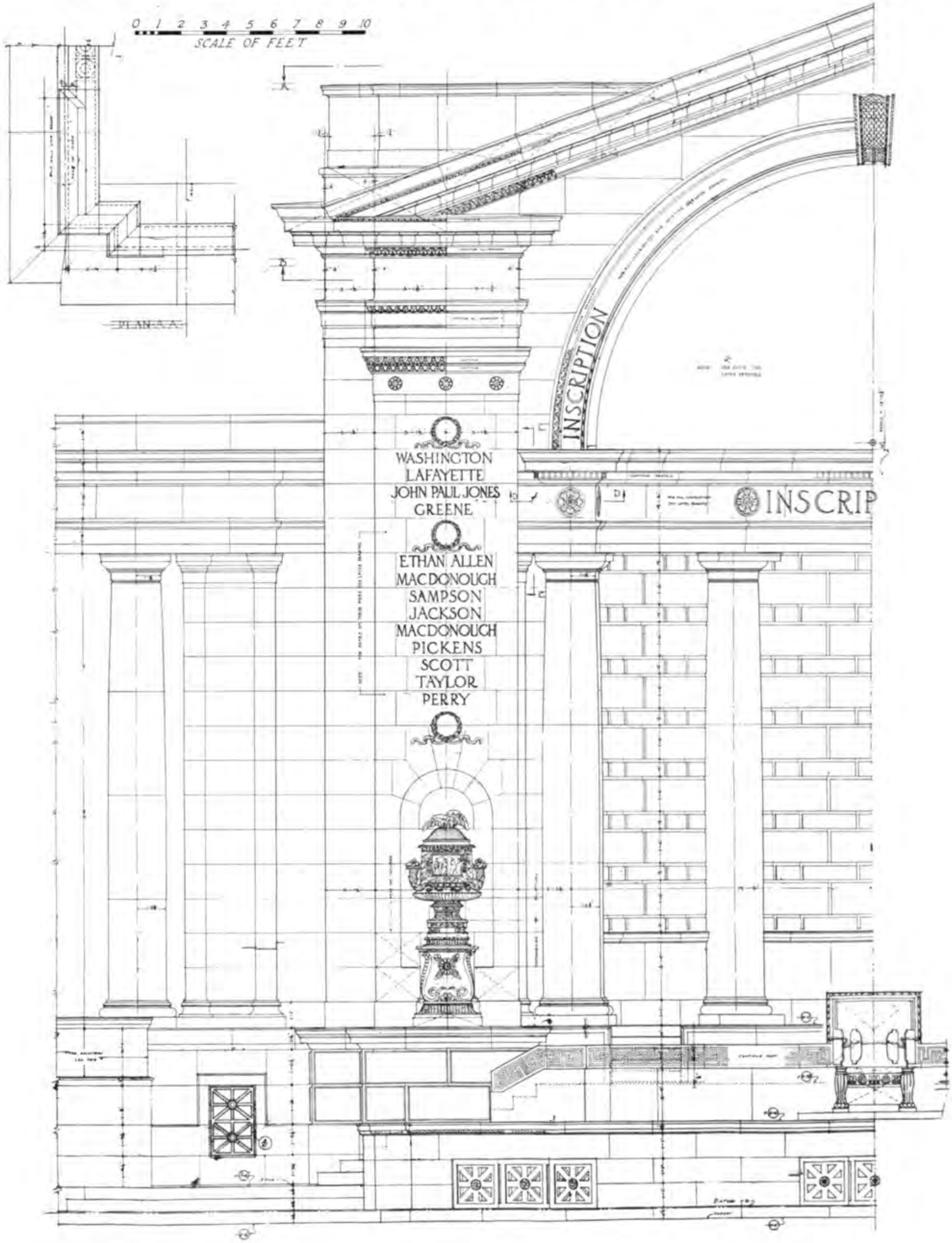
SECTION THROUGH CHAPEL AND STAGE ON AXIS OF ARCADE, ARLINGTON MEMORIAL AMPHITHEATER, ARLINGTON, VA.
CARRERE & HASTINGS, ARCHITECTS



Half Elevation of Main Facade of Reception Building

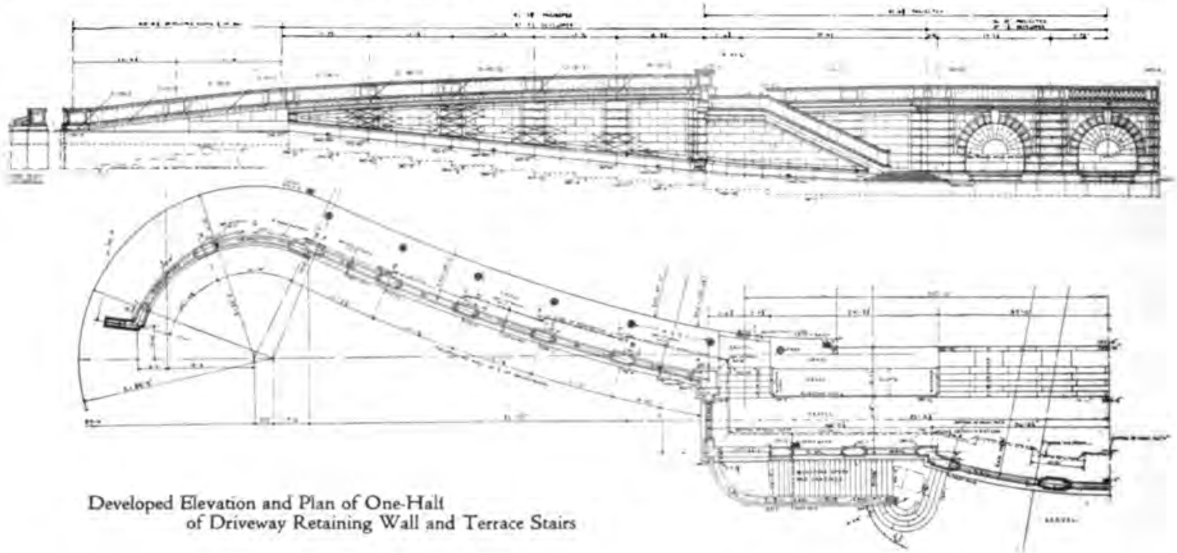
the reception pavilion is a great room faced with white marble and with a gallery at either side supported upon marble columns. This reception hall, or gallery, is intended to serve as a place for the entertainment of distinguished visitors upon suitable occasions and for the exhibition of battle flags, portraits and other trophies and relics. Since it may be necessary at times to use the reception hall for gatherings of a somewhat different nature provision has been made for serving luncheons and the necessary kitchens and service rooms are installed. Just beyond are corridors and stairways leading to the stage of the amphitheater proper. The stage is semi-circular in form and is covered with a half-dome roof which is richly carved. On either side are piers upon which are inscribed the names of eminent warriors. Appropriate inscriptions are cut upon the frieze around the stage and also upon the arch facing the amphitheater. The stage is built upon three levels and will seat almost 100 people. Beneath the stage is a mortuary chapel with a domed ceiling and raised ambulatory. It is intended that this chapel shall be sometimes used for funerals or commemorative services when the number of people attending is not large, and it has been arranged to seat 150.

The arcade which is a striking feature of the memorial as seen from the approach encircles the amphitheater which is elliptical in form. Marble benches will seat 4,000 and in the boxes within the



HALF ELEVATION OF STAGE, ARLINGTON MEMORIAL AMPHITHEATER, ARLINGTON, VA.

CARRÈRE & HASTINGS, ARCHITECTS



Developed Elevation and Plan of One-Halt of Driveway Retaining Wall and Terrace Stairs

bays of the arcade 500 more may be seated; the arcade also allows standing room for about 1,000 so that some 5,500 people in all may be accommodated at one time. Beneath this encircling arcade there are 300 crypts in which are to be placed the remains of the nation's distinguished soldiers and sailors. In front of each crypt and in the pavement of the arcade directly above will be inscribed the names of those buried there. Upon the outer cornice of the arcade there are 44 panels in each of which is inscribed the name of some important battle in which the army or navy of the United States has been engaged, beginning with the early battles of the revolutionary war and including the most important engagements of the war just ended.

In the construction of the Memorial Amphitheater care has been exercised in selecting the best qualities of materials and making use of the most approved methods of building. Foundations throughout have been laid of concrete and brick with steel used as reinforcement, and steel has also been employed in building the floors and roof of the reception pavilion. The retaining wall, which faces the Potomac River and which extends across the main front of the memorial, is faced with granite from the Fox Island quarries and the exterior of the building proper and the encircling arcade or colonnade is built of marble from the quarries at Danby, Vt., carefully selected for its whiteness and even texture. For interior construction considerable use has been made of Botticino marble in floors, columns and cornices and in certain other instances.

Particular care and thought have been given to the designing of appropriate details of metal wherever they occur in the form of grilles, lighting fittings and other accessories. An amphitheater, open to the weather and built almost wholly of marble, demands careful consideration of the resulting problems of drainage and an examination of the plans will show the provision of adequate drains in every part of the structure. Across each of the aisles there are several metal gratings covering drains, and other drains are provided for every four or five rows of benches in the amphitheater.

General View from the Approach

ENGINEERING DEPARTMENT

Charles A. Whittemore, *Associate Editor*

Terra Cotta Roofing Tile

PART II

By ALFRED LO CASCIO

FREQUENTLY in looking at houses with tile roofs we see indications of settlement and sagging in different parts, more especially around dormer windows. This opens up the flashing at points where water and snow can easily get in and cause damage to walls and ceilings. To obviate this difficulty it is quite essential to see that the frame for the roofing is properly arranged. This is true in materials other than tile, such as slate, and in this connection it may be well to suggest to architects that the roofing construction should be sufficiently tied across, with additional studs, braces, etc., so that the minimum depth of the rafters may be used, and still leave no opportunity for difficulties caused by sagging or settlement.

The Spanish tile weigh 950 pounds per square or 9½ pounds per square foot.

French (interlocking) tile weigh 925 pounds per square or 9¼ pounds per square foot.

Interlocking shingle tile weigh 900 pounds or 9 pounds per square foot.

6 x 12 x 3/8 shingle tile weigh 1150 pounds per square or 11½ pounds per square foot.

6 x 12 x 5/8 shingle tile weigh 1725 pounds per square or 17¼ pounds per square foot.

The Roman pan and roll tile weigh 1100 pounds per square or 11 pounds per square foot.

The straight barrel mission (half cylinder or concave and convex tiles) weigh 1200 pounds per square or 12 pounds per square foot.

For comparison with these figures the weights of slate roofing may be noted. The ordinary slates weigh 650 pounds (a little under 3/16-inch size), the 3/16-inch weigh about 750 pounds and the ¼-inch about 850, 3/8-inch about 950 pounds, ½-inch about 1000 pounds and 1-inch 1500 pounds per square. Any slates more than 1-inch thick, such as graduated and special thicknesses, are from 1500 to 1900 pounds per square. It is evident, therefore, that the weight of standard tiles as compared with the weight of the ordinary slates requires no special framing whatever and that the proper framing for slate is absolutely sufficient for tile, which is contrary to the general impression.

The usual rafter sizes to carry terra cotta tile are 2 x 7 or 2 x 8, 16 to 18 inches on centers. These sizes are used in almost all residential work and in a great many other buildings for the standard tiles. Of course for the extra heavy slab or graduated tile heavier rafters would be needed, which is also true for extra heavy or graduated slate.

The sheathing used over the rafters need not be tongue and grooved, as long as the boards are fairly even and laid closely, although the tongue and grooved sheathing makes a better job. The usual thickness of the sheathing is from 7/8-inch to 1-inch and it is not good construction to use cheap sheathing, uneven, irregular and with knot-holes, because difficulties may soon arise in connection with improper nailing. There must be something substantial to receive and hold the nails fastening

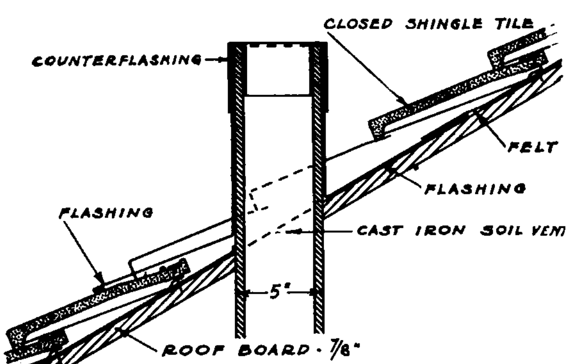


Fig. 10. Method of Flashing around Vent

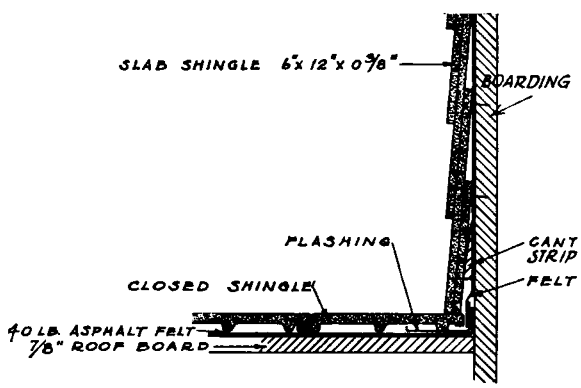


Fig. 11. Flashing for Perpendicular Slab Shingle

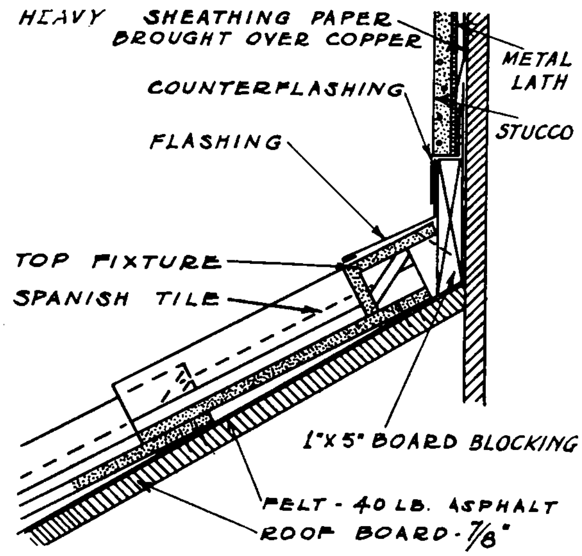


Fig. 12. Flashing Pitched Roof to Vertical Wall

the tile, and surely a knot-hole or wide spacing in the sheathing is not the right foundation.

It is not the purpose of this article to enter into a discussion of carpenter phases of tile work, but there are a few suggestions which are really important. The custom seems to prevail at the present time of having dormer studs run by headers and spiked through, instead of being halved on as in the earlier days. The result of this method of construction is that the weight of the tiles in the dormers is indirectly transferred to the nails and is carried only by them. This is obviously unfair in any type of construction, but more so where permanency is one of the chief assets, and in connection with roofs of first class construction it is important to see that the frame of the roof is not so constructed.

It has been found in the cases of large apartment houses that book tile may be laid, carried by light angles, over which is a layer of concrete, which has a characteristic of holding the nails securely. There are many types of material on the market at the present time answering this description.

Many real estate owners have found it to their advantage to eliminate altogether tar and gravel for roofing surfaces of certain structures, such as office buildings. Particularly is this true in large corporation buildings and department stores where the roofs serve the purpose of an exercise yard for the employes. In such cases it would be well to use flat quarry tile or a special flat shingle tile which can be bedded either in concrete or mastic or joints run in tar.

One point which frequently causes trouble is flashing around steam pipes, vent pipes, etc. which penetrate the roof surfaces. Fig. 10 shows a method of preparing this flashing and while it is indicated for a sloping roof with a board finish, the same

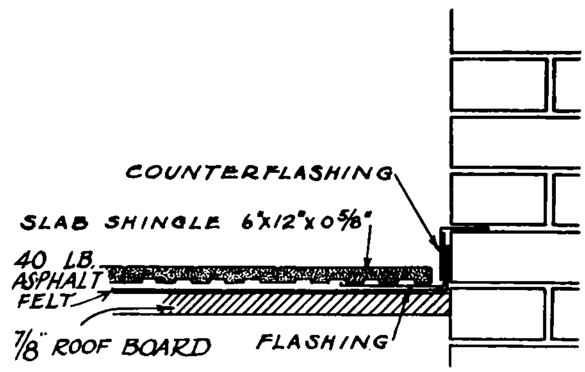


Fig. 14. Flashing Shingle Tile against Brick Wall

general details would apply for flashing an all fireproof construction and also for all flat surfaces. It should be noticed that the apron flashing over the tile is carried up against the vents and it is essential that a copper flashing be placed over this and carried down. For this method, in place of the usual stock plumber's pipe showing a 10- or 12-ounce 10 x 12 copper flashing, it is better to use not less than 20 x 24 16-ounce soft roll copper or lead flash-

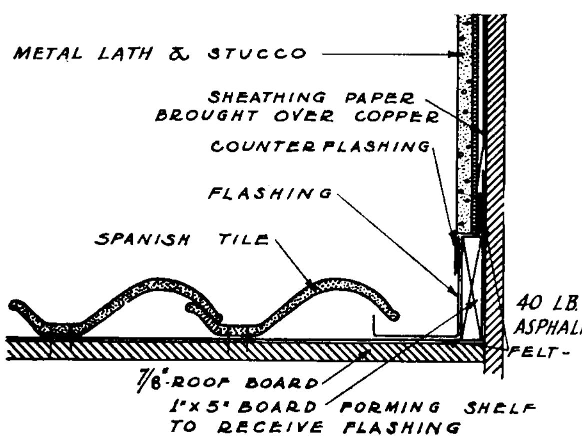


Fig. 13. Method of Flashing against Stucco Wall

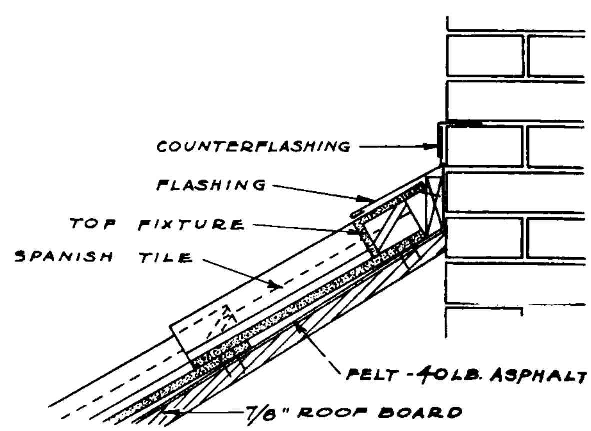


Fig. 15. Metal Apron in Brick Wall for Pitch Roof

ing. Lead is sometimes used to greater advantage in connection with a roll tile, as it is easier to mould around the tile than the copper. This, however, is not always true when flat shingle tile is used.

In a previous article the problem of flashing against the sides of dormer windows or vertical walls was taken up. Figs. 11, 12 and 13 show the accepted methods of flashing under these conditions.

Relative to this method of flashing there is a very simple but rather important process which is often neglected, that is the placing of roofing paper against the vertical wall before the wire lath and stucco are placed. This paper should come over on top of the counter flashing, so that if water should find its way through the stucco it would follow the lines of the paper over the flashing, whereas, if the flashing were placed against the paper, the water would naturally run down in back of the cant strip, causing a leak. Where the roof comes in contact with surfaces of different characters, expansion and contraction from heat and cold of the materials used must be carefully considered. In this connection counter-flashing and

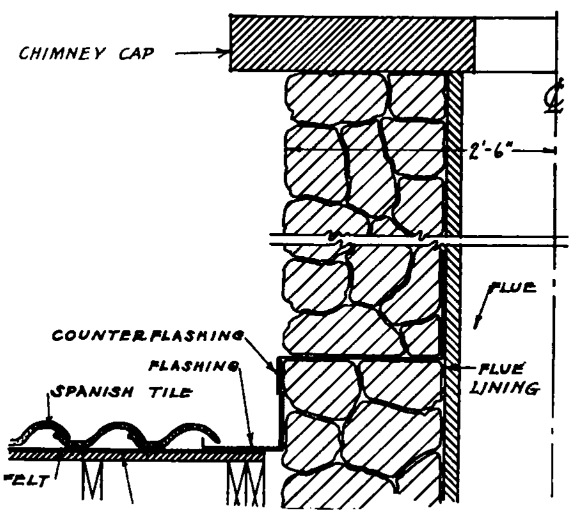


Fig. 16. Method of Flashing with Stonework

under-flashing should always, to secure the best results, be followed by double flashing. Figs. 14, 15 and 16 illustrate methods of flashing which will take care of expansion and contraction.

Fig. 16 also shows the construction of a chimney out of field stone, which is a very treacherous material with which to work. The counter-flashing should be carried through the stone and up against the flue lining and turned up in back of the stone, the remainder of the work being done in the usual way. If this arrangement is not carefully followed out, nine times out of ten the chimney will leak. Another point, which is frequently somewhat neglected, is the forming of the drip pan or flashing under dormer window sills. This is difficult when the flashing comes very close to the sills. Fig. 17

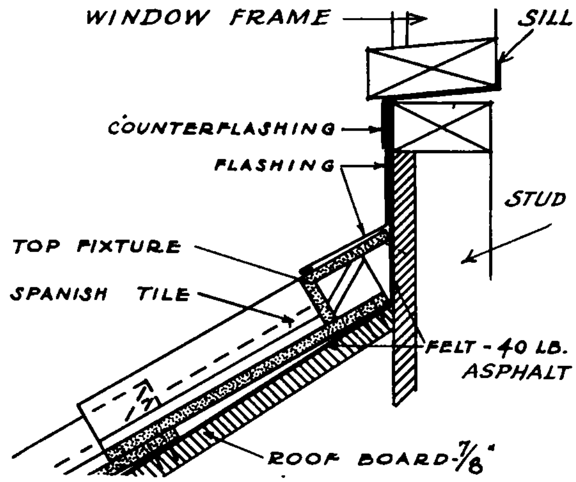


Fig. 17. Method of Flashing Dormer Window

shows a method which has proved its merit in keeping water out from dormer windows where the sills are too close to the roof. Counter-flashing should be carried across and turned up at the ends of the sills.

In connection with tile roofs, the question of handling water at the eaves of the sloping surfaces is one which has caused considerable annoyance. A remedy for this is the construction indicated in Fig. 18, which has a gutter suspended in such a manner that a heavy rush of snow or ice will pass over the top of the gutter. The strap of the gutter should be

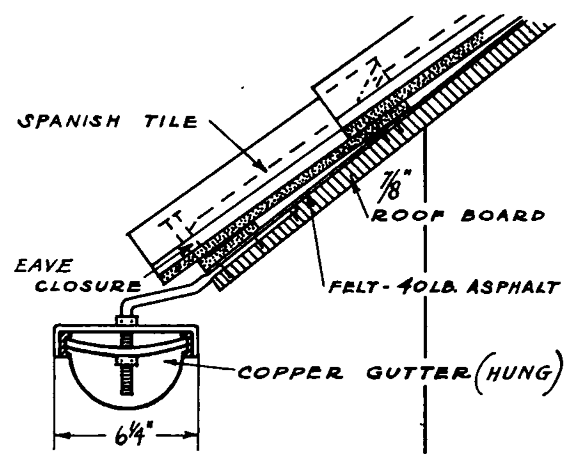


Fig. 18. Section through Gutter at Eaves

countersunk, flush with the roof board under the roofing paper. It is most essential to place gutters in such positions that they will receive the water from the roof in heavy rains or light rains, and special care should be taken to adjust the gutters to the conditions on each building. Some tile roofs require cant strips which are formed on tile-like eaves closures, which raise the valley or pan of the tile and great care should be taken in regard to the proper location of the gutter.

Truss Design and Details

PART V. THE SCISSORS TRUSS

By CHARLES L. SHEDD, C.E.

IN some buildings, especially churches, a form of wooden truss known as the scissors truss is frequently used. Figs. 19 and 20 show two forms of this truss. The heavy lines show compression members and the light lines show tension members.

The form shown in Fig. 19 is the more common. In this truss all members are made of wood except the small vertical in the center which is of metal,

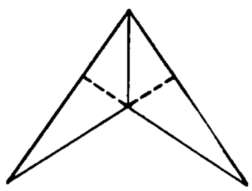


Fig. 19

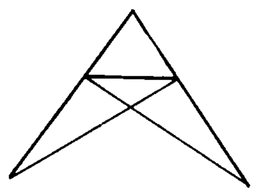


Fig. 20

usually a rod. Plates have to be used at the joints to develop the members. The detail of these joints is often rather difficult to design properly. When the only load on the truss is at the ridge, the members shown dotted have no stress to carry.

The form shown in Fig. 20 is made entirely of wood except the plates at the joints. If there were no shrinkage in the wood and if the joints were perfectly made it would act like any ordinary truss and have no thrust at the supports except that due to the wind and secondary stresses. In practice, however, there is more or less thrust developed at the ends, especially some time after the truss is built. If the truss is carried on the top of a wooden post or on the top of a high, thin wall serious trouble may develop a year or so after the building is erected. This trouble appears in a spreading of the walls and leaks in the roof. Such a condition may reflect on the reputation of the designer al-

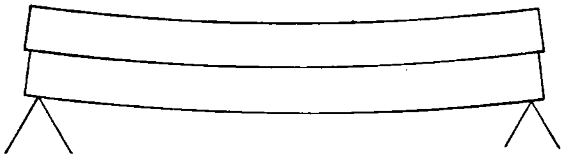


Fig. 21

though he may feel that he had designed the structure properly. He should therefore be careful not to use such a truss except where there are abutments in the walls of sufficient strength to resist any possible thrust which may come on them.

There is no doubt but that plenty of church roofs may be found with this type of truss and no provision made for thrust where the building has proved entirely satisfactory. However, the fact that one structure designed in a certain way has proved all right does not necessarily prove that every structure designed in this way will prove satisfactory. If, when reasonable care has been taken by the builder and the inspector, trouble occurs at times in a certain type of design, it is unsafe for the designer who values his reputation to repeat this type without taking proper precautions to guard against the trouble appearing in his structure. In other words, the designer should try to make his design "fool proof."

If one of these structures loosens in the joints there will also occur considerable bending in the wooden members due to what are commonly known as secondary stresses. This makes another point to guard against in the designing of this type of truss.

Deepened Beams

A previous article in THE FORUM described a common method of reinforcing a wooden beam known as the king post truss and the queen post truss. There are two other well known methods. One of these is formed by placing two beams on

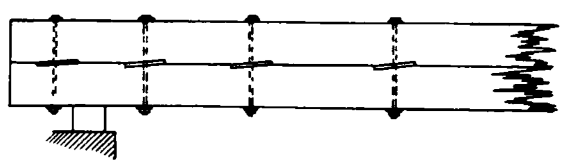


Fig. 22

top of each other. If they are placed in this way, but not fastened together, they will deflect into a form such as is shown in Fig. 21. Here it will be noticed that at the surface between the two beams they slip on each other. (Notice the positions of the ends.) In this case they will have a strength equal to the combined strength of the two beams which would be the same as if they were placed side by side. If, however, they are fastened together sufficiently so that they cannot slip when loaded they will have a much greater strength. If the sticks are of the same size the developed strength of the two sticks, fastened securely together, will be four times as great as one stick alone.

The first method which might occur to the designer for fastening these sticks would be to bolt them together with vertical bolts passing through both sticks. This however will seldom, if ever, develop the maximum strength although it would add considerably to that of the timbers if used with no connection. The reason for this is that the bolts will bend and crush into the wood before the full strength of the sticks is developed.

It is therefore common practice to put keys between the two beams and then bolt them together as shown in Fig. 22. These keys may be made of wood, preferably of some hard wood such as oak, or of cast iron, wrought iron or steel. Those shown in Fig. 22 would be of steel or wrought iron. Oak blocks would be larger, with the sides parallel to the sticks instead of inclined. See Fig. 28. Cast iron keys are often cast in irregular shapes. In any case it is important that these keys be longer than they are thick. The thickness of the key is determined primarily by the bearing required on the end of the wood fibers to prevent the slipping. This bearing stress causes a twisting moment on the key which must be resisted by bearing against the sides of the wood fiber in a direction at right angles to the first stress. This stress varies in intensity from zero at the middle of the key to a maximum at the end, so that, due to this and to the fact that wood cannot resist pressure against the sides of the fibers as well as on the ends, the key must be of sufficient length to distribute this stress.

The tendency to slip is less toward the middle of the span if the load on the beam is uniform. If the load is concentrated this stress is the same at any point between the support and the first concentrated load. In Fig. 22 the keys are shown spaced farther and farther apart as the distance from the support increases, as would be the case for a uniformly loaded beam.

The Flitch Beam

The other method of strengthening a wooden beam is known as the flitch beam, shown in Fig. 23. In this case two or more wooden beams are placed side by side with metal plates between them. These plates may be made of steel, wrought iron or cast iron. As the allowable stress per square inch varies considerably for various materials and as the modulus of elasticity also varies it is not correct to add the strengths of the separate parts together to get the resultant strength of the flitch beam. Such a result would often be very different from the true strength which would be developed. The principle underlying this type of design usually appears to be obscure to anyone who has not had it explained and faulty assumptions may result if it is not clearly understood.

When we speak of the modulus of elasticity we mean the relation which the stress per square inch bears to the deflection. Thus, with hard pine if a certain beam deflected an inch there would be a certain stress per square inch in compression at the top of the beam, but if that same section were made of steel and loaded until it deflected an inch the stress per square inch in the same relative position would be very much greater. The allowable stress per square inch in steel is much larger than it is for hard pine, and if the ratio between these allowable stresses were the same as the ratio between the actual stresses with the same deflection then we could add the strengths of the different parts together to obtain the strength of the whole, but unfortunately these ratios are not the same. The result would be that if we took such a beam and started putting on the load a little at a time the allowable stress in one material would be reached before it would in the other. It is therefore evident that the safe load on such a beam would be reached when one of the materials had been stressed up to its safe amount.

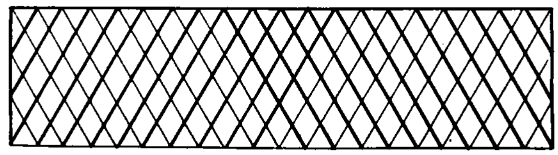


Fig. 24

This form of beam is not in such common use now as it was years ago, due largely to the fact that it is not usually an economical section. When this type is employed it is not necessary to use a metal plate in the middle but an I beam or two channels may be used facing each other with a wooden beam between them. The bolts do not resist any considerable stress but hold the different parts together and make them act simultaneously if it happens that the load is at first applied to one part more than to the others.

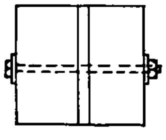


Fig. 23

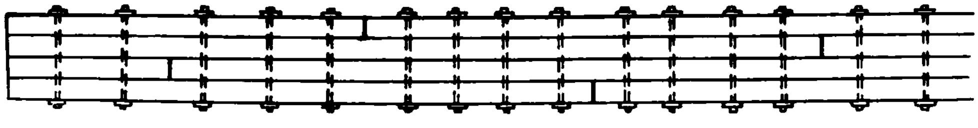


Fig. 25

Latticed Trusses

In Fig. 24 is shown a latticed truss. This is really in effect several trusses with chords in common. They are built of wood with the web members fastened to the chords by wooden pins or bolts. It was quite common years ago to build this form of truss for bridges throughout New England and many of them are still standing on highways and railroads and are spoken of as "covered bridges." In these the web members passed between the pieces forming the chords and extended some little distance beyond them. This was to prevent the pins or bolts from shearing out at the ends of the web members. A source of weakness was often found in the end posts due to

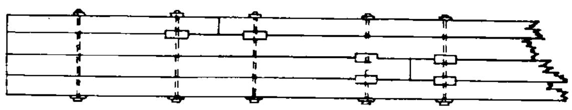


Fig. 26

bending caused by the stresses from the short web pieces which met on them. When the loads were light this form of bridge was very satisfactory. It was cheap, easily built with local labor, and any developing weakness was observed in such a wooden structure usually before it became dangerous, and could be repaired to make it safe.

During the late world war considerable notice was taken of this type of truss for roof construction. The chords could be curved or inclined and they proved to be a very satisfactory structure for a cheap, temporary building which could be erected with considerable speed and without labor of great skill. It appears to the author, however, that some architects have given undue credit to this form of truss, welcoming it as "a new type of design" and as "a type developed by the war and come to stay," all of which description appears to be an exaggeration of the true facts. The idea is not new, and therefore was not developed by the war, and the writer doubts if it has come to stay except in special construction where, after careful consideration of

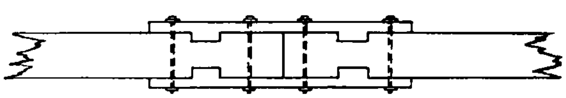


Fig. 27

the conditions and a complete understanding of the value of this type of truss, it is determined upon as the best to use. In some of these trusses which the author has noticed it has appeared to him from superficial examination that there existed a weakness in the fact that the web members were not carried a sufficient distance beyond the pins or bolts to provide against shearing out at the ends, as noted in the preliminary description of the old covered bridges.

Tension Splices

In wooden construction, especially trusses, it is at times desirable to splice a member which is subjected to tension. In our consideration of wooden trusses in previous articles it was noted that it was often cheaper to pay the extra for a longer stick than to make the splice if it were designed properly. However there are times when a splice is the proper thing to use. In trusses it is the bottom chord which may require splicing. If this chord can be made up out of several pieces, side by side, these separate pieces may sometimes be broken near the ends of the truss where the stress is not a maximum, and by staggering the breaks in the different sticks splices may be made which by the aid of bolts do not overstress the structure at any point. When it can be accomplished in this simple manner it would look something like Fig. 25.

It may here occur that the bolts are not sufficiently strong to resist the stress which they transfer, in which case we have to insert keys similar to those used in the deepened beam in which case the splices would look like Fig. 26.

These types of splice do not develop the entire strength of the sticks in any case—in fact it would be impossible to develop the full strength of any tension stick due to the loss of section from cuts or bolts. However, these splices described so far can be used to develop a small part of what the stick

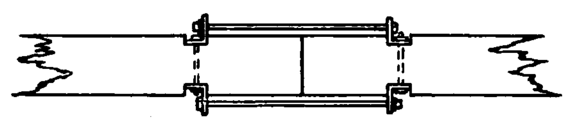


Fig. 28

could carry were it in one piece and the types shown in Figs. 27 and 28 can be used to develop still more strength.

In the case of Fig. 27 a splice is shown in which the material is entirely wood with the exception of the bolts. To reduce the size of the splicing material wrought iron or steel may be used in which case the lugs may be made of separate plates riveted to the long plate by countersunk rivets. The efficiency of the splice may be increased up to a certain point by increasing the number of lugs. The greatest efficiency can be reached when the material in the stick which is left between opposite notches is a maximum. Lugs should not be used less than ¾ inch thick and one inch is still better. The distances between the lugs and from the nearest lug to the joint should be at least 12 times the thickness of the lug.

A simple splice is shown in Fig. 28 composed of four short angles connected by bolts and bolted through the wooden sticks. Especial care should be taken to make the angles thick enough to resist the bending to which they are subject. The maximum efficiency of this type of splice is quite likely to be limited by the available thickness of this angle. This could be helped somewhat by angles running along the long bolts and so stiffening this outstanding leg of the short angles. The bending on the other leg might then be the limiting feature.

An endless number of splices might be designed but these described illustrate the basic principles.

MINOR ARCHITECTURE
EXEMPLIFIED IN MODERATE COST BUILDINGS

A City House Development of Greater New York

WALTER HOPKINS AND PHILIP RESNYK, Associated Architects

THE securing of the absolute maximum in value for the "irreducible minimum" of expenditure is, in well planned homes of moderate cost, worked out to a solution so successful that the utmost in area and equipment is had at the smallest possible financial cost.

Norwood Gardens is a development in which these results have been secured to an unusual degree. The selection of the location itself denotes the practice of efficient economy for it is in a district of Queensboro actually close to Manhattan, being almost opposite East 86th street, but hitherto neglected by builders owing to the lack of transportation service necessary for its development. The opening of new transit lines has brought this district to within 15 minutes' travel of 42nd street, at a five-cent car fare. Another detail in which economy of planning is evident has been the financing of the project, in all of its aspects, by one great financial institution, the Metropolitan Life Insurance Co., which has supplied the funds for building, making possible close prices on large quantities of material bought for cash, and which also furnishes the funds required for the permanent mortgages which many of the buyers of these homes assume. The price of a house in Norwood Gardens is $15,000, of which $1,500 is payable on signing the contract, $3,500 on delivery of deed and $10,000 covered by mortgages.

Planned and built by one ownership, results have been secured which give to the development a highly distinctive character which is attractive to a discriminating class desiring city residences of artistic design and good construction, in a restricted

View of Fifteen-House Block Showing Variation of Facades

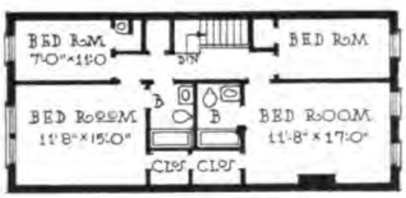
A Gabled Facade Used at Intervals in Blocks

locality and readily accessible from the business district of New York. The setting of the houses 25 feet from the street affords a clear space of 110 feet between houses on opposite sides, and 25 feet of this space on each side of the street is arranged in a continuous parked space which gives a well cared for appearance to the locality.

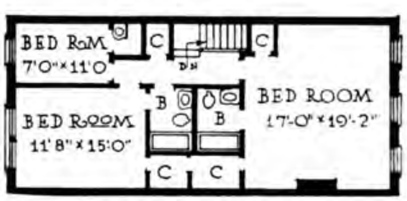
Behind these spaces, planted with grass and shrubbery, the facades of the houses appear to the greatest advantage, each with its brick-paved terrace across the front, edged around with a privet hedge. Wholly unlike the dreary brown stone fronts of an earlier day or the restless, incoherent buildings of a later period, these tasteful dwellings with their well ordered symmetry suggest homes in certain parts of London, for while the materials used are different, the effect of unified development is much the same.

The facades show a careful use of rough textured brick and cream colored stucco with roofing tiles for certain cornices and a moderate use of wrought iron and modeled terra cotta, while well selected colors for the shutters and other exterior woodwork heighten the distinguished appearance of the houses. The wide use of automobiles and constantly growing demand for garages, even in city houses, have resulted in a practical and economical solution. By giving up the ordinarily useless back yard of the city dwelling and throwing together all such areas a wide, open, paved space has been secured upon which there opens from each house a garage sufficiently large for two cars.

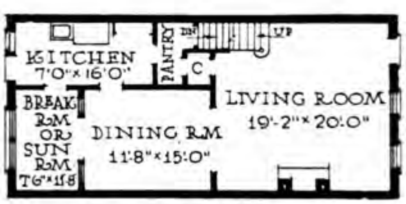
In planning the interiors of these houses there have been secured for them the sunshine, fresh air, spaciousness and the easy housekeeping features of more costly dwellings. In those houses from which the hall is omitted the entrance is directly into a living room 19 x 20, which alone covers about the area of a city apartment of two rooms and bath.



Alternative Second Floor Plan



Second Floor Plan



First Floor Plan

Typical Rear Detail Showing Basement Garage

Interior Decoration Commissions

BUSINESS METHODS SUCCESSFULLY EMPLOYED BY ARCHITECTS

I. Utilizing the Services of a Professional Purchaser

AS explained in the January issue there are three practical methods by which an architect may handle an interior decoration commission. The application of these methods depends partly upon the intricacy and size of the project and partly upon the architect's personal inclinations. These several methods may be briefly reviewed.

1. On a complex problem it may be well to advise the employment of a skilled interior decorator, usually of the type maintaining an extensive stock of reproductions, antiques and modern decorative materials. In carrying out this method the decorator works with the architect and owner.

2. This method involves the handling of the complete transaction by the architect alone.

3. Sometimes another plan may be preferred, and this method involves the handling of the operation by the architect engaging an interior decorator as a professional purchaser to carry out details of buying, matching samples and carrying on business transactions with manufacturers and dealers.

This is the first of three brief articles which will outline the application of the various methods here described, and the subject for present consideration is the third method, by which the services of a professional purchaser are employed to carry out the details under the architect's guidance. We may first consider the business relationship to be established between the architect and the client, and between the architect and the interior decorator who is to act as professional purchaser and adviser on details. We have three elements to consider: first, the commission which the architect should receive; second, how the interior decorator is to be paid; and third, the provision of a comprehensive service which will be satisfactory to the owner.

The architect's commission under this method of operation is usually 10% of the total expenditure involved. This is paid directly by the owner and covers these various details:

- Interior design and general specifications.
- Obtaining of estimates through the interior decorator.
- Supervising the purchases and work of the decorator.
- Checking costs and generally protecting the interests of the owner.

The decorator, being essentially a contractor, is paid no fee but is allowed the trade discounts which result when the owner pays retail prices. In some instances the decorator allows cash discount percentages which vary in accordance with the transaction but which serve to reduce the cost somewhat from the owner's viewpoint. The trade discount which the decorator receives may average 25% or more, but as he (or she) has not only to carry the financing of the transaction until the owner makes payments, but has also a large amount of detail work to carry out, this is but a fair return.

The architect, in consultation with the owner, develops the general interior room schemes. The work of obtaining samples and prices on paper, fabrics, furniture, fixtures and equipment of every kind is then turned over to the professional purchaser who, having a thorough knowledge of the market, will soon assemble the necessary data so that the architect may show samples to the owner or take the owner to various shops to inspect furniture and other decorative units.

The price schedule is prepared by the professional purchaser and is checked by the architect. When approved by the owner this entire scheme is put into operation, purchasing of necessary quantities is commenced and sub-contracts are made for papering, painting, decorative tile work, interior woodwork and similar details. These contracts and purchases are approved throughout by the architect and while the carrying out of the project is followed closely by the interior decorator, supervision is also provided by the architect.

This method of handling an interior decoration project is particularly applicable to the architect's office where there is not sufficient work to maintain a regular department, and where the services of someone who knows the market may be required in order to expedite the work and to relieve the architect of the laborious details involved in obtaining samples of materials and prices on furnishings of numerous kinds. It is therefore evident that the selection of an individual competent to carry out this work is important, and if an architect has not already been in contact with someone who is capable of doing this work, it may be that information is obtainable through other architects' offices or by inquiry among members of the wholesale decoration trades.

It is interesting to note that this class of interior decorators is made up almost entirely of women, which is probably a natural development based on the feminine instinct for shopping. The relations between the architect and interior decorator of this class should be entirely open and frank, insofar as a knowledge of the discounts received by the decorator may be concerned. There should be definite co-operation to protect the interests of the owner and to avoid the natural tendency of the decorator to purchase where the most favorable discounts are allowed.

Handling the Business Details

At best the business features of a project of this nature are complex, and while it may seem that the decorator's discount is at times large, it must be noted on the other hand that on many of the items involved the discounts are so small that usually they balance to no more than a fair total payment for the time and painstaking effort required on the part of the professional purchaser. Fundamentally, both from ethical and sound business viewpoints, the architect who is paid a commission on this type of work by the owner is not entitled to receive any share in the profits of the decorator, or any special discounts which are not immediately credited to the owner's account.

In many of the letters which we have received from architects on this subject it has been said that the usual charge in handling an interior decoration commission is 10%. There have been complaints that this is not sufficient to place this part of the work on a paying basis. If the architect handles all details of a project of this kind himself, without the aid of a professional purchaser, this condition is true, for the amount of time involved in gathering details is so great that in the end the architect will have nothing more than the satisfaction of carrying out his ideas through the entire project in building and interior design. In itself this reward to the average architect is of great importance, and many firms carry out the details of furnishing and decoration for this alone. On the other hand, it is evident that the payment of a fee by the owner constitutes sound business policy, and that he receives a definite service from the architect for this payment. Accordingly, the architect who may carry out a scheme in the manner just described will avoid much of the detail work, and consequently a 10% fee will show him a profit.

It may be noted at this point also that the Furniture and Decoration Department of THE ARCHITECTURAL FORUM has now developed a service through which it is in a position to recommend professional purchasers of good standing who are willing to co-operate in every way with the architect in carrying out a project under this plan. Or, if architects located at various points which may be out of touch with the furniture and decorative material markets developed in important cities wish the co-operation of local purchasers, this can also be arranged.

The question of securing a professional purchaser who will work efficiently in the interests of the owner and harmoniously with the architect offers some difficulties. Assuming that such a relationship has not as yet been developed, the architect will seek the services of someone who has good general knowledge of this market and the ability to purchase carefully. Experience is requisite which at least qualifies the purchaser as having accurate knowledge of fabrics and equipment and of furniture quality and styles. There are many individuals, usually women, who possess these qualifications and who are available for co-operation with the architect. Elaborating somewhat on the business features involved, it will be found that these decorators work either on their own accounts, as contractors, or directly for the account of the architect as agent for the owner.

Complex trade conditions provide issues which must be met squarely by the architect. Some furniture, decoration and equipment houses will deal directly with the architect, allowing discounts which he in turn credits to his client. Others will not deal with the architect on this basis but will allow such discounts to the decorator who retains these amounts in payment for services. Usually such discounts require payment of the bill within a limited period of time. As an instance, the case may be cited of one dealer who allows to the decorator a discount of 20% if the bill is paid in ten days. Evidently the decorator is forced to see that the bill is paid within this time—or else lose the commission. Consequently, if the decorator is not financing the project throughout (as a contractor) and collecting in turn from the owner, arrangements should be made for prompt payment.

A Typical Commission

The practical manner in which this condition may be met may be demonstrated by outlining a typical project recently handled under this plan. This project involved the complete furnishing and equipment of a new dwelling. A schedule with a few sketches was prepared by the architect, covering the house room by room. This schedule was not in detail but gave a general outline of decorative and furnishing requirements with approximate costs per room. After revision and approval by the owner, detailed requirements were given by the architect to the decorator. Material samples and furniture were assembled, one room at a time, for the owner's final approval. Actual cost tabulations were provided at the same time and upon approval of each room the owner drew a check to the architect's account as agent, covering all items. The architect was thus placed in a position to pay all bills immediately and to check against the cost figures provided by the decorator. This plan worked out to the satisfaction of all, the decorator was placed in a position to allow some cash discount to the owner and the project proceeded smoothly to completion.

Furnishing of Community Buildings with Limited Funds

THE CHESTER CLUB, CHESTER, PA.

CLARENCE WILSON BRAZER, ARCHITECT

THERE can be no doubt that several phases of war work, particularly those involving community betterment in the districts where soldiers were quartered, have contributed definitely to the development of interior decoration under limited expenditure. The ingenuity of architects and decorators was called upon for the furnishing and decoration of community buildings constructed by Y. M. C. A., War Camp Community Service, Knights of Columbus and similar organizations. As never before public interest has been developed in the subject of inexpensive club and community buildings for varied purposes—as war memorials, for industrial employes, and for purely social activities. It is but natural, therefore, that many architects will be called upon to supervise or carry out work of this nature.

A clever solution of such a problem, and one which may furnish valuable suggestions, is to be found in the recently constructed Chester Club at Chester, Pa., designed by Clarence Wilson Brazer under whose direction furnishing and decoration has been carried out. The Chester Club, while it is a private club, is to be used for various city functions, receptions and similar community activities.

Owing to the necessity of limiting the expenditure to a moderate sum the idea of using specially designed furniture was immediately eliminated. The architect made interior sketches of typical rooms, indicating the furniture requirements and drawing on information contained in the catalogs of several manufacturers and furniture makers. He then invited dealers, who carried the most suitable lines, to submit prices. After carefully checking prices, orders were placed taking into consideration not only reasonable prices but quality of workmanship and design of the stock materials and furniture. This work, therefore, represents an assemblage from the stocks of several firms but through all the rooms there has been maintained the harmony necessary with a well designed building. The colonial spirit is accentuated without the sacrifice of comfort. There is no overfurnishing, neither is there to be found the meagerness which might have resulted owing to the limitation of expenditure. The Windsor chair, which has gained much popularity for its comfort and artistic value, is used extensively throughout the club. The lighting fixtures of black iron and brass have been adapted from the designs of old lamps used in colonial days.

A successful method of handling the purchase of

The Lounge Looking toward Library

Ladies' Dining Room Adjoining Main Dining Room

One architect, who has handled many large furnishing commissions in connection with buildings which he has designed, has very successfully developed this purchasing method. If he requires 400 or 500 dining room chairs for a restaurant, he places a contract directly with the furniture factory to produce the chairs in unfinished form, a separate contract being let for finishing, painting, staining and varnishing. This architect usually selects a typical chair from stock, and sends to the factory for the shop drawings. Slight changes are then made in his office, such as the turning of the legs or arms, or the form of the chair back, and a new shop drawing is prepared to accompany the order, thus achieving a distinctive result at small increased cost over the usual stock chair.

furniture and decorative materials, which is often employed in connection with large projects where quantities of furniture are required, may be of interest to architects facing a similar problem. In the instance of the Chester Club sketches of rooms, together with specifications, were submitted to several firms on a contract basis in much the same manner in which an architect would begin the placing of a sub-contract in a building operation. Definite price quotations were received on the basis of the specifications and contracts placed.

With upholstered pieces, the order is often placed with this office for the necessary wooden framework and a separate contract is made for upholstering, the necessary covering material being furnished.

Several of the large department stores which maintain extensive furniture departments are always interested in supplying furniture and decorative materials on a contract basis.

Main Dining Room on Second Floor

BUSINESS & FINANCE

C. Stanley Taylor, *Associate Editor*

Business Aspects of a Successful Co-operative Apartment Development

DURING the past few months there have been received in the office of THE ARCHITECTURAL FORUM a great many inquiries regarding the business methods of developing co-operative apartment house projects. A number of these inquiries have asked for definite information regarding a successful individual project of this nature.

After a careful analysis of various developments of this type we have selected that known as the Jackson Heights Development of The Queensboro Corporation as being representative of a co-operative housing project based on sound business principles. Many of the co-operative projects which have been successfully developed heretofore have been of the very expensive type involving partial occupancy by owners and the renting of the remainder of the space in the building. In the Jackson Heights Development, however, the apartments while attractive in design are moderate in cost, and consequently will be of more general interest to those who contemplate such developments in various sections of the United States and Canada.

In the January, 1919 and July, 1920 issues of THE ARCHITECTURAL FORUM there were shown a number of illustrations of the architectural and building details of this development. This article will, therefore, be confined entirely to describing the business factors involved.

In order that the development of the Jackson Heights project may be clearly understood we give a brief description of the method of organization. In this development there have already been constructed approximately 60 apartment buildings, accommodating from 12 to 24 families each. Two companies were formed. One was a land company which owns a large tract of approximately 350 acres, located directly across the East River from the central business section of New York and having excellent transportation facilities by subway, elevated railroad and the Pennsylvania Railroad. The second was a building and holding company which purchases land as needed for construction from the land company. This may be considered the original owning company and the first important principle involved in this operation is that the buildings are completely constructed before stock is sold to the individual tenant. This in itself is an unusual feature as in most co-operative developments the tenants provide financing from the plans and make agreements to purchase before the building is constructed.

In reading later paragraphs of this article it must, therefore, be kept in mind that the original owners are in reality speculative builders, and that they operate according to a plan here briefly outlined.

Financial Organization

The land is purchased from the land company and an architect is commissioned to draw plans. A building loan and first mortgage is arranged on each building, usually with a bank, trust company or the loaning department of a life insurance company. The buildings are constructed through the purchase of materials and the placing of sub-contracts directly by the owning company. After a building is completed, so that its exact cost is known, the owning company adds its legitimate profit to establish a definite selling price for the entire building. The difference between the first mortgage and this selling price, or in other words the equity amount, becomes the amount of capitalization of a co-operative tenants' corporation which is to own this individual building and which is limited by the terms of its charter to the ownership, maintenance and improvement of a specific plot of ground and the building thereon. This provision is made to prevent any chance of speculation with the corporation money.

Having in this manner incorporated the equity in the building, stock is offered for sale to prospective tenants. The amount of stock purchasable depends on the number of rooms contained in the apartment which the tenant proposes to occupy. Under this plan all apartments are occupied by stockholders. There is a considerable difference at this point, however, between the principles of this operation and those of the average co-operative development. In the first place, the ownership of stock involves only a right to occupancy of the specific apartment on yearly lease by the original purchaser. This lease is renewable annually as long as the stockholder wishes to occupy the apartment. Each tenant-owner pays a monthly rental to his own corporation which is established approximately on the prevailing rental value and is to cover interest, taxes and maintenance cost, the balance being paid out again in the form of a dividend which is paid in cash or, if the apartment has been bought on an easy payment plan, this dividend amount is credited to the tenant-owner's amortization account.

Details of a Typical Investment

In order to demonstrate clearly the exact financial operation of this transaction we give a complete financial outline of a typical purchase in any one of these buildings. The transaction is thus described:

A conservative first mortgage has been placed on the building, averaging approximately $800 per room. A purchaser of this typical five-room apartment pays approximately $10,500 on an easy payment basis. Of this amount, at the rate of $800 a room, $4,000 is in the form of a first mortgage, leaving an equity of $6,500 which he must pay. He is only called upon to provide $2,000 in cash, leaving an unpaid contract balance of $4,500.

The tabulation here shows how this $4,500 is paid off. It will be noted that the monthly payment of $134 is fair market value for an apartment of this class, but out of this amount $35 is directly credited as an installment payment, and the dividends out of the monthly rental of $99 are credited to the account of the tenant-owner. Thus in the fourth month of the seventh year, after paying a normal rental over this period and enjoying all community advantages, he is the owner of a valuable equity.

Equity	$6,500	Monthly rental	$ 99
Cash	2,000	" installment	35
Contract	$4,500	Total monthly	$134

With an initial cash payment of $2,000—monthly rental of $99 and monthly installment of $35 on contract—and crediting the estimated dividends on the equity at 7%—the entire stock equity will be paid in six years and four months.

	Installments	Estimated dividend @ 7%	Gross credit	Interest (deduct from gross credit)	Net credit	Total credit on contract end of each year
1st year	$420 +	$455 =	$875 —	$270 =	$605	$605
2nd "	420 +	455 =	875 —	234 =	641	1,246
3rd "	420 +	455 =	875 —	195 =	680	1,926
4th "	420 +	455 =	875 —	154 =	721	2,647
5th "	420 +	455 =	875 —	111 =	764	3,411
6th "	420 +	455 =	875 —	66 =	809	4,220
4 mos. of 7th year	140 +	152 =	292 —	5 =	287	4,507

These credits, with the $2,000 initial payment, will pay in full the stock equity of $6,500. After the equity is paid, monthly cost is:

Rental	$99.00
Dividend (estimated at 7%)	37.92
Net monthly cost	$61.08

A feature of this plan is an agreement whereby all stock purchased is held by the original owning company for a period of five years. This avoids the necessity of placing a second mortgage on the property and as this owning company (as just explained) has a contract to manage the property, it is evident that if it does not so manage that the dividend is 7% as estimated, it in turn must have its money tied up over a longer period. Consequently the management contract is doubly safeguarded from the purchaser's viewpoint, as the managing Corporation not only works in general for the tenants' benefit but employs every reasonable effort toward economy.

All apartments are occupied by stockholders with the provision that if a stockholder finds it necessary to move he may give notice in July and vacate the apartment October 1 of any year. He is no longer liable for the rental and while he still maintains his stock ownership and receives dividends accordingly the apartment is actually rented to a tenant by the owners' corporation of which his stock ownership is a part. Conversely, stock ownership other than the original purchase does not carry with it a right to occupy an apartment. The stock owner may sell his stock to whom he pleases at any price he can get, but the new purchaser of the stock must receive the approval of the owners' committee before he can personally occupy the apartment in question.

When the stock of an individual building has been sold the title to the land and building passes to a company composed of the tenants. The Queensboro Corporation makes a contract to manage the building for a period of ten years with an option on the part of the tenant-owners to renew for a like period. As this organization has had extensive experience in management and has large purchasing power it is quite evident that such management will be more efficient than an amateur attempt at building management by a committee of tenants. Experience has shown that tenants are invariably satisfied with this arrangement. With entire management of the various buildings sold under this plan it is possible for The Queensboro Corporation to maintain excellent community conditions, which is of course highly desirable because of the extensive ownership of land and buildings in this vicinity by the original owning organization.

From the Tenant's Viewpoint

The advantages from the tenant's viewpoint in connection with this plan of co-operative development may be briefly summarized:

A tenant-owner is protected against an increase of rent, and he obtains in semi-annual dividends all earnings above the actual fixed charges and operating costs of the building, which, based on present costs of operation, are estimated at 7% on the amount he invests in the building.

The tenant-owner is protected against undesirable neighbors because he is a director of his own corporation and has a voice in their selection, and because the leases of the apartments are not assignable without the consent of the Corporation and its agent. The tenant-owner may surrender the lease of his apartment at the end of any year, on proper notice, and still retain his investment in the building.

Tenant-owners have equal rights in all activities, such as tennis courts, golf courses, community club, children's playgrounds and community gardens. He is eligible for membership in any of the community activities, subject to the rules of each separate organization. Each tenant-owner is his own judge as to what activities he desires. He may join all or none. There is no solicitation, and no assessment unless he participates.

Details of this plan, as outlined by Edward A. MacDougall, President of The Queensboro Corporation, at the recent Bridgeport Housing Conference, and quoted here, may bring out added points of interest.

Ownership and Incorporation. Each apartment building is owned by a separate company capitalized for the amount of the equity, whereof the entire stock is held by the stockholders in proportion to the number of rooms occupied by them, and all apartments in a given building have been leased to stockholders of such corporation for their own personal occupancy.

Mortgage. There is but one mortgage on each building, usually held by a savings bank or life insurance company.

Title. Title to the land and building passes to the company composed of the tenants. Each tenant-owner subscribes for an amount of stock which is proportioned to the size of the apartment which he occupies, and each tenant-owner may become a director in the corporation owning the building.

Terms of Payment for Purchase of Stock. After 20% cash has been paid on the stock subscription, the balance may be paid in monthly installments over a period of years.

Management. The Queensboro Corporation makes a contract to manage the building for a period of ten years, with an option on the part of the tenant-owners to renew for a like period. The Queensboro Corporation has managed apartments for many years and is enabled to effect the greatest possible economy. The fee for this service is the usual 5% of the rentals collected.

The Lease. With the purchase of his stock, the tenant-owner leases the apartment he has selected from his own corporation. This lease automatically renews itself from year to year. Should he

Example of Typical Unit in Apartments at Jackson Heights, Long Island, N. Y.
George H. Wells, Architect

Typical Floor Plan of Apartment on Page 113

wish to vacate for a year or more he may surrender his lease any October 1 by giving notice on or before the previous July 1. His liability for the rent then ceases and the apartment is leased to someone else.

Each tenant-owner signs the same form of lease. Leases are not transferable, which prevents undesirable persons from obtaining possession of an apartment. This is one reason why, under the Jackson Heights plan of tenant-ownership, the stock ownership and the lease are separated.

Rent. Each tenant-owner pays a monthly rent to his own corporation at the prevailing rental value for the premises occupied, which rent is fixed and cannot be raised without his consent. Gas and electricity are metered separately to each individual apartment and are paid for by the occupant. Garage accommodations are paid for by each individual user.

Sale of Stock by a Tenant-Owner. There is, of course, no restriction upon the sale of his stock by a tenant-owner, but such sale of stock would not carry the right to the buyer to occupy an apartment. Unless the buyer conformed to the standard of tenancy set by the Corporation, he could not lease an apartment.

The seller has the right to set his own price for the sale of his stock. If desired, The Queensboro Corporation will endeavor to sell his stock for him, charging the customary commission.

The Directors. Each tenant-owner is a director of the tenant-owner corporation, and it is the declared policy of the directors of the Corporation to divide all surplus earnings over and above the cost of operation, fixed charges and amortization. These earnings are estimated to average about 7% per annum on the investment.

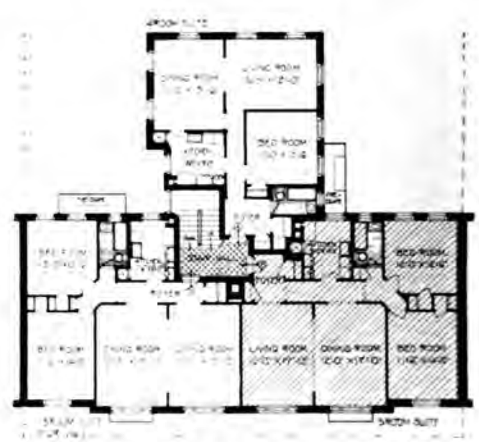
Dividends. The Queensboro Corporation, as agent for the tenant-owners, collects the rent and makes all the disbursements on account of the operation of the building. The balance is a surplus which is available for dividends, which under the by-laws can be declared from time to time by the directors of each corporation. Apart from the duty of the tenant-owners as directors of the corporation of meeting twice a year to declare a dividend, they are relieved from all burden and care in connection with the management of the building. The tenant-owner is living in his apartment at the actual cost of running the building, and all rent paid in excess of this actual cost comes back to him.

Reduction of the Mortgage. The mortgage is reduced annually by a sinking fund taken from the monthly rentals paid in by the tenant-owners. The mortgage is thus gradually reduced and paid during a period of years. The rentals also pay all the operating expenses of the building, such as taxes, insurance, heat, janitor service, mortgage interest, light of public halls, water rentals, maintenance and repairs.

Limitation of Each Corporation. By the terms of its charter, each corporation is limited to the ownership, maintenance and improvement of a specific plot of ground and the building thereon. This provision prevents any chance of speculation with the corporate money. Each corporation elects its own officers, but no officer receives a salary.

Taxes and Assessments Paid. The sale price of each building includes all taxes and assessments

Planted Plot between Blocks Showing Garages



Typical Floor Plan of Apartments on Page 111 paid to the time of passing of the title. The price includes also the paving of the street on which the building is located.

Some of the inquiries received by THE ARCHITECTURAL FORUM request information as to the rights and interests of tenant-owners in case the building is destroyed by fire or otherwise. It is evident that under this plan the ownership in the land and all other net assets lies jointly with the tenant-owners. In estimating net assets it must of course be realized that the holders of mortgages have a claim to full satisfaction from the returns of insurance payments.

Another question which has been asked is what will prevent any tenant from obtaining 51% control of the stock of the company. It is quite evident that nothing will prevent the acquisition of such control as far as owning a large percentage of the issued stock is concerned, but as this control can neither change the rentals of any apartments under the stock selling agreement, nor make it possible for the owner of the "controlling stock" (so termed) to introduce objectionable tenants or any features contrary to the agreement under which the stock was originally sold, it is evident that there is nothing to be gained by obtaining actual stock control.

It may be noted also that this investment by a tenant-owner is principally for the purpose of maintaining a reasonable rental and that from his viewpoint it is not a speculative investment. The only manner in which the building could be placed in the speculative market for re-sale would be through an agreement by all tenant-owners or by the outright purchase of all stock in the holding corporation.

APARTMENT buildings in the Jackson Heights Development contain no rear apartments in the usual acceptance of the term. Such apartments as do not face the streets look into inner courts or open spaces which are made of unusual size by placing together the courts of two adjoining structures. The exteriors of the buildings on the sides facing the courts are built of the same material as the street fronts and the courts themselves are made attractive with parked spaces, planted with grass and shrubbery. Upon the wide paved areas which surround these parked spaces open the garages which are features of these buildings.

The fronts of the buildings are being worked out to present an appearance of architectural unity. There are no radical differences in height, and variations in material and certain details of exterior design will prevent monotony of appearance.

Type of Unit Developed in Apartment Buildings at Jackson Heights, Long Island, N. Y.
George H. Wells, Architect

EDITORIAL COMMENT

ENCOURAGING HOME BUILDING

THERE have been under discussion during the past two or three years many proposed methods by which the housing shortage could be relieved. These have been of interest to the architectural fraternity as potential factors tending toward an increase in the volume of building construction. The methods and effect of practical measures which have recently been put into force in various sections of the country are, therefore, well worth consideration.

Through its approval by the Board of Aldermen of New York a realty tax-exemption measure now becomes a law, offering special inducements to those who have built, or will build, residence structures between April, 1920 and April, 1922. This measure provides for an exemption of real estate tax up to $5,000 on the appraised valuation of each individual dwelling or each apartment in a multi-family structure over a period of ten years from the time of completion. Based on a tax rate of $2.85 this means a direct saving of approximately $1,400 per unit which will help to offset any depreciation of replacement value which may occur during the next few years.

The practical effect of this measure was reflected in the real estate news of New York within one day after its final approval. A number of real estate transactions involving the purchase of recently constructed apartment houses, which had been held pending action by the Board on this measure, were consummated. Several large speculative building organizations, which were offering a number of newly constructed dwellings and moderate cost apartments on the co-operative basis, were able to advertise that a $1400 saving could now be enjoyed by purchasers of their offerings. It is particularly interesting to note that in the co-operative apartment house developments of The Queensboro Corporation, which are completely described in the Business and Finance Department of this issue of THE ARCHITECTURAL FORUM, it is now possible to reduce the owner's rental approximately $10 a month because of this tax-exemption.

Immediately upon the passing of this measure the number of inquiries from prospective home owners and home builders increased extensively and, judging by inquiries for vacant residential lots and reports from some architects' offices, it would seem that the amount of residential construction in New York during the period covered by tax-exemption would be enormously increased.

With the precedent set in New York there is no reason why this question of tax-exemption on new buildings of the residential class should not become a live subject in every community in the United States. The definite saving which is offered through a measure of this kind can be easily appreciated by prospective home builders and purchasers, and as it represents from 10 to 15% saving on the cost of the dwelling it will undoubtedly appeal to an investor of this class. From the viewpoint of the city or community this tax-exemption does not represent a great amount. On the other hand, it means an increase in the total appraised valuation of real property which in turn reflects beneficially on city credit. It means also the increment in general land values where new communities may develop, adding again to the tax revenue. It means a practical method of relieving a local housing shortage.

In discussing the question with a prominent official closely connected with building loan institutions, we have been definitely assured that a tax-exemption of this nature will tend to encourage more liberal financing of dwelling construction as it reduces the danger, supposed or actual, of deflation in collateral valuation. Above all, such a measure has a direct effect in restoring public confidence in the building situation. It would seem, therefore, that architects everywhere have an opportunity to sponsor local action of this kind which is certain to follow if sufficient public pressure can be exerted.

The effect of a general demand by the public for increased consideration on the part of banking institutions regarding building and permanent loans on dwellings is being felt at various points in the country. The reduction of the volume of commercial credits and unusual investment opportunities is bound to be reflected in the mortgage loan field, particularly in view of an average reduction in cost, approximately 20%. Here again architects may exercise a certain influence in following more closely the local building loan situation. We are told that throughout the East building loan associations are placing every available dollar and using all their credit capacity in making loans for dwelling construction. At any point in the country where this is not the case, there seem to be logical arguments now why building loan associations should become particularly active. On behalf of his clients it will pay an architect to study the methods and operation of building loan associations and to maintain his contact with them as well as with mortgage money sources.

From the building field we have the information that contractors are now able to give closer figures, owing to the fact that the labor situation is better. A definite schedule of reduction in labor costs has been adopted by the Building Trades Employers in Chicago and at other important points.

The entire situation is one which offers many opportunities for architects to contribute, sometimes indirectly, to the efforts now being made toward the stimulation of building activity, for we are on the verge of an indeterminate period in which every individual effort is of value.

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Some Recent Work in Hartford, Conn.

By DONN BARBER, ARCHITECT

BUILDING conditions during the past few years have been such as to almost entirely preclude the erection of residence structures of any kind, and a large proportion of such building as has been done has taken the form of structures for the use of certain types of business, and in some instances of buildings for state or municipal uses.

In Hartford, Conn., there have been completed during this period several structures for these purposes, illustrations of which are included here. Business is served in the buildings which have been erected for the Travelers Insurance Co. and *The Hartford Times*, and the massive structure on Capitol avenue serves for the housing of certain departments of the state government; these illustrations show the appearance of this structure in its finally completed form.

STATE LIBRARY AND SUPREME COURT

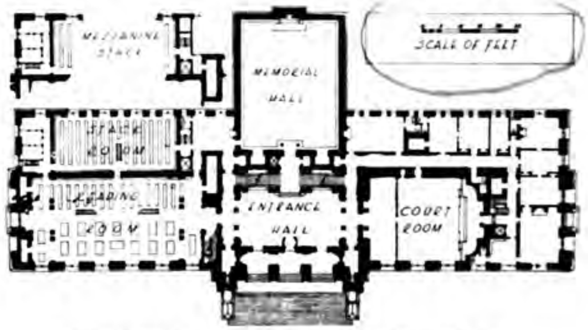
Near one edge of the extensive grounds of the state capitol at Hartford there has been built the dignified and monumental structure which houses the State Library and the Supreme Court, besides containing a Memorial Hall. The building is T shaped and consists of wings grouped about a central pavilion which has been designed with a three-arch motif, the arches being separated by columns which support an attic story. The exterior walls are of white granite of fine texture and tone, and sloping roofs are covered with copper, while flat roof surfaces are of vitrified tile.

Although not shown on the plan given, the central or main hall, Memorial Hall, the Library reading room and the Supreme Court room extend through both the first and second stories of the building, and thus occupy practically all the available space except in the case of the central hall where, owing to the greater height of the building at this point, there is a large attic area which has been provided with means of communication and access so that in case of future need this space can also be equipped and occupied for public purposes.

The main or first floor upon which are located the main reading room of the State Library, the Memorial Hall and the court room and principal offices of the Supreme Court, is reached at the middle of

General View of State Library and Supreme Court the Capitol avenue front by a broad flight of granite steps, leading between large columns and across a vaulted porch to three doorways which open immediately into the large central or main hall which forms the center of the general plan. This is a large room with barrel vaulted ceiling formed of richly coffered paneling. This ceiling starts from a cornice which is carried by massive columns and pilasters. The entire floor of this hall, together with the entire wall surfaces from the floor to the top of the cornice, including the columns, pilasters and gallery railings, is executed in marble of buff color. The coffered ceiling has been executed in plaster decorated in color. The ceilings above the galleries overlooking this hall are also formed of decorated plaster and supported upon marble arches. The gallery at the south of the hall overlooks Memorial Hall.

Located at the east or left of this central hall and opening from it is the main reading room of the State Library. Located at the right, or west, and opening from it is the Supreme Court room and its several departments, and adjoining on the south, directly opposite the main entrance but beyond the main stairway, is placed the Memorial Hall.



Main Floor Plan, State Library and Supreme Court

The Supreme Court, as already said, occupies the west wing of the building. South of the court room but separated from it by a wide corridor which opens into the central hall are the lawyers' retiring room, and offices of the messengers, clerks and reporters and the suite of the chief justice, with suitable vaults. Beyond the court room to the west is the consultation room for the judges. The interior of the Supreme Court room is wainscoted in paneled oak of rich design for a height of eight feet above the floor. The walls from this wainscoting to the frieze are finished in artificial Caen stone with simple wall surfaces and richly decorated cornice. Above this cornice is a deep frieze treated as a part of the ceiling of the room and executed in richly paneled and decorated plaster treated with color.

It has long been considered almost impossible to combine in one large room a library, a portrait gallery and a museum, and have them all successful. One seems to be always subservient to the others. In this building provision has been made in the Memorial Hall for the proper hanging of the portraits of the governors, Gilbert Stuart's portrait of Washington, and the display of the old charter. This new arrangement will not only make it possible for portraits to be properly hung and lighted, but will exclude noise and confusion from the Library.

The walls of the Memorial Hall are covered with oak wainscoting forming a dado up to the height of the usual picture railing, above which to the under side of the cornice the walls are hung with woven material as a background for paintings. Above the cornice a wide cove, which is broken by penetrations on all sides, reaches to the ceiling. These penetrations form effective

Detail of Library Wing, State Library and Supreme Court places for the display of special memorials. There are no windows in this room, which is amply lighted by means of a ceiling light with a skylight above, forming the entire ceiling of the room within the limits of the cove. The electric lights for illuminating this room at night are placed above the ceiling and so arranged as to faithfully produce the effect of daylight, while the lamps themselves will not be visible from any point.

The cornice and coved ceiling of Memorial Hall are executed in richly decorated plaster treated in subdued colors. At the far end of the room, directly facing the entrance from the central hall, a large alcove or niche is formed, in which is placed, upon a raised dais, the special vault containing Connecticut's historic charter. Above this is hung the Stuart portrait of Washington. The floor of this room is of decorative tile. The ground floor below this hall is occupied by the packing room, repair shop and bindery, general store room and locker room of the Library which are easily reached by the service elevator and stairs adjoining.

Entrance to Record and Newspaper Rooms of State Library

As the State Library, Supreme Court apartments and Memorial Hall are conveniently grouped about the central hall, so also are the several departments of the Library conveniently grouped around the main reading room. Along the south side of this room are placed the two-story steel stacks with open shelves for the accommodation of the law library and general works of reference. The rest of the floor space is occupied by the special study and reference tables, with catalog cases conveniently located for service.

The interior of the main reading room is treated in the same manner and in style harmonious with the Supreme Court room, except that all of the available wall surfaces in this room for the height of 14 feet are here covered with steel bookcases and steel wainscoting. The reading room is equipped with fireproof furniture. In the treatment of this room it has been planned to eliminate the use of wood.

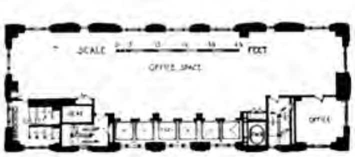
Conveniently located near this main reading room are the librarian's office, the main stack room, the special study and stenographers' rooms, the special vaults for the accommodation of archives, records, valuable papers and special collections, the newspaper room, and rooms for cataloging, repairing, packing and storage.

Opening from the main room on the south, just west of the stack room, is the librarian's office directly connected with the main reading room, stack room, Memorial Hall and central hall, all of which are on the ground floor, and by means of the adjoining stairs and service elevator having communication with the cataloging rooms and galleries above and with the several departments on the floor below. Located immediately under the main reading room and connected with it by a special stairway are the record and newspaper rooms.

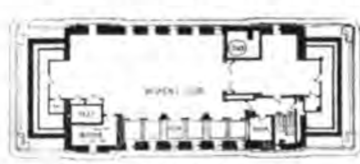
THE TRAVELERS INSURANCE COMPANY

The structure of great height which is visible for miles in any direction from Hartford is the home office or headquarters of the Travelers Insurance Co. In addition to providing office space,

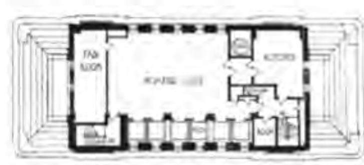
Twenty-third and Twenty-seventh Floors



Eighteenth Floor Plan



Twentieth Floor Plan



Twenty-first Floor Plan

Building for the Travelers Insurance Company arranged with great efficiency and with direct reference to the requirements of the particular purpose in view, the building by reason of its great size and strikingly original design possesses advertising or publicity features which are of considerable value to its owners.

The building has grown gradually and has been developed to keep pace with the growth of the clerical force and official personnel. These forces numbered 482 when the north wing of the building was constructed in 1907, and 955 in 1913 when the south wing and the Main street front were finished, while at present, with the extension of the south wing to Prospect street and the construction of the tower over it, the home office accommodates a staff which numbers 4,000.

Detail over Entrance Portico of *The Hartford Times*

Designed in a free adaptation of the renaissance, the building combines consistent simplicity in its scheme with dignity and unity in its expression, massive proportions and boldness of detail. The building is of composite construction, consisting of a framework of steel bearing an anchored covering of stone and brick. The exterior walls are built of pink Westerly granite and the inner walls, which face upon various interior courts, are of light colored brick. It is interesting to note that the quarries at Westerly, Rhode Island, from which the granite was procured, were first developed by James G. Batterson who also founded the Travelers Insurance Co.

Architecturally speaking, the first three floors of the building constitute a base for the next floors, the 4th to 8th inclusive, which unite to form one architectural feature; the 9th is treated as a frieze carrying the massive copper cornice, above which is a 10th floor, set back somewhat from the front and but slightly visible from the street. With these ten stories as a base there soars into space the great tower, an impressive and monumental structure 34 stories in height. The top of the lantern is 527 feet above the sidewalk, a height exceeded by but few buildings in the world. Up to the 15th floor the tower maintains the architectural lines of the main building; the 16th story is treated as a horizontal band, while the 17th and 18th are developed as an arcaded motif.


Building for *The Hartford Times* by Night

Above the 20th floor the tower is set back on its long dimension and three stories serve as a base for the Ionic colonnade which extends through the 25th story; above the colonnade the tower recedes to form a square which is finished symmetrically on all sides. At the 27th floor a loggia is developed, 359 feet above the street, the four corners of the roof being supported by piers and free Doric columns. Upon each side the balcony is formed by a Palladian arch and a balustrade. The roof of the loggia is pyramidal, sloping to a second lookout just below the cupola. Up to this point the entire tower is of stone, but the cupola is of metal. The lower portion of the cupola is utilized as an outlet for the smokestack and the upper portion, built to form the crowning feature of the structure, supports a finial with a cluster of metal balls varying in diameter from 4 to 20 inches. This cupola or lantern which is 81 feet high is of copper covered with gold leaf. Under the cupola, at the 34th story level, there is a beacon consisting of 44 projectors of from 200 to 400-watt power, throwing a solid band of white light which is visible for many miles.

Looked at from the east or west the tower appears quite slender, while from the north or south it shows considerable breadth—a great white cliff, studded with windows and surmounted by a series of classic building units of diminishing size, rising successively in agreeable composition. The narrower face of the tower assumes approximately the proportions of a Corinthian column; that is, the ratio of its width to its height is about 1 to 10½. The corresponding ratio is 1 to 11 in the Washington Monument, and in the campanile of St. Mark's it is about 1 to 9. The accuracy of the Travelers tower, built for utility as well as for beauty, is thus emphasized. The tower is filled with offices up to and including the 24th floor.

BUILDING FOR *THE HARTFORD TIMES*

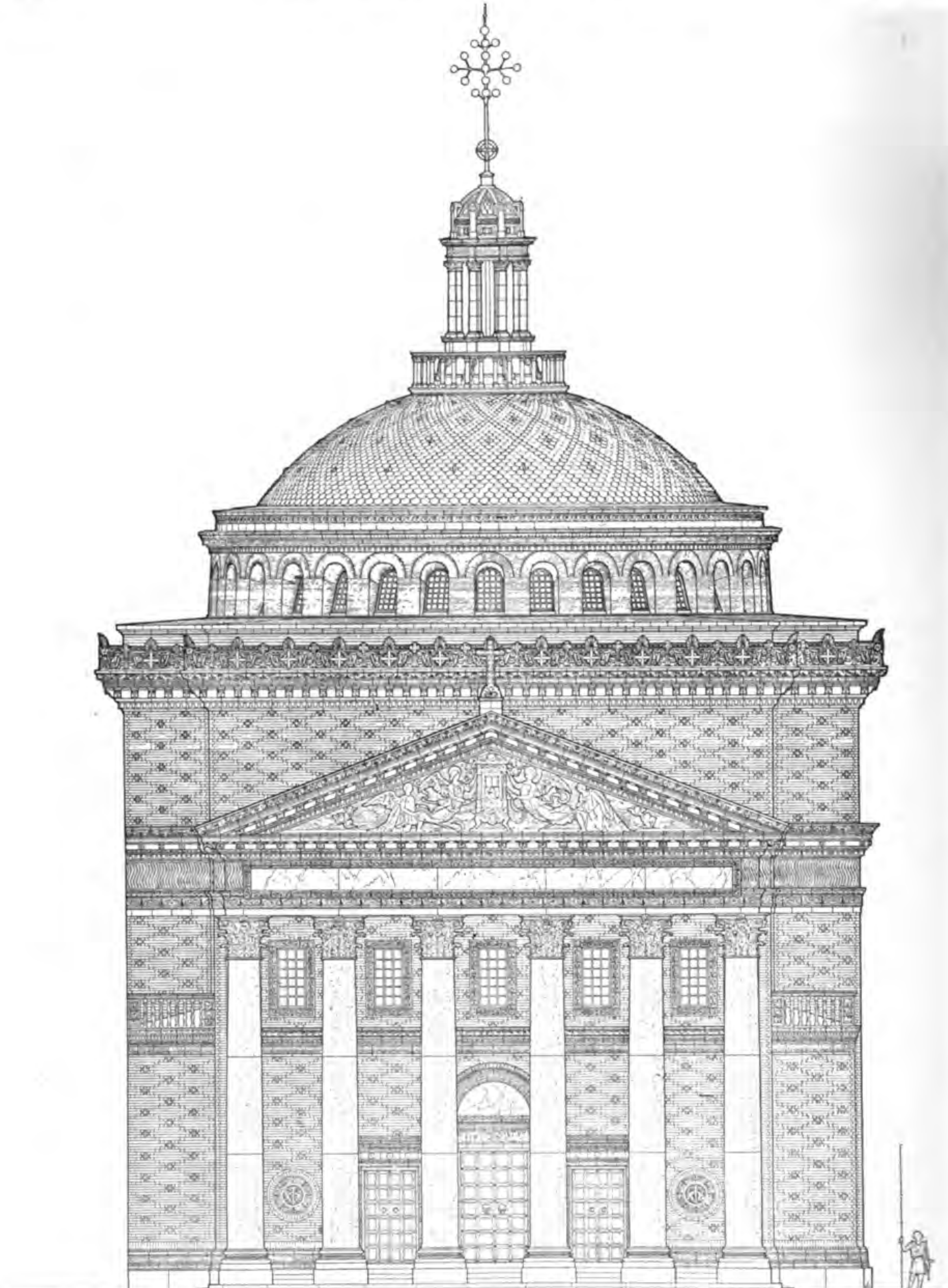
Another instance of successful designing done in this office is the building of *The Hartford Times*. The planning of this structure, and the interesting use of terra cotta detail and other material from the dismantled Madison Square Presbyterian Church in New York, were described in THE FORUM for April, 1920 and the illustrations included here merely prove anew the success with which this material has been adapted.

As has already been noted, the *Times* building is placed at the end of New Atheneum street and the building is seen at the end of this short street between the long facades of the Morgan Memorial at the left and the Municipal Building at the right. Both these neighboring structures are of very moderate height and the *Times* building is of much the same height so that the water table lines and the balustrade motifs of all three buildings are in agreement.

In this newer building has been included the greater part of the exterior material from the church; the columns, pilasters and cornices have been used, and also the steps, platforms and base courses, fitted together as placed originally, excepting for a change in the positions of the pilasters. It was necessary that a colonnade motif of seven bays be used instead of a porch motif of five. The large, circular headed windows which lighted the church upon the 24th street side are now used to form the entrance doors within the arcade, and the windows which were behind the columns on the Madison avenue facade, together with the two side doors which led into the vestibule of the church, appear within the arcade.

It was found to be impossible to adapt, for this newer building, the richly wrought terra cotta Corinthian capitals which were so notable a detail of the church, and new Ionic capitals have been used instead. The pediment and two circular windows which also contributed so largely to the splendor of the church have been utilized in another building, which is described elsewhere in this issue of THE FORUM.

The Newspaper Plant which Includes Material from the Notable Dr. Parkhurst Church



WEST ELEVATION, MADISON SQUARE PRESBYTERIAN CHURCH, NEW YORK
McKIM, MEAD & WHITE, ARCHITECTS

An Outdoor Exhibit at the Metropolitan Museum of Art

PEDIMENT OF THE MADISON SQUARE PRESBYTERIAN CHURCH

By EDWARD H. PUTNAM

THE preservation of an example of modern architectural art by the Metropolitan Museum establishes a precedent that, if followed with judgment, should prove to be of great interest. There are several small wings on the Central Park side of the building, built of brick and severely plain, since it is intended that future additions shall entirely conceal them. Of course integral parts of complete designs would not be consistent in such a setting, but it cannot be denied that they would add material beauty to the buildings, if beautiful in themselves, and a plain brick background, which makes no architectural pretense, is the safest setting that could be found.

Two years ago the Madison Square Presbyterian Church was taken down; wrecked is not the word. The marble columns, the beautiful polychrome terra cotta capitals, jambs, lintels, cornice frieze and pediment panel, even the specially made brick were taken down carefully by hand. Instead of chuting the material into a waiting wagon to be sold second hand or for junk—as is the case with too many demolished buildings—the marble columns and most of the other exterior details were used on an important secular building in New England, the door jambs and lintels were taken by Mr. Lawrence White for his Long Island home, and the terra cotta faience pediment panel and two circular windows of reticulated terra cotta have been set in one wall of the library wing of the Metropolitan Museum, the wall having been increased in width to accommodate the three details. There the panels will remain for generations to come, an enduring memorial to Stanford White, and an example of much that is best in American ecclesiastical architecture.

The Three Details as They Appear on the Library Wing

Probably the genius of Mr. White was never better expressed than in the design of the Madison Square Presbyterian Church. Standing in a busy commercial district and overshadowed by the Metropolitan Tower—the second highest building in New York—the church seemed to fit its setting, belonged where it was placed, and its individuality impressed itself on the passerby. Its design and its color gave it a prominence that could not be denied. It is unfortunate that such a novel and successful example of architecture should have outgrown its usefulness, but in the city's northward march the location became inaccessible to the members of the church's congregation, and its end was inevitable. At the request of the original donor the trustees of the church presented the panel to the Metropolitan Museum, so that its preservation might be assured.

The Madison Square Presbyterian Church was the first important instance of the use of polychrome terra cotta in this country, and as such it marked the revival of an art that died with the Della Robbias. In the hands of Mr. White it was a complete success, and although polychrome has come into increasing vogue of late years, it is doubtful if the success with which it was used here will ever be surpassed. The plan of the pediment panel, the dominant feature of the church, was originated by Mr. White, designed by H. Siddons Mowbray, modeled by Adolph A. Weinman and executed in polychrome terra cotta. The figures are in cream white against a background of blue. In the base and cornice that surround the panel, the major color is dark yellow enlivened with blue, sienna and green.

A word might be added regarding the two circular window grilles of terra cotta, since their use within the portico of the church formed one of the most interesting details of a highly distinguished building. While open work, or reticulation, of terra cotta can hardly be regarded as unique or even unusual, it is only rarely that it attains a result as successful as was secured in this instance. The pale gray of the terra cotta, with its richly intricate Byzantine design backed by sheets of iridescent glass, formed a notable detail which, in its original setting, was readily appreciated as it was placed upon the eye level.

The Portico of the Madison Square Presbyterian Church
Showing Original Setting of the Pediment

Royal Cortissoz in the *New York Tribune* thus describes the pediment:

"The decoration has for its subject 'The Adoration of the Shrine of Truth.' The central shrine or tabernacle is supported by angels with harp and scroll, and these angels who, with the cherubim placed at different points in the composition, chant the praises of God, are symbolical of religious song and word. The knight on the right of the shrine represents the Church Militant. In the same position on the opposite side is a shepherd whose meaning is equally obvious, and the two together illustrate the equality of the mighty and the humble. The sun and moon are also indicated against the starry blue background. The idea embodied in this decoration is very beautiful and it has been developed with remarkable grace and skill. Both in its linear qualities and in the play of subtle modulation which belongs to a work in relief, the sculpture is free and even picturesque, yet kept well in hand, so that the final impression received is one of suave delicacy." Such is the pediment now permanently placed.

The Central Manufacturing District, Chicago, Ill.

PART I. GENERAL FEATURES OF OPERATION

By S. SCOTT JOY, ARCHITECT

WITH the growth of Chicago, and the development of various industries, there has come the necessity of opening up new districts for the use of business. In Chicago there is endless opportunity for such growth, for in three directions there exists boundless area, much of which is adapted for such uses.

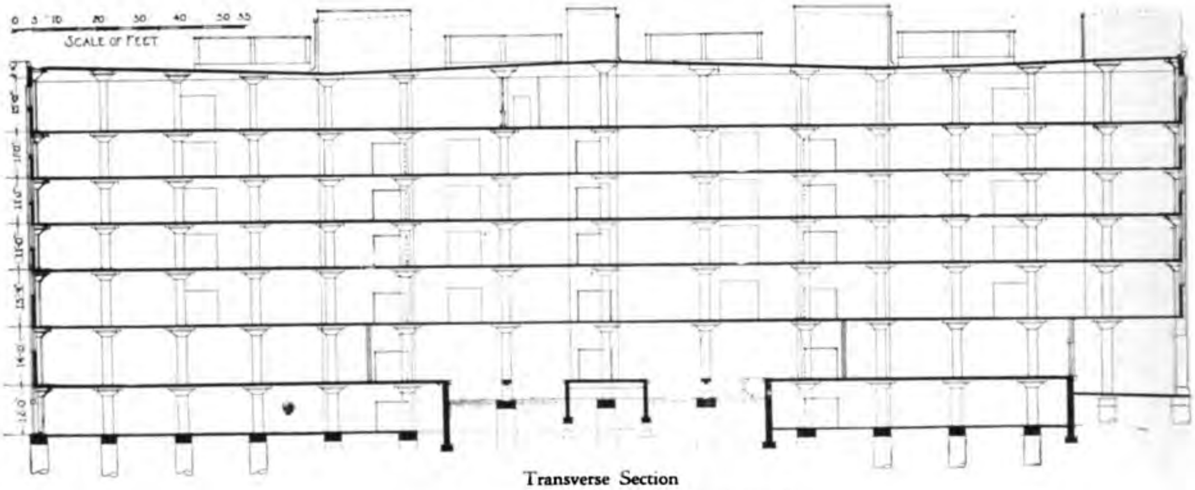
The Central Manufacturing District owes its inception to the expansion of the Chicago Junction Railway. This railway is of the type commonly known as an "inner belt line" and connects directly with all the railroads entering Chicago, having been built originally to serve the Union Stock Yards and the packing industries. After a growth of some years, however, the Packingtown and Stock Yards districts were fully occupied and it became necessary for the Chicago Junction Railway to seek the development of other districts which would contribute tonnage and allow the railroad's growth to continue.

Just to the north of the Union Stock Yards lay a tract of some 300 acres which was unimproved and, with the exception of a few dilapidated lumber yards scattered along the South Branch of the Chicago River, was devoted to the cultivation of cabbages. It was an uninviting prospect and a keenly prophetic vision was necessary to see in it a future which would make justifiable the tremendous effort necessary to put it into attractive condition. However, the farsighted men who were guiding the interests of the Chicago Junction Railway had the requisite degree of confidence in Chicago's industrial growth and were prepared for the test of this idea. Accordingly, there was bought practically all of the land lying between Morgan street and Ashland avenue and stretching from 35th street south to 39th street.

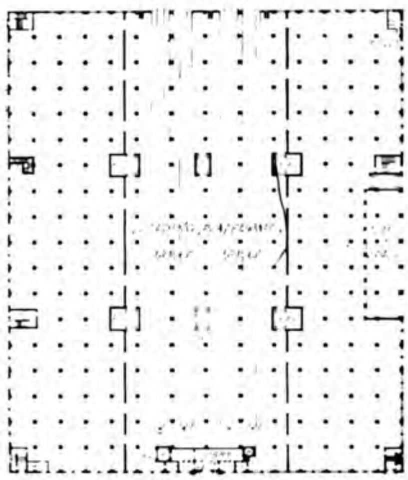
The acquisition of this property dates from 1902. It was purchased outright from the various holding interests by men who were likewise financially interested in the Chicago Junction Railway and Union Stock Yard & Transit Company. In 1908 active development of the Central Manufacturing District was begun. Many thousands of dollars were expended on improvements which included pavements and sewers. Industries began to drift into the District, slowly at first but increasing in number, until at present it accommodates a total of some 200 industrial residents.

To the south and west of the Central Manu-

The Montgomery Ward & Company Warehouse



Transverse Section



Ground Floor Plan of One Unit

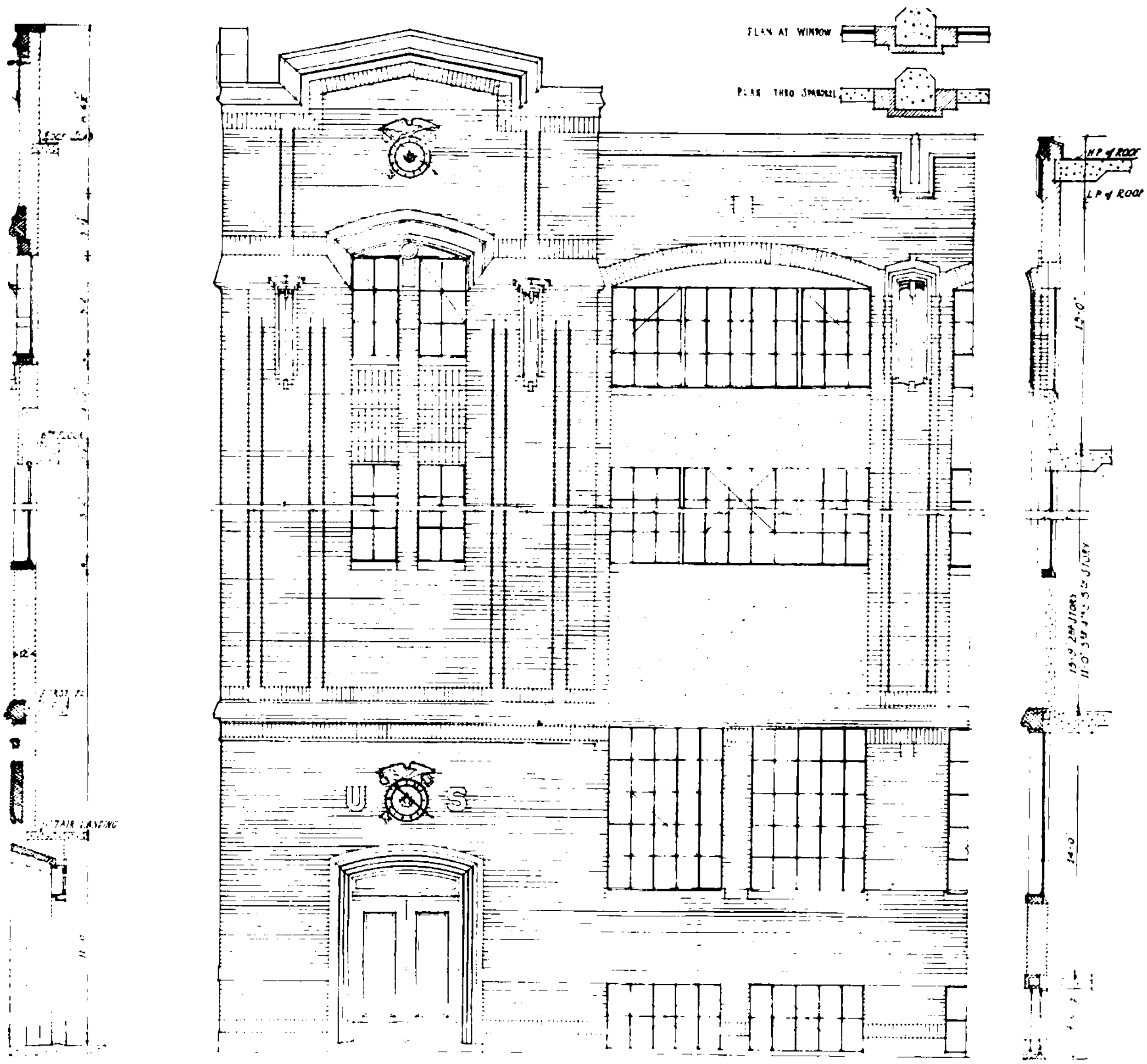
facturing District lay another tract of waste land, about 100 acres in extent, stretching west from Ashland avenue to Western avenue and south from 39th street to the branch of the Chicago River generally known as Bubbly Creek. In 1916 the trustees controlling the development, having acquired this acreage, proceeded with its improvement. Bubbly Creek, which for years had been an eyesore to Chicago, was filled and replaced by a large sewer line, thus increasing the value of the land, and making it desirable as an industrial location with direct connections to the Ashland avenue yard of the Chicago Junction Railway.

Most of the buildings which house these industries have been erected since active development was started. The total cost of improvements and building operations amounts approximately to $30,000,000. Of this large figure $18,000,000 represents the aggregate expenditures by the trustees to cover the making of streets, erection of buildings and other

U. S. Army Supply Depot before Construction of Third Block improvements for industries under various agreements which have been made.

The value of the location depends chiefly upon excellent transportation. Each building has its own switch track. This track need not be utilized only for carload shipments; on the contrary, less than carload shipments may be loaded at the very door of a factory building and thus the necessity for vehicle transportation either wholly obviated or greatly reduced. This is accomplished through the agencies of union freight stations and trap car service. Freight loaded out is dispatched the same day, carloads for the respective carriers being extracted from the station settings by their own locomotives. All inbound freight and carloads inbound are handled to and from industries at the through Chicago rate. The Chicago Junction Railway method is peculiar in that each day is a time unit to itself. Each day's business is handled during that day and the next begins a clean slate. Efficiency and system make possible the entire clearing of the congestion in the freight yards once every 24 hours; in this way the accumulation of shipping is impossible. This is due to the fact that the carrying facilities are controlled by the District authorities, which means that transportation problems are so handled that delay and friction are unknown by District manufacturers.

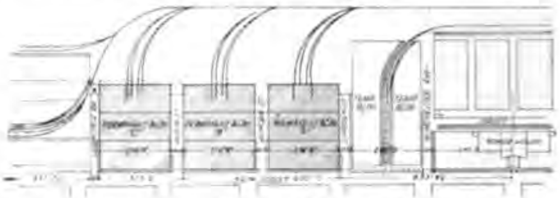
Aside from its unusual advantages in the way of railroad facilities, the District is fortunate in its being within a convenient distance of residence neighborhoods which are suitable for the homes of the vast number of employes needed for such a business development. Within 4 miles from the center



Wall Sections and Detail of End Bays. U. S. Army Supply Depot of the Central Manufacturing District dwell somewhere between 1,000,000 and 1,500,000 people. A recent survey has proved that of this number about 40 per cent are male adults and 36 per cent female adults. Something like 52 per cent are Americans and the remainder are variously proportioned between a dozen other races. These workers can reach the District by through or cross-town lines on several streets.

The District offers a variety of community features. It is served by a bank under state supervision, which is one of the most complete outside of the Chicago loop. There is a club in which District residents have membership and which has all the attractions of any similar organization. In the District are branch offices of the express and telegraph companies, which give immediate service. The District surgeon and his staff are fully equipped to take care of workers who suffer accidents, and an ambulance is in readiness for use, if necessary, at any hour of the day. There is supported a traffic bureau the duties of which are to aid shippers and to help in the solving of traffic problems.

The matter of financial agreements between the

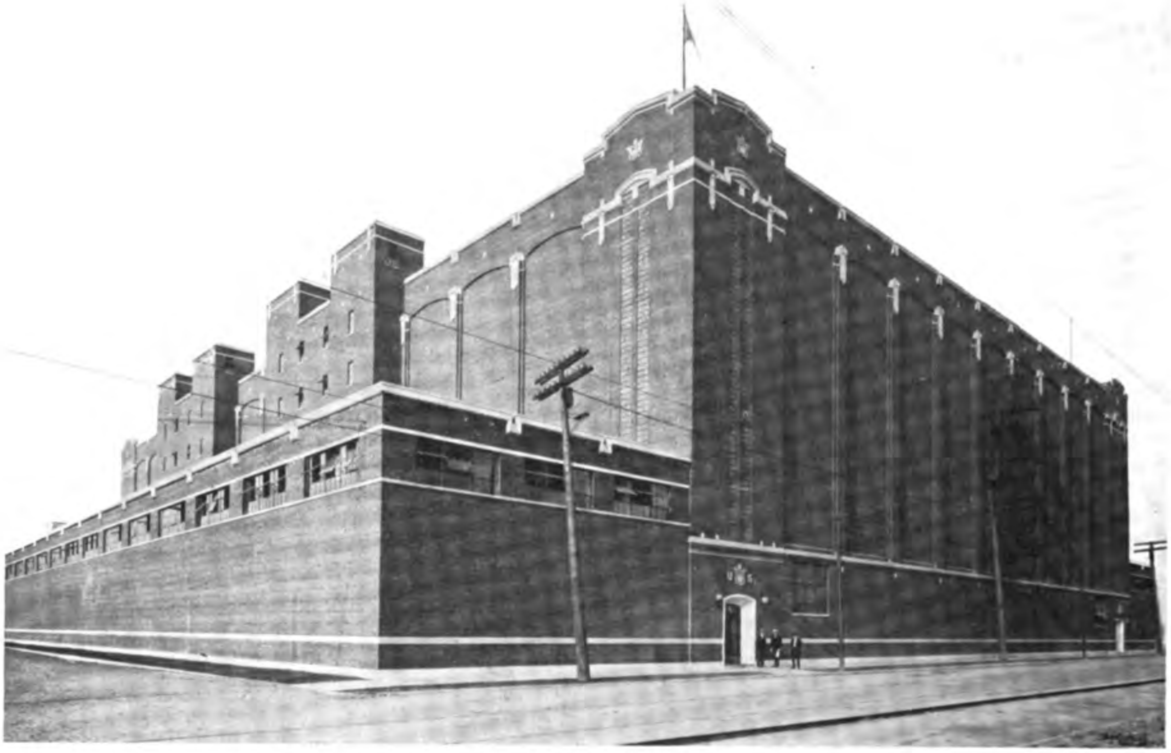


Plot Plan Showing Location of Present Three Blocks of Army Supply Depot

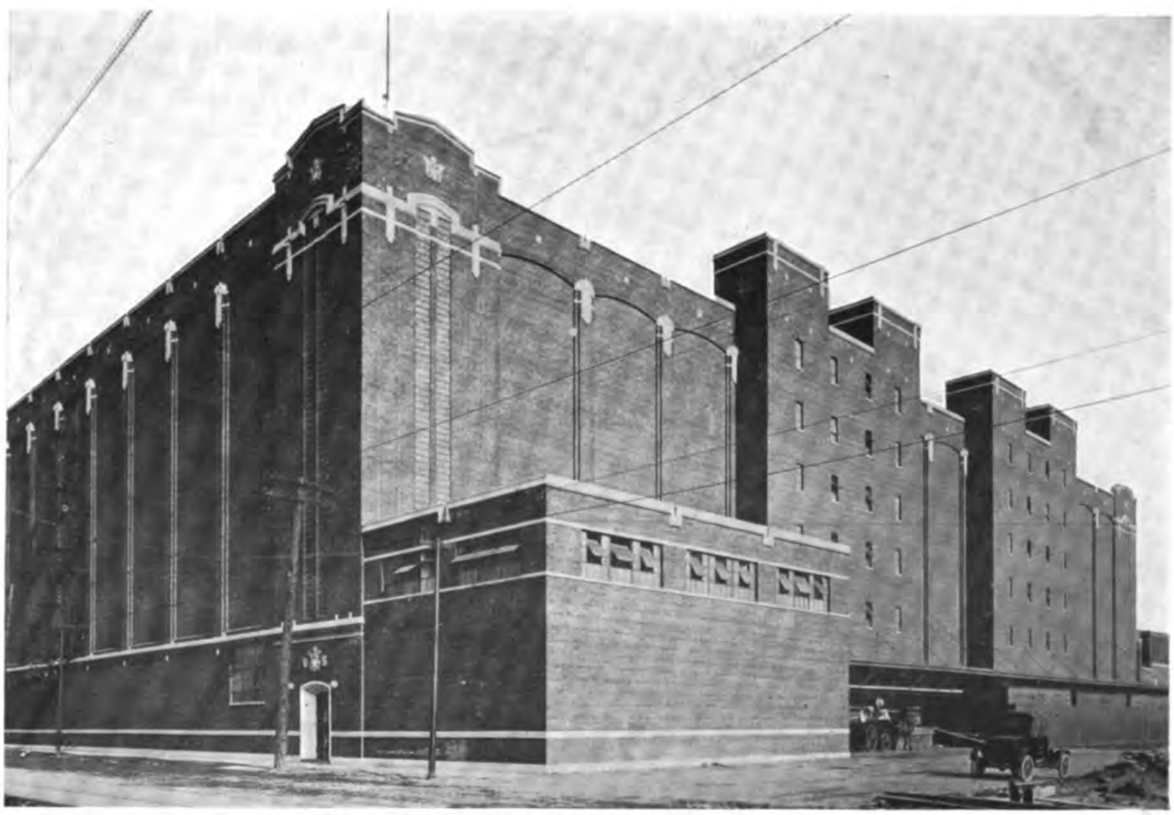
management and industries locating in the District is, of course, of great importance. Several forms of contract, varying in nature, have been adopted so that to each individual industry can be submitted the plan which it and the trustees consider most favorable. Some industries are fully prepared to take care of their own finances and prefer to buy outright. Others, which have no financial reserves established, prefer a long term lease arrangement with the privilege of an option on their property. The trustees fully appreciate the problems of young and growing industries and are generous in their terms with them.

There are three financial arrangements which cover all requirements well. The trustees will sell the land outright and erect a suitable building for an industry, or they will lease the ground and erect a building, and the industry then has to pay the charges in the form of annual rent for 25 years, the period for which the lease is written, this rent being figured on a basis of 6 per cent on the value of the ground and 9 per cent on the value of the buildings and improvements. Probably the most popular form of agreement is what is known as the "Contract of Purchase." Under this arrangement the trustees will sell the land and erect a building for an industry which has to pay a certain percentage of the total, usually 25 per cent, in cash and the remainder in the form of annual rental, spread over a term of 10 or 15 years, with interest on the unpaid balances. The trustees naturally do not wish to locate an industry which is not financially capable of discharging the responsibilities incident to a location in the Central Manufacturing District. Like all good propositions, it has nothing cheap about it. The advantages claimed for the District are evident and they fully justify the investment required. They are also interested as much now as originally in securing industries of which the production will be sufficient to materially add to the tonnage of the

Typical Central Entrance of Quartermaster's Department



PRINCIPAL STREET FACADE



UNITED STATES COLD STORAGE BUILDING, CENTRAL MANUFACTURING DISTRICT, CHICAGO

S. SCOTT JOY, ARCHITECT

Chicago Junction Railway, whether in carload or less than carload freight.

From the manufacturer's standpoint, the problem of financing centers chiefly around the improvement in his business prospects resulting from the advantages he secures through his location in the District. If his business has been established for a long period of years, and he has been able to lay up a surplus for the purpose of investing in a new site and building, he finds the "Contract of Purchase" plan the most economical and profitable. On the other hand, if his business is in process of building and he needs its income to help its growth, the lease plan is decidedly more favorable. Most manufacturers, of course, are endeavoring to build up permanent commercial structures. They see in settling in the District a chance to give their businesses naturally healthy growth which is bound to come with the best available modern manufacturing and shipping facilities, and with this growth they foresee a further opportunity to introduce permanence by discharging the responsibility incurred in buying their respective locations.

The District is adapted for the manufacture of practically any product. In Chicago there are more than 11,000 manufacturing plants. This fact is an indication of the unexcelled advantages to be had here. The argument which applies in the case of Chicago as a location, applies equally to the Central Manufacturing District, and in some respects the District has additional advantages. There are no restrictions to exclude certain lines of business from the District, but the trustees, with an eye to the interests of residents already located, are adverse to negotiating with concerns the business of which would endanger the interests of others already established.

The entire District organization is trained to exert itself toward the maintenance of mutually agreeable and helpful relations. The management has continually in mind the necessity for co-operation between the residents in this community and between the residents and the trustees. The policies of the trustees are liberal, and consistent effort is made to assist the industries in any possible way for promoting efficiency.

Entrance Doorway, U. S. Cold Storage Building

In the contracts with the United States government, through which resulted the new permanent Army Supply Depot, the trustees acted as general contractors. The government purchased altogether approximately 750,000 square feet of land, having a frontage of 1525 feet on 39th street with a 500-foot depth. This ground was utilized by the government for the erection of three great permanent warehouse units and the largest cold storage plant in America. The building of this plant was approved by the War Department upon the condition that should it be decided at the close of the war that it was not required, the trustees would re-purchase it from the government at a price to be fixed by appraisal. The early termination of the war caused the government to abandon this project, and in accordance with their agreement the trustees took over the cold storage warehouse, giving the government in return the third permanent warehouse unit and a cash sum to make up the total of the storage plant's appraised value.

ENGINEERING DEPARTMENT

Charles A. Whittemore, *Associate Editor*

Steel Construction

PART I. GENERAL CONSIDERATIONS

By CHARLES L. SHEDD, C.E.

THE use of steel beams and columns was developed when it became necessary to erect larger structures than could be built with wood construction, in which solid wood and masonry would take up too much room. Before the steel beam became a commercial possibility, wrought iron beams had been in use. Wrought iron was not as strong as steel, but the passing of time has demonstrated that it had qualities that do not exist in steel. It does not deteriorate nearly as fast from moisture and therefore, in some classes of work, has a much longer life.

These beams were at first merely used in floors to span between walls, and usually brick arches were formed from beam to beam. Then it was found that one beam could be framed to another by the use of connection angles fastened to their webs. This permitted framing around stairways or other openings in the floors. The next were used as compression members; that is, as small struts in the interiors of the buildings. The sizes of these struts were increased until large columns were made capable of carrying even the outside walls, as may be seen by reference to the illustrations. Some of these columns carry millions of pounds. By using columns in the outside walls it was possible to make the walls themselves quite thin, in fact no thicker than would be necessary for a one-story building, and on tall buildings much greater speed could be made in construction as the steel frames could be erected rapidly and with very little temporary bracing, so that it was possible to start a separate gang of masons on each floor to build the walls resting on the beams, just as if each story were a separate building. As a matter of fact, in practice the masons do not start with a separate gang on each floor but often start several gangs on floors six or seven stories apart, and each gang works up until it reaches that working next above.

Between these beams various kinds of material are used for the floors, including wood for non-fireproof buildings, and for fireproof buildings brick and terra cotta arches, reinforced concrete and various patented materials such as gypsum.

Under the columns bases are constructed to distribute the loads to the foundations. Small steel bases, built with the columns themselves, are used for the smaller loads, cast iron for larger loads and cast steel for still larger loads. The foundations are usually made of concrete and when these bases are not large enough to distribute the loads over sufficient areas of concrete, steel beams are placed in layers under the bases to increase the foundation areas. These grillage beams are used to a large extent to distribute the loads over sufficient areas so that the soil will not be over-stressed, but with the increased use of reinforced concrete such beams have largely disappeared from use. Some 20 years ago a stone block was used between the cast base and the concrete, but its use has been given up almost entirely.

In Fig. 1 are shown various steel shapes. A is known as the I beam; W is the web; F the flange, and f the fillet. The principal work done by a beam is to resist bending. The most of this is resisted by the flanges while the web resists shear, principally. Hence the web is made as thin as possible to resist this shear and still be strong enough to prevent buckling from the compressive strains. The flange is designed to be sufficiently wide to resist compression. B is known as the channel and is about the same as half of an I beam. This section can be used better than the I beam in some places, such as around stair and elevator openings, in spandrel sections, to carry hangers, and to make columns and compression chords of trusses. C is an angle section with the two "legs" of equal length. It can be used for lintels, spandrel sections, shelf angles, connections of beam to beam and for columns. D is another angle with unequal legs. E is the T section. It is used for small struts and occasionally for lintels.

F and G are Bethlehem sections. F is a girder beam and G the H column. F is the same as A excepting that it is a newer style and made only by one company. Its difference consists in having a broader flange. This makes it stronger in bending; that is the flange is larger in proportion to the web than is the case with the ordinary I beam. The manufacture of these beams was made possible by a new process. In the rolling of the ordinary beam and channel a large piece of red hot steel is passed between two rolls which roll against the webs, the ends of these rolls pressing against the flanges. Outside the flanges are stationary guides against which the metal squeezed out from the rolls is pressed and then forced out between the ends of the rolls and the guides until the flange is formed. To get the best results it is only possible to force the flange out to a limited distance as this metal, not being rolled, would not be as dense as the web which had been compressed between the rolls. In the Bethlehem process the guides outside the flanges are replaced by rolls revolving at right angles to those rolling the webs, thus shaping and condensing this material.

placed first. It has been suggested that it would be an improvement on this practice if the lengths of the legs were placed in such order as to show which way they turned. The first might be the horizontal leg, or in the case of a vertical section it might be the outstanding leg. This appears to the author to be a good suggestion if it could be universally adopted. Ts are marked as "3" x 3" x 6.8# T," the first two figures being the width of flange and depth of stem respectively, and the last the weight in pounds per lineal foot. Here the decimal must be used as the weight varies from the halves and quarters. The thickness of the metal is not given, as in the case of angles, as the stem bevels considerably being thinner at the end than

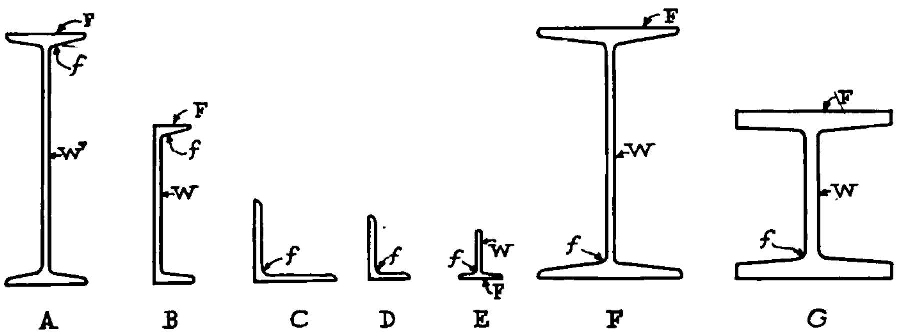


Fig. 1

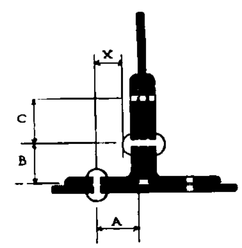


Fig. 2

it is up against the flange. Bethlehem beams are marked "15" BI 38#" or "24" BG 120#" as in the case of the standard I beams. "BI" stands for Bethlehem I beam and "BG" for Bethlehem Girder beams. The catalog divides the beam sections into these two classes, the larger beams being known as girders. The H columns are designated as "14" BH 170.5#." The 14" is the approximate depth of the section. These vary considerably in actual measurement from the lightest section to the heaviest, due to the method of manufacture. The same rolls are used for several different weights, but are spread farther apart for the heavy weights. This is true of the standard shapes also, but as the guides for the flanges are stationary or fixed for the different weights the depths do not vary. Since the manufacture of these Bethlehem shapes began the Carnegie Co. has begun the manufacture of some new I beams to compete with them, and some small H sections smaller than those made by the Bethlehem Co. Plates are marked as "16" x ¾"," the first being the width and the last figure the thickness. It is usual to use as the width, not the smallest dimension but that from which the plate would probably be cut. This of course would be as near even inches as possible.

These different pieces of steel are fastened together by bolts or rivets. Rivets are used in any work of importance, as they are stronger and less

G is the Bethlehem H section which is made in the same way as their I beams, but is made with the depth about equal to the width of the flange. These sections are used as columns in competition with the ordinary plate and angle column. Besides these shapes there are the flat plates, the round rods and the square rods. The plates are used in plate girders, trusses, columns and for reinforcing and connecting beams. The rods are used as hangers and as reinforcing material in concrete.

In designating the different shapes certain conventional methods have been adopted. For I beams it is customary to mark one such as a "12" I 31½#." The 12" is the depth of the beam, that is from out to out of flanges, while the 31½# is the weight in pounds per lineal foot. It seems preferable to put the I between the two numbers to separate them rather than to place it at the end as some do. The fraction, rather than the decimal, is also preferable on plans where a decimal point is not altogether desirable. The channels are marked similarly as "15" [33#." It is frequently written so that the sign for the channel shows which way it is intended that the channel should turn when in place in the building. Angles are designated as "6" x 6" x ¾" L" or "5" x 3½" x ⅜" L." The first two figures represent the length of the legs on the outside of the angle and the fraction at the end shows the thickness of the legs. When the legs are of unequal length the greater is liable to loosen. When the rivet is placed in the hole it is red hot, with one head already formed. When the other head is formed the rivet is so compressed that it expands until it completely fills the hole. If the rivet is not sufficiently heated or properly driven, a competent inspector on the work would reject it, cause it to be removed and driven over again. In building work rivets are usually ¾ inch in diameter. In the flanges of beams less than 8 inches deep and in angles where the leg is less than 2½ inches a smaller rivet must be used such as ⅝- or ½-inch. In very heavy construction rivets of ⅞-inch size or occasionally even larger are used.

In the mill, the beams, etc., are rolled in long lengths and afterwards sheared into the desired lengths. The edges of the metal are therefore classed in two divisions—rolled edges and sheared edges. As the rolled edge is much more accurate than the sheared edge, rivets can be driven nearer to it than they can to the sheared edge. With rivets it is common practice to use minimum distances from the center of the rivet to the rolled edge; the custom with ¾-inch is to use 1⅛ inches for rolled edges and 1¼ inches for sheared edges. More conservative engineers use 1¼ and 1½ inches respectively. In Fig. 2 is shown the lower flange of a plate girder. It shows the lower part of the web plate, the two flange angles, a flange plate and the rivets to fasten them together. This will illustrate the placing of rivets in angles. We will assume that the usual ¾-inch rivets are used. In order that the rivet may be properly driven the distance X must not be too small when the rivets come opposite each other. This distance should not be less than 1⅛ inches for ¾-inch rivets.

For convenience certain standard distances have been adopted for different sized angles for the distances A, B and C. These distances are called gauges. For legs 4 inches or less one gauge line, that is the distance A, is used. For a 2½-inch leg the gauge A is 1⅜ inches; for a 3-inch leg, 1¾ inches; for a 3½-inch leg 2 inches, and for a 4-inch leg 2½ inches. In a 5-inch leg two gauges are generally used but C is so small that the rivets should not be driven opposite each other. This is not on account of its not being possible to drive them but because there would be so little metal left between the holes that the strength of the angle would be too greatly impaired. B is 2 inches and C 1¾ inches. Sometimes only one gauge line is used, and when such is the case A equals 3 inches.

In a 6-inch leg B is 2½ inches and C is 2¼ inches. If the thickness of the angle is not too great these dimensions are sometimes reversed, and in some cases B is made as small as 2 inches when the stresses are such as to cause a bending on the angle which can be held more firmly by a small gauge. In an 8-inch leg B and C are both 3 inches. In some cases three gauge lines are used for angles not too thick; under these conditions all three distances are made 2¼ inches.

As was noted in the case of the 5-inch legs, the rivets cannot be too close together on account of weakening the angle or plate too much. It is usual to make this distance not less than 2¼ inches. When possible it is good design to keep the distance 2½ or 3 inches. This distance is called the "pitch." In compression members the pitch should not be too great as the outside metal might buckle between the rivets. It is common practice to limit this to 6 inches. Some engineers, including the writer, limit it to 5 inches when the outside metal is only 5/16 inch thick. It is also advisable not to have the rivets too far apart in a direction at right angles to the stress. This is usually limited to 12 inches. Likewise, the distance from the rivet to the edge of the plate should not be too great in compression members. Eight times the thickness of the plate, and never more than 6 inches, is a common requirement.

In Fig. 3 is shown the top flange of an I beam. The distance from the top of the flange to the point where the fillet joins the web is known as the "k distance." When one beam is supported at its end by another, the first is usually "framed into" the second beam. When this is done they are generally connected on their webs by "connection angles." If the beams are flush on top or bottom the flange of the first would strike the flange of the second. Therefore, the flange of the first, with a portion of the web, has to be cut off. This is known as "coping the beam."

If the top of the first beam is lower than the top of the second, by a distance less than k, a small

The S. S. Kresge Co. Building, Boston, is Typical Steel Frame Construction, Referred to in this Series of Articles

Newhall & Blevins, Architects
Charles L. Shedd, Engineer

cope must be made, but if the distance is greater than k no cope is necessary. The coping is an appreciable proportion of the cost of "fabrication" of the steel therefore, if it can be avoided without causing an equal additional cost in the building, a saving may be easily effected. In many cases another form of connection may be used, with no additional cost or inconvenience, if the designer will bear in mind the resultant economy.

The connection angles have been standardized and are universally employed where no special

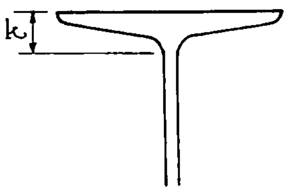


Fig. 3

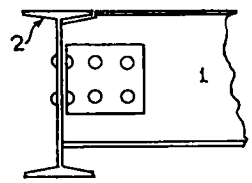


Fig. 4

conditions are required. There are, however, two standards, known as the old and the new. The new type is not as strong as the old as a new consideration has been taken into account in its design. This is in computing the bearing of the rivets on the web of the first beam. As this web is between the two connection angles, it is known as an "enclosed bearing," and has been computed to resist greater stresses than heretofore. Besides this, no account has been taken of the bending moment. There seems to be no doubt as to the propriety of considering the "enclosed bearing," in the writer's opinion, but the neglect of the moment appears to be worthy of serious consideration. That there is a moment no one would deny. As there is such a moment it must be resisted in some way. This may be done in either of two ways if it is not figured on the rivets. One way is by friction between the angles and the web of the first beam; the other way is by tension on the heads of the field rivets passing through the angles and the web of the second beam. It has never been considered good practice to consider either friction or tension on the heads of rivets and the writer would be very reluctant to do so. He therefore feels that unless a special investigation were made of the specific case, using the old recognized rules of computation for the stresses, it would be advisable to use the old standard beam connections.

In Fig. 4 is shown a 10-inch beam, framing into a 12-inch beam with the old style standard connection. They are shown framing flush on top with the top of the first beam coped. The two angles are each $6'' \times 4'' \times \frac{7}{16}''$, and 5 inches long. The four rivets connecting them to the first beam are driven in the shop. There are four rivets in the 4-inch legs of the angles, two in each angle. These are driven in the field; that is on the site of the building during erection. In all structural work it is important to have the field-driven rivets as few as possible. This is to effect economy and to save time; besides, a shop-driven rivet is driven under more ideal conditions and is less likely to be faulty. This distinction is not so important as it was before the time when power came into general use for driving field rivets. On small jobs, power is not now used as a rule, the driving of the rivets being done by hand. At the present time the mechanics doing this work do not appear to be as skillful or as careful as they were years ago. This often results in loose heads, in rivets not completely filling in the holes, and in the heads not being concentric with the stems.

It is sometimes desirable to hang a portion of one floor or a stair landing from the floor above. A hanger of a given strength takes up less room than a strut of equal strength, as the strut must have some considerable breadth in all directions to avoid buckling. A convenient method of forming a hanger is to use a narrow plate and rivet it to the back of a channel above and below. If a channel is not strong enough, two channels may be used and the plate or a round rod installed to pass between them. Sometimes the rod may be flattened out and this flat portion riveted to the channel. It is best not to attempt to flatten both ends of a rod with rivets as it is more difficult to make the adjustment accurately. Sometimes two angles are riveted to the back of a channel and the rod passed up between them. The angles can be made so that at the top of the rod they are flush on top with the channel and the nut on the rod will rest partly on the angle and partly on the channel. A bolt may be put through the two angles to hold the rod snugly against the back of the channel.

Another kind of hanger is formed by bending the plate at the top and, with a second short piece riveted to it, to form jaws engaging the flange of an I beam. This is not a good method to use where the load is of any considerable amount, as its strength is limited to the resistance of the plates to straightening out. It is used principally for hung ceilings. Sometimes these plates are extended upwards until they can be riveted to the web of the I beam, but that is not ideal as the plates are liable to straighten out somewhat, throwing the hung portion out of adjustment. Another form of hanger is made by slotting the flange of the beam and passing the hanger through this slot and riveting it to the web of the beam. This is an expensive method and in any event can only be done toward the end of the beam where there is more material in the flange than is necessary to carry the stresses in tension. Rivets in the bottom flanges of beams also weaken the beams, sometimes materially.

Calculation of Stresses in Wood Trusses

By MILO S. FARWELL

In a previous article in THE FORUM the graphic method of solving the problem of stresses in trusses was discussed, and the purpose here is to give design data for the use of the algebraic method. The Howe type of truss is used, as it is often employed for supporting roofs over structures of various types where the roofs are flat and almost symmetrical.

Mr. Farwell's article carries with it a story of interest to architects and engineers generally in indicating a method of truss figuring based solely on algebra. It is a method of long standing but is not used as frequently as the graphic method, particularly in the East. One reason for this is probably that the graphic method shows instantly any error by its failure to close. In the analytic method, however, despite the lack of graphic proof, it is easy to check all calculations so that the possibilities of error are negligible. The computations here given illustrate the method as employed by Mr. Farwell in his practice in Oregon. The formulae for the design data used have been taken from the work on "Roof and Bridge Trusses" by Merriman & Jacoby.—Editor's Note.

THE purpose here is to give design data for the calculation of the stresses in the various members of a wooden truss of the Howe type. This truss is in common use for the support of roofs over garages, dance halls and similar buildings, often supporting a ceiling load on the bottom chord.

For our present purpose we will choose such a truss as might be used to support a flat roof over a garage. The span of the truss is to be 80 feet, with eight panels of 10 feet. The height of the truss to be 8 feet. Fig. A is a diagram showing the center lines of the members and the panel loads to be applied at the panel points of the top chord. We will assume that the roof joists rest on purlins which frame on the top chord at each panel point. The bearing for the truss at L_0 is to be a masonry or concrete pier.

The solution of this problem will be made without the use of any kind of a graphical diagram and will be according to what is known as the chord increment method. This is done by finding the number of shear points on each side of the center line. If the truss has an even number of panels, one-half of the shear for the center panel must be used, thus: $\frac{1}{2}$ L_4 plus L_3 plus L_2 plus L_1 = total shear on one side of the center. L_1 is 3.5, L_2 is 2.5, L_3 is 1.5 and L_4 is 0.5.

The next step is to find the tangent and secant of the angle between the bottom chord and the end post at the joint L_0. After this, by the method of chord increment, find the horizontal component of the stress in the web member adjacent to the chord in question. As an example, the shear of the web member $L_0 - U_1$ is 3.5. Multiply this by the value of tangent Θ, and the result will be the increment of the chord stress. This multiplied by the panel load will give the actual stress at the joint L_1. The stress coefficient at the succeeding points is found by adding the stress of the previous member to the increment of the member in question.

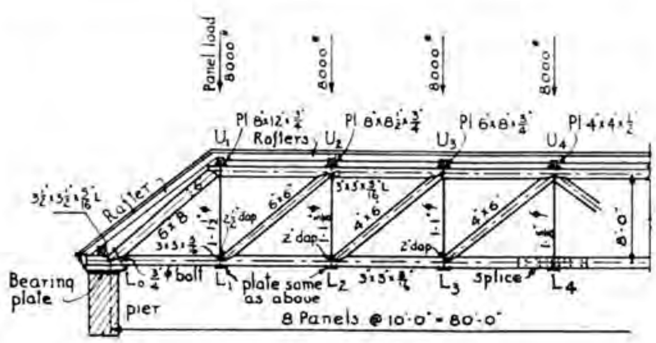


FIGURE A

CHORD STRESSES

Member	Shear	Increment	Stress	Actual Stress	Chord
L_0-U_1	3.5	2.8	2.8	22,400	[illegible]
L_1-U_2	2.5	2.0	4.8	38,400	[illegible]
L_2-U_3	1.5	1.2	6.0	48000	[illegible]
	.5	.4	6.4	51,200	$L_3 L_4$

WEB STRESSES

Member	Shear	Stress	Actual Stress	
L_0-U_1	3.5	4.2	33600	Secant of Angle θ $\frac{12.8}{10}$ = 1.28 Tangent of angle θ = $\frac{8}{10}$ = .8
L_1-U_2	2.5	3.0	24000	
L_2-U_3	1.5	1.8	14400	
L_3-U_4	.5	0.6	4800	
U_1-L_1	3.5	3.5	28000	
U_2-L_2	2.5	2.5	20000	
U_3-L_3	1.5	1.5	12000	
U_4-L_4	.5	.5	4000	

FIGURE B

DETAILS of SPLICE
FIGURE C

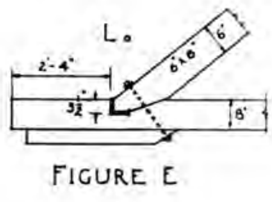


FIGURE E

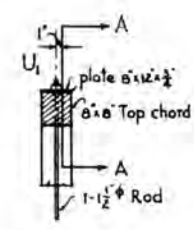


FIGURE D

The stress in the chords U_1-U_2 and L_0-L_1 = shear 3.5 times tangent Θ (0.8) = 2.8 the chord increment. 2.8 times the panel load (8000 lbs.) = 22400, the actual stress. The stress in the next chord is found thus: multiply 2.5 by tangent Θ (0.8) = 2.0 increment of chord U_2-U_3 and L_1-L_2. The stress in these chords is increment 2.0 plus the stress in chord U_1-U_2 and L_0-L_1 (2.8) = 4.8 stress in chords U_2-U_3 and L_1-L_2.

The stresses in the web members are found by multiplying the shears by the secant Θ, thus for L_0-U_1, stress is shear 3.5 times secant Θ (1.2) = 4.2, multiply this by the panel load, 8000 for the actual stress, which is 33600 lbs.

The accompanying table (Fig. B) shows the increments and stresses for all members.

Timber to be used #1 common rough Douglas fir Allowable stresses,

1200 lbs. per sq. in. for tension
1200 lbs. per sq. in. for compression with the grain
300 lbs. per sq. in. for compression across the grain
200 lbs. per sq. in. for shear parallel to the grain
16000 lbs. per sq. in. for tension in steel

Compression formula for all members in compression:

$$1200\left(1-\frac{\text{Length of chord in inches}}{60 \text{ times depth of chord}}\right)$$

Design of Members. The joint L_0 is designed without the use of a steel shoe. This is the most economical detail for a wooden truss, but can only be used where there is sufficient end distance. In many cases it is necessary to use a steel shoe on account of the end of the truss coming inside of a wall.

The bottom chord is shown with a splice. Securing a timber 84 feet long is usually difficult, so a splice should be used as shown.

The size of the bottom chord has been increased over the size required for the stresses so the splice will develop full strength.

Refer to figure C for details of the splice.

Lower chord L_3-L_4 stress = 51200 lbs.

$\frac{51200}{1200}$ = 42 sq. ins. required

6" x 8" timber is O. K.

Upper chord U_3-U_4 stress = 48000 lbs. by compression formula,

$1200\left(1-\frac{12 \times 10}{60 \times 8}\right)$ = 900 lbs. per sq. in.

1 – 8" x 8" = 64 sq. ins. section
64 times 900 = 57600
8" x 8" is O. K.

End Post L_0-U_1 stress = 33600 by compression formula,

$1200\left(1-\frac{12.8 \times 12}{60 \times 8}\right) = 816$

1 – 6" x 8" = 48 sq. ins. section
48 times 816 = 39168
6" x 8" is O. K.

Rods

U_1 and L_1 – stress 28000

$\frac{28000}{16000}$ = 1.75 sq. ins.

Use – 1-1½" round rod
area – 1½" round = 1.76 sq. ins.

U_2-L_2 – stress

$\frac{20000}{16000}$ = 1.25 sq. ins.

Use – 1 – 1⅜" round rod area = 1.49 sq. ins.

U_3-L_3

$\frac{12000}{16000}$ = .75 sq. in.

Use – 1 – 1" round rod area = .78 sq. in.

U_4-L_4

$\frac{4000}{16000}$ = .25 sq. in.

Use 1 – ⅝" round rod area = .30 sq. in.

Plates required for joints
U_1 and L_1 – stress 28000 lbs.

Refer to Fig. D

Bending Moment to be taken at AA 1" from center
Compression wood at 300 lbs. per sq. in.
B. M. at AA = 300 × 3 × 1½ = 1350 lbs.

$\frac{.75 \times .75 \times 16000}{6}$ = 1500 lbs.

therefore use plate ¾" thick

Area of plate = 8 × 12 = 96 sq. ins.
96 × 300 = 28800
Area O. K.

Use plate 8" × 12" × ¾"

Joint U_2-L_2 – stress = 20000 lbs.

$\frac{20000}{300 \times 8}$ = 8.3 Make plate – 8½"

Area of plate – 8 × 8½" = 68 sq. ins.
68 × 300 = 20400
Area O. K.

Use plate 8" × 8½" × ¾"

Joint U_3-L_3 – stress – 12000

$\frac{12000}{300 \times 8}$ = 5 Make plate – 6" long

Area of plate – 6 × 8 = 48 sq. ins.
48 × 300 = 14400
Area O. K.

Use plate – 6 × 8 × ¾"

Joint U_4-L_4 – stress – 4000

$\frac{4000}{300 \times 4}$ = 3.3 Make plate – 4" long

Area of plate 4 × 4 = 16 sq. ins.
16 × 300 = 4800
Area O. K.

Use plate 4" × 4" × ½"

Joint L_0 – stress from L_0-U_1 = 33600

See Fig. E for Horizontal shear

$\frac{33600}{6 \times 200}$ = 28" for end of chord

Depth of dap

$\frac{33600}{8 \times 1200}$ = 3.5 Make depth of dap – 3½"

Detail of splice for bottom chord, see Fig. C

Splice to be made between L_3 and L_4 at section AA

Net area of chord at AA
6 × 8 = 48 sq. ins.

Section is good for
48 × 1200 = 57600 lbs.
the 2 shear blocks at end of chord are good for
2 × 8 × 18 × 200 = 57600 lbs.
which is O. K.

MINOR ARCHITECTURE
EXEMPLIFIED IN MODERATE COST BUILDINGS

Innovations in Small Store Design

ILLUSTRATED BY THREE CANDY SHOPS IN BOSTON, MASS.

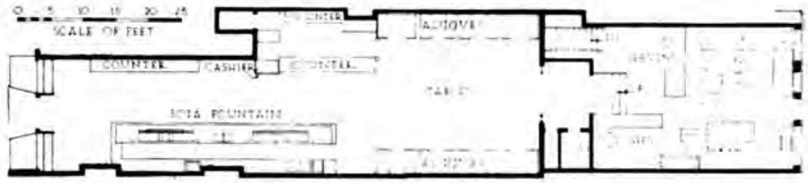
THERE are but few more interesting opportunities of giving a distinctive and highly decorative appearance to business quarters than are afforded in the designing and planning of soda and candy shops, tea rooms or luncheon rooms of the better class. The very purpose for which such quarters are to be used might be supposed to excuse the use of a certain degree of decorative treatment, which many conservative architects might consider unsuitable for business premises of most kinds, and this makes possible a gaiety of expression which would seem to be highly desirable in rooms of this sort.

The illustrations included here suggest the pleasing results which may be attained in work of this character. The designs of the most successful examples are comparatively simple, the aim being apparently to avoid ornament or decoration of any kind which is introduced purely for its own sake, and to rely, for decorative effect, upon well designed utilities and fittings and upon the use of materials in which excellence of texture, design or color is combined with necessary utilitarian qualities, and the results which good taste may secure in such work are surprising.

The Brunswick Shoppe, of which two illustra-

Detail of Fittings in Forward Part of Store at 306 Boylston Street
William Chester Chase, Architect

tions are given here, is a combination of soda and candy shop and luncheon or tea room. The space which has been devoted to the candy shop proper was until recently used as a florist's shop while the larger area, now arranged as a luncheon and tea room, was utilized partly as a store room and partly as a delivery room in connection with the hotel which occupies the premises. Between these two areas is placed one of the entrances to the hotel, but the adapting of part of the ground floor to a wholly different purpose has involved but little change in the planning of this street entrance and its stairway to the main floor above.



Floor Plan of Store at 306 Boylston Street
William Chester Chase, Architect

The walls of the candy shop are covered from the top of a dado to the ceiling with a scenery paper of brilliant coloring on a pale gray background and the necessary counters, show cases and other requisite fittings are of wood, painted white. The floors are laid with cork tiles in squares of black and gray. The tea room or luncheon room which, as may be seen by the floor plan, occupies considerable area, has been treated in a somewhat similar manner. Instead of using a scenery paper the walls from the dado to the rather low ceiling are covered with canvas upon which has been painted, in gorgeous coloring, the continuous landscape or garden scene which is a striking form of wall decoration. The windows upon two sides of the tea room are arranged with narrow valances and long straight draperies of gray blue, plain surfaced fabric with cream colored appliques, and the floor is covered with the same squares of black and gray cork tiling used in the candy shop. Necessary tables and chairs are of wood painted black, with simple decoration of bronze and the lighting fitments are of bronzed metal with figured cut glass prisms which lend to the tea and luncheon room a pleasing note of festive simplicity.

Another successful result, equally attractive but wholly different and secured by the use of other materials, is the candy and soda shop at the intersection of Beacon and Center streets in Brookline, a suburb of Boston. Here the requirements call for much less in the way of actual area and details of equipment than was true of the Brunswick Shoppe which has just been described, for in the shop which is under discussion the serving of luncheon and tea is either not done at all or else is of much less importance than the sale of candy and the serving of the usual soda and ices. The floors are of tile of plain colors in which are set inserts of blue, green and black. Walls are of scoured plaster having a slightly roughened surface.

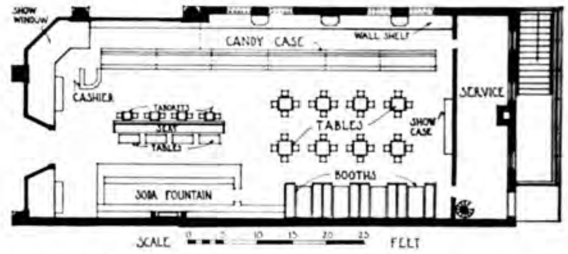
Doorway and Show Windows of Store at 306 Boylston Street

Throughout this candy shop the woodwork of various kinds—wainscoting, counters, tables and chairs, together with built-in show cases, benches and other details—is of wood painted, with certain panels and other details polychromed in borders, swags or other motifs which seem to be in harmony with the generally Italian spirit of the setting. Against the painted plaster walls have been hung two modern Flemish tapestries in the soft greens and wood colors in which such tapestries are usually woven, and above the soda fountain and counter, serving to emphasize the decorative importance of what is the chief feature, is a pleasing disposition of cut mirrors between columns which support a circular pediment in renaissance fashion. Added interest is conferred by the use of wrought iron lighting fitments, either suspended from the ceiling or fixed to the walls and having shades of decorated parchment to temper the brilliance of the electric lights. An examination of the floor plans of this shop will show that advantage has been taken of its corner location to arrange show windows upon the entire frontage on Beacon street and upon a part of that on Center street, while in the remainder of the wall space upon the side street are windows which light that portion of the shop where patrons are served at small tables. The width of the shop near the main entrance makes possible a built-in seat and several small tables down the center which add to the decorative interest of the shop and serve, at the same time, the convenience of patrons.

The attractiveness of another candy and soda shop, at 306 Boylston street, Boston, is due chiefly to the excellent taste with which the designing of the street front and the interior details have been treated, and the good judgment with which furnish ngs have been designed and color combinations selected. The front of the shop, as may be seen from one of the illustrations, has been given a very simple treatment in which marble, cast iron and glass are the principal materials, with wood used for doors. Within there exists sufficient well lighted area to make possible a somewhat unusual treatment, where in addition to the usual soda fountain and candy counters considerable space has been arranged with tiny tables, seating two or four, and a number of small alcoves or booths which consist of built-in seats or settles at the sides of small stationary tables which suggest the small "breakfast alcoves" which have become popular in city apartments and in small suburban or country houses.

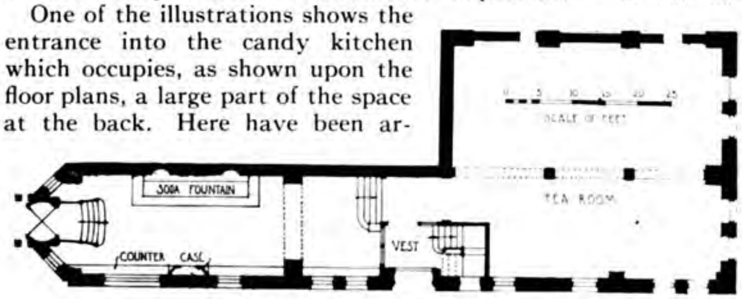
In this shop the wall surfaces have been painted and then lined off with stone joints, the ceiling being left plain. The floors are paved with heather brown tile. Furniture, and the lower parts of such stationary fittings as cases, and the front of the soda fountain counter are of hard wood treated with mouldings and painted designs in the style of the Italian renaissance. Just back of the soda

Space for Patrons and Service Door to Candy Kitchen in Store at 306 Boylston Street fountain the wall treatment here takes the form of mirrors arranged in small panels surrounded by a painted frieze, pilasters and columns, and the central feature is an arrangement of cut mirrors surrounded by a broad border of painted decoration over which is placed a semi-circular painted panel. Parchment shades which are used to soften or tone the light from various hanging lighting fixtures suggest the design and repeat the colors used in the painted renaissance panels upon the counter and other stationary fittings. One minor detail, which adds much to the interest of this candy shop when seen from the sidewalk, is the use of black tiles, having soft, dull surfaces and laid in dark gray mortar, for the floors of the show windows. This background affords an excellent setting for the various objects likely to be placed in the windows of such a shop, a detail of considerable importance.



Floor Plan or Candy Shop at Brookline
James Charles Flaherty, Architect

One of the illustrations shows the entrance into the candy kitchen which occupies, as shown upon the floor plans, a large part of the space at the back. Here have been ar- ranged the various utilities, steam kettles, bake oven, gas range, mixing and moulding tables, and numerous other details required, while a portion of the area is arranged as pantry or serving rooms for the washing of dishes, polishing of glass and other uses connected with the work of a shop of this kind. In the case of the Brunswick Shoppe the service quarters are in connection with those of the hotel of which this shop is a part, and with that at Beacon and Center streets, which is really not a luncheon room, and where the wares sold are probably made elsewhere, very little in the way of actual service facilities is required.



Floor Plan of Brunswick Shoppe

Soda Fountain and Tea Room Beyond in the Brunswick Shoppe
Blackall, Clapp & Whittemore, Architects

DECORATION & FURNITURE

Jeanne Taylor, *Associate Editors*, Leland W. Lyon, R.A.

Decorative Fabrics Following Original Designs

THE field of possibilities of interior decoration is constantly being widened and enriched through the untiring efforts of manufacturers who have developed highly specialized departments of design. Here artists are creating new designs in furniture and fabrics, often adapting ideas and motifs from museum pieces and good originals in private collections.

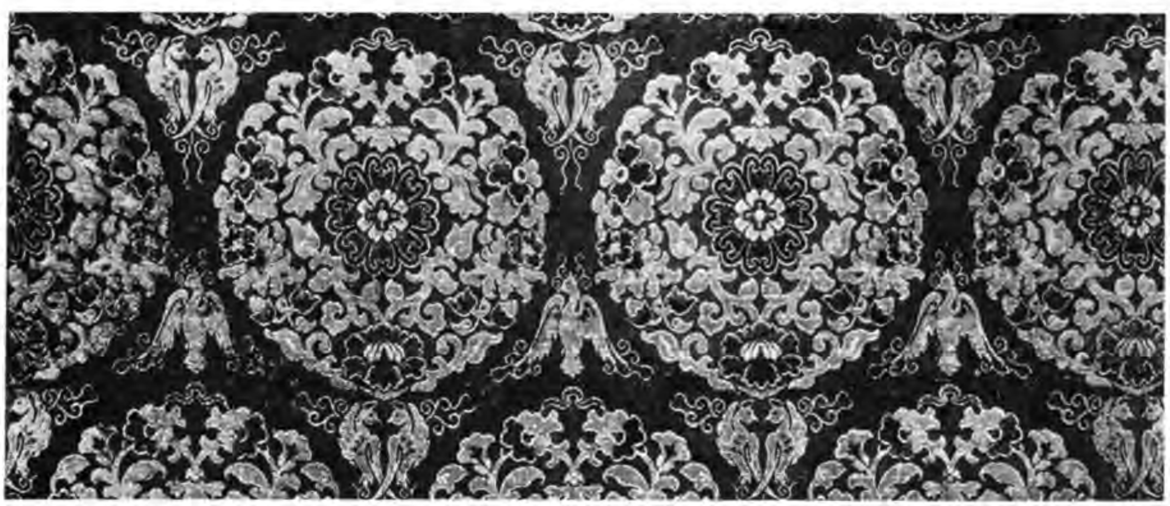
Probably as never before, there exists a demand on the part of the American public for better artistic expression in the elements and materials which make up a home, even of the moderate cost type. The widespread nature of this demand has been noticeable in its influence on domestic architecture of medium cost, where before much that constituted good design and good taste was confined to the more expensive homes. Thus it is that the proportion of well designed dwellings of average cost has greatly increased in the past few years.

Photographs reproduced in this article by courtesy of Cheney Bros.

Japanese Brocade Available in Several Color Combinations

This condition has created at once a demand and a steadily developing market for well designed furniture and fabrics. It is for this reason that the making of fine furniture and accurately designed decorative materials has passed from the workshops and hand looms of the craftsmen to the great factories and intricate, power-driven looms which without sacrifice of artistic merit place within the reach of many, products for artistic home making which before constituted the possessions of only the few.

It is evident, therefore, that the efforts of a large number of designers working in the industries producing decorative materials must result in placing on the market designs in decorative materials and good furniture, some of which are adaptations and others direct copies from originals developed in the



Chinese Brocade with "Cycle of the Lotus," Flying Fish and Phoenix Motifs of Chien Lung Period
Medallion reproduced from rare embroidery in the Metropoli an Museum of Art

Printed Silk Fabric Depicting *Mi-careme* Festival Scenes in Paris

various artistic periods of older countries. Nowhere, perhaps, is this condition more evident than in the class of materials used for draperies and drapery linings, wall hangings and panels, furniture coverings and other upholstery uses.

It is a recognized fact that hangings, wall coverings and carefully selected upholstering serve in large measure toward the furnishing of a room, particularly in these days when simplicity is the rule rather than the exception, and rooms are not filled with large quantities of furniture. Just because the modern home is no longer crowded with a variety of objects, it becomes more than ever important that what furnishings there are shall be exactly what are required for the correct expression of the character of the interior.

It is evident, therefore, that architects who include in their work the planning of interiors are interested in following the development in the production of decorative fabrics, and from time to time in this Department suggestions will be given of available designs which seem particularly fitted for decorative schemes, and not only for large dwellings, but for moderate cost homes.

We present illustrations of a number of decorative fabrics in silk, and as it is impossible to show

East Indian Settings Furnish Design for Silk of Oriental Character

Motifs from Spain and the Mediterranean in a Drop Pattern Arrangement for Silk

them in color, brief descriptions of several are given which may suggest uses for them.

Two brocade designs, one Chinese and one Japanese, are shown on the first of these pages. Both carry conventionalized figures and are based on various oriental motifs such as the Cycle of the Lotus, the Flying Fish and the Imperial Phoenix, as shown in the Chinese design.

On other pages four types of fabric design are presented, the first representing Paris in the midlenten or *mi-careme* festival season. The Cathedral of Notre Dame is to be noted in the background. The figures in the floats are the king and queen of the carnival. Under the trees, which represent the gardens of Luxembourg, are two costumed figures of the period of Louis XV.

Another design is Spanish in character, showing various typical diversions of the Spaniards. Thus the dominant scene is the bull ring, showing the *matadore* with red cloak in hand and sword upraised. To the right of this appears the garden of Granada with a troubadour playing a Spanish guitar to his lady on the steps above. Farther to the right is a gipsy girl dancing and playing a tambourine. To the left of the bull ring one catches a glimpse of the Mediterranean with Gibraltar

Textile Print Inspired by Work of Japanese Artists Showing Familiar Features in the distance, while above are two girls dancing the fandango. Another detail of the design suggests the garden of Granada by moonlight, and another little scene depicts a weary traveler on a burro approaching a wayside inn.

Two characteristic designs which express the warmth and richness of oriental life are to be found in the fabrics pictured on still another page. One of these portrays life in Buddhist India. The Taj Mahal is in the center of the design, and before it runs the River Ganges on which native boats drift leisurely. A typical Maharaja, under a jeweled canopy, is being entertained by a dancing girl. Here are to be found the five dancers of the royal festival dance of Siam, and across the river is to be noted a famous Jaganath Temple. Elephants in gorgeous trappings travel toward the great temple, and opposite an intricately carved stone temple gate the fakir is charming two cobras by means of his musical pipe.

Another interesting fabric of oriental design is conceived and executed in the manner of the Japanese wood block artists. The composition and the characteristic brush strokes of the masters of Japanese art have been followed carefully throughout the design, and empaneled signatures of six of Japan's great artists are incorporated as part of the decorative scheme. Fujiyama, as usual, is in evidence and the bamboo, cherry tree, bridge and Japanese ladies have been used to create an unusually interesting fabric design.

It is usual, when a reproduction is made of an old fabric of any period, or when an entirely new design is used, to produce the material in a line of quite a comprehensive variety of colors and color combinations, and this of course adds immensely to the possibilities which any given design may possess for the interior decorator, for these colors and combinations are chosen with reference to their suitability no less than to their practical use.

Mural Decoration by the Late Howard Cushing in Oval Room, House or Mrs. Willard D. Straight, New York
Woodwork of bright canary yellow and mantel of yellow Sienna and white marble. Delano & Aldrich, Architects

BUSINESS & FINANCE

C. Stanley Taylor, *Associate Editor*

Have We Reached the Turning Point?

IT is impossible to disguise the fact that at least during the past few months business has been very slow in the offices of most architects. Immediately after the close of the war almost every office was busy, but since the sharp decline in the volume of construction, the on y offices which have been busy are those which specialize in institutional buildings or which may be completing certain large projects begun some time ago.

In the average large office, and probably down to the smaller offices, there are employed today approximately one-third the number of draftsmen who a year or more ago were kept busy. The suddenness with which this change took place may be traced to the same general conditions which caused a rapid price deflation in many industrial and commercial lines.

Prices Breaking Downward

The public, having experienced a sharp break downward in commodity prices, has been eagerly watching the building material and labor markets, expecting a somewhat similar break which might tend to reduce construction costs. The fact that lumber prices have been so materially reduced has done much to encourage this viewpoint and, in a measure, has done a little to encourage construction.

There are, of course, diverging opinions regarding the possibility of a noticeable drop in the cost of other building materials during the next year. A study of relative costs, taken from recent figures in various sections of the country, shows that there has been an approximate decrease in construction costs of 20 per cent from the peak. Manufacturers of various classes of building materials, who have been interviewed in collecting data for this article, claim that any further sizable reduction in prices cannot be expected, at least until labor and transportation costs are decreased materially. There are several conditions which would seem to substantiate these statements.

In the first place it is apparent, by the very nature of the business, that there are not on hand extensive stocks of materials. The production of building material has always been maintained to meet the demand and there have been very few periods of over-production in this field. Consequently, it may readily be seen that this is no time to expect sharp price declines on account of over-production.

Unquestionably, the public is still looking for this decrease in prices. During the month of March a questionnaire was circulated through the pages of *The Builders' Journal* in an endeavor to obtain first hand information from builders and material dealers in various sections of the country. The questions which were asked may thus be briefly outlined:

1. Do you anticipate activity in home and moderate cost building in your locality n 1921?
2. Is it difficult to obtain building loan and mortgage money locally?
3. Is there a dwelling shortage in your locality?
4. If building is "slow,"—why?

Replies to this questionnaire were received from every section of the country, and these answers probably represent the consensus of opinion:

1. Some building activity expected, but definite activity seems certain by the fall of 1921.
2. Less difficult to obtain mortgage money now than it has been.
3. There is a very definite dwelling shortage in most localities.
4. Local building is "slow" because the public is still waiting for a further decrease in material and labor costs. There is every reason for labor to accede to wage reductions. There is a decided increase in the efficiency of building labor and a noticeable return to the building industries of workmen who have been engaged during previous years in other work.

For further substantiation of this condition we may turn to the interesting nation-wide survey just made by The Fidelity and Deposit Company of Maryland. This is the second survey of this nature which has been made by this large financial institution, and from it we have selected certain points which are of direct interest in connection with the building activity:

1. There have been appreciable wage reductions in the building industry in these sections of the country:

New York district,	South Atlantic district,
Pennsylvania district,	East-South Central district,
Ohio district,	West-South Central district,
Indiana, Michigan, Wisconsin and West-North Central district,	Western Mountain district,
	Pacific district.

It may be noted that these reductions have been largely forced through by building trades employers.

2. The productivity of labor per man in all industry has increased since last September in every section of the country.
3. (*a*) There is need for building construction in the low priced dwelling class in every section of the country.
   (*b*) A demand exists for high grade dwelling and apartment buildings in all but the South Central and Western Mountain districts.
   (*c*) Factories and warehouses are needed in New England.
   (*d*) For office and store buildings there is strong demand on the Pacific Coast.
4. Sentiment is not favorable toward building operations, at present costs, in any section of the country.
5. Savings accounts have increased throughout the Northeastern and North Central states and in California. In other sections of the country, particularly throughout the South, the total of savings has decreased.
6. This survey shows no noticeable movement of men back to the farms from industries, which would indicate the existence of a continued pressure of the housing shortage.
7. The chief local questions in practically every community seem to be taxation and housing shortage. The principal national questions, as reported from each section, are taxation, tariff and peace settlement.

This survey has been analyzed by the Hon. David F. Houston, from whom we quote: "The country has successfully borne the strain caused by a most notable drop in prices, particularly of a vast volume of raw materials, and has weathered a trying period of liquidation. The demand for finished products has not developed to the point where our factories feel justified in taking the requisite quantity of our surplus raw materials to furnish the necessary relief to their producers; but there are some indications of a change in this direction. Business men realize that forced action, based on artificial optimism, may lead to unfortunate results and produce further embarrassment. The foreign situation has not shown the expected improvement, and continued difficulties are experienced in discovering effective European markets for our commodities.

"Certain favorable conditions are indicated in this survey. The cost of living has appreciably diminished. *Building operations in a number of districts tend to increase in number.* There have recently been no strikes of consequence and greater productivity of labor per man is reported from all districts. Raw materials are plentiful, and physical transportation conditions are good. There have been no business failures of any importance. The crop outlook is satisfactory and the banking situation has improved. It is believed that confidence in business circles is slowly spreading, and that while there is hesitancy the business men of the country are feeling their way with sound business caution, and the country is working back toward a more stable condition."

The present high cost of freight transportation seriously affects building costs, in that it is applied from the time the material in raw form is shipped to the factory, until it reaches its final destination at the building. When we add to this the disturbed condition of the labor market in the building field, we have a situation which, though it may be plain to those who take a professional or service interest in construction, is not readily understood by the building public.

We understand from unofficial sources that this question of railroad rates—both for passenger service and freight transportation—is to be taken up seriously when congress convenes again, and that a reduction in rates throughout may certainly be expected. This condition cannot but reflect beneficially upon the building industry, and if it proves to be sufficiently drastic must favorably affect building material costs. We may note here, however, that a reduction of prices by manufacturers will not be immediately felt, as it will be necessary for dealers to get rid of any stocks which may be on hand before this price reduction enters definitely into the retail field. The survey referred to shows that sharp reductions in wholesale prices of commodities have not yet been entirely reflected through similar reductions in retail prices.

The Question of Building Labor

It is apparent that labor in the building field is in a state of unrest, which might well be expected when the temporarily suspended law of supply and demand begins to function, feebly at first but with increased strength, as labor decentralizes from other industries which have drawn it away from the building field.

A brief analysis of this condition shows that many good mechanics of the building trades are coming back from the automobile plants and the war industries, seeking again the work for which they were originally trained. Viewing broadly the proposition of labor in the building industry, it is questionable whether any law except the economic law of supply and demand will ever govern labor costs for an extended period. The power of labor unions is naturally greatest at the peak of demand, and weakest in the valleys of building inactivity.

We hold here no brief against union labor, but owing to the unfair application of the principles of unionism, as affecting the building industry during the past five years, we are thoroughly committed in our own minds to the open shop policy or to a re-establishment of the functioning and requirements of labor unions in this industry which will recognize the difference in the productive value of individuals—in other words, taking off the limitation of production so that every laborer shall be worthy of his hire, and in turn shall receive proper value for his services.

In the foregoing paragraphs we have endeavored to make clear some of the fundamental economic conditions which bear upon the building situation today. It would seem that a number of these perplexing problems are reaching a point where it will be possible to offer logical and practical solutions. It is certain that conditions are not getting worse, nor are we yet in a definitely quiet period. Having recently visited the offices of many architects in the East and Middle West, we find indications of increased business where, during the past few months, there has been no interest on the part of clients, but where now architects are reporting inquiries and, in some cases, definite increase in the volume of work.

So it would seem that the first phase of returning building activity is now opening up—that is, the period when prospective builders realize that there is not much to gain by waiting, and those who are in immediate need of buildings of various types are now proceeding seriously to the business of planning and construction. There is naturally a great interest in new houses, but a still more definite interest is to be noted in the provision of schools, hospitals, and other institutional buildings, a condition to be expected at this time.

Out of the maze of conflicting opinions there may be gained these definite impressions:

1. That the year 1921 will show approximately an average volume of building construction.
2. That money spent in this field will be principally for buildings of the habitation class.
3. That there will be further progress toward settlement of the labor question, and some additional reduction of material prices which will make the year 1922 an opening year of sound activity in building construction.
4. That this period of activity, when it does open up, will continue steadily for at least five years.

It must be realized, of course, that this is only an expression of opinion, but as it is a reflection of the best professional and public opinion it seems to be about the most valuable forecast available at this time.

It is certain that there will be during the next year more recognition on the part of the federal government of the problems and needs of the building industry, which has definitely suffered under the past administration. The country has apparently passed the worst of its period of business depression, and part of the program of reconstruction being necessarily a program of building to meet building shortages, all evidence is favorable to the interests of those engaged in any branch of the building construction industry.

A Country House Near Apeldoorn, Holland
A. H. Wegerif, Architect

Results from Tax-Exemption

A RECENT New York ordinance exempting from taxation, entirely or in part, all residential construction done during a period of two years, has already shown definite results in stimulating building activity. This is probably the most practical measure toward this end that has as yet been put into effect in the United States. It is evident, therefore, that this question of tax-exemption should be given serious consideration in every city and community where shortage exists.

Briefly, this ordinance, which is retroactive and covers a period from April, 1920 to April, 1922, exempts from real estate taxation for a period of ten years $5,000 of the appraised valuation on any individual dwelling, and $1,000 a room up to five rooms on each apartment of multi-family dwellings. In other words, on a dwelling with land that is appraised for taxation at $8,000, taxes are to be paid only on the balance of $3,000. The present New York tax rate being $2.85, it may be seen that this ordinance saves, per family housed, approximately $142.50 a year, or $1,425 in ten years. This is an actual saving which is negotiable from a real estate viewpoint. On a two-family house the saving would be twice as much, and similarly in buildings containing more apartments the saving would increase, in accordance with the terms of the ordinance.

While this ordinance has been in effect only a few weeks there are already in evidence a number of interesting results. It may be noted first that activity in the sale of improved realty has increased, a number of recently constructed apartment houses having already been sold under the new cost-saving conditions created by this ordinance. Brokers in outlying districts of the city, where land values are low, report a greatly increased interest in purchase of vacant property for building purposes. Naturally the effect of this exemption will be most beneficial to the inexpensive type of houses where relative proportion of exemption to total appraised value is high. Thus on a dwelling in the high land value districts, where the lot might be appraised for $15,000 and the building for an equal amount, the exemption would represent only $5,000 on a $30,000 appraised value, or a tax-exemption of approximately 17%. In the outlying residential districts, where a $15,000 house might be built on a lot worth $3,000, the tax-exemption would be approximately 30%. Similarly, in the low cost district a house costing $7,000 might be erected on land worth $1,500 and the appraised valuation here, based on present appraisal methods, would probably be about $5,000, which would make this house exempt from taxes for a period of ten years.

The result of this condition is already reflected in architects' offices, particularly in Brooklyn and other districts where land values are not high. Several speculative housing operations which have been in abeyance are now proceeding.

Walter Stabler, Comptroller of the Metropolitan Life Insurance Company, at a recent meeting of the Board of Estimate of New York reported that since the passage of the tax-exemption ordinance this company had loaned over $2,000,000 to builders of five-story apartments of the walk-up type, and that he considers the ordinance responsible for a great deal of building activity.

It is interesting to note that the definite effect of this ordinance is being felt exactly where the housing shortage is greatest, that is, in the districts available for the construction of moderate cost dwellings and apartment houses. Evidently in the outlying sections of other cities of the United States, and in small cities and towns where the housing shortage is acute, a tax-exemption measure would go far toward encouraging home building.

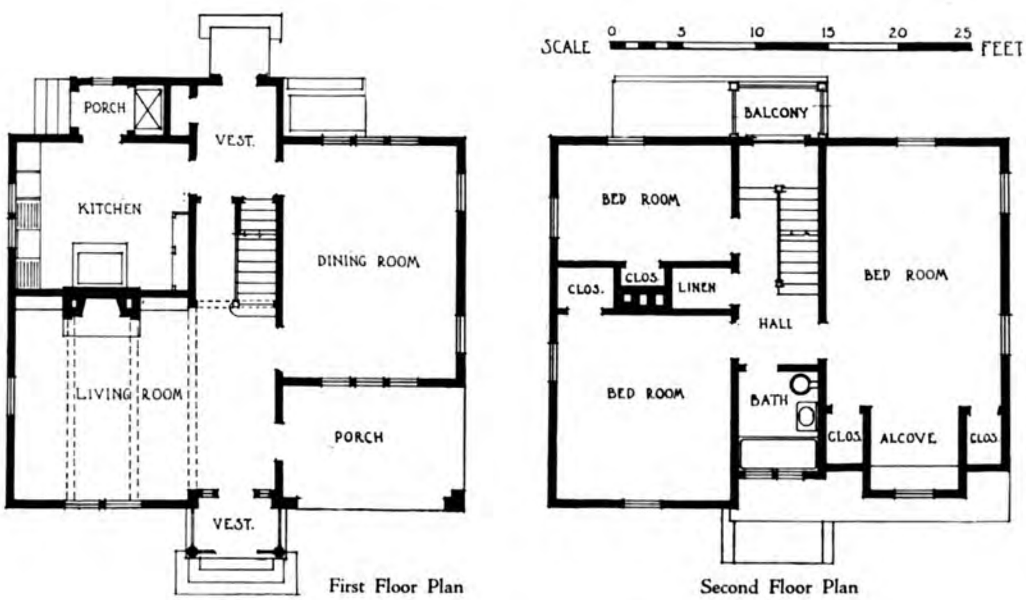
Many of the savings banks and other loaning institutions which have been approached for mortgage money have been willing to loan, but restrict their appraisals to the pre-war building valuations. This is because they have been afraid of shrinkage in the replacement costs of buildings. This tax-exemption measure, which has the effect of actually reducing the cost of construction by amortizing $1,400 per family back to the purchaser over a period of ten years, naturally reduces this much of the potential shrinkage in value, and should influence the mortgage market toward a more liberal appraisal and toward the encouragement of building by increasing the local volume of money available for building and for permanent loans on structures for dwellings.

Builders, architects, real estate operators and others interested in stimulating local activity should, therefore, give serious consideration to this important action in New York, and realizing its results should make a definite effort to bring about some form of tax-exemption elsewhere. It is true that strong opposition has been brought to bear on this measure and that several arguments have been advanced, some being in the interests of property owners who are not in the exemption class—in other words, those who own buildings constructed before the tax-exemption period.

From the viewpoint of the municipality there is nothing to lose and much to gain by limited tax-exemption of this type. Practically all dwellings constructed because of an inducement of this nature will pay taxes on the amount of appraisal in excess of the exemption, and there will also be an increment in the value of land in districts in which these houses are constructed which will reflect favorably on the income of the city because of an increase in taxable values. But more important than this is the fact that through this means the housing shortage may be somewhat relieved and considerable sound activity developed in the building material and building labor markets.

A Small House at Yonkers, N. Y.

ARNO KOLBE, ARCHITECT AND OWNER



First Floor Plan

Second Floor Plan

EDITORIAL COMMENT

CALDER COMMITTEE REPORT

THE results of the hearings and investigations, conducted over a period of many months in different sections of the country, by the United States Senate Committee on Reconstruction and Production is now made available to the public. The Committee, owing to its government appointment, had the opportunity of digging deeply into the many conditions that have operated to retard construction, particularly the building of homes, on which the Committee's work was chiefly centered.

Houses will not be built in any appreciable numbers until the public has become satisfied that material prices and wage rates have reached a reasonable basis and that investment will not be jeopardized by falling realty values. This is the chief obstacle to construction, and it will not be removed by investigations, conferences or government fiat. Aside from this there are, of course, a number of influences at work that have served to make construction difficult, even granted that its cost was not the deterrent factor.

Chief among the conditions which have been found to work to the disadvantage of building is the question of credit. On this the report says: "The history of the past two years shows that enterprises producing luxuries and consumable goods have promised greater profit than have enterprises providing housing, transportation or the development of national resources.

"Loans have been available to make possible the hoarding and maintenance of high prices of sugar, cotton, wool, hides, foodstuffs, etc., and this has resulted in maintaining the cost of living at an artificial level in defiance of the law of supply and demand. . . . The paradox has been that money has not been loaned for building because the cost of building has been too high but money which has been loaned for trading in commodities has so increased the cost of living that the cost of building has increased."

The other recommendations deal chiefly with matters of taxation and would react only slightly on new construction, with the exception of the provision for the exemption from taxation on interest of mortgage loans not exceeding $40,000 when such loans are held by individuals.

The sum total of the Committee's efforts, if enacted into legislation will, it is seen, help but little in supplying the houses that are so badly needed. They will tend, of course, to reduce the cost of financing and other promotion expenses, but these items are but a small part of the cost of construction and the major items—materials, transportation, wages and efficiency of labor—must remain to be worked out in accordance with the law of supply and demand.

This is rapidly taking place and is already showing its effect in growing construction activity. To quote from the report,—"When the commodity index figure of wholesale prices of building materials approximates that of general commodities, there can be little reason to fear loss in investment in building through future lower replacement values, and because of the accumulated demand for structures of all sorts, building materials will be safe if they reach such a level in the near future."

Following the release of restrictions by the government on material costs, the wholesale index figure reached the point of 256 in November, 1919 as compared with 100, the base in 1914. This rise was, however, more gradual than that of general commodities because they had already reached the point of 207 in November, 1918. May, 1920 saw both reach their maximum level, building materials being 341 and general commodities 272. At the end of January, 1921 building materials stood at 239 and general commodities at 177.

The divergence between the figures is, therefore, constantly growing less and with the rapid fall of the last several months, which has probably not been recorded in any other similar period of economic history, building materials may very soon be expected to reach a level which will provide a stabilized basis for the resumption of construction of all kinds.

THE MISPLACED KEYSTONE*

By ERNEST O. BOSTROM, Architect

Inspired by the cartoonist's conception of where the A. I. A. belongs in the building industry as illustrated in THE ARCHITECTURAL FORUM of February, 1921.

ONE fell glance—
Just by chance,
Made me want to hop and prance.

Made me mad—
Same time sad,
To think that it could be so bad.

Didn't you see—
What the key
Of the arch was now to be?

Can't you wake?—
Must I shake?
Must the very arch stones quake?

We must think—
Not just blink,
And not only splatter ink.

We must act—
That's a fact!
With all wisdom, speed and tact.

Public thought—
Can't be bought,
Should be moulded as it ought.

Off we must—
Shake the dust,
Ere the very brain cells rust.

Am I right?—
Then let's fight,
That which we believe a slight.

Who will stay?
Join the fray!
It will be a battle gay.

Be not slow—
We will show
Where the key should *really* go.

And its name—
Borne by Fame,
Shall be classed with Art again.

*This poem, as printed, is much abbreviated from the original.

The
ARCHITECTURAL
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The American Institute of Architects' Convention

WASHINGTON, D. C., MAY 11, 12 and 13

THE commercial and business structure of our country is in the midst of great economic difficulties. It is but natural that these difficulties should be reflected in the practice of architecture, which is dependent in an almost complete measure upon business prosperity. Dissatisfaction with present conditions is to be expected, and much straining and pulling are evident in an attempt to give artificial impetus to the process of settlement, which can only work out gradually in accordance with economic laws. The result is a confusion of ideas, a tendency to follow bypaths that offer tempting prospects; a questioning of the soundness of principles previously accepted as fundamental; all ending in obscuring the main goal—which must be kept in clearer sight today than ever before.

Such is the condition in a great majority of human activities; such is the condition within the architectural profession as it was represented by more than 200 delegates at the national convention of the American Institute of Architects.

What is the work of the architectural profession? What are its obligations to client, public and self? What is its goal, and how is it to be gained? What is the Institute? What are its duties to the public and the architect? These questions and many others are suggested by the proceedings of the convention. They remain undetermined, and there are as many opinions expressed and inferred as there are answers.

The convention consumed the time allotted to it; the delegates gave varying degrees of attention; those with special suggestions and recommendations from their local chapters presented them; they were considered in correct parliamentary form, but what does an analysis of the work accomplished show? Have architects, the country over, a clearer idea of their professional duty? Have they been given the feeling of renewed confidence and courage to attack their problems in a vigorous, straightforward way? The answer must be no. The opportunity to make this possible was present; delegates from every section of the country were in attendance, fresh from actual contact with today's conflicting conditions; but the will, machinery or whatever is necessary to bring constructive ideas from such an assembly, was lacking.

Why does such a condition exist? There is one outstanding reason—conservatism of the most deadening variety. The world is entering a period probably greater in potential influence than any previously recorded in history. It is to be a period of great economic development, in which material resources, executive and keen professional ability will be highly important factors. Will conservatism supply the energy and power to cope with forces of this character? Conservatism is satisfaction with conditions as they are; it provides a comfortable prop in the way of precedent on which to lean when conditions requiring a decision arise. It is a safe and comfortable path to follow in normal times, but it is difficult to associate it with progress, and progress is the keynote today. Conservatism will not furnish the answer to questions arising now, nor those that will arise in the next decade. The professional body, business association or individual lacking the courage to solve today's problems in the light of today's conditions, will fail.

Individual architects, to a large number, can be named who are meeting present problems in a manner that commands the utmost respect and admiration. But must the Institute lag behind in the path blazed by the individual practitioner? The Institute should represent the collective ideas of the progressive leaders in the profession; it should not be relegated to a position of following on the heels of progress. It should and must lead! Otherwise the burden of doing the work for which the Institute is organized falls on the individual or small group of constructive thinkers. The individual can and will assume the burden; he will make his own decisions that seem best in the light of local conditions. But is this policy going to strengthen the Institute? The great mass of architects look to the Institute as their guide—their inspiration. If the Institute has not the courage to fill this role, its usefulness as an aid to the practicing architect is greatly impaired.

Of what particular interest, therefore, is a chronological review of the convention proceedings?

There is little to record that may be described as actual progress; a resume of almost any previous convention would serve nearly as well. The ancient topics of competitions, architectural education and improvement of public taste were given their usual prominence; similar proposals were made and similar resolutions passed as in previous years. On the other hand, topics of vital, current interest are limited in debate, and in the end generally referred to the Board of Directors, which always genially accepts, for consideration or burial, any proposals too weighty for the delegates to discuss to a conclusion.

We will take this occasion to point out a few of the opportunities the Institute should seize to build up a professional society with which it will be necessary and desirable for every capable architect to associate himself. It is not our purpose to indulge in captious criticism, rather is it to exercise our editorial function — to hold the mirror, as it were, so that some observations may be expressed that, in the nature of things, are not so easily evident to those within the organization.

We have said that the proceedings of the convention suggest the question, "What is the Institute"? The founders of the Institute organized themselves to uphold and improve the standard of architecture as a fine art, and to aid themselves and other architects in developing a professional pursuit on a high ethical plane with intelligent and capable service to the public.

If any one characteristic of the convention were to be singled out as indicating the trend of thought today it would be the desire for power and the recognition of its possession, on the part of the public. This in itself is not to be criticised in an organization where power is used in furthering public service, but the Institute appears somewhat impatient over the comparatively slow process by which public recognition is acquired, and there are consequently definite tendencies of a desire to force more speedy recognition. This is, we think, frankly a mistake. Recognition will come in full measure to any individual or group that makes a sincere effort to deserve it, and any attempts to secure it otherwise are likely to result in retarding the movement.

We fear that some of the fundamental purposes for which the Institute was organized are being lost sight of, due undoubtedly to the disturbed economic conditions under which we labor today. Thus the Institute in some of its own activities, and in its endorsement of other activities inaugurated by groups of its members, is becoming involved in ventures which are purely of a business nature. Business ventures may, of course, be perfectly honorable and legitimate, but in the very nature of things they entail the adoption of policies which cannot always be found compatible with the basic reasons underlying the existence of a professional body founded for the improvement of its members and the upbuilding of an art.

We refer particularly to the recent organization to provide plans for small houses to people throughout the country, who, statistics seem to prove, know little of the architect's work and seldom if ever employ him in solving their modest problems. For the past few years this problem has been bothering certain men in the profession, perhaps stimulated into crystallization by the experience of many in war housing. There is a definite phase of public service to the proposal that is most worthy of support, but we feel that in response to this urge a somewhat ill-considered program has been definitely adopted. In short, the public service angle has been merged with a plan which is purely business—with stockholders, subsidiary corporations, regional directors, a parent corporation and all the paraphernalia that goes along with the modern idea of "big business"—the whole given an excellent assurance of business success by the endorsement of the American Institute of Architects. The plan, carried to a logical and possible conclusion, means the control of a very large part of the small and moderate cost work of the country by a large national corporation, allocating work to some nine regional subsidiary corporations. The source of any art thus produced will be the corporation, the individual designers who conceive the plans being recognized only in the published lists of stockho ding members.

Wholly aside from the theoretical propriety of the Institute embracing activities of a business nature, is the larger aspect—the reaction on the profession at large, and the effect on the Institute in its function of developing the smaller practitioner to a point of high standards in both art and service.

We have, therefore, immediately a reversal of policy. Architecture has always been considered a personal art; it emanates from a designer who must be an individual and should be an artist. Small house architecture is, however, evidently an exception—it can be produced by a corporation, and it is claimed that the man who secures his modest architectural service through the corporation will gain a clear idea of the *architect's* function, and that when he prospers and has need for a larger home or a new business building, he will consult an individual practicing architect and employ him on regularly accepted professional terms!

The psychology does not seem quite clear. He will more probably consult the architectural corporation, and if it is not in a position to render him service he will be inclined to question the discrimination. He has been educated to stock architectural service, over the counter, and will search out some other corporation or service that has no limitations.

The housing bureaus are definitely in the "stock plan business." They undoubtedly will provide more complete service, and probably a better grade of design than existing agencies, but the success of the movement depends entirely on business considerations—involving extensive publicity. This

The less familiar view of "bowling green," gardens and buildings seen on looking toward the river

AIRPLANE VIEWS OF "MOUNT VERNON," NEAR WASHINGTON, D. C.

Few large estates of present-day development possess the informal symmetry and colorful patterns of terrain that George Washington's home on the Potomac spreads before the aviator. Notably beautiful on the ground, it could hardly have been more pleasing if anticipating the view from the air.

Photographs by courtesy of the U. S. Army Air Service will be possible only by the aid of large capital, which obviously the return from sales of plans will not provide. Arrangements with building material manufacturers, who have large distributing channels, therefore become necessary. They will be actuated by either the aid the plans will afford them in merchandising their products or the possible direct return from sales of the plans themselves. The architects making up the personnel of the various bureaus, and incidentally the Institute through its endorsement, thus become definitely allied with a commercial enterprise which is a departure from purely professional grounds.

Another phase which is of concern to the Institute, is the reaction upon it of large numbers of young men in the profession who are dependent for the start of professional careers on just such work as these corporations will take care of. These young men, on the whole, are doing creditable work. Each in his small sphere of influence is spreading the gospel of better architecture and, furthermore, he s creating a visible expression of the real service of the architect—the work of an individual designer who s able to interpret the owner's needs into actual building form with some degree of taste. While it is correctly contended that this plan service will reach people who, because of remote locations, could not possibly be served by architects, there is no means of confining the service to them and the plans will, in perhaps larger degree, be used in the suburbs of cities where innumerable young men are available for architectural service. To develop an architectural practice is not an easy problem, and for many it will not be made easier by a network of architectural corporations covering the country that propose to supply "complete architectural serv ce" at a price with which the individual architect cannot possibly compete.

We do not wish to underestimate the public service which is the underlying principle of this plan, but there are numberless ways in which this angle could be approached whereby those now not served by the profession could be given advice and plans at low cost and the field which is now being well served by the young architect would not be jeopardized. The young man working earnestly today is future timber for the architectural profession and the Institute, and he should be accorded every recognition and help; certainly no step should be taken by the national organization that might frustrate his efforts. The position of architecture in small work is not fundamentally bad; recent years have seen a tremendous advance in the standards of taste of the small home builder, for which the enthusiasm of individual architects and the live influence of their work have been responsible. This will steadily grow, and it is safe to say that it will eventually build up a more truthful and vigorous expression of America's taste in home building than artificial and hurried methods employed in corporate effort could ever do.

One feature which was a departure from late convention precedent requires comment. This was the provision of a place in the program for the discussion of subjects pertaining to design, and judging from the very full attendance these meetings enjoyed, in contrast to those dealing with routine matters, it would be distinctly worth while to continue them in future conventions. An opportunity was available, at the end of the lectures, for general discussion which was widely participated in and brought out points of decided interest and value. Harvey W. Corbett, of Helmle & Corbett, lectured upon the subject, "Planning High Buildings for Narrow Streets," and illustrated his talk with interesting slides of the newer tall buildings in New York designed in accordance with the regulations of the Zoning Law, which have been instrumental in changing completely the principles of design of office and other high buildings. The law, while not perfect, is at least working to the advantage of architecture, because it has forced the consideration of the tall building in three dimensions instead of the two dimensions of a street facade, and as a result some very interesting solutions of the tall building problem may be expected in New York.

Other illustrated talks were by George S. Howe on "The Minor Architecture of France," and by Charles Z. Klauder on "Recent American Collegiate Architecture," which afforded very convincing evidence of the high standard of design that has come to characterize Amer can colleges. These talks injected an element of inspiration that was not lost on the delega es. They were particularly of interest to architects from parts of the country where large opportunities for architecture have not yet been developed; through their membership in the Institute these men could feel a definite contact with the larger work and carry away with them a determination to take the greatest advantage of the opportunities that are afforded them.

This should be the keynote of all convention work. The Institute must provide the inspiration that will prompt the individual to make his service better from the angles of both design and business service. Opportunity should be given for the discussion of problems as they arise in practice, and action looking to the formation of policies should be taken at times when such action will be of most benefit. There is too evident a reluctance to deal with questions that require decisions; action is apt to be postponed to a time when conditions may be quite different and the decision of little value. The Institute must come to the realization that in its hands is placed the welfare of the architectural profession. It should adopt a progressive, alert policy that will establish it definitely as the leader of the profession. This accomplished, its membership will grow; the satisfactory increase of 700 members this year will be repeated again and again with little effort; its influence will extend to every section of the country, and the power and recognition it desires will be forthcoming n full measure.

Villas of the Veneto

III. THE VILLA BERCHET, ON THE TERRAGLIO, NEAR MESTRE

By HAROLD DONALDSON EBERLEIN AND ROBERT B. C. M. CARRÈRE

THE whole of the Veneto, so far as villas are concerned, is a thoroughly Palladianized country. Probably nowhere else, either within or outside of Italy, can a region be found in which the dominating influence of one man is more clearly to be traced in all the manifestations of rural domestic architecture.

It should not be inferred from this statement that all the country houses that may lay claim to any degree of architectural merit were designed either by Palladio or by those of his contemporaries or successors who closely followed his manner or precepts. But Palladio supplied the initial impetus, under divers phases of which villas continued generally to be built for two centuries afterwards and, indeed, to some extent, down to the present day. Not a few of them show sadly feeble and meager use of Palladian principles, it is true, but notwithstanding their manifest shortcomings one who is willing to analyze their compositions may discern back of it all a Palladian concept.

Andrea Palladio, 1508–1580

In other words, Palladio created the background, and upon this background his successors have wrought, sometimes well and sometimes unsuccessfully, according to their lights or according to the trend of current fashions. The architects of the baroque age, with characteristic assurance, did whatsoever they listed, and they embodied features of composition and methods of detail that would have driven Palladio, with his regard for archæological rectitude, to rage or despair.

But notwithstanding the florid creations of the baroque architects and the elaborations of Count Fregimelica, or those of his less gifted and less known contemporaries, it is evident that one and all followed along a well beaten path of which the course had been determined by the original Palladian trail. It matters not whether for examples we turn to the lordly palace of the Pisani, at Stra, or to the lesser villas, shooting boxes, and farmhouses along the Canale di Brenta; whether we pursue our course along the Terraglio towards Treviso, or whether we search the country in the directions of Castelfranco or Vicenza; whether we scan structures that command admiration for their excellence, or whether we contemplate architectural trivialities that disclose Palladianism run to seed, more and more does the conviction force itself upon the mind that Andrea Palladio laid the broad foundations of a generic style, which those who came after him have modified in varying degrees but have never wholly obliterated. Consequently, the inter-relationship of rural architecture in the Veneto is just as distinctly and locally characteristic of the region, and just as unmistakable, as is the clearly marked local relationship between the villas of Tuscany.

To understand how it was thus given to Palladio to lay in the Veneto a comprehensive foundation for rural architecture, a foundation that served to influence profoundly its whole subsequent development; how it was that he was privileged to chart, as it were, upon a clean sheet, a course that his successors found it expedient, in the main, to follow, we must bear in mind two controlling considerations. In the first place, the condition of the mainland in the Veneto, prior to the sixteenth century, had not been such as to invite the establishment of villas. Turmoil had prevailed almost without cessation, and the territory had been sadly harassed through the pillage and destruction attendant upon the strife of warring factions. Many of the holdings of great monastic houses, in the possession or under the feudal protection of which much of the land was formerly held, had been laid in ruins, and for hundreds of years afterwards, when fields were ploughed or foundations being dug, it was no uncommon thing to uncover bits of mediæval sculpture that had once graced buildings thrown down in the ages of violence. Thus the field was ready for the creation of an entirely fresh villa tradition. In the second place, with the coming of more settled conditions across the lagoons, and with the development of that wonderful system of canals that reclaimed large areas of fen country, the Venetians turned their thoughts thitherward and entered upon that course of building which was to bring forth some of the stateliest villas in all the north of Italy. To this experiment in the establishment of villas they were impelled not only by the invitation of a now secure and peaceful countryside, but also by a freshly awakened passion for the enjoyment of nature's charms, an impulse traceable to the all-pervading influence of humanism. The same influence led them to plant goodly groves and gardens where, in a congenial and appropriate setting, they might re-enact the polite and intellectual refinements of the Greek Academy.

In their enthusiasm for the "new learning," and prompted to imitate with a sort of amiable and harmless pedantry the manners of the ancients, the physical realization of their ideal demanded two things. There must be parks and groves of adequate size for entertaining, and the houses themselves must be sufficient to accommodate numerous guests and a retinue of servants. It was customary for the guests to come and spend at least several days; often they remained longer. Hence we find a series of salons and card rooms where, in the evenings, the guests might move about and divert themselves as their inclination led them.

When we remember that ordinarily many of these villas were occupied by the masters and their friends during the autumn only (the bailiffs, gardeners and *contadini* presiding there the rest of the time), and that this brief occupancy was a season devoted mainly to extensive entertaining, and entertaining very often carried on in a somewhat ostentatious way, we can understand the lack of a certain domestic quality in these country houses. That domestic quality they doubtless would have had, at least to a far greater degree, if they had been used as homes during a large part of the year. A somewhat modified interior arrangement would inevitably have obtained. As it was, the more purely domestic qualifications did not loom with large importance and, judged by the domestic standards to which we are accustomed, they must needs present a somewhat artificial and, at times, stilted aspect to one in quest of domestic values.

Entrance on Long Facade of Sculpture Gallery

The gardens too, full of delight and stately beauty as they often were, reflected the same underlying trend of insistent formality. There were long pleached walks, great expanses of lawn, systematically disposed avenues, imposing stretches of well regulated woodland, fish ponds and streams confined within carefully ordered bounds; casinos, grottoes, urns and statuary, set to terminate vistas, to yield a note of contrast, or to give due accent to some feature of the gardening composition. Order, the formal massing of luxuriant foliage, and the divers qualities of leafage were the chief elements of charm.

The flower garden was often merely a utilitarian adjunct to afford the requisite supply of cut blooms and was not, as it was in the average Tuscan villa, a spot of intimate delight, a veritable outdoor living place and inseparably associated with the house itself, whatever other features of more extensive planting and garden layout there may have been in addition.

VIEW OF SOUTH FACADE FROM OLD DRIVE

GENERAL VIEW FROM STREET

THE VILLA BERCHET, NEAR MESTRE, ITALY

End Facade of Minor East Wing

and does duty as a flower garden. Thus, in two respects, there is a wide departure from the original usage of Palladian tradition, in the chain of which the Villa Berchet forms a late and exceptional link. The plan, besides being asymmetrical, is apparently more or less fortuitous, and the *cortile* occurs as an integral feature of the scheme.

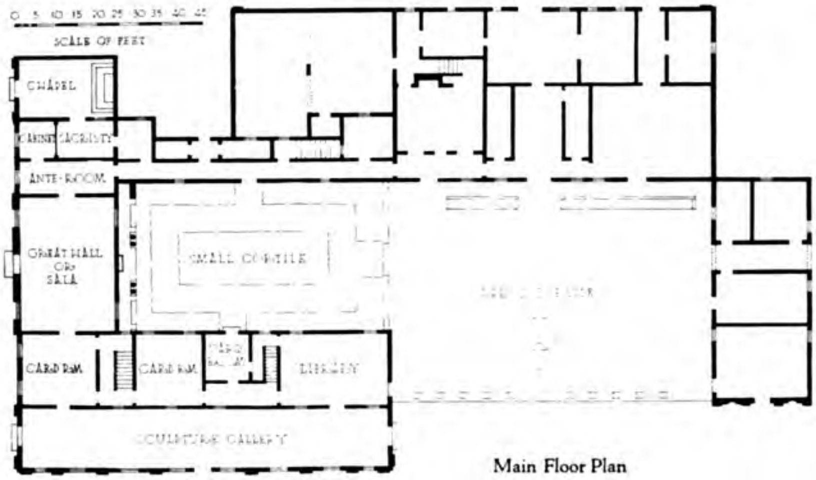
A study of the plans of villas designed by Palladio himself, and a comparison of the majority of those throughout the Veneto designed by his successors of various dates will show, for one thing, a most punctilious adherence to the principles of balance; when it was found inexpedient or impossible to make the two corresponding parts of the plan on opposite sides of the main axis exactly balance each with the other in internal arrangement, as was frequently the case, the exterior, at least, exhibited a symmetrical disposition of parts on each side of the central features. It may be observed that although Palladio in designing villas time and again made use of wings projecting forward from the central block of his composition, the space partially enclosed in this way could not strictly be called a *cortile* in the sense usually conveyed by that term, and it was his wont to plan the main portion of the house as a solid block. The great central hall or *sala*, which he customarily employed, took its place, and this central hall—according to Venetian use, lighted by massed windows at the ends, while the rooms opened from each side, thus in effect serving in lieu of a *cortile* where ground in the city was too precious to be given over lavishly to open spaces—was a local tradition strongly enough established to induce later architects to adhere to it.

Such were the requirements of the clients for whom Palladio and those who came after him were called upon to design villas—a task thoroughly congenial to the temperament and ideals of the great architect, we may well believe, and no less congenial to his successors. Without an adequate understanding of these conditions, and of the comparative permanence of the requirements which made it possible for the Palladian tradition to continue with such vitality, we should be in danger of misinterpreting all the villa architecture of the Veneto. Having formed this concept of the mode of life these villas were designed to accommodate, we may now address ourselves to the Villa Berchet in particular.

Though in general style quite representative of what was best in the work of the later period, the Villa Berchet is distinctly unusual in its plan, and herein lies one element of special interest. By a very irregular and asymmetrical scheme of massing, the several continuous parts of the structure are grouped about three sides of a large stone-paved *cortile*, while a part of its west side opens out into another, smaller and narrower, that extends bay-wise into the western block of buildings

The explanation of the fortuitous plan of the Villa Berchet is probably to be found in successive dates of construction, the formal front of the east wing and the urn-topped pediment of the long block at the back of the *cortile* being subsequently added to bring this rambling assemblage of older buildings into measurable conformity with the architecture of the more studied west wing that abuts on the highway. Be that as it may, both the composition and the general aspect of the buildings embody appreciable elements of charm, and although there is little in the plan, considered in detail, to commend it for modern adaptation, the ensemble is not without considerable value.

NORTH AND EAST SIDES OF LARGE CORTILE
THE VILLA BERCHET, NEAR MESTRE, ITALY



Main Floor Plan

Agreeably to the custom of the country, the walls are of brick coated over with stucco and the roofs are of reddish tiles. The stucco, in this case, is of a gray hue, the shutters are green, the vases adorning the roof are of terra cotta painted the color of the walls, and the empaneled bas-reliefs are painted the same, thus bringing the building into color unity.

The treatment of the south and west fronts of the main portions of the house is interesting and ingenious; across each facade there extends an order of pilasters with the entablature interrupted by the slightly recessed bays, so that what are actually sections of architrave, frieze and bed-mould appear to be imposts upon the capitals of the pilasters. The vases upon the roof continue to carry the eye upward and give sufficient vertical accent to prevent the building from appearing squat. Of course the whole scheme simply exhibits the ultimate adaptation of structural members to a purely decorative function and, according to all puristic theories, it should be reckoned thoroughly heterodox. Nevertheless, though theoretically indefensible, it is a clever bit of composition, and an effect that has been so adroitly managed once might well be repeated without anyone being the worse for it.

The ruffled critic will find more consolation in

The South Facade of Sculpture Gallery

EAST WING FROM THE LARGE CORTILE

CENTRAL PORTION OF LARGE CORTILE

THE VILLA BERCHET, NEAR MESTRE, ITALY

contemplating the south end of the east wing—a part of the house that has served by turns the purposes of billiard room and laundry—and still more mental balm and delight in viewing the casino or rotunda, the glistening white walls of which flash out from the dense green of the long *viale* of overarching limes. The garden setting corresponds, in the main, to the general description of villa grounds which has already been given. The casino once faced upon a broad lawn, but during the recent war this was ploughed up and planted in corn and has not yet been restored to its original condition.

Many of the most interesting villas of the Veneto escape the attention of students, or those in quest of inspiration, by reason of their being far from the beaten highways. These villas have been overlooked or else forgotten by the writers of guide books or the authors of histories of art, and even when their existence is known it is not always possible to find them, because even in one Italian province there may be several tiny hamlets having the same name. Writers on the villa architecture of Italy are apt to devote their attention to the more important examples, but the minor villas stand in close artistic relationship to their larger and more sumptuous neighbors, and prove that large and small alike were often designed or inspired by the great architects of the renaissance.

The architects of this period possessed in a high degree the happy faculty of being able to provide a setting both suitable and beautiful for the life intended to be lived within their villas, whether they were destined to be peopled with the brilliant personages of an ecclesiastical court, with the splendid members of a patrician family, or by the humble members of a *contadini* household, and the skill and ingenuity with which they arranged or disposed their motifs results always in a wide variety of picturesque compositions. Villas of a somewhat minor class are often full of inspiration to present-day architects, for Italian villas of not too great size may well afford models upon which modern country homes may be studied. Their architects intended their villas to be lived in—to be comfortable country houses—and they rarely made the mistake of sacrificing convenience or comfort to architectural interest or decorative effect. Then, too, the materials with which they built were such as might be had today in almost any part of America—brick, for the most part, stuccoed or merely whitewashed for exterior building, and the simplest walls and woodwork within.

Sala Facade on Small Cortile

House of A. C. Ernst, Esq. *Cleveland, Ohio*

"Euclid Golf," Cleveland, Ohio

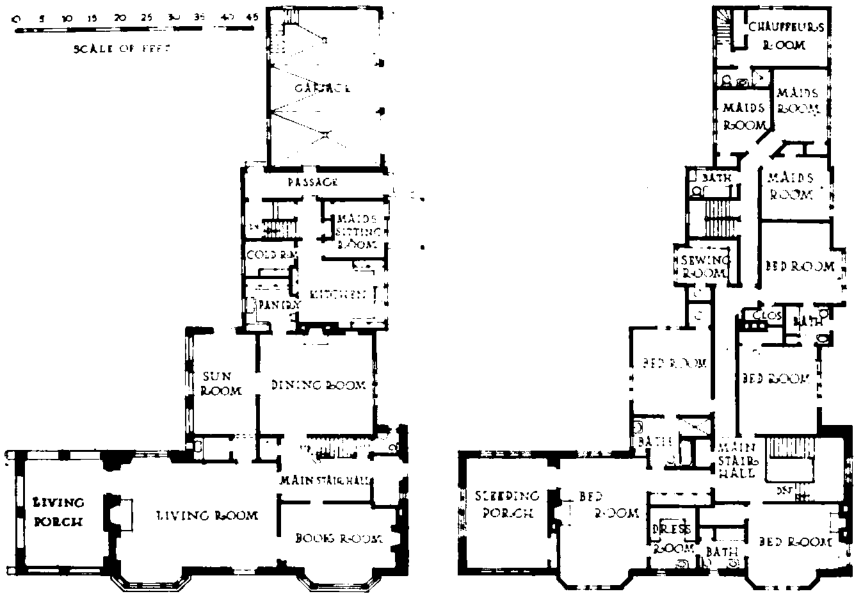
HOWELL & THOMAS, ARCHITECTS

By HOWARD DWIGHT SMITH

TO one who does not know Cleveland, the term "Euclid Golf" might convey the idea of a more or less interesting game with some form of mathematics combined with the manipulation of balls and clubs. To those who do know Cleveland, with anything more than a mere superficial acquaintanceship, however, the term has an entirely different meaning. To them it signifies a district centering about a wide curved boulevard, crossed by a dozen or so winding streets of generous width, an abundance of fine old trees and a sprinkling of substantial houses which are, as suburban houses go, quite likely in size and character. It is a residential section which has established its high character as a community both from a civic and from an architectural viewpoint, so that a discussion of it as a real estate venture ceases to partake of the nature of commercial advertising, and becomes an item of news value and of common human interest.

There are examples of real estate development where architectural ideals have been maintained, but where financial success has been more or less dubious. There are also examples, only too numerous, which have been of unqualified commercial success but which architecturally have left much to be desired. Hardly a city of any size has not its subdivided suburban districts. A few of these stand out and are recognized among real estate operators as most successful, for one reason or another; among these may be mentioned Forest Hills, L. I., Roland Park in Baltimore, Shaker Heights in Cleveland, and the Country Club district in Kansas City.

The story of Euclid Golf really begins with an interest taken by Mr. B. R. Deming of the developing company in some residential work designed by Howell & Thomas, in the vicinity of Newark, Ohio. This interest led Mr. Deming to consult this firm when he became charged with the task of subdividing a portion of the old Euclid Golf tract. Business and professional relations were based upon the real estate man's confidence that his architects were interested primarily in the expression of certain practical and artistic ideals, and upon the architects' feeling of assurance that the expenditure of funds in development and building would be governed only by a reasonable desire to attain these ideals without extravagance. Consequently, the

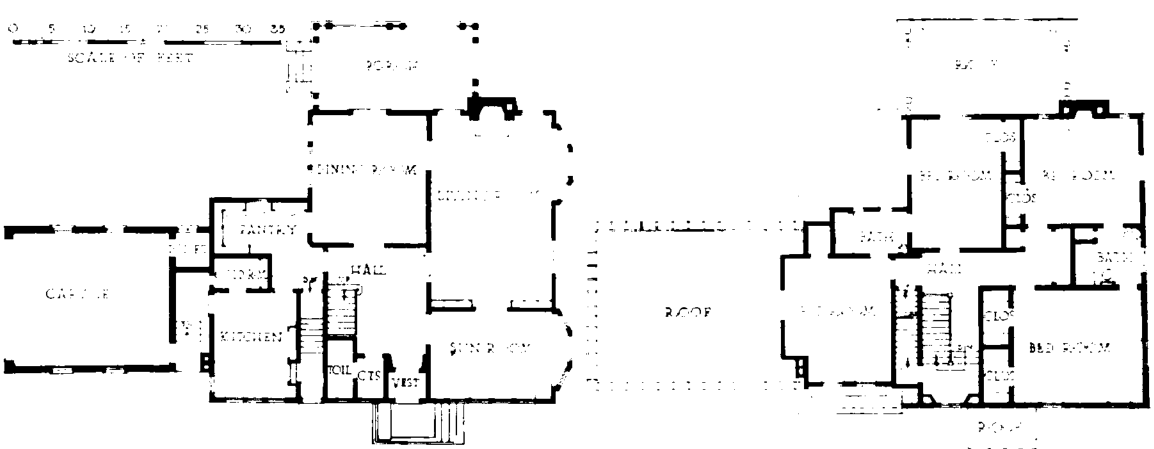


First and Second Floor Plans. House of A. C. Ernst, Esq.

architects' services were sought in the formation of the original general policies and in the discussion of ideas and schemes. The Euclid Golf Allotment is possessed of great natural beauty to begin with—plenty of old trees, as these illustrations testify, and of just sufficient variation of levels at its entrance to set it well apart from the surrounding territory. The layout of boulevards and drives has been made with a view of making the most of these natural advantages, and of providing sufficient variety of streets and roads to give interest, but to avoid the labyrinthine confusion which usually results from an effort to give every thoroughfare in a new suburb interest and individuality by devious windings. The possibilities of the Euclid Golf site were studied and the layout made accordingly, and the original building restrictions were drawn up with a view to establishing a censorship, which has usually been regarded by real estate men as a doubtful proposition. Having determined the most advantageous street locations, this censorship has been exercised on building operations to insure the continuation of the policies established.

House restrictions in Euclid Golf vary according to locations. The aim in establishing these restrictions has been to keep the character of the neighborhood up to the highest standard, and yet to have restrictions that permit the kind of development which increases land values. One restriction provides that "all houses built in Euclid Golf shall have plans approved by the company." In making this restriction the aim has been to assist the home builder rather than to limit him. Those who build good houses under these restrictions, homes which are the result of study and careful thought, have some assurance that neighboring houses will not only represent a certain minimum of investment but will also harmonize with the established character of the streets and their general setting. The sincerity and intelligence with which this censorship or supervision is applied is the measure of its success. Lax or biased application of such a provision has spoiled the architectural possibilities of more than one subdivided district.

The quality of service rendered by the general study of the chief problems of the Allotment as a whole may be well illustrated by the story of Mr. Deming's own home. This house, which was published in THE FORUM for May, 1917 was built from plans which were developed from some origi-



First and Second Floor Plans. House of W. R. Mitchell, Esq.

nal studies made to show Mr. Deming that there were some interesting architectural possibilities even in a certain discarded strip at the entrance to the Allotment—an irregular strip some 500 feet long, not over 40 feet wide at its widest point, and dropping off from the boulevard into an abandoned quarry. An interesting succession of rooms on various levels, a small dam in the quarry rill, overhanging bays and a long, narrow garden strip, with an exterior dress of stone, stucco and half timber, which combines some Tudor and some mediaeval traditions of the north of France, have produced a quaint continental charm which straightforward, simple domestic examples rarely possess.

The restrictions placed upon building in Euclid Golf are perhaps no more rigid or stringent than those in vogue in many other subdivided areas. Valid restrictions, those which are incorporated into contracts for the sale of lots, and which can be properly enforced, are quite common. First and foremost, a building line restriction is always recognized as necessary; a minimum cost restriction is perhaps the next in importance. In some residential sections there is an effort to restrict the character of buildings to single dwellings and to limit the minimum of lot frontage for any building. Permanent easements of certain widths on the sides of lots permit the location of service lines elsewhere than on the thoroughfares and prevent structures being built up to the lot lines.

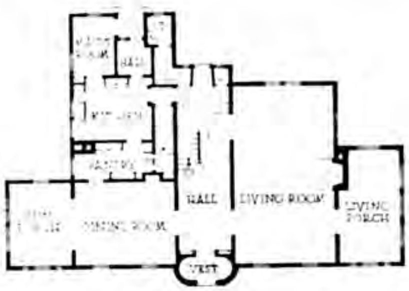
These restrictions are productive of much good. They insure fundamental things to a community and make investment reasonably stable. The addition of a restriction which gives a real estate company the censorship of any set of plans is of doubtful value unless it is rigidly enforced, and unless some carefully studied scheme guides all decisions in giving or withholding approval. A home owner who has the minimum amount invested in his property, in a modest but attractive cottage, must be protected by the company in some way from having an expensive, large sized structure built on an adjoining lot, and this protection must be forthcoming even at the risk of losing a valued prospect. On the other hand, one who chooses to build a large, expensive and attractive house on any given lot should be protected from the minimum price builder who might build on adjoining property. Then, too, certain restrictions which tend to uniformity or harmony are of importance when properly enforced. The well known requirement of a red roof at Forest Hills Gardens has produced a uniformity of color which has not interfered in the least with interesting variety of architecture. The value of this particular restriction is emphasized by the striking contrast with the nondescript character of adjoining tracts, where less idealistic restrictions have obtained. No such special restriction has been attached to the sale of land in Euclid Golf, but that requiring the approval of plans by the Allotment Company has been upon the advice of Messrs. Howell & Thomas, who have been governed solely

House of W. R. Mitchell, Esq., Cleveland, Ohio by the thought of establishing harmony and reasonable variety in each of the particular localities.

At the risk of appearing arbitrary in the dictation of style and character for any particular locality, the B. R. Deming Company early in the development commissioned Howell & Thomas to design certain houses for the purpose of setting standards for various portions of the Allotment. We find, therefore, in different sections, such houses as the large Lutyens type of English house now owned by A. C. Ernst on the large and important corner lot on the Allotment at the junction of Fairmount boulevard and Ardleigh drive, or the rambling New England colonial frame for Mr. R. G. Pack on a 160-foot inside frontage on Tudor drive. Houses of a smaller type, such as the New England gambrel roof cottage for W. R. Mitchell on a 70-foot inside lot on Woodmere drive set standards of simplicity and excellence which can be pointed to with reasonable pride.

The establishment of a style in any group of houses, or in any group of buildings for that matter in this day of eclecticism, is a difficult matter because of the great allowable latitude. Ease and facility of construction in any material with few structural restrictions make it possible for us to use exterior dress of almost any style regardless of its significance, and regardless of the restrictions which might have governed the original use of any style. By way of illustration, let us consider a single example of the influence of structural restriction on the development of a style. In the Cotswold district in England, heavy local stone has been used for walls and stone slabs for roofs for centuries. The limit placed upon the lengths of roof timbers to support the weight of these heavy roof slabs placed a certain limit on the widths of rooms. Present-day structural methods eliminate practically all local restrictions, and this makes possible the use of a variety of styles and a diversity of character in any group of buildings which may be fatal to its harmony and restfulness if not properly controlled. Subdivision restrictions which permit the erection of a frame colonial, a Tudor half timber, an English stone and stucco, a Spanish type, a Georgian and a mission style building on as many adjoining 60-foot lots allow the violation of a principle of harmony which is just as valuable to the orderly development of a residential tract as is a uniform building line. The setting of high standards and the living up to them are factors in Euclid Golf's success as a high class residential subdivision.

Consideration of some of the individual houses of the group will help in forming an opinion of the success of the work from the architect's point of view. The house for Mr. Ernst represents, perhaps, the boldest financial venture of the entire Allotment. Here is a house covering an area of approximately 3,500 square feet and having a cubage of approximately 135,000 cubic feet, exclusive of garage, which was designed and fairly on toward completion before a client entered into the proposition. To many practitioners the thought of erecting a residence of such proportions without the restraint or the spur of a client would seem like a bold venture indeed. In the house



First Floor Plan

Second Floor Plan

House of Colonial Type, Known as "Shingled Westover"

Second Floor Plan

First Floor Plan

House of J. C. McNutt, Esq., Cleveland, Ohio

which now bears Mr. Ernst's name the architects have produced an English manor house of the Lutyens type. This style, if such it may be called, represents the best contemporary domestic work in England, possessing originality without grotesqueness and quaintness without faddishness. Here the gables and chimneys and bays are of simple mass; the character of the random ashlar stonework in the walls and the judicious use of cut stone trim are distinctive.

Of only slightly lesser size is the house on Fairmount boulevard at the corner of Woodmere drive, now owned by Mr. Fred Nichols. This house, built in 1916, is also of the Lutyens English type, a continuation of the Tudor tradition. The house is of stone, stucco and half timber and because of its more developed planting it presents a more intimately domestic appearance than the Ernst residence. The plans of these two large houses are somewhat similar in the arrangement of the entrance features in secondary positions, and in the emphasis of the intimacy between the living portions of the houses and the grounds about them. The stonework of the Nichols residence is excellent, warm in color and of fine texture. It is all local material, having been taken from the excavation of a sewer in an adjoining street. The half timber work in this house is not as free in its treatment as is characteristic of the original Tudor work. Perhaps here the restraining hand of economy has played its part and forbidden the necessary carving upon the verge boards of the gable, and denied the accidental roughness to the vertical lines of half timber.

A goodly number of stucco houses have been built in Euclid Golf. Some are on frame with metal lath, and some on hollow tile and brick. Four of these houses are illustrated. That for Mr. C. A. Forster in Delamere drive is built upon a plan with living room and dining room disposed symmetrically about a center hall, but with a living porch built into the mass of the house on the living room side, which throws the exterior entrance feature decidedly off center. The inclusion of an upper story porch within the mass of a house, in some such fashion as is here accomplished, solves reasonably well one of the hardest problems in residence design—that of locating the sleeping porch; only the difficulty of treating the broad openings of garage doors as a part of any house design is as hard a problem in modern residential work.

The high roof, the denticulated cornice and the heavy stucco quoins, trim and belt course of the residence of Mr. Thomas White in Delamere drive give much the feeling of the minor French chateaux. The interesting asymmetry of the lateral facade, with its huge chimney, large stair window and trellised entry porch, does not detract from the interest of the single axis of the narrow front which faces directly on the street. The emphasis of this narrowness toward the street is doubtless due to the fact that the property has only a 75-foot frontage.

In point of number, the examples of Georgian and colonial houses by Howell & Thomas in Euclid Golf exceed all other styles, and aside from the two rather ambitious English examples already mentioned these Georgian and colonial houses represent the best of the entire interesting group. Four very successful examples represent the colonial style built in frame. One of these is known to the architects and the Allotment Company as "Shingled Westover." The architects have frankly appropriated the design of the well known James River mansion and translated it into frame and shingles, using the exact composition and proportions with a few minor changes in the main door, and adding an interesting round cornered vestibule and a porch at either end of the facade. The plan is that of a real Georgian center hall house with the stairs at the rear of the hall in a long straight flight to a high landing and a short return to the second floor level. The presence in any group of houses of so conservative and acceptable an architectural composition as "Shingled Westover" gives a tone and sets a standard of character which is beneficial to any community.

The house for Mr. J. C. McNutt, Woodmere drive, presents an interesting combination of plan and elevation. It is of a plain, New England type with narrow width siding and very thin mouldings, as fine in detail as interior woodwork, which was characteristic of the early New England houses. The view from the front gives the impression of a center hall type, with a bay window on either side of the entrance door. The entrance from the street is at one side of the house leaving the center door in intimate relation to the open front lawn. A glance at the plan, however, shows that the center door and one bay window belong to the living room and the other bay window to the sun room—a most interesting use of a type elevation and a readjusted plan.

The house for Mr. R. W. White, Delamere drive, is of that substantial Pennsylvania ledge-rock colonial that is set so close to the ground that it looks as if it had always been a part of the 175-foot lot upon which it is placed. It is the typical center hall type, with a projecting central door hood so characteristic of the middle states colonial style.

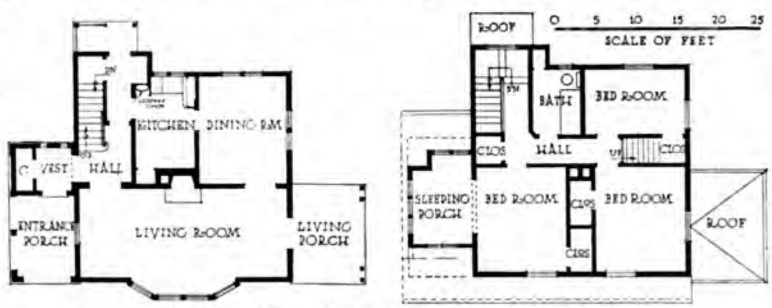
Second Floor Plan

First Floor Plan

If any choice can be made between the house for Mrs. W. C. Scofield, Fairmount boulevard and Woodmere drive, and the house for Mr. R. G. Pack in Tudor drive, it might lie with the latter because of the very successful handling of a difficult asymmetric composition. Here is a building which includes a sleeping porch within the mass of the structure and a facade which assembles seven different types of

House of A. C. Blair, Esq., Cleveland, Ohio

Two Cottage Houses Used to Block Out Surrounding Developments



First and Second Floor Plans of House at Right

openings, including a door, a full length stair landing window, a triple window in the dining room, a five-windowed living room bay, three single bedroom windows and open porch arches as well. This composition depends for unity on the great contrast of its whiteness with the dark mass of foliage about it, upon the skill with which uniform scale has been maintained, and upon its broad expanse of plain roof and straight, continuous eaves. It is a most interesting expression of an asymmetric plan. Another problem in the arrangement of door and window openings was met in the brick house of Mr. A. C. Blair.

Mrs. Scofield's house is the other extreme in its symmetry and simplicity, its facade presenting only two types of openings—the entrance door and one type of double hung, shuttered window. Like the Pack house it benefits by the strong contrast between its extremely white mass and the dark foliage about it. The tree grouping about this house is particularly happy and gives a setting quite befitting the conservative style of the house itself. The shingles of the side walls are almost as heavy as the hand-riven clapboards of New England. The cornice overhang is generous, the rafters are exposed, the chimney whitewashed and the well proportioned Doric portico tells a story of colonial refinement which is interesting and refreshing.

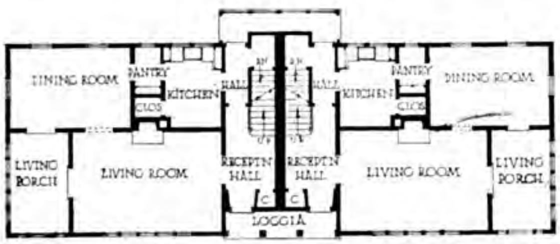
A number of small houses for investment purposes have been built in the colonial character in parts of Euclid Golf. These are moderate priced houses, but they set a standard of excellence worth living up to, and act as an incentive to the home builder.

First and Second Floor Plans of House Shown Above

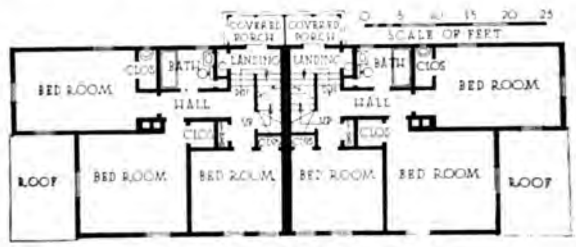
An interesting problem confronted Euclid Golf at the head of Tudor drive. The solution of this problem may be taken as the typification of the spirit which is back of Euclid Golf and which has made it so successful. South of St. James parkway, which forms the southern boundary line of the major portion of the Allotment, there has sprung up a poor class of investment houses built on irregular shaped lots with no restrictions, and presenting an unsightly vista from Tudor drive. The unrestricted lots on the south side of St. James parkway were purchased and those directly at the head of Tudor drive were combined to form the site for a renting two-family house which is illustrated here. The main feature of the front of this double house is the three-arched loggia directly on the Tudor drive axis. This loggia unifies an otherwise bifurcated composition, and places an effective focal point in a screen which protects the Euclid Golf community from just the thing which it has sought to eliminate within its own precincts. On the two adjoining lots the architects, Messrs. Howell & Thomas, have built two interesting little cottages, models of modesty and economy, which add their part to this protective screen about Euclid Golf.

The development of the suburban districts throughout the country may be studied, and it will be found that almost every subdivision which is considered especially successful has been directed by the ability and vision of one personality, which has exercised control over its policies. From the nature of things such a personality is not apt to be the architect's, but in the most successful instances the advice and service of architects have been important factors in the achievement of results. Architects may be regarded as necessary adjuncts, or even as necessary evils, in many cases, but experience with group projects, such as industrial housing and also with larger developments, has fully established the fact that the properly trained architect may be confidently depended upon to produce eminently satisfactory results in group or plot planning, as well as in the actual building.

Too frequently the development of speculative real estate is governed only by business expediency; the results in Cleveland prove, however, that it is both good business and of tangible value to the community for promoters to recognize the special qualifications of the architect and accord him generous and sympathetic co-operation in his work.



First Floor Plan



Second Floor Plan

Double House at Boundary of Allotment, on Axis of Tudor Drive

DECORATION & FURNITURE

Jeanne Taylor, *Associate Editors*, Leland W. Lyon, R.A.

Mural Painting for Minor Buildings

WITH considerable advantage to themselves and to their clients, architects might well give more consideration to the claims of mural painting as a means of decoration. As applied to domestic buildings, and in fact to moderate cost work of many kinds, mural painting offers possibilities which are well worth encouragement. Because in the past mural decoration in America has been largely confined to use in public buildings, we have perhaps come to regard it as a form of decoration which is suitable only for structures of a monumental character. Many state capitols, court houses, city halls and some churches possess mural paintings, which attest the skill of our artists where large wall spaces afford fitting opportunity for portraying historical events or allegorical episodes, in ways which accord well with their architectural surroundings, but this has resulted in a seemingly prevalent belief that mural painting is an art which, generally speaking, is above the heads of the people.

The minor villas, and even smaller houses, in Italy present many striking instances where mural painting, in some one of its manifold forms, constitutes almost the entire decoration. Many are the airy loggias or halls where such decoration is used, and where it still exists even after long periods of neglect, and fortunately rather more than a mere beginning has been made in the use

Breakfast Room Showing Panels "Spring, Summer, Autumn and Winter." Delano & Aldrich, Architects

in America of this highly architectural form of decoration, which may be adapted to the use of interiors of divers kinds and in keeping with their architectural character.

For breakfast rooms and elsewhere, when bright color notes predominate, mural painting in a high key may be in order. Or again, the mural decoration over the mantel may be the one necessary bright color spot in the room. Similarly, where the desired atmosphere is that of quiet dignity, mural paintings in subdued key and conservative design may be employed. Mural decoration offers to the architect countless interesting possibilities of expression in the decorating of interiors. It may be noted also that the mural decoration is as much a part of the interior architecture as mantels, fixtures and wall finish, and the architect can, by the employment of simple mural decoration, create an atmosphere which will encourage suitable furnishing.

Overmantel at Greenwich House, by Eugene Savage

It was recently suggested by Mr. Chester H. Aldrich, that young painters might well direct their study towards that kind of technique which makes the figure, landscape or marine composition so admirably suited to flat wall enrichment, instead of joining the already swollen ranks of the small canvas colorists. Perhaps equally interesting, however, might be the suggestion to architects of giving commissions to competent mural painters, or of inducing their clients to do so. Such encouragement as is now being given to young sculptors would go far toward bringing mural painting into recognition.

Foyer of Greenwich House, New York. Delano & Aldrich, Architects
Mural Decorations by Arthur Crisp

Decorative Features in a Remodeled City House

DELANO & ALDRICH, ARCHITECTS

IN planning alterations for residential buildings, the ingenuity of the architect is often severely taxed to meet the exacting conditions presented by structures in which the principal lines and proportions have already been established. Of interest, therefore, are a few views of a remodeled city house, in which unusually good interiors have been developed under restricted conditions. It may be noted that this was a five-story residence, the architects' problem being to add another floor, and to develop a building containing three apartments of the duplex type.

The three illustrations which are included here indicate the character of the results which may be obtained by careful study on the part of the architect. A living room, shown as remodeled, has a deep cove at the ceiling with three penetrations on each wall, giving so little plain surface in the center as to appear like a groined barrel vault. This treatment in natural gray plaster, besides suggesting a lower story height, accomplished a stylistic background for a few choice examples of Italian furniture and pictures. Slightly darker than the walls, and of a warm tone, is the antique stone mantel. A mellow light pervades the room by way of five large windows hung with orange Chinese silk in pleasing contrast to the somber taupe of the chenille rug and upholstery velvet. A bloom of age is present on the old walnut of tables and chairs, while a subdued glint of old gold or silver is barely apparent on portions of frames, candlesticks and other accessory furnishings, adding a sparkle in the rich glow.

The octagonal breakfast room shown on page 173 is a unit of this suite and gives an idea of the deviation from wall handling in other rooms which is, however, in perfect harmony. An illustration of the treatment of the hall is given because of its interesting arrangement. The method of concealing the radiators under the windows in this hall is particularly to be noted.

The demands of comfort met here can almost invariably be reconciled with the requirements of good taste, and a judicious arrangement will help to give an effect of dignity and space, even where little space actually exists.

Detail of Entrance Hall in Remodeled House, New York

TWO VIEWS OF LIVING ROOM IN REMODELED HOUSE, NEW YORK
DELANO & ALDRICH, ARCHITECTS

The Central Manufacturing District, Chicago, Ill.

PART II. ARCHITECTURAL AND CONSTRUCTION FEATURES

By S. SCOTT JOY, ARCHITECT

THE new Central Manufacturing District, the development of which was briefly described in THE ARCHITECTURAL FORUM for April, covers an area approximately one mile square, in the center of which are the tower building and the central heating and power plant. The lower floors of the tower building are used for offices of the District architect, contractors and the construction accountant's staffs, while the upper portion is used for the housing of two 250,000-gallon steel sprinkler tanks which feed the sprinkler lines of all the buildings in this area, thereby eliminating unsightly unenclosed sprinkler tanks on individual buildings.

Adjoining this tower building is the central heating and power plant of the District which furnishes light, heat and power to the buildings, paid for by the owners or tenants of the buildings at a rate equal to that paid by consumers just outside the District. The owners however, and tenants as well, are not continually annoyed with the upkeep and necessary attention required for these plants, and when such an inconvenience as a shortage of coal, for example, occurs in other portions of Chicago, such a need has probably been foreseen by the District authorities and preventative measures taken so that operation of their businesses is not interfered with.

Buildings which are in the area known as the old District, which adjoins the new, are provided with their own individual heating and power plants, but wherever possible towers enclosing the sprinkler tanks are made an architectural feature of the building without entailing a great amount of expense. This supplies another means of avoiding monotony of design. The future plans for this District, and for others which are newly started, are to establish central heating and power plants, together with centrally located sprinkler tanks to supply all the buildings in each District. This decision was arrived at because of the efficient and profitable operation of the plant in the new District, which is to be a model for several others.

It is obvious to one who has visited the Central Manufacturing District that there must be some decided advantage in giving an architectural value to buildings of the warehouse and manufacturing types of which the District is chiefly composed. Several important factors contribute toward the maintenance of the architectural standard of all District buildings. In the first place, the trustees of the Central Manufacturing District, through their industrial agent, request that this standard not only be maintained but improved upon where such improvement is in keeping with practical and economical construction and design. The owners are all high class manufacturers and men who take pride in the exteriors as well as the interiors of their buildings. They are appreciative of the great undertaking which the Central Manufacturing District has begun, and they realize that unification and standardization of their buildings obtain for them larger and better structures than would be at all possible under conditions where each owner demands a building of a design which will suit his own individual taste, regardless of its suitability for its surroundings or of its relations to other buildings.

The architect maintains the architectural standard of these buildings in his designs, and is materially assisted by the high standard of building ideals of both the trustees and the owners. The scheme as originally conceived has been adhered to, and the employment of one architect has made possible unity of design without monotony. The trustees of the District leave the designing of all buildings to the architect, and it is mutually understood that all new buildings will harmonize with the style of architecture already established so that the whole development, when completed, will be distinctive and indicative of its purpose. The manufacturers, upon becoming members of the District, accept the general scheme as it has already been established, and impose limitations on the architect only as to the simplicity or elaborateness of the architectural treatment, which, in the case of a manufacturer, may give to his business some value in the way of publicity. Due to the assistance of both the trustees and the manufacturers, as outlined here, the architect is given more or less of a free rein to keep his buildings typical of the established style of architecture.

If these warehouses and manufacturing plants were designed and built by individual architects and contractors, in the usual manner, their architectural treatment would show a greater increase of cost over the usual factory design than would be shown by the District buildings. The minimum of cost, the efficient method and type of construction, and the high standard of architectural treatment, all of which are constantly maintained, are secured in the District through a well developed system of operation. The trustees have confidence in the policy of employing one architect, one general contractor and, for most trades, one sub-contractor, to do all the work connected with the District. These organizations, in turn, can well afford to contract for this work on the basis of a much smaller percentage of profit, knowing that the volume of business will warrant such reduction in percentage, when accepting the job.

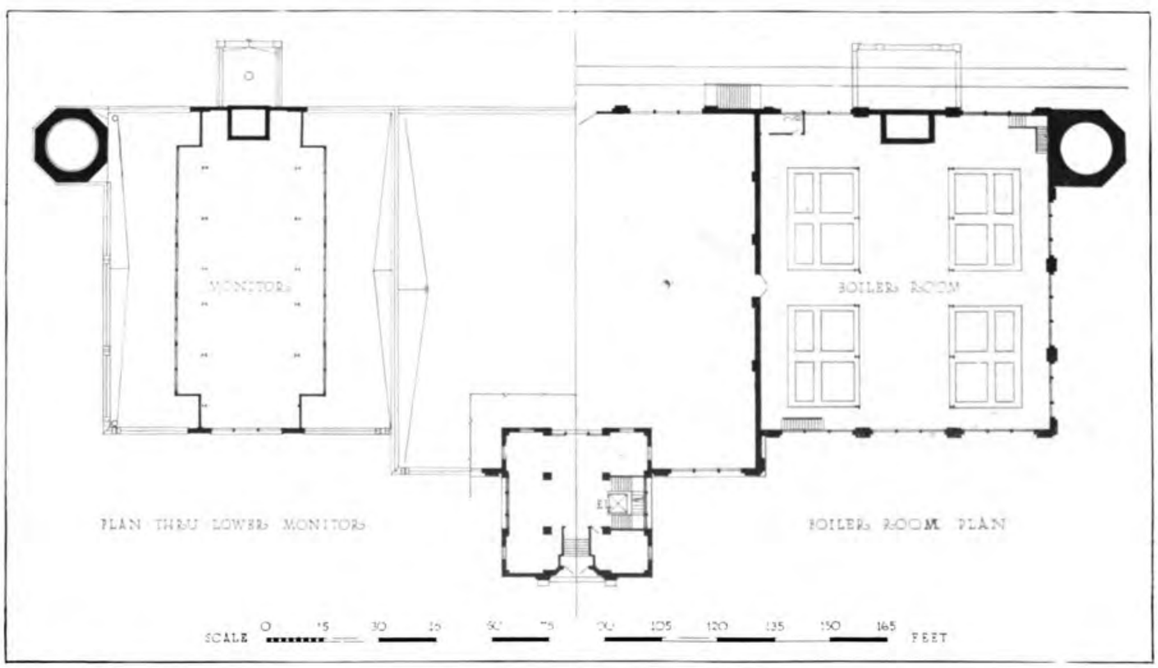
As in every other architectural design, the handling of kinds and colors of materials plays almost as important a part as architectural proportions in the design of these buildings. The cream colored terra cotta, in contrast with the dark red "Standard District Brick," is used to accentuate the axes of pylons and piers. It is also used for pier caps, and for the carrying through of belt courses, cornices and copings. Polychrome terra cotta is often used for the decoration of the entrances to buildings. The concrete spandrels are frequently painted dark green, which gives a little color to the design and remedies the monotony of a motif too often repeated, besides introducing a subordinate vertical motif to break up the long horizontal lines. The same uses of terra cotta and belt courses occur in practically all buildings, even employing the same profiles of mouldings. Variety is obtained by the different proportions of the pylons and of the buildings themselves, in the breaking up of the coping lines, variety in the details of the ornamental features, and in the treatment of the entrances.

Detail of Clock Tower Containing Offices

There are just two types of construction used—heavy mill, and reinforced concrete, both of which are adapted to the use of buildings for either factory or warehouse purposes. In the case of a factory, part of the building is often used for manufacturing, and part for storage of the raw materials or of the finished product. The designing of these buildings, for use in either of these two capacities, permits the proper adjustment and arrangement of the manufacturing space and also provides for future expansion, which important feature is never neglected. A scheme is developed for each client's entire property so that the unit buildings of each may be built as they are needed, and yet at the same time adhere to and advance the scheme originally conceived.

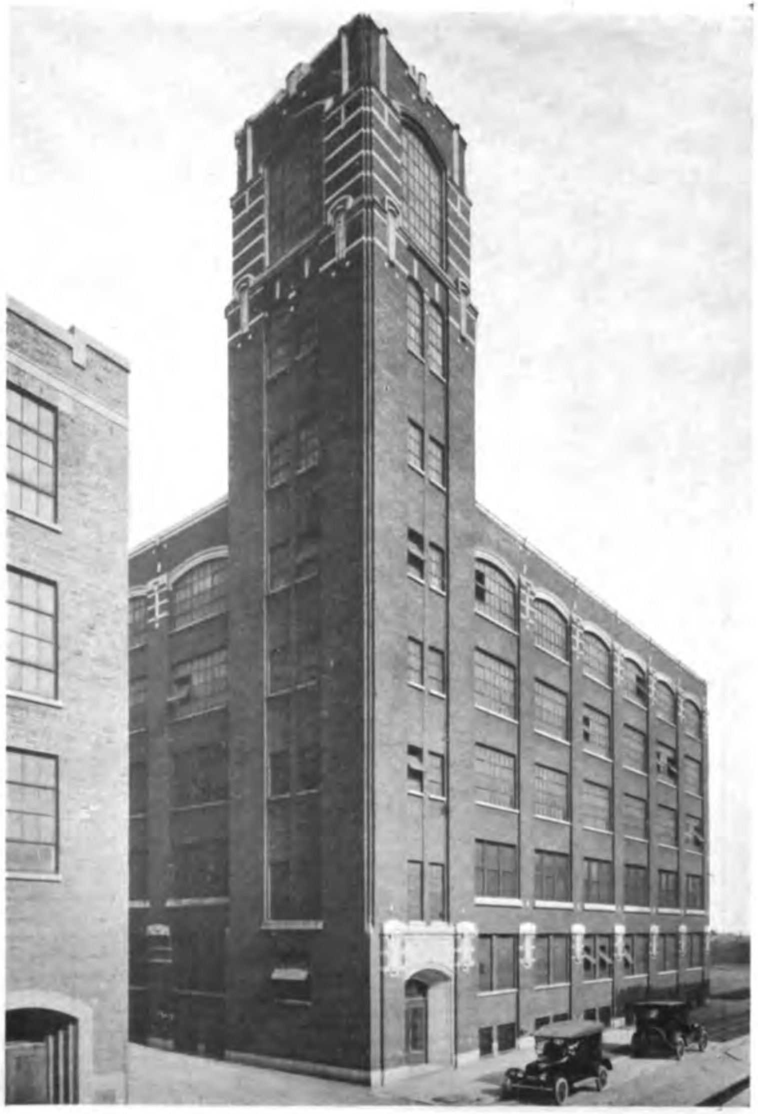
Mill constructed buildings are usually designed with bays 16 x 16 for laminated flooring for buildings having long, continuous runs of floor, thereby eliminating all the cutting possible. Joists and heavy matched and dressed flooring are used where greater spans and lighter loads are required. Both systems are estimated on for each building, and that is adopted which is the more economical and best suits the given conditions. Girders are always run the short length of a building to permit their erection and the complete framing of the whole floor before the walls are brought up.

GENERAL VIEW



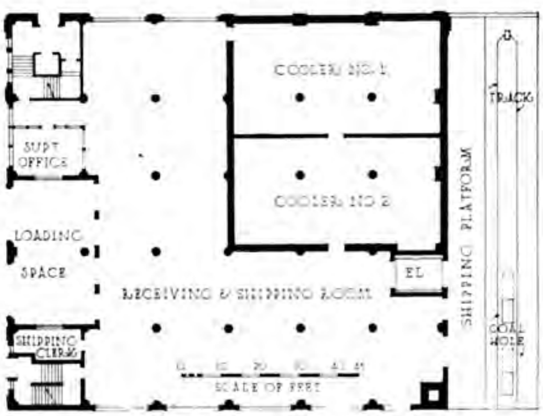
TOWER AND POWER HOUSE, CENTRAL MANUFACTURING DISTRICT, CHICAGO, ILL.

S. SCOTT JOY, ARCHITECT



BUILDINGS FOR NORTHERN JOBBING COMPANY AND WILSON & CO., CENTRAL MANUFACTURING DISTRICT, CHICAGO, ILL.
S. SCOTT JOY, ARCHITECT

Building for Troco-Nut Butter Company



Main Floor Plan

Reinforced concrete buildings are designed with bays as nearly square as possible, usually 20 feet each way, for flat slab construction. At the present time when the costs of construction of mill buildings and buildings of concrete are so nearly the same, the concrete construction is invariably used. It permits the light to penetrate farther into the interior of the building, instead of being cut off by deep girders and beams; it facilitates the running of pipes and shafting without hanging them so low that they cut off the head room; it gives the maximum of height for storage purposes and makes possible a decidedly lower rate of insurance, even in buildings that are unsprinklered.

It is only in exceptional cases that manufacturers require larger bays than those just mentioned, in which cases the live loads are decreased and the bays increased in the direction which allows the most practical and economical use of the lumber as applied to mill buildings. In concrete construction the bays are usually large enough in all cases, but larger bays are obtained where required by carrying the walls and sash on a cantilevered slab projecting 4 feet beyond the outside line of columns which gives 3 feet 8 inches of additional floor space in these outside bays.

Account is taken of the requirements of different kinds of manufacturing processes by variation in the dimensions of the bays as described here, and in the live loads to be imposed on the floors, which loads range from 150 to 250 pounds. The average load on most floors is 200 pounds. Elevators and provisions for the accommodation of machinery are all arranged to suit the requirements of the manufacturer. These special arrangements are such that the buildings can be very easily converted for the manufacture of products other than those for which they were originally designed, when necessary.

Speed of erection is one of the primary factors in the construction of any building, and is insisted upon in buildings erected by the Central Manufacturing District. It furnishes not only an inducement to the prospective manufacturer to begin operation in his new plant at the earliest possible moment, but it also saves for the District the loss of rentals, thereby again giving the District use of its capital for immediate reinvestment.

Within the last year contracts have been closed on the afternoon of one day, and on the next morning the steam shovels would be excavating for the basement of the new building; on the second day correct excavation plans would be furnished the contractor, and on the fourth day the foundation plans would be in readiness. While the work is being gotten out by the contractor, according to the information he then has available, the architect completes the plans and these, together with the necessary specifications and details, are completed in approximately ten days' time. During this period also certain sub-contracts are placed by the architect for materials which take a considerable length of time for delivery, and the quantity of which can then be estimated and described. Also preliminary plans are furnished the general contractor from which he can take off his quantities of brickwork, concrete work, steel, etc., which would not be apt to vary to any great extent from those quantities as shown on the final drawings.

While the excavation of the work is in progress the layout of the "job plant" is made and installed. This detail is given very careful attention, especially on concrete work, and is designed to handle the receiving, storing and distributing of materials for various portions of the work with the greatest facility and economy. All work is done with the idea of attaining the most practical speed coupled with the highest degree of efficiency. Progress charts are made out at the beginning of the work, and during the course of construction they are watched very carefully.

The general contractor and most of the subcontractors are selected and the contracts are awarded to them on a percentage basis with a fixed maximum cost, which, if exceeded, will be at the contractors' expense unless that excess is covered by extras which are approved by the architect and the owner.

One of the best examples of progress and cooperation on the part of all contractors employed on the work is shown in the record of the latest of the three units of a storage warehouse built for the Quartermaster Department of the United States Army in the new Central Manufacturing District. This "Unit C," typical of its two predecessors, is a six-story and basement building constructed of reinforced concrete with brick walls, terra cotta trim and steel sash, and otherwise complete as would naturally be required in a building of this type. Work was begun on this building April 10, 1919 and the entire structure was completed on December 31 of the same year. During this time all progress ceased from July 17 to September 21, due to the builders' strike in Chicago. This unit contains approximately 630,000 square feet of floor space and was erected, complete, at a cost of $1,700,000, or $2.70 per square foot.

It has been found unnecessary to estimate the cost of these buildings by the cubic contents, as their story heights do not vary to any great extent. The square foot floor area basis is employed by the trustees of the District for estimating their rental values of buildings to be leased. This same system is used by the architect for estimating the cost of these buildings, which cost is based on the gross area. The average reinforced concrete warehouse is heated to a temperature of 50° in the warehouse portions and 70° in the office portions; it is sprinklered, has a moderate equipment of plumbing fixtures, electric lighting equivalent to 1/5 of a watt per square foot, one freight elevator to every 30,000 square feet and trackage for one freight car to every 20,000 square feet. At present prices this kind of building would cost approximately $4 per square foot. This, of course, is due to the present high costs of labor and material, the pre-war price of this same type of building being $1.25 per square foot.

Chicago Junction Warehouse Building

ENGINEERING DEPARTMENT

Charles A. Whittemore, *Associate Editor*

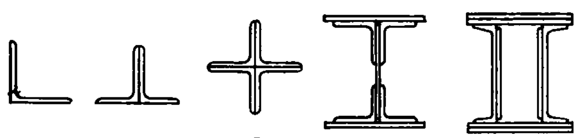
Steel Construction

PART II. COLUMNS AND BEAMS

By CHARLES L. SHEDD, C.E.

COLUMNS are uprights designed to resist compression. In Fig. 5 are shown several types of column. A is a single angle, to be used only for light loads and for short lengths. A column is designed to carry a certain load when the unsupported length of the column is known. By unsupported length is meant the distance below the beam which brings the load to the column to the next level, where it is properly braced sideways to resist buckling. When a column fails from being over-stressed, it bends in much the same way as a beam. When a column section is not symmetrical, it bends about its weaker axis.

The engineer refers to the stiffness of a column by the size of a property known as its radius of gyration. The reason that this is used is on account of its relation to the beam action when the column buckles or bends. He uses as a symbol for the radius of gyration a small r or the Greek letter rho. This is the measure of the stiffness of a particular column section. The measure of the stiffness of a particular column is the ratio of the unsupported length to the radius of gyration. This is spoken of as the l over r, or l/r. These two factors are in inches and it is good practice in design not to allow the l/r to exceed 120. For small loads, where the column serves a minor purpose, this is sometimes allowed to reach 150 or 160. When the l/r is small the allowable stress per square inch is large, and when the l/r is large the allowable stress per square inch is small.



A B C D E

Fig. 5

A great number of tests have been made to determine a formula to give the amount of stress allowable per square inch for different values of l/r. Unfortunately, these tests have not given uniform results, and this has caused various engineers and compilers of building laws to adopt various formulæ and considerable confusion has resulted. The formula which is most widely accepted is undoubtedly 16,000—70 l/r. If this were universally accepted it would be much better for everyone. This formula has been adopted by the American Railway Engineering Association, the City of Chicago and the City of New York. It is common practice to place a maximum for this stress below 16,000, usually about 14,000.* In this discussion, any figures given will be based on this formula, with a limit for the l/r of 120.

In the single-angle struts as shown, Fig. 5A, an angle with equal legs is generally used. A 3x3 angle should not be used when the unsupported length, l, is greater than 6 feet. The maximum load for such a column, when the thickness of the angle was ⅜ inch, would be 15,000 pounds when the l was 6 feet. A table can be made up showing these limits:

3" x 3" x 5/16"L	5′ 11″	13,000#
3" x 3" x ⅜"L	5′ 10″	15,000
3" x 3" x 7/16"	5′ 10″	18,000
3½" x 3½" x 5/16"L	6′ 11″	16,000
⅜"L	6′ 11″	19,000
7/16"L	6′ 10″	21,000
4" x 4" x 5/16"L	7′ 11″	18,000
⅜"	7′ 11″	21,000
7/16"	7′ 10″	24,000
½"	7′ 10″	28,000
5" x 5" x ⅜"L	9′ 11″	27,000
7/16"	9′ 10″	31,000
½"	9′ 10″	35,000
9/16"	9′ 10″	39,000
6" x 6" x ⅜"L	11′ 11″	33,000
7/16"	11′ 11″	38,000
½"	11′ 10″	43,000
9/16"	11′ 10″	48,000
⅝"	11′ 10″	53,000

In Fig. 5B the column is made up of two angles, back to back. When the legs are not equal, the long legs are placed together to make the two radii of gyration as near equal as possible, and thus effect economy. To make them more nearly equal, the angles are frequently separated a little by washers through which the rivets pass, fastening the two angles together. The angles should be riveted securely together so that neither can buckle between the rivets alone, and so that the buckling

*A. R. E. 13,500#; Chicago 14,000#; New York 16,000#.

tendency of the column as a whole cannot overstress the rivets. It is common practice to space these rivets from 1 foot to 1½ feet apart. A small table will be made up for this type of column, similar to that for the single-angle type. These tables are not intended to provide data sufficient to design columns, but merely to give the architect a reasonable idea how much space will be required by the engineer for his material. These two types of small columns are frequently spoken of as struts, to distinguish them from more important columns.

Section Ls ⅜" back to back	Length to make l/r = 120	Allowable load when l/r = 120
1—3" x 2½" x 5/16" Ls	9' 5"	24,000#
⅜"	9' 4"	28,000
1—3" x 3" x 5/16" Ls	9' 2"	28,000
⅜"	9' 1"	32,000
7/16"	9' 1"	37,000
1—4" x 3" x 5/16" Ls	12' 9"	31,000
⅜"	12' 8"	36,000
7/16"	12' 6"	42,000
½"	12' 6"	47,000
1—5" x 3" x 5/16" Ls	12' 2"	37,000
⅜"	12' 3"	45,000
7/16"	12' 4"	52,000
½"	12' 6"	54,000
9/16"	12' 7"	62,000
1—5" x 3½" x 5/16" Ls	14' 6"	38,000
⅜"	14' 7"	46,000
7/16"	14' 8"	54,000
½"	14' 10"	61,000
9/16"	15' 0"	68,000
⅝"	15' 1"	74,000
11/16"	15' 2"	82,000
¾"	15' 3"	89,000
1—6" x 4" x ⅜" Ls	16' 2"	55,000
7/16"	16' 3"	64,000
½"	16' 6"	73,000
9/16"	16' 7"	81,000
⅝"	16' 8"	88,000
11/16"	16' 9"	98,000
¾"	17' 0"	105,000

Fig. 5C illustrates what is commonly called the "star column," composed of four angles, back to back or separated by a small distance similar to those in Fig. 5B. This is a very uneconomical type of column but is often used in theaters under balconies as it requires but little fireproofing and therefore occupies ess space and can readily be finished round. This illustrates what makes a column economical. With a given area it is evident that the greater the radius of gyration the greater the allowable load. To get this condition ideal it is therefore necessary that the material shall be as far away from the center of the section as possible and uniformly distributed. A circular hollow column, such as is commonly made from cast iron, obviously fulfills this condition in an ideal way. In the steel sections shown in Fig. 5, that for type E comes as near to filling this condition as is possible.

Type D is perhaps the most common type of column in use at present. It is called the "plate and angle" column, and is made up out of the web plate in the middle with four angles and two or more cover plates. Of course the cover plates may be omitted entirely. In the April number of THE FORUM mention was made of the Bethlehem H column which is similar to this, and a comparison was made between the two. When unequal legs are used in the angles, the short legs are placed against the webs for economy, but these must not be too short to provide for good riveting, especially when beam connections must be made to the column on the hollow side. A 3-inch leg against the web is a minimum, and then only with thin angles, and a 3½-inch leg is better, especially if a beam connection must be made on it. Care must also be taken not to put too many cover plates on the flanges as rivets must not be too long to drive well. It is best to limit the grip of the rivet to 3 inches when the usual ¾-inch rivet is used, not forgetting to include the connection angles for the beam connections. By grip is meant the total thickness of the metal through which the rivet passes.

With 8-inch webs and 10-inch cover plates the unsupported length may reach 21 feet at which point the maximum allowable load would be about 435,000#. By using 12-inch cover plates the length may be increased to 23'8" and the load to about 475,000#. With a 10-inch web and 12-inch cover plates the length may reach 26'4", and the load about 500,000#. With 12-inch webs and 14-inch cover plates the length may reach 32 feet and the load 640,000#. With web plates and covers both 14 inches, a length of 36 feet may be reached and about 660,000# as a load. When the length is only 24% of the lengths given here, the load may be increased about 84% and intermediate conditions approximated from these two extremes by interpolation.

Fig. 5E shows the "plate and channel" column. This type was much more common 15 years ago than it is now. For long lengths, and where the stress is not limited to 14,000# per square inch, it is considerably more economical than the plate and angle column. The inside plates on the backs of the channels are not used except for very heavy loading, after the cover plates and channels have been made as heavy as practicable. With 8-inch channels and 12-inch cover plates, a length of 36 feet may be reached. With 10-inch channels and 14-inch covers, 43 feet; with 12-inch channels and 16-inch plates, 48 feet; and with 15-inch channels and 18-inch covers, 55 feet. For still heavier columns a plate and two angles may be substituted for a channel, or an I beam may be placed between the channels, or a plate and four angles may be substituted for the I beam. These designs might be multiplied indefinitely, but those mentioned are typical. In designing peculiar sections, these two things must be borne in mind: to have it possible to drive the rivets required, and to drive good rivets without unusual or unnecessary expense.

In connecting beams to columns two methods are frequently used. One is to have the connection angles on the web of the beam, and to rivet them in the field to the column with no more than a small angle under the beam already riveted to the column for erection purposes. The other is to have a seat with necessary stiffeners already riveted to the column with a small top angle. (See Fig. 6.) The advantage of the latter plan is to bring the field riveting down to a minimum. This means speed without sacrifice of anything serious in the design. It means slightly longer rivets through the stiffener angles, which are the small upright angles under the seat. It is not good design to have too many rivets in a row in these stiffener angles, as the top rivets are sure to get the greater part of the load. Two or more such angles may be used when the load requires it. If the stiffener angle projects far enough to interfere with the architecture, a plate may be used but it is not as satisfactory as the bearing of it against the seat angle cannot be made as certain as if a stiffener angle be used. When there is an eccentric loading to be resisted by the beam connection, the horizontal and vertical legs of both top and bottom angles may be made 6 inches to allow more rivets to be used.

When a beam frames into a column off center it is said to be eccentric, and it has a tendency to cause a bending in the column unless there is something to resist it, such as another beam which can pull in the opposite direction and which is strong enough to do so sufficiently, and the connection of

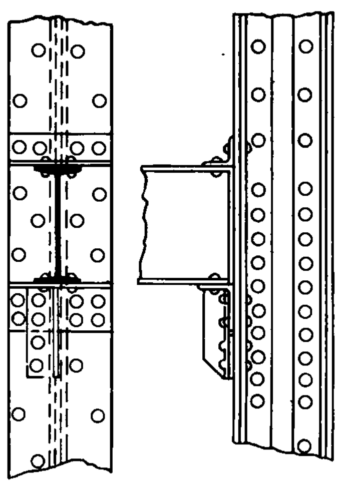


Fig. 6

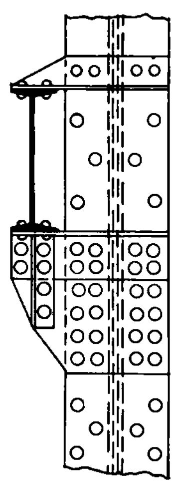


Fig. 7

which to the column is sufficiently strong to resist the strain safely. When a beam frames into a column eccentrically it needs special brackets to transfer the load to the column without overstressing the rivets. These rivets, in addition to transferring the direct load, are resisting a twisting known technically as a moment. Fig. 7 shows a typical connection for such a beam when it frames into the plate side of the column. When it frames in on the hollow side and is eccentric, it might have a connection similar to that shown in Fig. 8. If this beam had been nearer to the column so as to almost touch it, it might rest on a seat similar to that shown in Fig. 6.

Columns in office buildings are commonly made in two-story lengths, that is from 25 to 30 feet long, and sometimes a little longer. In buildings with large story heights, such as churches, each case has to be treated separately and some columns have to be shipped with very long lengths. These two-story lengths rest on top of one another and are

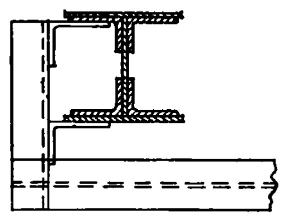


Fig. 8

spliced together. They should be designed so that the metal of the column above will rest entirely on metal below, or very nearly so. This bearing area should not in any case be stressed up to over 16,000# per square inch. The columns decrease in size in the upper stories of a building, and in some cases it is feasible to have an extra cover plate on the lower story of a two-story column. The splice is usually effected in a plate and angle column by adding short plates just outside the cover plates of the column below and have them extend up beside the column above. Filler plates are usually necessary between these plates and the column above. The plates lap over each length about 1′6″ making them about 3′0″ long, and are attached in the shop to the column below. The rivets to the column above are driven in the field.

When it is difficult to provide bearing properly between one length of column and that below, a small difference may be taken up by a horizontal plate called a "cap plate" being placed between the two lengths. This is also attached to the column below, it being done by two small angles like seat angles on the hollow side of the column. In some buildings it will be found that there is an odd number of stories so that one length of column must be short and of one story only. It is usually best to have this short length at the top, as the first story of a building is usually the larger, and the basement considerably smaller. This makes it possible for the lower length of column, which is the heaviest in the building, to have very little waste material in either the basement or first story. The bases for columns will be taken up in a future article.

In Fig. 9 are shown some ways of framing a cantilever in steel. This condition frequently occurs beside a stair well. In a wooden building an X shaped frame is frequently used. This would be bad in steel, due to the connections from one beam to another being at or near an angle of 45°. Under these conditions it is difficult or impossible to drive the rivets properly, and it causes trouble in the shop and during erection. It is therefore common practice to frame the cantilever into the beam, supporting it in the manner shown in Fig. 9. A beam on the opposite side of the supporting beam from the cantilever extends back to a support and anchors it down. If the beams are the same size, the first method is used. The plate on top takes tension and the lower plate takes compression. To prevent this plate from buckling, it must be riveted to the lower flange of the supporting beam. As this is the tension flange of the supporting beam, it of course weakens it and due allowance must be made for these holes. If the supporting beam is sufficiently deep the third method may be used, the compression in the lower flange of the cantilever passing through the seat angles to the beam on the other side.

As the cantilever beam will not bear against the web of the supporting beam accurately, and usually not at all, this compression must pass through the flange rivets nto the horizontal leg of the seat angle, and similarly through the seat angle and rivets on the other side to the anchor beam. Therefore enough rivets must be provided to transfer this stress. If the supporting beam is not sufficiently deep to give room for the seat angle the second method must be used, necessitating the cutting off of the flanges of the cantilever and anchor beam to allow deep angles to be provided to transfer the compression. Here, of course, the cantilever and anchor beams are weakened in bending where they are most strained, and allowance must be made therefor.

It is best that beams frame into each other as nearly at right angles as possible. If the bevel is not more than 3 inches to the foot, it makes practically no difference. Up to 45° it can be done only with more or less awkwardness, and beyond that it is very unsatisfactory. The smaller beams carrying the floor directly, frame into larger beams known as the girder beams. It is sometimes, for architectural reasons, more practical to use two shallow beams than one deep beam. This effects a greater head room but sacrifices economy in the steel. When a beam frames into a double girder similar to this, the flanges of girder beams are usually so close together that rivets cannot be driven with a head on the web between the two beams. It is then necessary either to use bolts passing through both beams, or seat angles, or one-sided connections. The author objects to the latter type wherever it is possible to avoid it.

In outside beams, carrying walls, it is usually best to have them placed flush on bottom with the interior beams. This simplifies the column connection. Loose lintels may be placed below them over the windows and doors. Exterior columns are best placed with the webs parallel to the wall. This is because the beams are usually eccentric and the connections to the columns can be made better. (Compare Figs. 7 and 8.) This of course is not the strongest to resist eccentric loading, but it is preferred by the author as an interior beam usually frames into the outside beams at or near the column. These exterior wall-carrying beams are known as spandrels.

Beams do not necessarily frame into larger beams, as the size depends on span and distribution of loading. It is common practice to frame a beam into one the next size smaller, and a 10-inch beam or smaller may frame into one as small as 7 inches. The 7-inch beam does not conveniently frame into a 6-inch beam, however. It is often good design not to frame a beam of less than 8 inches into a column when seat angles are used. This is because a smaller beam cannot take a ¾-inch rivet in its flange, resulting in two sizes of rivets on the job and causing some confusion. An 8-inch beam also makes a better brace for a column than one smaller.

It is often possible to frame the web of a beam into a double-angle strut by passing it between the angles after cutting off the flanges. Others prefer to pass a plate between the angles and rivet it to the web of the beam. On the opposite side of a double-angle strut a shelf angle may be used. If the web of the beam is parallel to the outstanding legs of a double-angle strut, it is usually best to run a plate by the strut riveting it to the outstanding legs and to the web of the beam. At least two rivets should be used in a connection, or it would be possible for it to rotate about the single rivet.

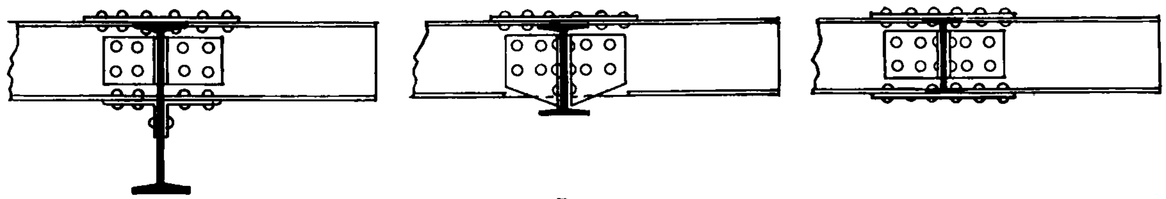


Fig. 9

Terra Cotta Roofing Tile

PART III

By ALFRED LO CASCIO

WE have come to a period when irregular laying of tile roofing, to help give texture to a roof as a whole, is being given particular consideration. Texture is largely secured through the use of hand treatment, applied by some manufacturers to the surfaces of the tile by thumb pressing, hand combing or some other such process involving hand work which, added to the excellent color schemes possible, gives tone and character that are most pleasing. With all this, however, it is essential for the tile maker to understand what is required, without attempting too much, which might easily result in mechanical irregularity and be a failure.

It is surprising to note the difference between the appearance of a roof covered with tile laid in the customary manner and that of another roof of exactly the same design and covered with the same tiles laid irregularly, and by irregularly is not meant carried to an extreme. The mission tiles, and even the Spanish and shingle patterns, can be laid with varied exposures to the weather, and use may be made not only of tile of the same size, for if a greater variation be required, manufacturers can produce tile of different sizes, which, mingled judiciously, will give the desired effect.

The purpose of all this is to secure a natural tile roof such as those seen in the old world countries, laid hundreds of years ago, crudely rustic and weathered in the course of time, before manufacturers or modern processes entered into the industry. Of course it would not be possible or practical, in view of climatic conditions in this country, to make or use tile hand made in its entirety. Tiles made wholly by hand are, therefore, a thing of the past insofar as modern manufacture is concerned, but it is quite possible to secure all the picturesqueness of the old roofs by using tiles of present-day manufacture, which means that all the desirable results which might follow the use of old tile may be had without any sacrifice of the practical qualities which are expected of a modern roof; all that is required is that the roofing tiles be laid in a manner somewhat different from the way in which tiles are usually applied.

There are small huts or ancient structures in certain European countries, and in the mountains of Porto Rico, where tiles can be found that were

Details of Tile Roofs on Two Houses in California

That at the right has eaves closures, while the other shows cemented hips made by the Spanish monks hundreds of years ago, still in very good condition, so that once in a great while such tiles are secured and used, by purchasing an entire structure and bringing the tiles to America. These imported tile, however, are of such a nature that it has been found impossible, with severe changes of weather, such as are usual in some latitudes, to depend greatly upon them, and they are used chiefly on small areas such as mansards, projections here and there, wall coverings, belfries, or over arches for garden work—just touches to give a picturesque setting. These handmade tile are varied in colors, such as buff, pink, tan, green, gray, brown and black, and they must be embedded in cement as they are without nail holes. The tiles themselves are so varied that some are warped, while others have the edges turned, and the curves of others are so flat that several tiles are required, one over the other, in order to give the proper effect.

Example of Tile Treatment for Small Surface
George Washington Smith, Architect

The protection of this sort of a roof for the inside of the building is entirely another factor; the under roofing must be thoroughly waterproofed and made tight before the tile are laid, which is a costly item, so that a roof of these tiles should not be attempted if low cost is to be considered. There are a very few instances where tiles have been imported and placed on the roofs of summer houses or small buildings of other kinds to add to the attractiveness of certain large estates on our Atlantic coast, but while they are enchanting to view and beautiful in color tone, these roof surfaces have to be covered during the winter with heavy canvas, and even with this care the surfaces are in some instances beginning to discolor and scale, simply because the tile are not made for this climate and, in time, nothing will be left but the plain, drab under roofing, which will have to be recovered with some other material. If the owner, or architect, wishes to secure a similar effect, without continued importation of tiles unsuited for this climate, by co-operation with the manufacturer as to the requirements, he can get a roof that will rival the interest of the old world examples and, what is equally important, constitute a covering that will outlast the rest of the building.

The tiles of present-day manufacture are produced to withstand climatic conditions and in textures, shapes, sizes and colors to give an artistic and practical roof covering which can be laid with

House at Santa Barbara, California, with Roof in Character of Early Spanish Missions
George Washington Smith, Architect

Venetian Palazzo Showing Roof in Scale and Texture of Early Italian Work

such irregularity as to give the effect of the original handmade tiles, put in place centuries ago. To gain this result we must also eliminate stock ridges, hips and terminals, and in their places use the half-round, straight barrel, or tapered mission tile for all hips and ridges and their connections, mitering or laying them in crude fashion with Portland cement. There are sections on such roofs where it is absolutely necessary to use elastic cement instead of Portland cement, as the roof must be leak-proof, and if Portland cement is used against the hip board, under the hip roll, in the course of time with the least vibration of the building, the cement which has hardened will crack and fall out, while elastic cement will expand and contract with the building. To use a touch of Portland cement here and there, along the eaves courses, for example, in place of manufactured eaves closures, adds to the quaintness of the effect. Examples of old world methods of tile roofing, seen more often throughout California, are chiefly the result of an irregular method of applying the tiles to the roof; there are a few roofs in other parts of the country laid similarly, but there should be more and more of them.

Some tile have a natural rustic texture on account of the particular kinds of clays used, which adds wonderfully to the results obtained with the irregular laying, but in placing such a roof, consideration must be given to trying climatic conditions. If the tile is of vitreous quality and the texture and color are the result of natural burning in the kiln, or even if the color constitutes a slip covering on the surface, and the body on which the color is dipped or sprayed be hard burned, it is a safeguard against serious damage caused by climatic changes. In many parts of America we have snatches of summer and winter weather within 24 hours, and it is necessary that no misgiving be felt about the wearing qualities of a roof. There are, of course, sections of the country where tile need not be of this quality, as, if they are of good, hard clay they will withstand more severe weather than is experienced even in New England, for example.

These irregular methods of applying roofing tiles to give a desired effect are as foreign to the inexperienced tile roofer as building a staircase. One might suppose that the irregular laying would be better accomplished by an inexperienced roofer, who has not been schooled and drilled into mechanical perfection, but this has been disproved by past experience. To gain a natural, artistic roof requires the services of an experienced tile roofer because as he works, or rather as he plays, he still keeps in mind the element of risk in regard to weather tightness and remembers that leaks must not mar the integrity of the roof laid in natural beauty of irregularity with hard, mechanical lines forgotten.

It is, therefore, plainly to be seen that such roofs as we so often hear talked of can be secured right in this country and can be constructed in much the usual manner, with the protection assured by the use of practical workmanship, and it only means, as explained in articles previously written on this subject, the full co-operation of all who are interested. Particular pride should be felt that these tiles can be obtained without attempting to import them, and that one can have, with tiles of American manufacture, both the protection of a practical and water-tight roof when it storms, and the satisfaction of possessing an artistic, fascinating roof covering when the sun shines.

EDITORIAL COMMENT

WHAT CAN ARCHITECTS DO TO STIMULATE BUILDING?

CURRENT building reports, encouraging as they are, represent only work for which permits have been secured. The figures for work actually under construction would undoubtedly show a considerable shrinkage. This is apparent in talking with a number of architects; there is an undeniable interest in building, but there are still many obstacles in the way that prevent owners from signing contracts. The margin between what might be termed the "asking price" and the level on which contracts can be signed, is not particularly great—ranging from 10 to 20 per cent. This fact prompts the question, "What can architects do to stimulate building?"

That architects are able to stimulate building is proved by a number of offices, known to us, that are as busy right now as at any time in their careers. They are offices in which well organized business departments are working, which enable them to follow the trend of construction costs and to present evidence to owners that they have been able to eliminate practically all costs which are not represented by honest labor and fair material prices. When the cost of a building is cut down to these basic factors, with extravagant overhead, different kinds of "insurance," and wasteful organization on the work eliminated, the result is likely to be a figure on which an owner can proceed.

One architect, in talking recently with a member of our staff, made the statement that of the work that came to his office this year, none had failed to go ahead. He has no mystic power over his clients; he has no peculiar business secrets, but he follows the simple, businesslike practice of investigating contracting and material fields sufficiently to find where the excess cost lies, and then eliminates it. To be more specific, he prepares his plans in the usual way, basing them on current data obtained by his office with reference to costs. Surveys of materials are prepared and the plans submitted for bids to contractors, but instead of confining the asking for bids to some half-dozen or more contractors, 30 or more are asked to bid. Before asking for figures, assurance is had that the contractor actually *wants* work, and that he has a reliable organization that can execute the work efficiently.

The contractors are asked to submit their bids in detail, giving sub-contract figures, principal material quotations, and their profits. The architect reserves the right to, and does, secure independent sub-contract and material quotations. In this list of 30 or more sets of contract figures there is, of course, a wide range, but at the bottom of the list there are always from four to six figures within very small amounts of one another. These represent the bids of contractors who make real efforts to buy materials and operate economically.

The results of the architect's own investigation of material prices and sub-contract quotations are checked against the general bids. If the architect has been able to secure lower quotations, they are substituted for the figures of the contractor finally decided upon. The contract is made with the contractor's known profit as a fee, and with the total estimated cost of the building as the guaranteed contract price, the work being carried on in practically all respects as under a lump-sum contract. Additional provisions are made, however, that any savings in the cost of materials, under the prices on which the contract is based, revert to the owner, and any savings as a result of increased efficiency are divided equally between owner and contractor.

This method of arriving at a contract price undoubtedly places an extra burden on the architect; it is effective, however, in eliminating excess cost, and in accomplishing that the architect has made a contribution to the welfare of the building industry that will prove a lasting asset. With the evidence of the architect's economy properly laid before the client, it is comparatively easy for him to see that he is getting as much value for his expenditure as is possible under prevailing conditions. The provision giving him the benefit of any reductions in material costs removes objections to any possible penalty for going ahead, and the wheels of industry are started, which is most essential.

Plans similar to this are in use in other offices, sometimes with the elimination of the general contractor,—the purchasing of materials and the assembling of sub-contracts being done by a construction division of the architects' organizations, or as in Chicago, by an independent supervisory agent, working with the architect and known as a "construction manager." It is usual, under either method, to make a charge of four per cent to the owner which is paid to the construction manager or to the architect, according to the actual method of handling the detailed work involved. There are advantages, however, in the service of the general contractor which cannot immediately be given by the architect, and on the whole some such method as outlined will prove most satisfactory.

Numbers of other suggestions might be offered to show that progressive architects are extremely important factors in he revival of building. The few given will suffice, however, to point the way and it is safe to say that architects who use their resources thus will profit in gaining reputations for accomplishment under difficult conditions.

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The Bulfinch Church, Lancaster, Mass.

By the REV. CHARLES A. PLACE, the Minister

Photographs by the Author

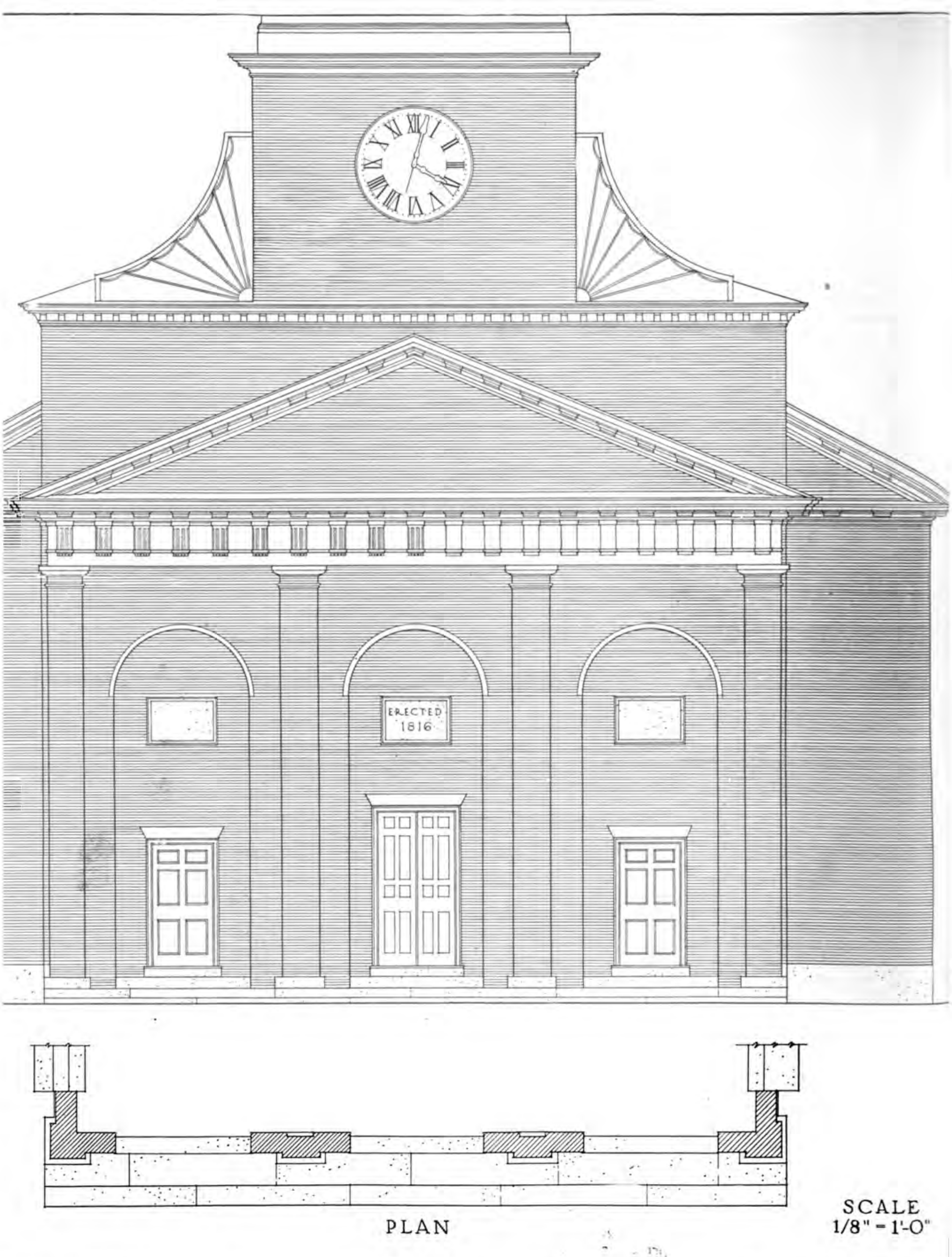
ONE of the charmed spots of beautiful Lancaster on the Nashua is the green. Four buildings face the green—the church, the library, the high school and the town house. No one who has stood in front of the town house on some day of sun and shadow, and looked across the green to the church on the north, will ever forget the beautiful setting. The story of the church, the oldest and finest of the four buildings, appealing alike to the architect and to the lover of the beautiful, is here set down briefly, and as fully illustrated as may be.

The Pulpit from Organ Gallery

The corner stone was laid July 9, 1816; the building was completed within the year, and dedicated Wednesday, January 1, 1817. The sermon was preached by the Rev. Nathaniel Thayer, D.D.,— the minister of Lancaster, whose descendants today constitute a very influential part of the town and congregation. The cost, approximately $20,000, was ordered by vote of the town and assessed on the pews. The edifice is of brick from plans of Charles Bulfinch of Boston, and is without doubt the finest proportioned of all his churches, though with an interior less elaborate and costly than the New South which formerly stood in "Church Green," Boston, — corner of Summer and Bedford streets. It was reared almost wholly by artisans of Lancaster,—a noble memorial to their skill and integrity,—of Lancaster brick in Flemish bond, Lancaster timber, and of the celebrated Bolton lime. In size it is 74 by 67½, with a porch or vestibule 49 feet in width, projecting 19 feet, and a portico 4 inches less on each side in width, and projecting 17 feet. It stands today almost exactly as built, and practically as sound. A Roman Doric cornice is well executed, having bored mutules. Measured drawings are shown of the portico, the cupola and of certain interior details.

The tower and cupola are deserving of long and careful study. Suggested in Holy Cross, 1803, and the New North, 1804, Boston, the result here is wonderfully fine. It will be noted from the picture that the angles between the tower and porch attic are decorated with fanlike ornaments. The cupola is surrounded by twelve Roman Ionic columns, supporting a well balanced entablature. An interesting feature, and suggesting old Roman construction, is seen in the lines of the dome. The total height from the ground, including the vane, is 118 feet. In the cupola hangs a Revere bell, which, recast on account of some defect, bears the date 1822. It would be difficult to alter any line of the cupola without impairing its balance. Comparison of its proportions with those of the choragic monument of Lysicrates, increases our appreciation of Bulfinch's lines.

The facade and tower treatment bear witness to the influence of Bulfinch's trip abroad. Directly or indirectly, he drew from the best examples of the past. The arcaded portico, with its touch of the classic art of Italy, has a charm beyond what a picture or description can suggest. The treatment of the three doors is simple, all having beaded frames



CHARLES BULFINCH ARCHITECT

ELEVATION
FIRST CHURCH OF CHRIST
LANCASTER MASSACHUSETTS

AFTER MEASURED DRAWINGS BY BIGELOW & WADSWORTH ARCHITECTS

FIRST CHURCH OF CHRIST, AT LANCASTER, MASS.
BUILT FROM DESIGNS BY CHARLES BULFINCH IN 1816

and a 1½-inch round moulding in the angles of the frames and masonry.

The porch or vestibule has a distinctly New England spirit, with the dignity and plainness of a New England meeting house 50 years earlier. There are touches of beauty here, but they are few and not what the exterior leads us to expect. Two staircases bend in and meet halfway in a common landing, under which the congregation passes to the middle inner door; a broader staircase ascends to the upper floor, passing from thence to right or left to the galleries, or up a narrow flight of stairs to the belfry.

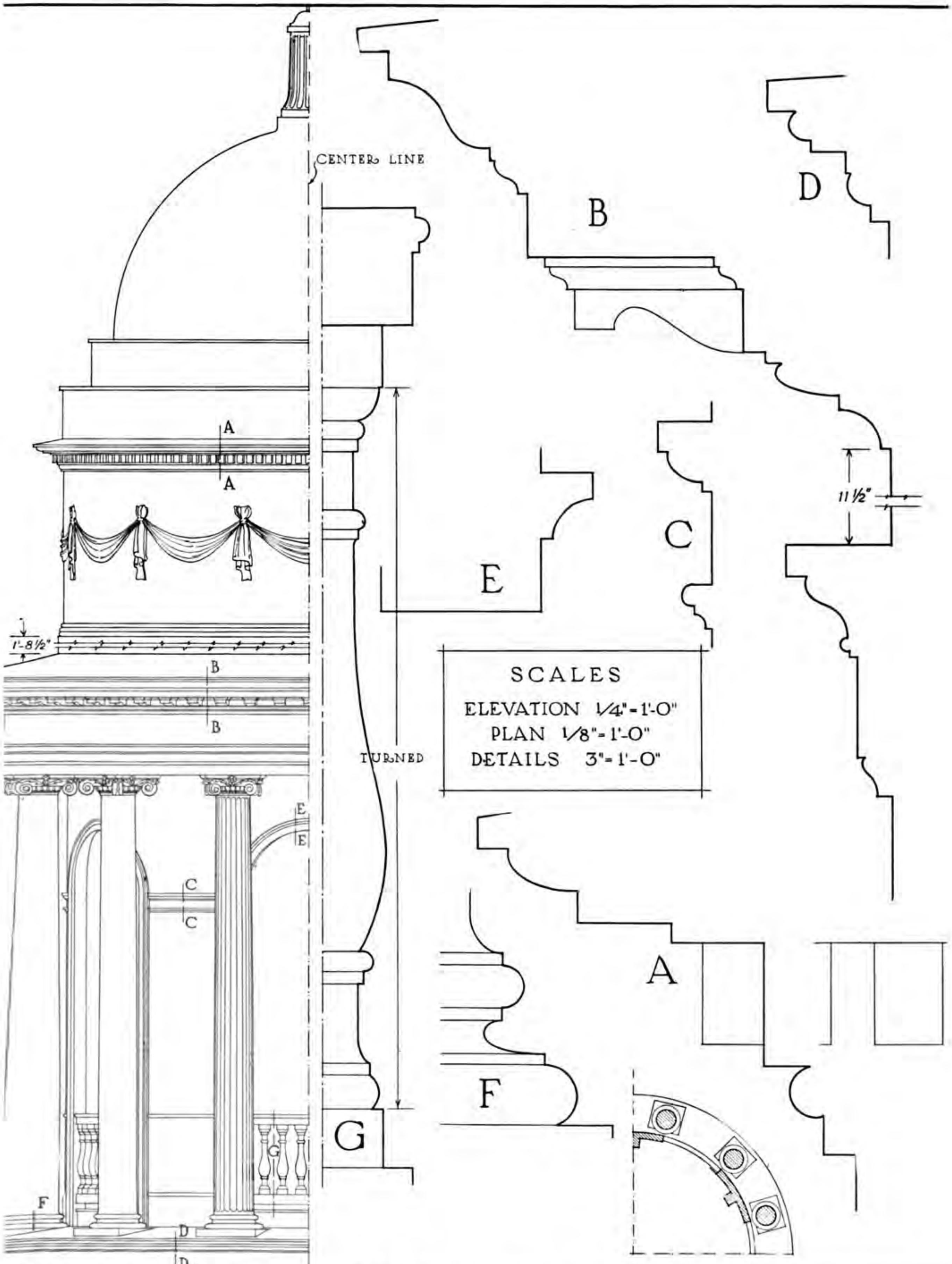
View in Porch on Church Front

On passing from the porch into the church we come upon beauty fully worthy of the best of the exterior. The interior which meets the eye, with the exception of the ceiling and wall ornamentation and certain changed details in the north end, is the same substantially as when finished in 1816. In 1881 the Thayer Memorial Chapel was built, connecting with the church, necessitating the cutting of two doors, the closing up of the arched window back of the pulpit and the removal of four pews on each side of the pulpit. Two windows each side of the pulpit, on the lines of the lower and upper rows of windows, eight in all, had been closed at some earlier date. In the gallery a few changes were made when the organ was installed. Otherwise the seating is as originally planned.

In 1869 a proposition was made to run a floor on the level of the gallery floors, thus converting the structure into a lower vestry and an upper church. This was in line with what actually happened in so many New England churches, but would have been little short of vandalism. The beautiful pulpit would have been lost, and low-

Wall Treatment and Doorway to Vestibule

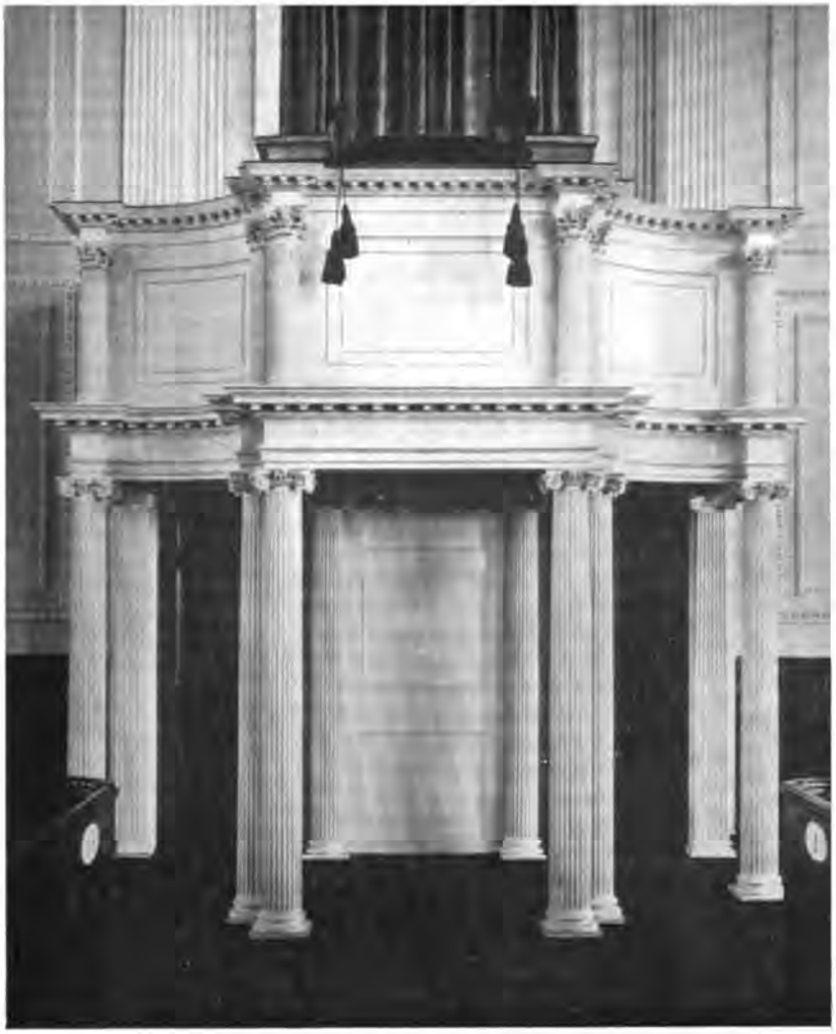
Stairways to Gallery from Vestibule



HARLES
LFINCH
RCHITECT

UPPER PORTION OF TOWER
FIRST CHURCH OF CHRIST
LANCASTER MASSACHUSETTS

AFTER MEASURED
DRAWINGS BY
BIGELOW & WADSWORTH
ARCHITECTS



Detail of the Pulpit

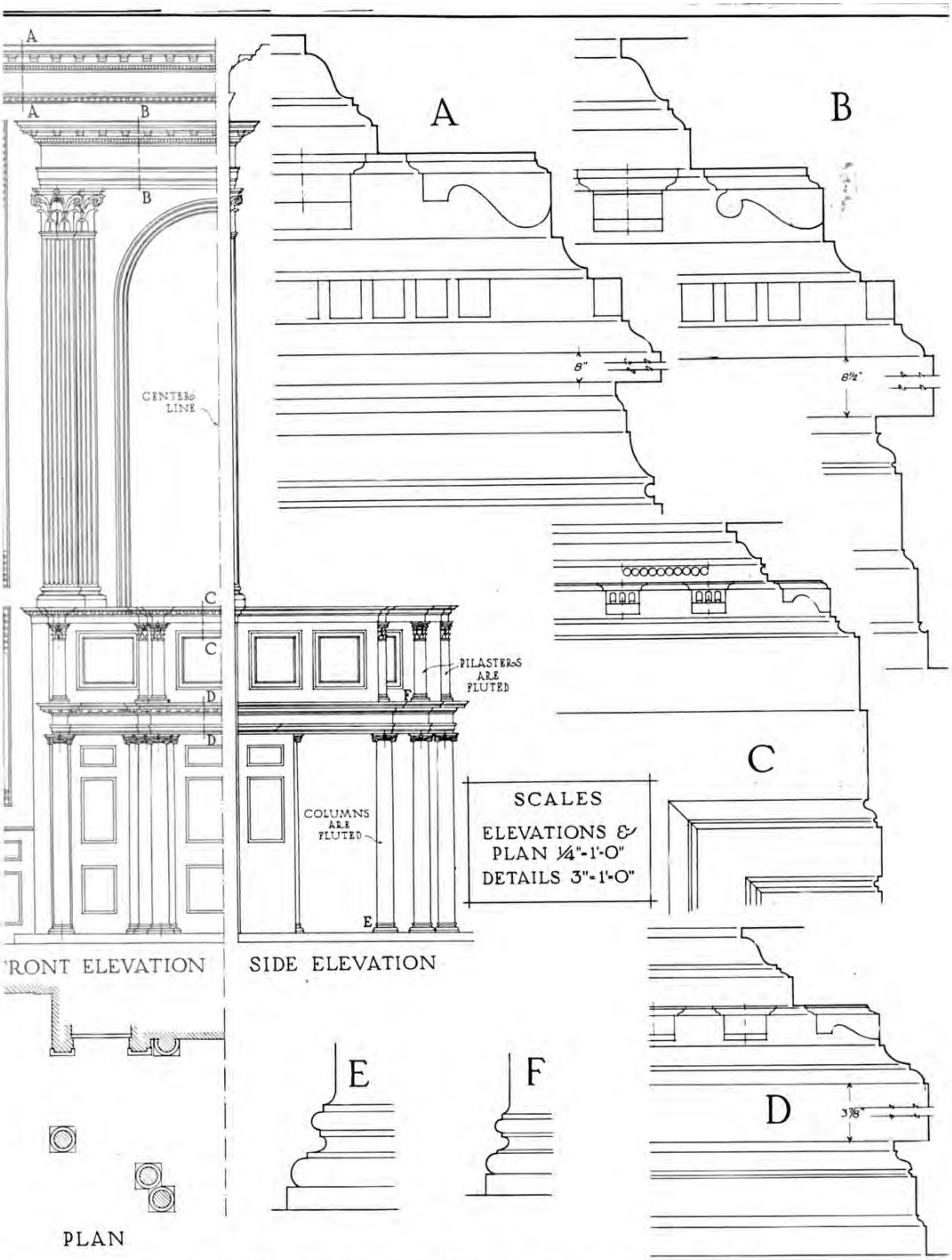
is shown and another of one of the gallery doors, showing wall mouldings and detail of the cornice. The gallery is supported by fluted columns with Roman Doric capitals, with no bases, 10 feet 11 inches high and well proportioned. The gallery is enclosed with an open balustrade, so called, and curves in toward the south end. An illustration is shown looking toward this south end. At present there is no way of artificially lighting the church, and the old method of heating it with two stoves is still in use. The pews are made of pine, stained cherry color, and the numbers on the doors, at one time covered, have been restored. Side pews, 4 x 8, suggest the old style "box pews," while those in the middle of the church, 3 x 10, are usually called "slips." The windows have inside blinds. The two busts at the south end in one illustration are of Dr. Thayer (1793–1840), and of Dr. Bartol (1847–1906), and were executed by Bela Pratt.

Of the pulpit, much should be said, or very little. Two illustrations are here shown and also a measured drawing. The pulpit should be seen and carefully studied; then the judgment of architects well qualified to pass upon it would be confirmed, that no more beautiful pulpit of its type exists in America. Not only is the proportion of width to height well nigh perfect, but it possesses lightness and grace to a high degree. The only change in this design from the original is the removal of the arched window which was covered with "a rich green curtain of figured satin and velvet with a ball fringe roping and tossel." The present curtain is red damask. The pulpit stands on a platform 4 inches high, with Ionic columns 6 feet 5½ inches high. The total height from the platform is 10 feet 8 inches. It is painted white. The paneling and two mahogany doors enclose a 25-inch space which originally contained stairs,—the only way of entering the pulpit until the chapel was built in 1881.

studded utility rooms would have taken the place of the present beautiful interior. To the courageous and vigorous stand of the minister, Dr. George M. Bartol, the church is everlastingly indebted that the plan was abandoned. At that time the interior was redecorated.

There is no picture of the interior of the church prior to the changes made necessary by the erection of the chapel. What Bulfinch would have done with the wall and ceiling treatment, had he been given a free hand without the hampering necessity of economy, may be imagined from a study of the State House, Boston. Certainly the walls and ceiling in 1816 did not harmonize with the galleries, pulpit and other details, and decorating in 1900, while not Bulfinch's, are quite in keeping with the rest of the interior and what Bulfinch completed elsewhere. Some of the moulding designs used in 1900 are to be found in the State House, Boston, and in St. Stephen's Church, Wallbrook, London, which Bulfinch admired, and are quite in keeping with his good taste. An illustration of the ceiling

This description would not be complete without some reference to the architect and the artisans who made this beautiful building possible. That



CHARLES BULFINCH
ARCHITECT

PULPIT AND INTERIOR CORNICE
FIRST CHURCH OF CHRIST
LANCASTER MASSACHUSETTS

AFTER MEASURED DRAWINGS BY
BIGELOW & WADSWORTH
ARCHITECTS

Recent Ceiling Enrichment in the Bulfinch Manner

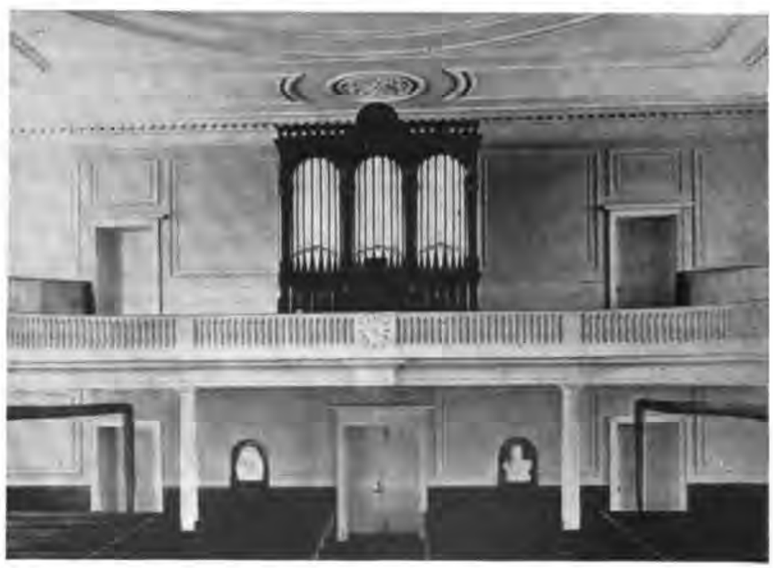
an ardent inspirer in choosing the Bulfinch plan and carrying it to execution.

There is no record of Bulfinch's ever being in Lancaster. Someone, therefore, must have interpreted the simple plans which he drew. That someone, it would seem, was "Captain Thomas Hersey, master builder," according to the town records. Hersey, who was not a resident of Lancaster, received $500. That is all we know. Who he was or where he came from is not known. Was he connected with Bulfinch in other work,—the New South Church, Boston, erected 1814, the McLean Asylum buildings, opened in 1818, or the two buildings for the Andover Theological Seminary, 1817–18? These are questions yet to be answered, upon which no clue has been found.

Charles Bulfinch was the architect is beyond question, though his name does not appear on the town records. This church is listed by Bulfinch, and he is also credited with its design in a newspaper report at the time of dedication. Why he should have been chosen to design the church is not hard to determine. Almost every man who was chosen by the town to aid in procuring land, to consider plans, or to form the building committee, was or had been a member of the General Court, and so had ample opportunity to see the wonderful Bulfinch State House and its exquisite interior finish. The building committee consisted of Eli Stearns, at the General Court 1806–10, Jacob Fisher, 1811–13, and William Cleveland, 1813–15. Eli Stearns was a local carpenter and builder, and a first class workman, as more than one Lancaster residence, now standing, attests. Jacob Fisher was a cabinet maker and a progressive business man, and possessed of rare skill with tools. Doubtless his hand carved the pulpit. It is a splendid work in every detail. There is a story about "Jacob Fisher and the Twelve Apostles" based on the tradition that Jacob Fisher gave twelve columns for the church. These undoubtedly were the eight columns and the four pilasters under the pulpit, and would thus naturally connect his hand with the pulpit and its carving. William Cleveland, a man of taste and refinement, born in Salem 1777 and coming to Lancaster in the early part of the nineteenth century, must have seen something of the wonderful work of McIntire, who died 1811, and hence was

Undoubtedly the plan of the church, its exterior lines,—the portico, the tower and the cupola; the interior arrangement,—the lines of the gallery and the design of the pulpit, were by Bulfinch. The execution of this plan was due to men who knew the principles of construction and the uses of tools, and who built with integrity and on honor. All high praise to those early artisans who wrought themselves into this enduring monument, as well as to him whose mind conceived its beauty.

While much of the best work of Bulfinch has fallen before the unceasing march of change which is common in American cities, enough remains to bear eloquent testimony to his rare taste and to his keen understanding of the value of proportions and the refinement of detail.



Church as Seen from the Pulpit

Architecture and the Automobile Industry

By WIRT C. ROWLAND

Of the Office of Albert Kahn, Architect

A TREMENDOUS impetus has been given to building, during the last 20 years, by the development of the automobile industry. Among those professionally interested in architecture to say this is not enough, for this industry, by reason of its special requirements, has given opportunity for the creation of a distinctly modern type of architectural design. Until recently this type has been characterized chiefly by a certain lack of grace, outline and color, and often a complete absence of pleasing proportion, obviously not the deliberate choice of the designers.

If a fanatical economy and a frenzy of practicability have produced such a result, so carefully, and often effectually, avoided in the designs of motor cars themselves, the opportunity affords a test of our ability as architects to cope with the difficulties of modern requirements, and,— by its faults, — it gives proof positive that we have not advanced abreast of the science of industry and invention, the problems of which we deal with.

The expansiveness and looseness which have characterized our architectural thinking, the yearning to be free from all restrictions, — these have been our inheritance from preceding generations of romantic thought and philosophy. The commercial and industrial problems have, by their difficulties, brought to us the compelling exercise of discipline. Therein lies the chief value of such a type of architecture, be the exercise never so distasteful and the result never so rigid and artistically unsatisfactory.

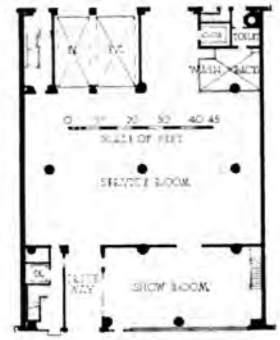
The beginning of the manufacture of motor cars in this country was almost simultaneous with the practical application of the concrete frame to building, a form of construction commended to the manufacturer and his architect by its economy and simplicity of erection. It is hard to say which has been the more dominant factor involved in these problems, — the arbitrary requirements of the manufacturer or the rigid form of concrete construction, — but in both we recognize the necessary agents of discipline, and we may be grateful to them for having turned us to real thinking.

A substantial element in planning these buildings has ever been a demand for unusual light. It is that in these problems which has brought into use the slender piers and the tremendous areas of glass, so difficult to be made to assume any semblance of architectural form. These, with the customary planning of the structural features in a system of bays, have limited the treatment to a more or less awkwardly connected sum of units, the chief opportunity being the careful adjustment of the proportion of piers and spandrels and as interesting a treatment of the surfaces of each as cost may permit.

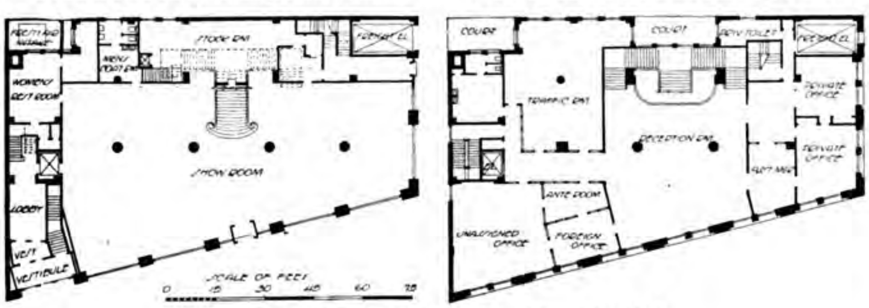
Two of the Four Wings, Durant Building for General Motors Co., Detroit

Detail of Ford Sales Building, New York

"Modern" Sales and Service Building, Detroit



Main Floor Plan of "Modern" Garage



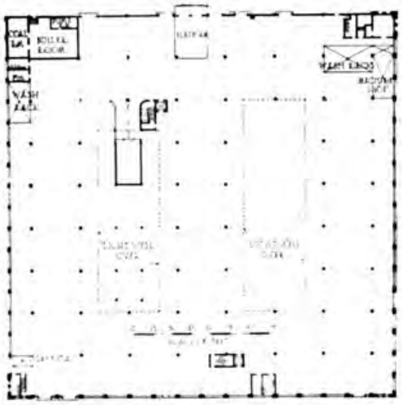
First and Second Floor Plans of Ford Building, New York

The so-called unit system has further prevented these buildings from assuming any sort of completeness, because they are generally arranged so they may be built upon and extended, story by story and bay by bay, without substantially altering the character; for indeed they do not seem to begin or to end definitely. It is this characteristic, more than any other, by which we may identify those buildings used for the manufacture and sale of automobiles. Today we find such difficulties only partially overcome where more pier space is allowed at the corner, or perhaps a whole pylon and a parapet which can be of more adequate proportions.

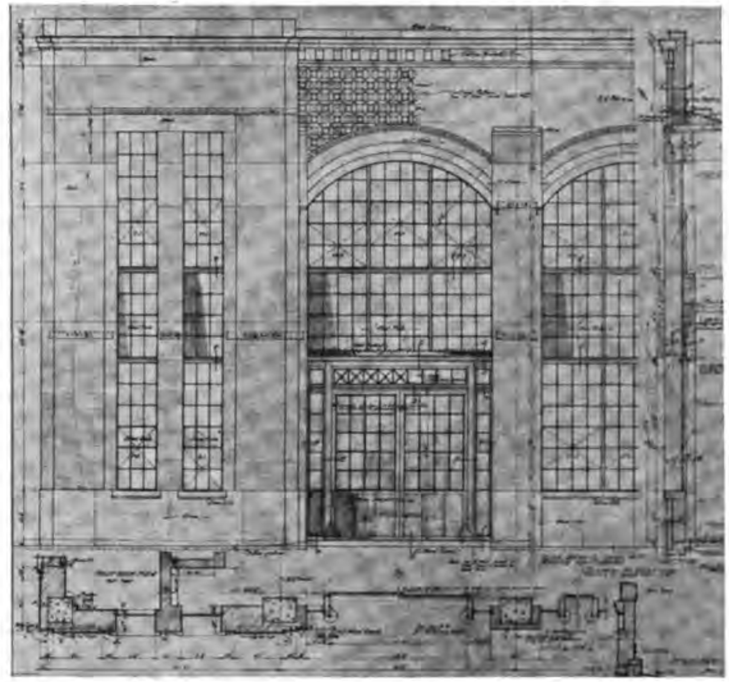
Nothing, however, has more happily contributed to the general organic effect than the opportunity of introducing smaller intermediate piers for mullions above the voids of the first story, particularly when the voids may be given an agreeable shape and proportion. Then we find ourselves, with the exception of opportunities presented by detail, at the end of any possible progression.

Economy has been a vigorous censor of elaboration in these buildings, and has restricted the kind of material and prescribed limits in detail. Those stern beginnings, with scarcely more than projecting bands to intrigue the interest, have taught us to rejoice at the present day in the use of the more plastic clay materials, brick and terra cotta, and the possibility of a scale of detail attainable by them. Brick was at first used in elaborate patterns because of the necessity of giving some interest to otherwise ugly proportions of pier and spandrel. It now fulfills its more useful function of giving its due color in the design, contrasted occasionally with simple bands of stone, or sparingly used in small surfaces of diaper patterns and projecting cornices and simple dentils. A solution for the crowning piece of detail, the cornice, has thereby been offered, suitable for the factory or service building of more modest architectural pretensions—a solution offering much variation of scale and elaboration.

Within the last few years there has come into demand, for the first time on the part of the motor industry, that which calls for a more architectural



Main Floor Plan



Detail of End Pylon and Bay, Packard Service Building

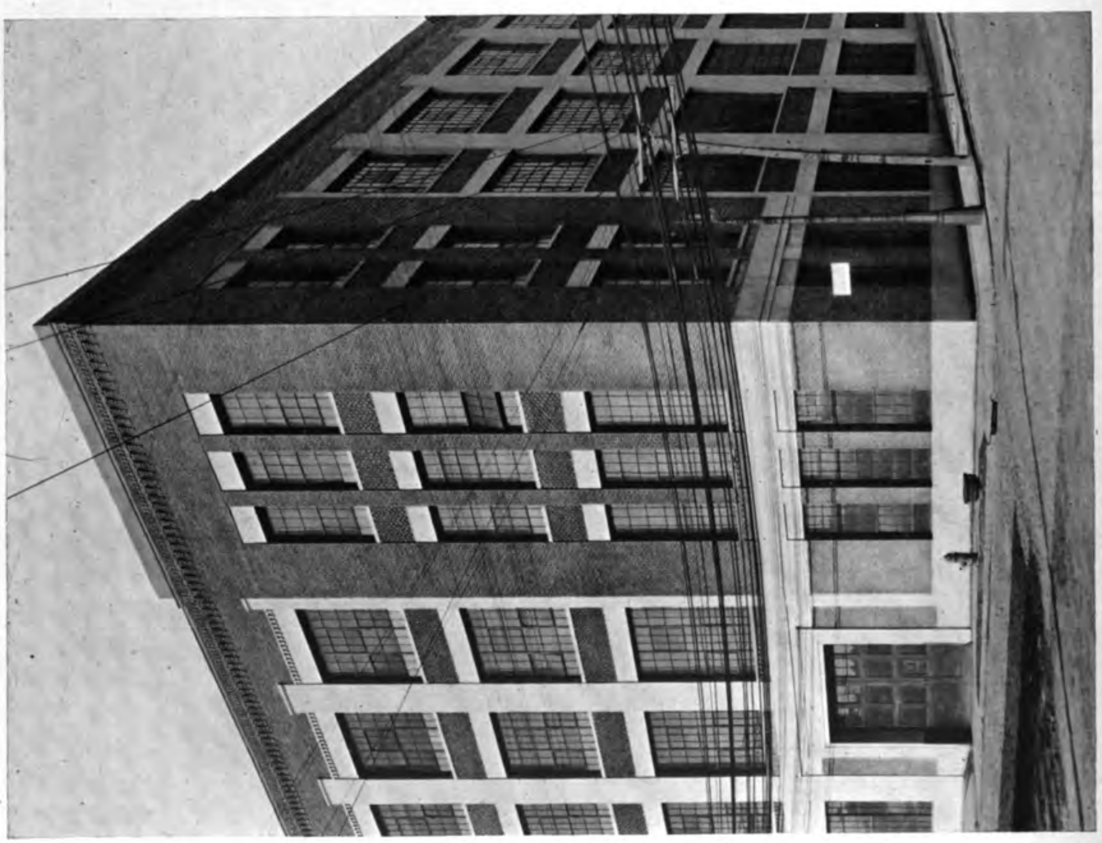
treatment—the service and sales building of an elaborate character. A clay material does not seem to have met the demand in either color or texture, hence we now obtain successful results with the light color and texture of stone facing, after a use of more than 20 years of concrete, a material which, however cleverly contrived, was never artistically acceptable to architects or owners.

The use of stone has effected much change in the designing of this industrial work and has imparted a character ever identified with a most dignified building material. It has made possible a general refinement, a freer contour, and an opportunity for modeling not found in other materials, and its necessary use in large courses of thin slabs has by no means reduced its interest but has given a certain distinction by providing a surface comparatively unbroken by joints and revealing, as never before, the beauty of its warm, gray surface. In this material, carved ornament of an appropriate character may add a human touch, a need often felt in buildings where the lines are otherwise rigid and geometrical.

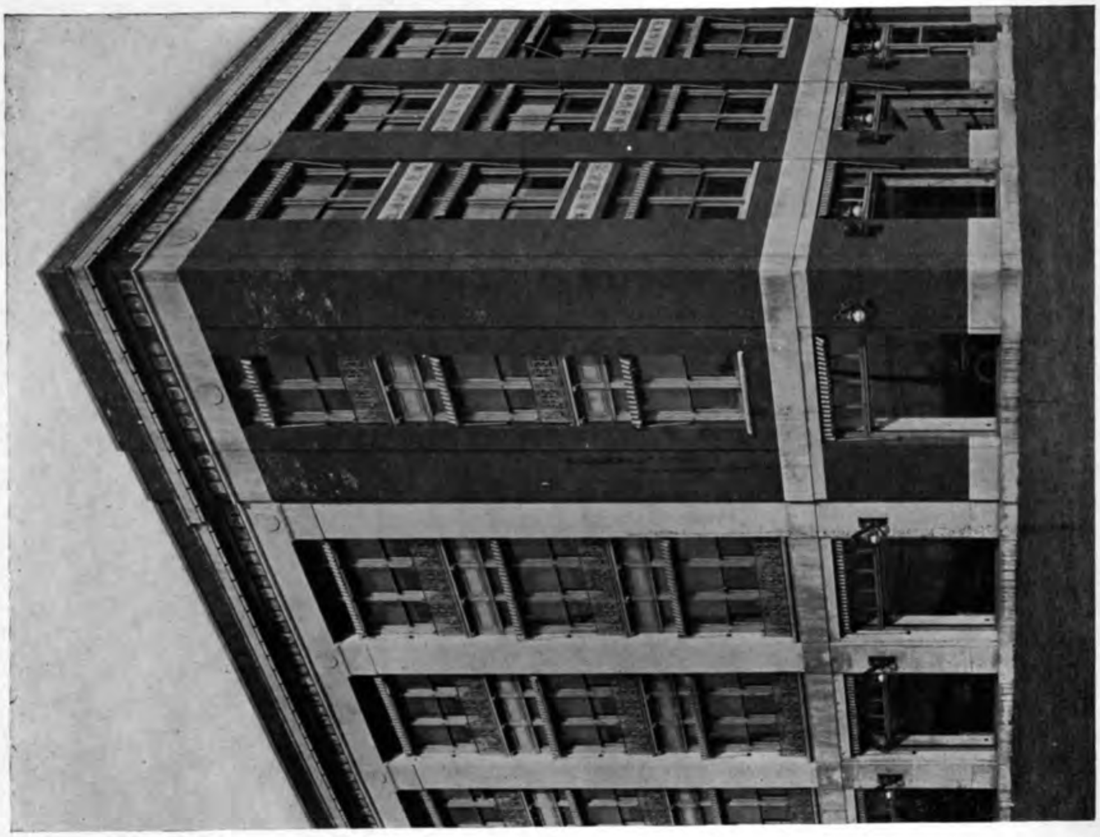
From start to finish, from concrete to stone, and under pressure of requirements both practical and structural, the architect has felt the need of nothing so much as of a reasonable precedent for the entire range of industrial work—that is, to speak of the architect who is not literally obsessed by the idea of a new architectural style. Perhaps, on account of the apparent lack of this precedent, there has been more thinking, more going back to structural and organic elements, always a healthy exercise in any art, and particularly in architecture. As far as architecture is concerned, any attempt to revivify it otherwise miserably fails, and most signally so when any effort is made to change its outward forms without attention to its inner principles.

We must invest our work with those prin-

Packard Service and Garage Building, Chicago



DETAIL OF PACKARD SERVICE BUILDING, DETROIT



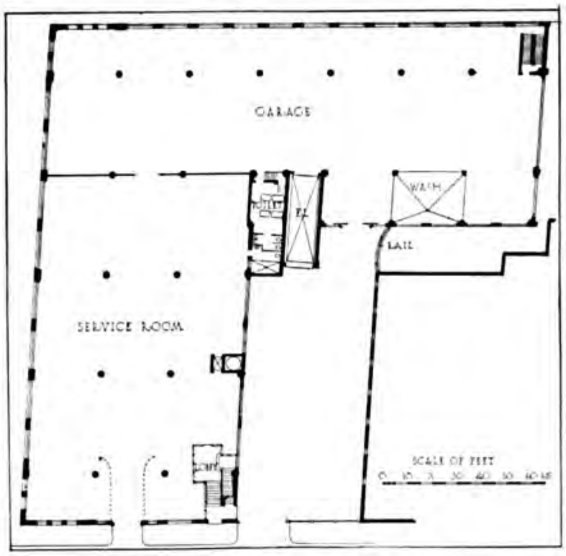
DETAIL OF FORD SALES AND SERVICE BUILDING, DETROIT

ALBERT KAHN, ARCHITECT

ciples, and if buildings for commerce and industry, particularly those in connection with automobile manufacture, have shown progress and thought, it has not been through any desire to create a new type, but through the application, from problem to problem, of those essentials which are incorporated in the great architecture of the past.

A reluctance to follow any but an outward form as a precedent in these industrial problems results in inevitable failure. History furnishes us, however, a rich store of precedent for analysis which must be broad as well as minute, and the opportunity to study scale, treatment of surface, profile and line is no greater than that of studying broad masses and groups of piers. For these we may look among the examples of Lombard Romanesque. Then, too, we cannot remain unaware of the many lessons to be learned from the Gothic—of the relation of tall openings to buttress piers. In these two styles there is much material for study, not to say inspiration, especially for that part of our industrial work to be built in brick or in brick and stone. The possibilities for giving actual charm and interest of detail are limited only by a sense of propriety.

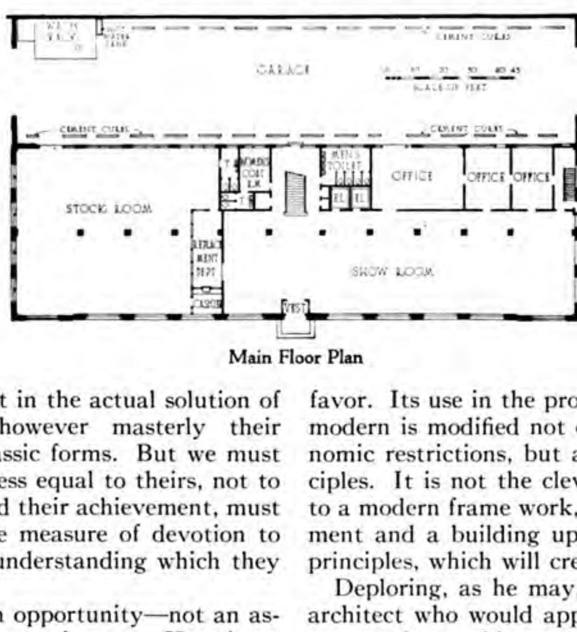
With respect to historical precedent, our attention is again drawn to our opportunities to build in stone. With 20 years of experiment behind us, we have rubbed elbows with every difficulty under the sun, and what can and what cannot be done with practical requirements is pretty well known. We have felt the restrictions keenly and it is with real satisfaction, in spite of them, that we may turn to such a material capable of giving us line and beauty of detail, for the inspiration of which we find no style so replete as that of the classic in its range from Greek to Georgian.



Principal Floor Plan of Building Below


Packard Service Building, Detroit

Ford Sales and Service Building, Highland Park, Detroit



Main Floor Plan

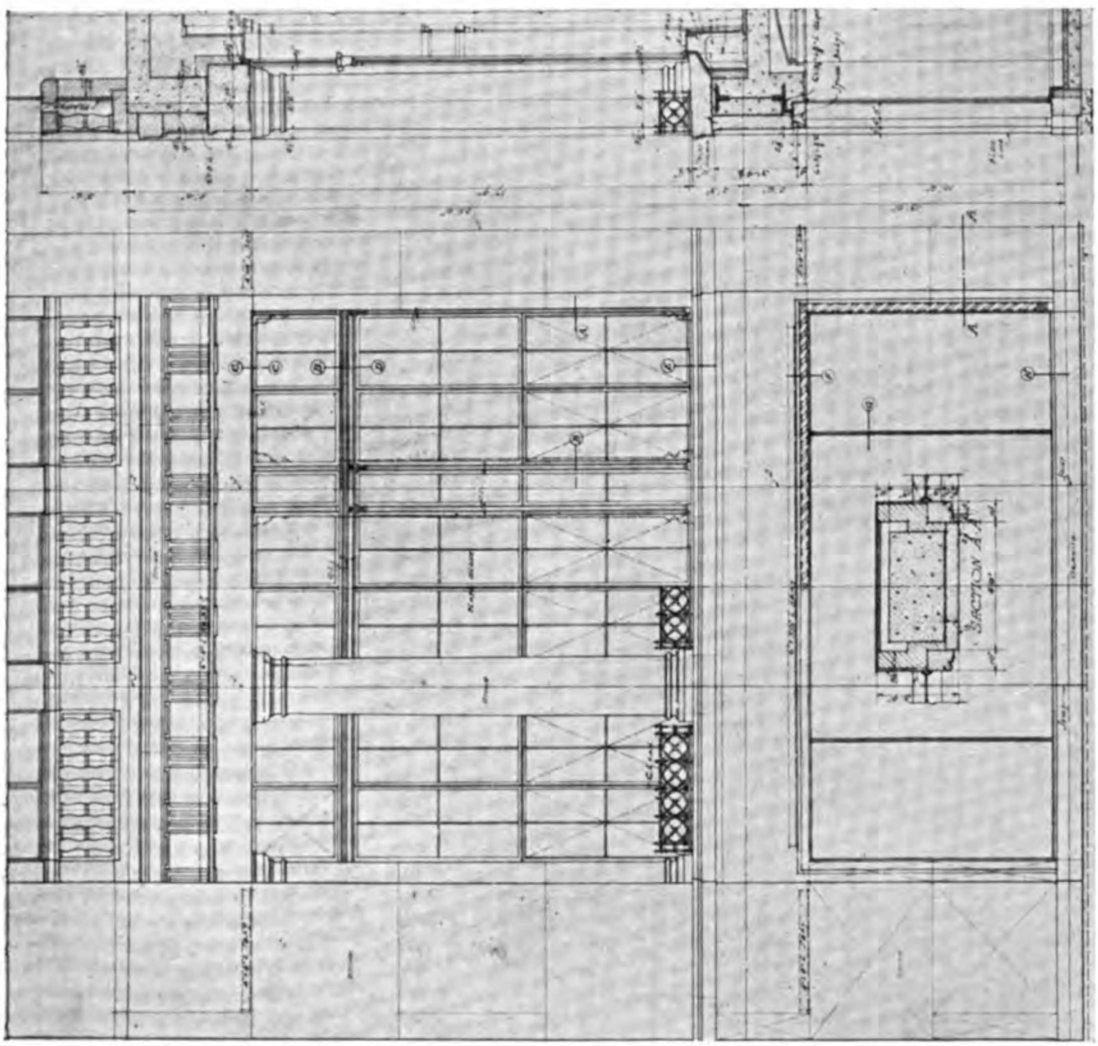
It is true that, for some time previous to this industrial development era, certain modern masters used the classic style for structures almost similar to the automobile service building. Their success was only partial, because their sympathies were not with modern ideas and modern requirements, and their interest was not in the actual solution of commercial problems, however masterly their knowledge and use of classic forms. But we must bear in mind that a success equal to theirs, not to say a development beyond their achievement, must be attended by the same measure of devotion to study and the intimate understanding which they possessed.

By the use of stone, an opportunity—not an assurance of success—has been given us. Here is an opportunity of using the underlying principles of architecture with an actual knowledge of its forms, for a superficial, drafting-board code of the classic orders will not suffice, nor will any other ideal based on fine sketches only.

One becomes aware of a danger which accompanies the solution of the modern industrial problem. The cleverness which has been engendered by the effort to make our buildings of architectural interest with such limited means tends to overbalance those fundamentals which we have learned in dealing with organic members. Classic form is not susceptible to this cleverness; it is too impersonal and too universal, — that is why it finds such substantial and enduring favor. Its use in the problems which are distinctly modern is modified not only by practical and economic restrictions, but also by its own very principles. It is not the clever adaptation of its parts to a modern frame work, but an actual dismemberment and a building up again according to those principles, which will create and endure.

Deploring, as he may, this commercial age, the architect who would appreciate the possibilities of present-day problems must first strip his ideas of architecture down to the very skeleton. His view of history and tradition must exclude the unessential, and magnify only those vital periods when structure and beauty were developed at the same time and exerted an influence upon each other. Our modern industries permit somewhat the same opportunities for beginnings of architectural development, and for the exercise of just such skill, though such efforts in this department of human endeavor may

CENTRAL BAY OF MAIN FACADE



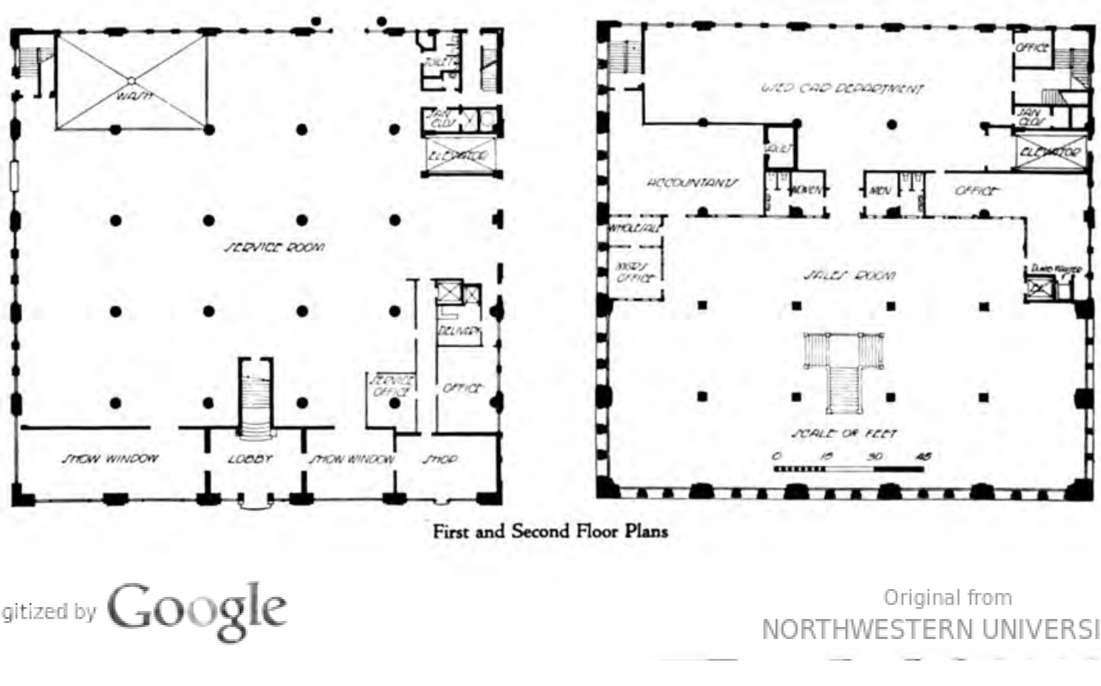
ELEVATION AND SECTION OF TYPICAL BAY AT LOWER FLOORS

SALES AND SERVICE BUILDING FOR THE CADILLAC MOTOR CAR CO., DETROIT. ALBERT KAHN, ARCHITECT

Main Facade of Sales and Service Building for Cadillac Motor Car Co., Detroit

not compare ethically with impulses or forces which produced Greek temples or Gothic cathedrals.

Not the least among commercial forces, the automobile industry has given commissions to erect building after building, hardly varying in demands of arrangement, thereby offering the opportunity to perfect by repetition and constant experiment. It has, by its commercial ideals, forced us to eliminate elaboration and to conform, in our architectural expression, to structure, thereby disciplining us in the sole use of essentials. It is not possible to predict great things from the motion of a force so unethical and so material, but many believe in the salutary effect of training which the solution of its problems must have upon men who may have opportunity of expressing a more lofty, human ideal.



First and Second Floor Plans

Steel Construction

PART III. PLATE GIRDERS AND COLUMN BASES

By CHARLES L. SHEDD, C.E.

STEEL plate girders are used when the loading is too great for single beams. Fig. 10 shows a typical plate girder. The angles and plates at the top and bottom are known as the top and bottom flanges, while the vertical plate between them is called the web. The vertical angles are known as stiffener angles. Under them, next to the web, are filler plates. Web splices are shown at *a* and *b*. If the plate girder is supported by a column it is best, unless the girder is small, to rest it on the top of the column with stiffener angles over the column section as shown in Fig. 10, even if the column continues up above the girder. A plate is carried down on the back of the end stiffener angles, along the column, to make the structure more rigid and to reduce the eccentricity in the column as much as possible.

When the girder deflects it necessarily puts more load on the inside than on the outside of the column, and more rivets are necessary in the stiffeners over the inside of the column than on the outside. The figure shows two stiffeners on the inside and one on the outside of the girder over the column. These stiffeners must bear firmly against the lower flange angles, and the column below must be planed so as to bear smoothly against its cap plate. Connection angles are provided under the cap plate, and stiffeners on the inside of the column if double stiffeners are used on the girder over the inside of the column. These stiffeners always have filler plates under them. If there is a column above they must also bear against the top flange angles firmly, and the column above must be planed to a smooth bearing. In planing the columns care must be taken that this planed surface is accurate and at right angles to the axis of the column, the same as when one column bears on the top of another.

The figure shows the girder carrying another column a short distance from the column below. Stiffener angles must be provided under this column with filler plates, and the stiffener angles must bear firmly against the top flange angles; the column above must be planed accurately, similarly to those at the end.

The stiffener angles at the end must have enough rivets to take the reaction of the plate girder. When there is no column of any size above that below, as is shown in Fig. 10, it is good practice to provide enough rivets in the stiffeners on the inside to take $2/3$ of the load and enough rivets in the outside stiffeners to take half of the load. The stiffeners under the column above should have enough rivets to take the load from this column into the web of the plate girder.

Directly across the web the plate girder is subjected in a vertical plane to shear only. At an angle of 45° it may be subjected to either tension or compression. In a horizontal plane it is subjected to shear. In Fig. 11 are shown two dotted strips, *a* and *b*, at 45°. The strip *a* would be subjected to tension and the strip *b* to compression. These conditions, of course, are continuous the whole length of the plate girder and in a symmetrical arrangement each side of the zero shear point which is, in a symmetrically loaded girder, at its center.

The reader can actually see this compression and tension in the web if he will construct a plate girder out of cardboard, and cut slots as indicated in Fig. 11 along the dotted lines. After he applies the load the strip *a* will be found to be tight, whereas the strip *b* will be found to be loose and will buckle.

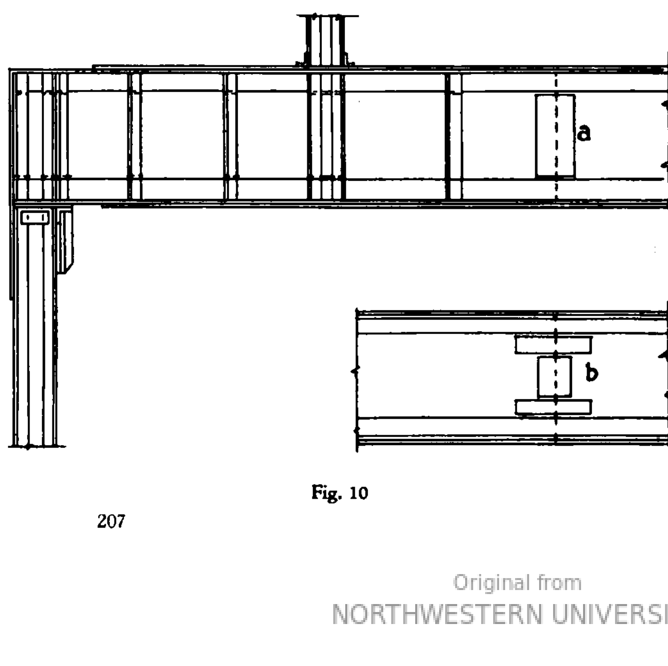


Fig. 10

To prevent this buckling tendency intermediate stiffeners, such as those shown in Fig. 10, may have to be used. These stiffeners may be with or without filler plates and need not be made to bear against the flanges. When there is no filler plate they are said to be crimped over the flange angles. The amount of compression in a strip such as *b* is proportional to the shear in the plate girder's web; its tendency to buckle depends on its length and the thickness of the web, besides the shear per square inch on the web. If the clear distance between the flange angles is too great, stiffeners should be provided to reduce the length of these little columns. They are not true columns, due to the fact that each strip is braced to a certain extent by the metal to either side of it so that the formulae used to determine the spacing of these stiffeners vary even more than those for columns. It would be useless, in this article, to attempt to discuss the relative merits of these formulae.

When the plate girder is too long, say over 30 feet, it may be necessary to splice the web. In Fig. 10 are shown two methods of splicing the web, *a* and *b*. The form *a* may or may not take into account the bending which the web resists. It is common practice to include ⅛ of the area of the web with the flange area in designing the flanges. Whether this allowance is made or not, the web actually does resist bending to a certain extent. Some engineers in designing a web splice as shown at *a*, Fig. 10, do not consider this bending. In the *Engineering News-Record*, Vol. 84, page 949, Mr. Edward Godfrey claims that this practice is all right if no allowance is made in the design of the flanges for the portion of the moment which the web is capable of resisting. He claims that if the rivets do slip a little horizontally, their capacity to resist the vertical shear is not impaired "an iota." The author cannot agree with this statement, for if they

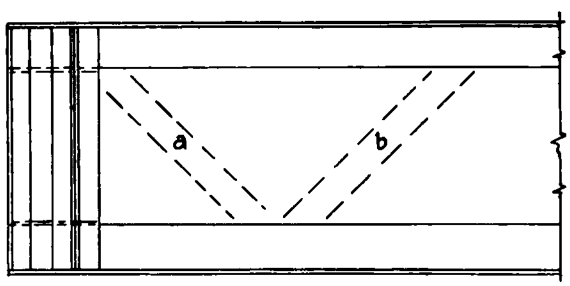


Fig. 11

did slip horizontally they must be resisting a horizontal stress, and if so the resultant of this with the vertical stress must obviously be more than the vertical component alone.

Type *b* for a web splice represents an approximate but safe method. The long plates near the flange angles are figured to resist the bending which the web is capable of resisting, while the middle plates are figured to resist the vertical shear only.

The angles can usually be obtained in longer lengths than the web plate so that the necessity for splicing them or the flange plates does not so often exist. The splice can be effected by putting a short angle over the main angles on either side, and perhaps a short plate on top of the flange plates.

The spacing of the rivets through the flange angles and the web is directly proportional to the depth of the girder and the thickness of the web, and inversely proportional to the shear. The rivets between the flange angles and the flange plates bear

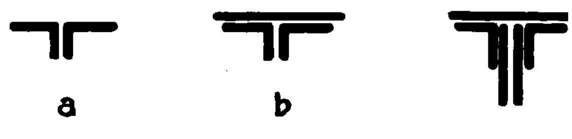


Fig. 12

the same relation to the rivets through the angles and the web that the area of the plates bears to the entire flange area; that is, the smaller the flange plates the fewer the rivets.

The greatest flange area is necessary near the middle of the girder, where the bending is maximum. Therefore the flange plates need not extend the full length of the flanges, but may be cut off at varying distances from the end of the girder. In bridge work it is customary to run one plate the full length of the girder to prevent moisture from entering between the flange angles and the web. In building work this is obviously not necessary.

In Fig. 12 are shown three of the most common types of flanges for building work. These are arranged for light and heavy girders.

The upper flange of a plate girder (unless it is a cantilever) is in compression and has the same tendency to buckle as a column. It is usually possible to so place the plate girder that beams will frame into it at or near its top, thus bracing the top flange. If this cannot be done, the flange should be made as wide as possible, and if this is not sufficient the allowable compression per square inch should be reduced the same as for a column. It is common practice, where the top flange is frequently braced, to allow 16,000# per square inch in the flanges in building work. In bridge work this is not allowed any more than it would be in columns. A formula for the allowable compression in the flanges in plate girders, which would agree in practice with the column formula 16,000 — 70l/r, is 16,000 — 200 l/b where *b* is the breadth of the flange. This takes into account that the flange is partially braced by the web and that it is not fully stressed for its whole length, and that the radius of gyration of a section similar to *b*, Fig. 12, is about .25b.

In bridge work when beams frame into the girder some distance below its top, it is common practice to brace the top flange with knee braces setting on top of the top flanges of the beams and extending up against and fastening to the top flange of the girder. This is not usually feasible in building work, as the knee brace might project out into the room and be in the way. Otherwise it is good design.

The flange angles may be either equal or unequal leg sections. When the unequal leg type is used, it is best to have the long legs horizontal if sufficient room exists in the short leg to get in enough rivets. When the horizontal leg has but one gauge line and the vertical leg has two, it is best not to have more area in the flange plates than in the flange angles; otherwise trouble may be found in getting the rivets through the flange plates. Some specifications require this and provide that the center of gravity of the flange shall not be above the back of the top flange angles. The same care must be taken not to get rivets with too great a grip as is taken in the design of columns. The bottom angles and plates, being in tension, are designed for their net section; that is, with the area of the holes deducted, and it is usually required that the gross area of the top flange shall not be less than the gross area of the bottom flange.

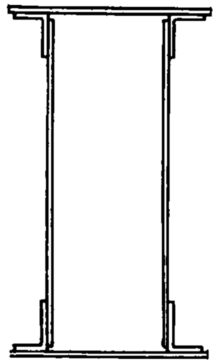


Fig. 13

Fig. 10 shows a plate girder carrying a column and bearing on a column where the webs of the column are parallel to the web of the girder. If the webs of the columns were at right angles to the web of the girder, it would be better to use two girders. Each could be narrow and have its web under a flange of the column. At times it is better to use two girders to avoid the excess depth of a single girder in the building.

No fixed rule can be made for the depth of plate girders in buildings, but in general a depth equal to about 1/10 of the span will work out most satisfactorily. A depth of less than 3 feet is awkward to design, although it can be made down to 2 feet. Special cases require a wide divergence from this rule; in fact, the author has just designed a plate girder for an alteration where the depth was about ½ of the span. This was an extreme condition.

Some engineers, in designing the rivet pitch in the flanges, use the effective depth (that is the depth from center of gravity to center of gravity of flanges), while others use from center to center of rivets. When the plate girder is deep the percentage difference between these two methods is small, but when the girder is shallow it increases and it is best in shallow girders to design both the rivet pitch and the section from the moment of inertia, being careful to deduct for rivet holes in the bottom flange.

A few years ago it was common practice, especially for carrying a wall, to use what was known as a box girder. Such a girder is shown in Fig. 13. It had the advantage of a broad flange, which was good in compression, as was explained in the first article of this series. Care had to be taken, even here, that the plate between the two webs was not too broad for its thickness. Due to the width of flange a wall could readily be built upon it. The chief trouble was that the flange rivets were in single shear, and the designer often forgot to see if it were possible to get in his rivets until the oversight was discovered by the detailer. To avoid this difficulty, it would appear that two girders side by side are much better, and their flanges can be braced together if necessary, so that they will work together to resist buckling.

For very heavy work, more complicated flange sections may be designed. Sometimes they each resemble an I section or a plate and angle column. Another scheme is to use a channel for the flange, with the web flat and the flanges of the top channel turned down. This channel may be replaced by a plate and two angles. These types are especially common in factories to carry a crane girder where lateral stiffness is required to resist the side shock from the moving girder.

The rivets through the intermediate stiffeners need not be very close together. There is no way of figuring this pitch, but 6-inch is frequently used. Some shops prefer to use a pitch such that the rivets will line up with some rivet in the main stiffeners, such as skipping every other one in the intermediate stiffeners.

Column Bases

Column bases are made of either steel or cast iron. For very small struts and columns the bases are made of steel, riveted to the columns. For larger columns the bases are usually separate and made of cast iron. For still larger columns, the bases are made separately and are of cast steel.

In Figs. 14, 15 and 16 are shown the first kind of base. Fig. 14 is for a single-angle strut. A plate is placed under it and the parts are usually held together by a single angle. Another small angle could be placed on the inside of the other leg of the strut. In all cases the bottoms of the struts or columns should be carefully planed to smooth surfaces and care taken that these surfaces be accurately at right angles to the axes of the columns. In Fig. 15 is shown a base for a double-angle strut. Two other small angles could be used to connect the base plate to the strut if desired, these being placed inside the other legs of the angles. Fig. 16 shows a similar base for a small plate and angle column.

In all cases the rivets passing through the base plates should be countersunk on the bottoms. The figure shows these rivets with the conventional sign of a circle with a cross inside, meaning countersunk on the far side. It is usually best to use a ¾-inch plate for the base plate. In Figs. 15 and 14 the connection angles could be ⅜ inch thick, but in Fig. 16 it would be better to make them ½ inch.

When the base extends more than 4 or 5 inches beyond the edge of the column it is best to make a cast iron base, but some engineers prefer to use a built-up steel base similar to those already described. Fig. 18 shows such a cast iron base, and Fig. 17 a steel base for the same column. If the steel type be used, stiffener angles must be provided on the column. These must contain enough

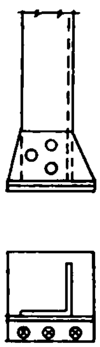


Fig. 14

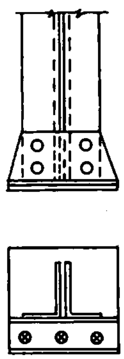


Fig. 15

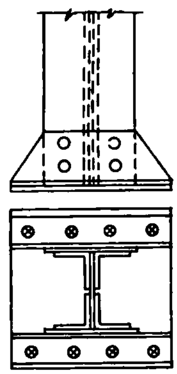


Fig. 16

rivets to develop the portion of the base plate beyond the edge of the column. They must also bear firmly against the base angle and be provided with filler plates between them and the large plate known as the gusset plate. The small angles fastened to the base are simply to stiffen the base plate and prevent it from bending between the gussets. The base plate can be $\frac{3}{4}$ inch thick, and the base angles $\frac{1}{2}$ inch for the long ones and $\frac{3}{8}$ inch for the small ones. The stiffener angles and gussets should be $\frac{1}{2}$ inch thick. The filler plate should be the same thickness as the large base angles.

Sometimes even larger and more elaborate bases than this are made in steel. They are often made long and narrow, making the gussets longer. When the gussets become very large they should have angles riveted on the incline, along their sloping edges, to keep these edges from buckling. The cast iron base shown in Fig. 18 is designed for the same column, and is evidently more simple. The three ribs under the column metal should be made at least as thick as the metal above them. The other ribs should be designed by computing the bending and shear, and designing them the same as a beam for their moment inertia and area in ribs.

It is not advisable to use metal of less than 1 inch nor more than 4 inches. Even 3 inches is as thick as some designers care to go. Where the metal is of varying thickness, cracks are likely to develop in the cooling of the material. Care should be taken in designing to avoid this condition, which is especially likely to occur where the ribs meet each other at the corners of the top plates.

The top plate is usually made a minimum of 1 inch in thickness, with large openings in the middle between the ribs to make it possible for the cores to be removed after the metal has hardened. The top plate should be planed on top to provide an accurate bearing for the column. Care should be taken that this planed surface be exactly level. After the base is made, the four holes in the top should be drilled to allow bolts to pass through, fastening the connection angles on the column firmly to the base. These should be $\frac{13}{16}$ inch in diameter for a $\frac{3}{4}$-inch bolt. They should be drilled, and not cored, to insure accuracy.

The two ribs parallel to the web of the column can usually be made 1 inch unless more material be required for shear or bending. The corner ribs are usually from $\frac{1}{4}$ inch to $\frac{1}{2}$ inch thicker than the others, as they are longer. In the bottom plate are placed grout holes, usually 2 inches in diameter, to allow the grout to flow freely under the base when it is placed in position. These holes may be cored

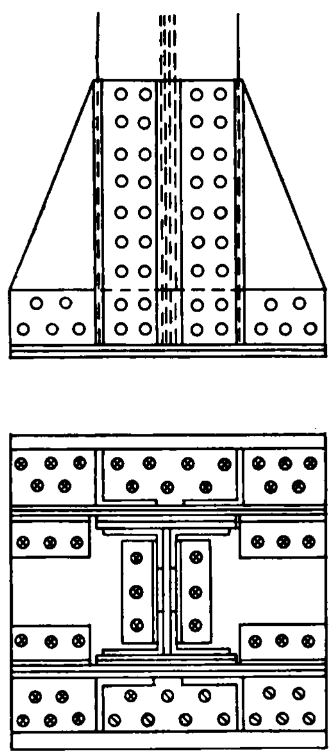


Fig. 17

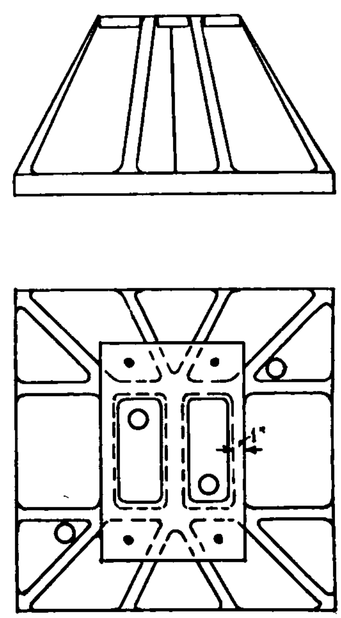


Fig. 18

and they should be so placed that no two will be on the same line parallel to either axis of the base. These should also be placed so as to be as effective as possible in distributing the grout.

When a cast base is placed in position in the building on concrete, it is leveled up by small steel wedges under the edges of the base. Around the top layer of concrete is built a small wooden form and in this the grout in a very fine mixture is poured and allowed to flow under the base until it appears in all of the grout holes and it is certain that the space under the base is entirely filled.

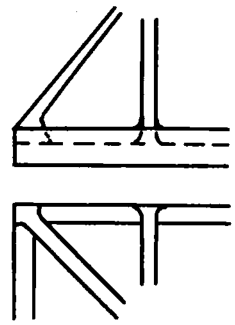


Fig. 19

When the base cools in process of manufacture it sometimes happens that the lower plate warps, forming a curved surface. If this is too marked the base should be rejected. When the ribs meet, or a rib meets the top or bottom plate, there is a slight curve in the material called the fillet. These are usually called for to be ½ inch in radius. They strengthen the base and aid in its manufacture. When the material of the base gets too thick, or is not sufficiently strong to resist local bending between the ribs, a small border may be placed around the outside as shown in Fig. 19. This is usually not over 2 inches in either dimension.

Other styles of cast iron bases are made by various designers, but that shown here is preferred by the author. In one form the top plate is made solid except for the bolt holes, and round holes are provided in the side ribs for extracting the core. In another form the middle ribs form a circle with one across it to carry the web of the column. In such a base the metal of the column does not bear accurately over the ribs below, causing bending in the top plate. It has the advantage of avoiding thick places in the ribs where they meet, as the ribs radiate from the circular rib.

When the column load is large and the metal in the base would be too great to use advantageously in cast iron, it is best to substitute cast steel. This makes a much lighter base, as cast iron in tension is only good for 3,000 # or 3,500 # per square inch while cast steel, like structural steel, is good for 16,000 # per square inch. For buildings not over 11 or 12 stories high, cast iron is usually satisfactory, but for larger buildings cast steel is preferable. When the base rests on grillage beams the bases are considerably smaller than when they rest on concrete, due to the difference in the allowable bearing, and care should be taken, particularly in regard to the shear and direct compression.

In office buildings and similar structures it is not usual to anchor the columns down to the foundations, excepting in buildings where the force of the wind might be an important factor or an uplift be possible, such as at the anchor ends of theater cantilevers. In factories, where the structures would be subjected to shock or vibration, it is common practice to anchor the column bases down to the foundations by means of rods. To make sure that these rods are accurately placed to fit the structural material above, a thin plate is used on top of the concrete in placing the rods in the green concrete to act as templates. These are known as sole plates.

These anchor rods extend down into the concrete to obtain an anchorage sufficient to develop the stress to which they may be subjected. When the concrete footing is sufficiently deep this may be effected simply by the bond of the concrete to the rod. When this depth is not great enough it is necessary to anchor them in some way. A simple right-angle bend has no value as an anchor. It simply adds to the length of the rod to resist slipping by bond resistance. All recognized authorities are agreed on this subject although some contractors argue otherwise.

The full strength of the rod may be developed however by a hook formed by bending the rod around another rod until it is bent around double or an angle of 180°. Some contractors will object to doing this, saying that they have no means of doing it. It is usually an excuse to avoid the discovery of defective material. Rods are often made of an inferior grade of material such as wrought iron or soft steel and if they were bent around double they might fracture. One of the tests required in good specifications for structural steel is that it should be possible to bend a rod double without sign of fracture. When these hooks are made, sufficient concrete should cover them to prevent their straightening out. Another way of developing the rods, is to place plates on the bottom of the rods with nuts under them. The concrete footing might be of such shape that even with such anchorage a piece of the footing could be lifted out by shearing the concrete or the bearing of the plate against the concrete might not be sufficient. This bearing is limited sometimes by the possible thickness of the plate due to its strength in bending. To overcome this the plates might be replaced by channels placed with the webs flat to provide surface for bearing while the upturned flanges resist bending. Angles could be used and a similar endless number of designs as the case might require, as in Fig. 20.

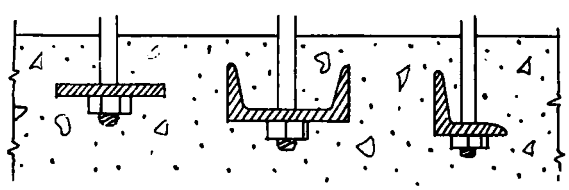


Fig. 20

A New Brick Wall

THE Common Brick Manufacturers' Association has developed a new type of brick wall which it is expected will greatly affect residence construction in America, because the use of this wall, it is claimed, will bring masonry construction down to the level, in cost, of frame construction. The principle of its construction consists of laying all or part of the bricks on their edges instead of flat, and leaving a hollow space between which is bridged at intervals, depending upon the weight on the wall, by headers that bond the two portions of the wall together.

During the recent national conference of the Building Officials of the United States, held at Cleveland, a practical test of the new "Ideal" wall was made. Building commissioners representing cities all the way from Boston to Portland, Ore. witnessed this test and the Ideal wall was the subject of active discussion during the conference.

The accompanying illustration shows how this new method of laying brick was tested, both as to its compression strength and its lateral strength. Two parallel 8-inch walls were erected, 12 feet apart. Each wall was 9 feet high by 12 feet long, with a short perpendicular wall at each end. On top of the walls was placed a floor, and about this was built a wall 4 feet high of the 12-inch Ideal type. The enclosure was then loaded with sand to overflowing. The age of the wall, at the time of loading, was nine days.

Structural Test, Showing Variety of Bonds

In the supporting walls there were four types of Ideal construction. One-half of one wall was 8-inch all-rowlock, with alternate headers and stretchers. The other half of the same wall omitted 50 per cent of the through headers, using bats to replace them. The other wall was one-half rowlock backing, headers every third course and the other half rowlock backing, headers every sixth course. The mortar was 1:1:6, and ordinary run of kiln common brick were used.

The weight of the load upon the base of the wall was 82 tons, which the engineers estimated to demonstrate a factor of safety of 3 over a normal residence load. The walls showed not the slightest indication of stress, and according to V. D. Allen, former Building Commissioner of Cleveland, who planned the test, they could have carried four or five times this load with safety.

The parapet wall upon the top was made 12-inch all-rowlock, which is recommended for foundation construction, and this was subjected to a severe test by the pressure of the tons of sand on the inside of the wall. There were no bracing or supporting rods of any kind, the wall itself bearing the load without defect. The test was conducted by the Common Brick Manufacturers' Association of America.

A number of cities have already accepted this type of wall in their codes for residence construction, and following the engineering tests and fire tests of the wall now being made by the United States Bureau of Standards at both the Washington and Pittsburgh laboratories, more cities are expected to approve it.

In comparison with the solid brick wall, it saves one-third the brick, one-half the mortar, one-fourth the labor, and removes the necessity for furring and lathing, since it is claimed that the wall is absolutely dry when plastered directly on the brick. The lack of necessity for furring is explained by the fact that moisture can be conducted through a brick wall by one route only,—through the mortar joint. There is no danger, even in districts with a heavy rainfall, in moisture being conducted the full length of a header by capillary attraction. The Ideal wall provides a positive break in the mortar joint and eliminates the penetration of moisture from this cause. The 8-inch wall of this type has one such break and the 12-inch wall has two breaks in the mortar joint. In the 12-inch wall there is no material in continuous contact from front to back of the wall. The cavity also aids in keeping the wall dry, by the slight but continuous flow of air within it.

MINOR ARCHITECTURE
EXEMPLIFIED IN MODERATE COST BUILDINGS

Some Post-War Housing Developments in New England

THE HOUSING COMPANY, ARCHITECTS

By TYLER STEWART ROGERS

INDUSTRIAL housing and the housing shortage are inseparably linked together in the economic problems of the day. The housing shortage is due to well defined but not easily remedied causes.* It is increasing in importance daily, with little activity yet showing above the horizon to alleviate the relatively acute conditions. Many methods for attacking the problem have been suggested, ranging from tax-exemption schemes to a direct copy of the fatal British government subsidy plan. But after all, though it may seem trite to say so, the only real solution to the problem is the actual construction of houses, and he who builds even one home has accomplished more of real value than the hundreds who talk, criticise and argue over the situation.

The individual family is not yet in dire need, speaking broadly, for no place is yet so congested that people must be housed in tents or other temporary shelters. By the process of readjustment and the use of smaller quarters for each family, we have been able, like sitting on the lid of a full vacation trunk, to get everyone in somehow. How long this packing and rearrangement can go on is hard to determine, but there is a limit to everything.

Many manufacturers have a graver problem on their hands than has the individual, for their interests cannot stop with finding homes for themselves; they must find homes for many of their workers, or else do without their services. The situation has recently changed from the earlier condition, where good workmen's homes were considered a sound investment because they attracted more contented and efficient employes (*i.e.*, a matter of plant efficiency), to the present condition where homes are often essential in order to have employes to operate the plants; in other words, it has become a matter of plant equipment.

This condition varies widely in different centers and in different parts of the country. In the South it has always been a matter of plant equipment, and the only question was how good shall (or must) the houses be to obtain the proper class of employes. This is due to the fact that most Southern manufacturing plants are located in unsettled districts, and from the start have been forced to build industrial villages near the sites of the factories.

In the North the conditions vary, from a reasonable supply of labor, when the industry is located near large labor centers, to a situation similar to that of the Southern mills when the industry is

View from the North. Housing Development at Newmarket, N. H.

First and Second Floor Plans of Four-Family House

First and Second Floor Plans
Two-Family House, Newmarket, N. H.

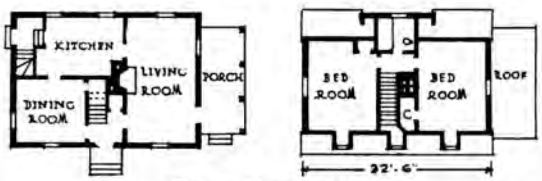
located in a small village some distance from the major labor sources. Many New England mills have reached the point where their continued growth is limited absolutely by the housing accommodations of their communities. With little hope of speculative building or the erection of homes by the workers to increase the capacity of their labor centers, these mills have come to the point where plant expansion involves the construction of homes, either directly as a part of the plant equipment, or indirectly by subsidizing other agencies.

This situation, though apparently favoring the city manufacturer, has certain compensations for the village plant. They are the oft-quoted arguments in favor of decentralization, backed up by the favorable experiences of thousands of industries which have moved out into "satellite" communities. There is the increased stability of labor, reducing the waste of excessive turnover; there is the possibility of selecting better types of workers, due to the natural action of the more intelligent people in leaving city congestion for the more healthful suburban locations, and there is plant loyalty, fostered in many places by some form of industrial democracy or shop representation. Then there are such factors as lower land values, resulting in lower overhead, lower living costs resulting in lower wages (without financial detriment to the workers), the possibility of unlimited expansion and the like, all favoring the out of town industry.

The forces which brought about present conditions were observable even before the war, as may be shown by numerous discussions of the subject in architectural and other journals prior to 1917 by housing and town planning experts. The situation was brought to a head during and after the war, so that well informed persons could foresee approximately the results we are now experiencing. Perhaps not many of them expected the extreme delay in reviving the construction industry which has

Plot Plan of Project, Showing Completed Houses

Six Houses of Varying Plans for Skilled Mechanics at Nashua, N. H.



Plans of House at Right

actually occurred, for we were too optimistic to anticipate the present depression.

Nevertheless, the observant ones were relatively few, and those who profited by their observations to take foresighted action were rare. Scattered here and there over the country are housing developments built by industries since the close of the war which attest the progressiveness and forcefulness of the few who saw and acted. These industries anticipated the coming crisis, and solved the problem in the only logical way—by actually building homes. Others, procrastinating, are today where they were three years ago Though some may say that those who built during the last few years did so at peak costs, the answer is easily found. It must be assumed that housing was needed for the industries to such an extent that even a loss in capital from a real estate point of view would be offset by gains to the industries in other ways. Granted that, then these plants have gained what they sought and have enjoyed its advantages, while their competitors have remained with the same problems, multiplied daily, on their hands. The present depression may give the tardy ones a little respite, but when activity commences the superior position of the plants with adequate housing facilities will testify to the correctness of their judgment.

Such was the position of the majority of the clients whom the Housing Company has served since 1919. The accompanying illustrations and descriptive matter show clearly the manner and character of industrial housing carried out by this firm for New England industries since the close of the war. In discussing the particular projects selected it is not the intention to convey an impression that they are the major developments in New England during this period, or even that they are representative of the most common type of workers' homes. Rather, on the contrary, these projects were selected on account of some distinction in the character of the houses, or by reason of the nature of the problem facing the architects.

There is one characteristic common to all of the developments illustrated, in fact common to all of the work so far done by this firm in New England, and that is the recognition of native architectural precedents. The truly indigenous architecture of this section reflects the puritanical spirit of its settlers, showing, except in the more polished and graceful works of Georgian character, a simplicity, restraint, and even a certain severity of feeling which distinguishes it from the colonial architecture of the Middle and Southern sections. Some people speak of this style as the New England farmhouse type to distinguish it from the more popular style of the larger town houses. Perhaps it would be better to call it the New England small house or cottage type.

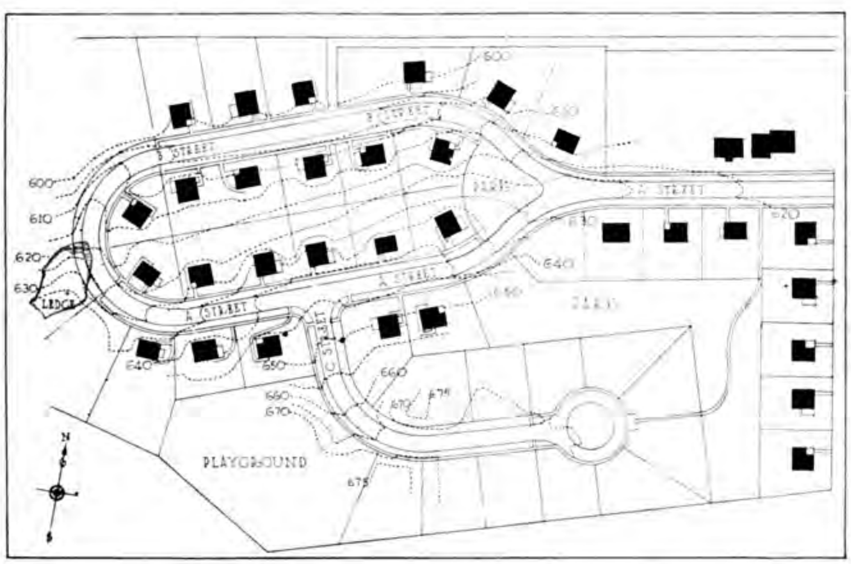
Native architecture naturally reflects the climatic character of a region. New England builders have for generations fortified their dwellings against cold, snowy winters and damp, easterly winds by small windows, vestibuled entrances, enclosed cornices and the like. This sort of adaptation to environment is another quality inherent in the work of the Housing Company. Their clients were also influenced in favor of this style of treatment because its characteristics spell economy, and economy was of prime importance in every case, in order to offset inflated building costs.

Taking them in the order of their sizes, the largest of the projects illustrated is that for the Newmarket Manufacturing Company at Newmarket, N. H. Twenty-two double or group houses for 50 families were constructed to provide dwellings for opera-

View of Development at West Fitchburg, with Floor Plans of House in Foreground

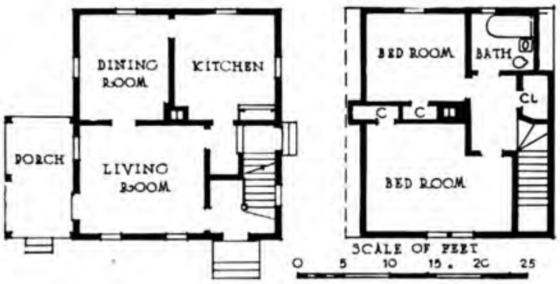
tives, as well as for overseers and foremen. Grouping the families together was done partly for economy in land and construction cost, partly for the reduction in costs of essential utilities, such as roads, water supply, and sewerage systems, and partly because the houses were to be rented instead of sold to the operatives. Opportunity was thus created for the use of structural units of fairly large sizes, which has resulted in a project distinctive for the solidity and dignity of its buildings and for the impressiveness of the ensemble.

The various types of buildings are built up from relatively few similar units of one and a half and two stories in height. The use of two different story heights has made possible a variation in roof lines, and a diversity of appearance that would not have been possible otherwise. For the most part the buildings are symmetrical in external appearance but occasionally two or more unsymmetrical units have been placed together to build up a street group of good proportions. In general appearance the buildings are characterized by small, well placed windows, adequate and appropriate dormers, and glass enclosed porches. The construction is of brick with asphalt shingle roofs, concrete foundations and lintels, and wood trim painted white. The floors are of rift yellow pine, the inside walls and ceilings of plaster on wood lath, and the interior finish is of N. C. pine. In equipment, all of the tenements are complete in every respect. The kitchens contain ample food cabinets, wash trays, sinks and hot water boilers. The bathrooms have the usual fittings. Hot air one-pipe furnaces and electric lights are provided for throughout.

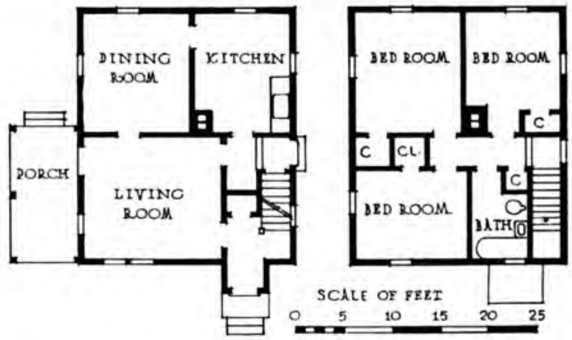


Plot Plan of Housing Development at West Fitchburg, Mass.

The project involved the layout of the tract of land, the development of new streets and the provision of a complete sewerage system with a disposal plant. A community garage, one of three planned for, was built in the center of a large block. Although



Example of Five-Room House Plan



Floor Plans of House Below at Left

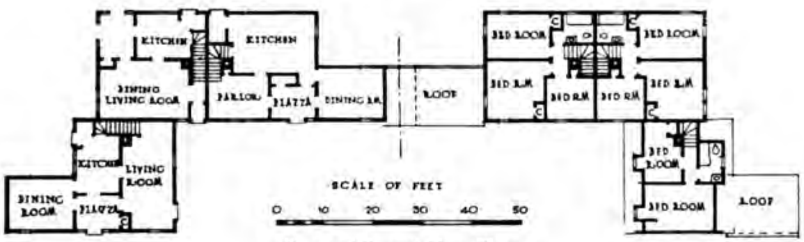
no planting was done when the photographs were made, and the houses and streets look rather bare and unadorned, it is easy to visualize the stately character of the tract which will obtain a generation hence with the fine houses covered with vines and shaded by elms and maples. Newmarket bids fair to take an important place in the history of private industrial housing developments, for few projects have been built with such regard for permanence, quality and character.

At West Fitchburg, Mass., is another relatively large housing project of quite a different type. It was designed and built for the Homestead Association, Inc., a subsidiary of the American Woolen Company, to house employes of the Beoli Mills in that town. The two outstanding features of this community, which comprises some 30 houses, are the consistent use of single dwellings of wooden construction, and the topography of the site.

The houses, though of similar character, are of five different types and contain four, five or six rooms each. Both one and one-half and two-story arrangements are used. Outside open porches or open corner porches give wide outlooks from the hill on which the dwellings are built. Rear yards

Houses at Foot of A Street. Development at West Fitchburg, Mass.

Model of Six-Family Group House at Crompton, R. I.



First and Second Floor Plans

are screened off by means of lattice fences which also function to tie the houses one to another, and to lend a continuity of feeling to the development which might otherwise be jeopardized or destroyed by the nature of the site. Each house has complete bathroom and kitchen equipment, a one-pipe heater, and each is wired for electricity. Gas is supplied for cooking. The buildings are of frame with clapboard siding, asphalt shingle roofs, interior walls and ceilings of plaster board, floors of fir, yellow pine or maple, and finish of yellow pine.

The site presented unusual difficulties owing to its position on the north side of a hill, having an average slope of 20 per cent. The houses are arranged around a loop which is elongated to parallel the contours as much as possible. The loop is joined to a main road which leads directly up the hill by a single road which forms the stem to the loop, making a "tennis racquet" on the plan. The maximum difference in elevation across the improved area is 78 feet, with an average difference from the upper row of house lots to the lower row (there are four rows in all) of 60 feet.

The Crompton Company at Crompton, R. I., built two double houses and a six-family group dwelling for some of its employes. These buildings were built of frame with stucco on wire lath walls, and slate roofs. They possess unusually good character, due to their simplicity and excellent proportions, the interesting relations and balance of masses in the group dwelling, and the texture of the expansive plaster walls.

The double houses depart somewhat from the New England type already referred to, and suggest contemporary English influence. The group house, however, hints strongly of our native rambling farmhouses, which have several units of diminishing sizes appended to the main houses in the form of "wings" or "ells." The group house is really a pair of three-family dwellings joined together by an arched opening spanning a service alley. It is interesting to note the similarity between a model made of the group before its construction and the actual building itself, and the faithfulness with which the model conveys a true impression of the finished product. The actual building loses some of its charm because of the badly placed fence posts and the lack of planting in the front yards.

At Nashua, N. H., is another small group of new homes erected to house the overseers and better class operatives of an industry. The Nashua Gummed and Coated Paper Company built six single brick cottages, all of different plan, but all having common characteristics which tie the group together harmoniously. These buildings were very thoroughly constructed, having brick walls, asphalt shingled roofs, plaster walls and ceilings, fir floors and N. C. pine finish, copper screens and complete equipment in the bathrooms and kitchens. Both electricity and gas are available. Hot air furnaces are used in all the houses.

The manufacturers who have thus checkmated the housing shortage by vigorous, constructive action have added to their business many assets that do not show directly on their books, for they have invariably built well and have provided, in spite of high costs, homes that raise the standard of living for their workmen to a plane commensurate with the present-day realization of labor's vital part in the world's work. Thus these manufacturers are winning the good will of labor, they are serving the interests of their communities and the country at large, and they have set an example of constructive optimism which cannot fail to help capital out of its present depression.

It is a particularly notable fact that every project which the Housing Company has undertaken, whether in the South or the North, has included modern bathroom and kitchen equipment and sewer connections.

SIX-FAMILY HOUSE GROUP

TWO-FAMILY HOUSE

HOUSING DEVELOPMENT AT CROMPTON, R. I.

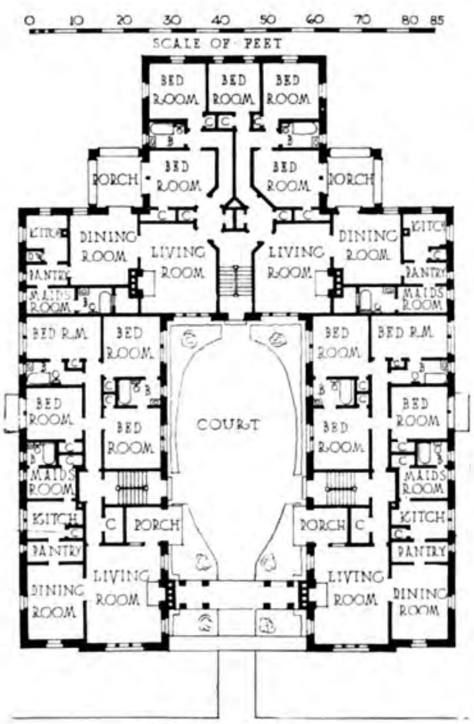
THE HOUSING COMPANY, ARCHITECTS

TWO VIEWS OF GROUP HOUSES

HOUSING DEVELOPMENT AT NEWMARKET, N. H.

THE HOUSING COMPANY, ARCHITECTS

GENERAL VIEW



TYPICAL FLOOR PLAN

COURT VIEW

PONDFIELD COURT APARTMENTS, BRONXVILLE, N. Y

HARRY LESLIE WALKER, ARCHITECT

GENERAL VIEW
HOUSE AT NEW ROCHELLE, N. Y.
C. A. PATTERSON, ARCHITECT

DECORATION & FURNITURE

Jeanne Taylor, *Associate Editors*, Leland W. Lyon, R.A.

Authentic Precedent in Colonial Interiors

IN the architectural development in moderate cost dwelling designs throughout the country there is noted a decidedly quickening interest in the early American colonial types. The result is that many of the new houses throughout the West, and as far South as Texas, are modeled upon the early houses of the English or Dutch colonists.

Architects show a steadily increasing interest in developing their work to include advice as to the furniture and decorations to be used. It is but natural, therefore, that the growing influence of the colonial types of furnishing should interest the architect, since they apply to the problems of interior decoration as well as to those of domestic architecture.

We have been fortunate in obtaining some excellent photographs of authentic English colonial furniture of an early American period. Some years ago an enthusiastic collector of colonial furniture, George T. Ives, of Danbury, Conn., removed from the Old Post Road at Brookfield, Conn., to another point on the same road in Danbury, an old building constructed in the seventeenth century as a tavern to serve the stage coach route which was operated on the Old Post Road between New York and Hartford, via Litchfield and Farmington. This building was carefully taken down and rebuilt in its new location. It has since been used by Mr. Ives as a home, and it provides a logical setting for an unusually interesting collection of colonial furniture; in fact the interiors of the old tavern are practically unchanged. Naturally, this collection of furniture and decorations, representing the result of a lifetime of interest and effort on the part of an enthusiastic collector, offers many instructive suggestions and serves almost as a textbook illustrating authentic types of early American furniture.

The active interest in colonial furniture, which for many years has been in evidence in the Eastern section of this country, has naturally led to the adaptation of various types for commercial reproduction. It is found, however, that in many instances the real colonial precedent has been almost lost sight of, and that in the course of such commercial production graceful lines and contours have often been much changed to meet the demands of the processes of manufacture or to cater to the supposed taste of purchasers. Among architects the interest in colonial furniture is general, but opportunities for examining authentic pieces are comparatively

Entrance Hall Looking into Tap Room (Fig. 1)

A Corner of the Dining Room (Fig. 5)

few, particularly in the West and South. It may be helpful, therefore, to illustrate a number of types of such furniture and decorations, and to give brief descriptions of the rooms with a classification of their furniture, since in this way a document of definite reference value may be added to the architect's collection of data on furniture and decoration.

Fig. 1 is a view of the main entrance to the tavern, looking into the tap room. Of particular interest is the iron hardware on the large entrance door, and the door itself, with its panels flush with the rails and stiles. Turning into the tap room, Fig. 2 (illustrated in the following plates) shows the interesting furnishing and equipment of the bar room of early American days. Studying the illustration from left to right several pieces of particular interest include a large wing rocker which, it may be noted, belonged to General Putnam. The settle is of paneled pine, aged to a soft brown. The mantel and the door at the left of the illustration are, of course, of a later date, though it may be noted that the simple, graceful paneling of the door is of particular interest as a study in proportion. The walls and ceiling of this room are painted a soft old rose color. Woodwork is of white pine throughout, and the floors are of natural gray oak.

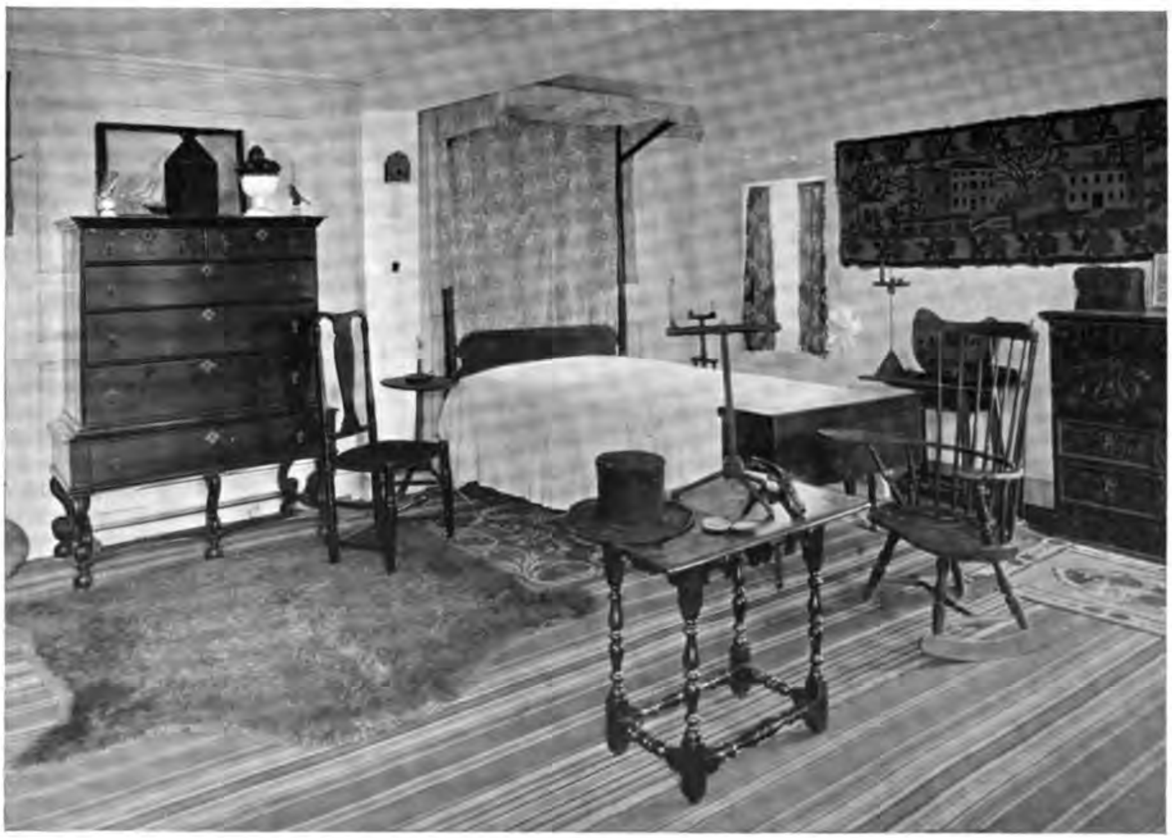
Dining Room Looking toward Bedroom (Fig. 4)

Parlor with Entrance Doorway (Fig. 6)

The rugs used in this room are of the braided rag and hooked types. It is interesting to note the complete bar equipment of the old days, as shown in the cupboards to the right of the fireplace. Numerous graceful fixtures for candle lights are to be noticed.

Another view of this same room, Fig. 3, (on a following plate) shows a "Carver" chair, an "Elder Brewster" chair, a butterfly table, and a comb-back Windsor chair with a writing-arm. The tall clock is an excellent piece of cabinet work, executed with the simple lines of the period and it brings out the full-grain effects of curly maple. Throughout these interiors the painted window shades may be noted, each carrying an outdoor scene, accentuated as the daylight passes through the shade.

Figs. 4 and 5 show different views of the dining room. This room has the same gray oak floor with accentuated grain, due to the wearing process of years of cleaning. The walls are of white pine paneling, and here they are painted a pumpkin yellow, with simple white curtains at the windows. To the left of Fig. 4 will be noted a curly maple spread-leg table. Next to this is a pine cellarette, while in the corner is to be noted a gate-leg table especially designed to fit in a corner. The large



Room Known as Ladies' Parlor (Fig. 7)

table is also of the gate-leg type, and the chairs are comb-back Windsors. The sideboard is of particular interest. It is built of pine, showing the natural grain and having a small amount of painted ornamentation. The lines of this sideboard are particularly graceful, suggesting a later English period.

Other illustrations, Figs. 6 and 7, are views of the ladies' parlor. It will be noted that this parlor has a private front entrance. In Fig. 6 there is shown an unusually fine example of a fireside chair. It will be seen that the wings of this chair are of carved curly maple, a very unusual and attractive feature. The clock shown in this illustration is known as a grandmother's clock. Usually we hear of the grandfather's clock, but the grandmother's clock is of a smaller type and not quite as imposing as the usual grandfather's clock. The chest of drawers is of pine wood, with scalloped base and attractive fittings. In the other view of this room, Fig. 7, there will be noted a chest of drawers resting on legs and stretchers and known as a high boy. The type of bed shown is known as a "slaw bed." This is probably the forerunner of the ubiquitous door bed, as it is designed to fold up, and the canopy curtain is pulled out to conceal it. These beds were often used in the old taverns, and were held in reserve for unexpected or extra guests. At the foot of the bed will be noted a chest which was used for the storage of blankets. Here again the writing-arm, comb-back Windsor chair with back braces is in evidence, this example being of the rocker type. On the wall will be noted an unusually fine old hooked rug. The chest of drawers is of decorated pine. Here the floors are completely covered with carpet, and the hangings are of flowered fabric in subdued colors.

A glimpse into the old ballroom, Fig. 8, shows extreme simplicity of furnishing. In the corner may be noted a pile of hand painted bandboxes, much used in this period, and in attractive, brilliant colors. Here again, the painted window shades are in evidence. Over the pine settle hangs the old tavern sign, showing the coat of arms of Connecticut. The arm chair in the background is one originally made for George Washington. Next to this is an interesting Windsor settle with fingered arms. To the right of the settle may be noted a banister back arm chair, and in the right foreground of the picture is a small settle of the type known in the colonies as a "wagon seat."

Illustrations such as these are useful in showing the kinds of furnishings which are appropriate for use in an interior of the early English colonial type. Many of the pieces of furniture, and some of the accessories, may be had in excellent reproductions, and rugs of both the braided and hooked varieties are now being made again and may be had in any desired colors and of almost any size. Many architects have found that clients are readily interested in acquiring suitable furnishings, and that with even a few suggestions pointing out the desirability of furnishing with consistency, an interest has been awakened which often leads to surprising results.

The Old Ballroom (Fig. 8)

BUSINESS & FINANCE

C. Stanley Taylor, *Associate Editor*

Developing the Constructive Force of the Architectural Profession

OUT of all the editorial comment which has been made on the subject of advertising by architects, and publicity which would tend to place the profession more favorably before the public, there apparently have been no practical suggestions acceptable generally to architects. It may be well at this point, therefore, to restate certain facts and conditions which on several occasions have been brought before the profession, regarding the changing conditions under which the architect is operating today.

It is now evident to all within the profession that architecture must receive serious consideration as a business, as well as a profession. The need for a broader public understanding of the responsibilities and activities of the architect is evident. To those who understand the diversified character of the architect's work, and of the demands which are made upon him, there is no need of justifying his logical position in the economic structure. Unfortunately, however, here is but one phase of the activity of an architect's office which ever comes to the attention of the public—the artistic phase, as evidenced in the design of buildings of every type, which may compel attention because of their interesting character. The work of the architect in connection with the development of a building project passes without recognition. The detailed efforts of preparing working drawings and specifications, which make possible the construction of a building according to the demands of economy and practical utility, pass for very little from the public viewpoint. As the building is being erected it is the building contrac or who receives publicity.

One reason for the existence of this condition (with due regard to such associated effort as may have been made in the past by architectural organizations), is that there has been little constructive effort made locally by architects, individually or in groups. As a body in each community, architects have not functioned conspicuously on local problems, except in a few striking instances. Recently the writer had the opportunity of observing rather closely some of the work which had been done in Chicago by the Illinois Chapter of the American Institute of Architects and by the Illinois Society of Architects. This has been particularly in reference to suggested changes in the building code of Chicago. The actual details of such activity and the results which may be forthcoming are not of particular importance to this discussion. *A distinct impression left by our observation, however, has been that possibly through such constructive effort there at last opens up a channel through which the architectural profession may come definitely before the public in matters of public service.*

If we may digress for a moment, it is advisable to again point out the fact that the architect is constantly thinking and working in terms of one of the most important economic elements affecting the daily life of every person. This is the element of *shelter* as represented by buildings of every nature. Homes constitute the most important single factor in social life and intercourse. Today the housing problem is so acute that the attention of everyone is directed to this question, and the daily press, as never before, gives consideration to home building because it is actively in the public interest. Buildings are the most important tools of industry, for without them we should have no production and no commerce.

Digressing still further, we may now call attention to the lack of uniformity in building codes in various cities and towns throughout this country, and to the fact that the average code contains restrictions as to types of building materials and limitations as to construction practice which have a directly detrimental effect on the cost of building construction. This is because in many instances such codes entail the use of unnecessary quantities of material and an over-demand of structural precautions, and also because through the barring out of materials which have been developed to a point of sound utility, competition is decreased.

Having in mind the facts already outlined, it has occurred to us that here may be an opportunity for bringing the architectural profession, in local units, before the public in no uncertain way, gaining thereby favorable and proper publicity for the profession as well as a wider recognition by other business interests which contribute to the industrial, commercial and civic development of every locality. The fact that architects can get together and wield direct influence toward the correction of unfavorable local building conditions and restrictions has already been shown in several instances, but the need for leadership in this activity is evident. We believe, therefore, that now is the time for architects, either through already organized bodies or through the formation of local organizat ons, to take their proper position in relation to public activities of various forms, and in actual leadership toward the correction of unfavorable conditions, opinions, laws and codes.

Practical Results Under Fixed-Fee Building Contracts

IN another article in this Department we have outlined the complete service rendered by one architectural organization. Naturally, there are but few organizations which are equipped to carry out complete building projects in this manner, but, as we have suggested in various articles in past issues of THE ARCHITECTURAL FORUM, a somewhat similar service may be developed by architects through co-operation with practical builders under the fixed-fee type of building contract.

As a result of the discussion on the subject of the cost-plus-fixed-fee contract, we have received from architects a number of letters covering various points involved in this relationship. One question, almost invariably asked, relates to the actual advantages to be gained by letting out a building project under this type of contract. While we have discussed the theoretical advantages before, we have found it interesting to investigate the actual experiences of several large firms of building contractors who work exclusively under this form of contractual relationship.

In discussing this matter with contractors who work on the fixed-fee contract basis, we have found no apparent attempt to bring in an element of "coloration" to support the cause of this type of contract. Naturally such firms are interested in working on this basis, but where they are properly organized to render service it is evident that a service which brings them closely in touch with the interests of architect and owner will have good results if the builder knows his business.

While discussing this subject we have been impressed primarily with the importance of selecting a builder on a competitive basis. At first thought it would seem that competitive bids could not be taken under the cost-plus-fixed-fee type of contract, but it was suggested by the builders themselves that competitive bids might be taken, if due attention were paid to these several points:

1. The business standing and experience of the contractor.
2. The amount of fee required as payment for carrying out the work.
3. Willingness of the contractor to include a penalty clause, which would reduce his fee in case of excess cost.
4. Amount of bonus on saving over estimated cost.
5. The estimated cost of the work, and methods by which this cost is determined.

While it is true that the contractor is assured of at least a portion of his fee, there is no reason to believe that a contractor who is carrying on his business in a sound manner would be so blind to his own interest as to become careless or inattentive to costs. Certainly if the contractor has carried out work to the satisfaction of other architects and owners on this basis, it is not likely that his work will be any less satisfactory in the future than in the past. It was found that the close co-ordination of the architect's and contractor's forces in designing, listing, purchasing, shipping and building was of direct value to the owner in saving duplication of effort. This type of contract works most favorably when the contract is awarded before working drawings and specifications are complete. This makes it possible to bring in the contractor and to allow him ample time to deal with sub-contractors.

In examining the results of the operation of the fixed-fee contract on two buildings—one large and one small—now under way, we have found that the spirit of the work is excellent. The owner, architect and contractor meet once or twice a week to discuss the progress of the operation and any required changes. The contractor, being assured of the work and not hurried by the necessity of meeting competitive bids for the general contract, is able to work directly with the architect and to incorporate in the requirements of plans and specifications any such changes as might be made desirable by market conditions. More time is given, in this manner, for sub-contractors to familiarize themselves with the requirements of the work, and a large part of the necessary material and equipment has been purchased while the plans were still under way. The architect, owner and contractor all work in direct co-operation to get the best possible figures on materials and sub-contracts. This involves good bargaining and good judgment, with full consideration of the owner's interests, which might not be possible under a lump-sum contract method.

Many types of building projects involve numerous changes after the contract has been let. Such changes are usually represented by "extras" under the lump-sum contract, but with the fixed-fee method it is possible to incorporate changes, sometimes at no cost to the owner, or at minimum cost of materials and labor. Where there are many changes on a building the contractor who is working on the lump-sum basis may legally and properly claim compensation for extras, which may run into large figures. When the builder's fee has been fixed in advance, however, any changes which are suggested by him, or which the architect or owner may decide to make, do not add to this fee.

The element of time saving is a particularly advantageous factor. On a fixed-fee basis the contractor may proceed immediately with the purchase of materials and the arrangement of sub-contracts and may go ahead with excavation, foundation, and other work possible without waiting for finished working drawings.

On the two contracts to which we have referred, it is claimed that approximately two months were saved in the time of delivery of the completed buildings. In one of these instances this saving of time meant that the rentable space was made available during the renting season, in time to create income on a heavy investment and to arrange advantageous leases.

After carefully studying the working of the fixed-fee contract, we feel that architects will do well to give this subject serious consideration. It is particularly important at this time that every possible means for cutting down the cost of construction should be developed, in order that additional building may be encouraged. Competitive building on a lump-sum basis does not always represent the lowest actual cost to the owner. The manner in which some architects and builders are cutting down building construction cost today involves:

1. A careful study of the most economical building materials and equipment, from the viewpoint of labor cost as well as the actual cost of materials.
2. In obtaining sub-contracts on the work the number of bidders is materially increased, in order that a wide range of selection may allow for closer bargaining.

It is evident that some architectural firms are so organized that they can undertake the economical arrangement of sub-contracts and material purchases. On the other hand, there are many architectural offices not equipped, by either knowledge or experience, to delve deeply into the subject of sub-contract figures and actual prices of materials in necessary quantities. Here the service of the contractor under the fixed-fee plan of operation will prove invaluable. This arrangement provides the necessary time to develop keen competition on the part of sub-contractors and to locate material supplies available for the work at the lowest costs which the market affords. The material markets today may be termed "spotty." Here and there will be found odd lots of material which the architect may have no means of knowing about, but of which the builder may be aware because of his more intimate relations with material dealers and transportation possibilities.

We believe that the greatest benefit offered by the fixed-fee type of contract is that the contractor's force really becomes the necessary skilled branch of the architect's service to the owner. Thus the need of self protection, which is necessary under a lump-sum contract, is eliminated as far as the building contractor is concerned. He can at once become an active and dependable partner of the architect, and join forces as an interested party in getting the best results under difficult conditions. Naturally, not every building contractor's organization is fitted for such work, nor can every organization be depended upon to render the necessary services under this form of contract, so it remains for the architect to recommend the services of only organizations bearing sound reputations for work performed under these conditions. It may be remembered also that a number of comparatively new contracting organizations have been developed to work on this basis. Here the personnel of the organization should be the deciding factor, and if it seems that such an organization is composed of individuals possessing broad experience in this type of work, the possibilities presented in employing such an organization should not be overlooked.

The first requirement, therefore, when an architect selects a building organization to work on this basis, should be that the builder has a reputation to protect or a record to make. If this is his greatest incentive, it means the introduction of what loaning institutions term a "moral risk"—an element which is every day coming to play a more important part in commercial transactions.

An Organization Which Renders a Complete Building Service

AT this time the architectural profession is giving serious consideration to various important details of organization development, such as service, publicity and advertising. We have, therefore, read with interest a booklet recently issued by the firm of Preston J. Bradshaw, Member A.I.A., St. Louis, entitled "Modern Architectural Practice," which contains a brief description of the organization, its scope and methods.

The opening paragraphs constitute a definition of service as it applies between the architect and his clients. Before actually commencing plans, the first element of service covers the economic phases of the problem, the various elements of this preliminary service being:

To thoroughly investigate and analyze a building problem.

To suggest the class and size of structure most appropriate for the particular site.

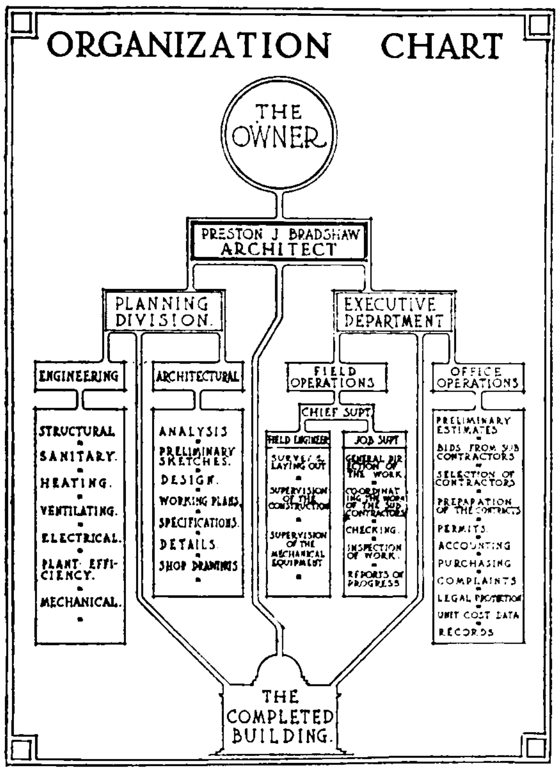
To survey neighboring buildings and approaches.

To recommend a building suitable for the class of tenants to be accommodated.

To make a thorough analysis of materials best adapted to the program contemplated, and then to submit a comprehensive report of findings.

An interesting method of keeping closely abreast with building costs is in use in this office. A group of key plans for typical buildings is maintained, on which bids are taken periodically in order that an accurate cubic foot cost basis may be available for use in estimating the costs of new buildings of various classes. This, or a similar method of maintaining dependable cost figures, will be found invaluable in every active office, and we have already laid stress repeatedly on the importance of having accessible dependable estimates of costs during the period of the development of plans and designs, in order that the client may not be disappointed when final costs of building are obtained.

After preliminary plans are drawn, in this St. Louis office, they are passed on to an engineering department where the structural, heating, ventilating and sanitary details are incorporated. Meanwhile, as the plans develop, specifications are written and costs are taken in order to eliminate changes in the final plans. It is interesting to note that this organization maintains an extensive reference file of plate illustrations, showing new buildings developed in all sections of the country, and that cost data is incorporated in this file, wherever possible.



The work of this organization does not end with planning and supervision; a special department has been developed to act as agent for the owner in carrying out the construction, through a series of sub-contracts, which means dispensing with the services of the general contractor. Under this subletting method of handling building projects, these several functions are undertaken by the architect, after complete plans and specifications have been prepared:

Securing bids from reputable sub-contractors, covering entire operation.

Checking these bids with the specifications and quantities.

Listing the bids, and submitting them to the owner for his approval.

Preparing proper contracts between the owner and the sub-contractors.

Obtaining bids, and surety bonds when required.

Securing all necessary permits from the building department, street department, etc.

Auditing all accounts, and issuing certificates for payment to the various sub-contractors.

Operating a complete field force of superintendents and engineers.

Expediting the work of sub-contractors to eliminate delays.

Preparing both progress and completion reports on the work.

Securing clearance on bills, and waivers of liens against the property.

The benefits under this plan of operation are claimed by the architects to be:

Saving of time by dealing directly with sub-contractors.

Immediate and uninterrupted communication between the drafting room and the work on interpretation of plans.

Absolute jurisdiction over details, time of completion, and the distribution of funds, as the sub-contractor comes direct to the architect for certificates of payment, thus permitting enforcement of proper and speedy execution of the contract.

The direct selection and purchase of all materials which enter into the construction of the building.

This is a firm of architects—not contractors in any sense of the word. They do not employ labor, but act as agents for the owner in the employment of sub-contractors, and all the elements of service as given by this office are in entire accordance with the principles laid down in the recently published Handbook of the American Institute of Architects.

While every architect is not in a position to maintain an equally extensive organization, the principles indicated by the scope of the service here described may be applied to the business of every architect, regardless of the volume of work which passes through this office. We are informed that throughout the Middle West the sub-contractor method of carrying out the construction of moderate cost dwellings is employed in at least one-half of the architects' offices. In some cases which have been brought to our attention, architects working for speculative builders and real estate developers are carrying out complete designs of dwellings and are letting sub-contracts for construction as agents of the owners. The architect then supervises the work and co-relates activities of sub-contractors in order that construction may be carried out quickly and with the least possible friction.

In building moderate cost dwellings, it is customary to divide the construction into five or six sub-contracts. Bids are taken on these, which include the provision of necessary materials. The contracts are then placed, not always with the lowest bidder, but on the conditions which seem to insure the most satisfactory service from the viewpoint of the owner. The customary charge on small house work of this nature seems to be 10% to cover the complete service of the architect.

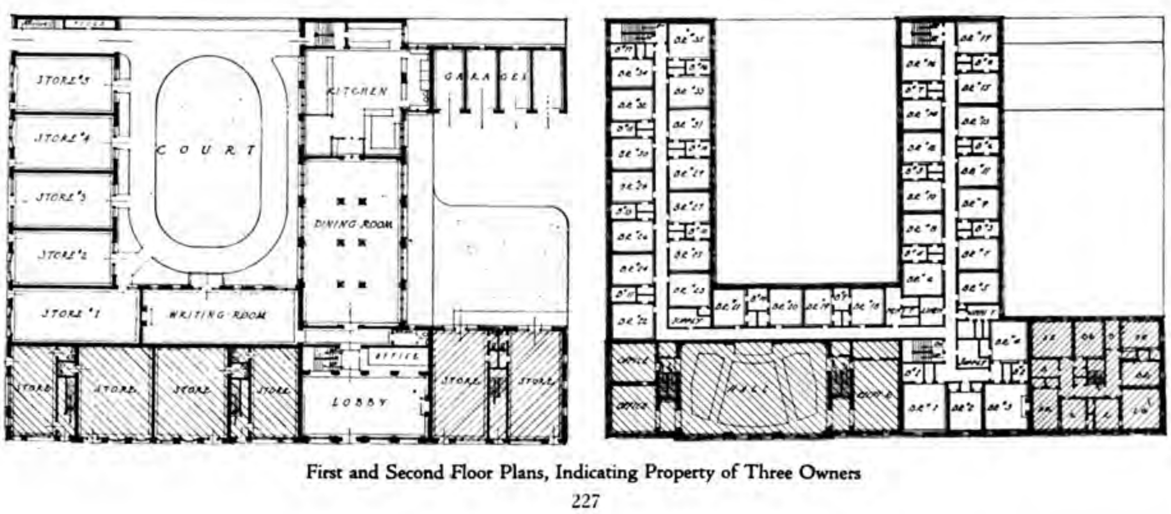
A Group of Stores at Southern Pines, N. C.

AYMAR EMBURY II, ARCHITECT

Block Containing Hotel and Stores on 190-Foot Frontage

MUCH of the badly mixed appearance of the buildings facing the streets of American cities and towns is due to lack of co-operation on the part of property owners for harmonious development upon some definite plan. Each owner avails himself of every man's inalienable right to build what he will, and the result is the heterogeneous rows of buildings which may be studied in almost any town. A plan by which each building would be a part of a well arranged development would mean a successful architectural result, which cannot fail to increase the value of each of the individual holdings as well as of the locality in general.

An instance where co-operation has achieved highly successful results exists at Southern Pines, N. C., where three owners agreed upon a form of treatment in which each building should contribute its share to the appearance of the group as a whole. The two-story building upon the corner at the left, which seems to be three buildings, belongs to one individual and contains stores upon the ground floor and a hall with reception room and suitable offices above. The three-story structure farther to the right is the front of a hotel which occupies the greater part of the block and which faces also upon the side street. The plans show stores upon the lower floor and the hotel departments elsewhere, all surrounding an open court which provides light and air as well as a private entrance to the hotel and delivery entrances for the stores. By this plan most of the bedrooms are away from the railroad which is across the street from the front of the hotel. The two-story building at the right of the group belongs to a third owner and contains two stores and two apartments, the space behind being occupied by four garages which are reached from an alley.



First and Second Floor Plans, Indicating Property of Three Owners

EDITORIAL COMMENT

THE YOUNG MAN IN THE PROFESSION

MUCH attention has recently been directed to the problem of the relations of the draftsmen to the profession; the obligations resting upon the architect in giving draftsmen in his employ opportunities for acquiring a broader and more general conception of professional service, and the means for supplying in another manner the advantages that are held out as an inducement to extend the scope of the so-called draftsmen's union.

Organizations within the profession or among men so closely identified with it as draftsmen, which partake of the nature of groups for collective bargaining will certainly be detrimental to the good of architecture. The work of any of these men more nearly approaches an art than a trade and its success depends upon a healthy individual enthusiasm which is quite contrary to the principles of mass action as now maintained by unions.

The subject, however, cannot be dismissed with this statement and allowed to take its own course. There is an undeniable sentiment today that results are not produced by the will or power of any one man; the problems are too large and complex to make this possible. Work of any kind accomplished today is the result of co-operation on the part of many, each contributing some worth while element. This is recognized by those who fill the various roles and it is but natural they should consider it fair and proper that their function and value be admitted.

The average draftsman is a man of good breeding and intelligence who has a fair knowledge and appreciation of architecture. Most men in becoming draftsmen do so with the aim and intention of ultimately becoming architects; certainly men graduated from the architectural schools who must of necessity acquire their practical experience through drafting have this intention. In how many cases, however, do they find opportunity for getting the necessary knowledge and experience to become architects, or in fact well-rounded assistants in their employers' offices? They are engaged without any contract; their stay in the offices depends usually upon steady maintenance of work; if there is a lull between commissions, they are dismissed and new a force taken on when work picks up again.

It is not unreasonable to expect that after a number of years of such employment the enthusiasm of becoming architects has been dulled and if they remain in the profession, they are reconciled to remaining employes and take only such interest in their work as is necessary to keep their employment. The best of architecture cannot be produced with assistants of this calibre, neither will it be produced if these men become associated with unions that by means of collective bargaining secure only monetary advantages.

There is a middle ground that will prove effective; it will require a real and lively interest on the part of architectural societies—perhaps the Institute and its Chapters—but the fundamental interest which every draftsman has in architecture supplies a beginning of substantial character. We believe a model for accomplishing much good has been set up by the Boston Society of Civil Engineers and because of the similarity of the problem in both professions the chief points of its program are outlined.

In its effort to better its service, the Boston society considered means of securing the interest of the young men. Conferences were held with them, resulting in the conclusion that discussions of designs and designing methods would prove of interest and value. It was further determined that the society work of the young men should be managed by themselves and to accord with their convenience and desires. A nucleus of about forty men was recruited chiefly from the designers; some were already members of the society and the others became members to secure the advantages of the young men's section.

The meetings are arranged to suit the ideas of the men themselves. They begin at 6 o'clock and last about two hours. About half the time is given to the presentation of a subject and the balance to discussion. The sessions are entirely informal, manuscripts of the papers are not required and no stenographic record is kept. Questions are encouraged and the blackboard and stereoptican are at hand to illustrate difficult points.

It has been found that the greatest interest is aroused in meetings in which actual designs are discussed rather than pure theory. It is usual for the speaker to select a design that has recently been developed in the office with which he is connected and the discussion that follows results in a general interchange of ideas that is most helpful.

The Boston Society has wisely recognized two important qualities of youth. These young men are energetic and they want to do things, and furthermore they want to do things in their own way. By encouraging these qualities and placing confidence in their ability to carry them out, a most successful section of the society has been instituted and in addition to enlarging the membership it makes possible in the young men a keen professional interest in their work which is reflected in their office associations.

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The Cunard Building

A GREAT ACHIEVEMENT IN NEW YORK, BY BENJAMIN WISTAR MORRIS

By ROYAL CORTISSOZ

UNDER the pressure of commercial conditions, and perhaps of their own bad taste, some of our designers of tall buildings have in recent years turned their backs upon architecture. They have been content to produce, instead, simply skyscrapers and hotels. It is undeniable that from a certain point of view they have produced these things very well. The huge office building and the huge hotel or apartment house are all as poignantly expressive of American life as the cathedral of Amiens is expressive of French life in the middle ages. If the genius of a people is reflected in great hives of living rooms and business offices, then the inventors of a new category in American building have at least been true to their race. We may chuckle derisively over the hotel lobby swamped with junk from the old world, but we know perfectly well that that is what the public wants, and the designers aforementioned know how to supply it. In the case of the office building the public want is based, moreover, on an irreducible public need and it is hard to find fault with the architect whose endeavors to satisfy it result only in bald prose. How is it possible to extort anything else from the steel cage principle?

I used to ponder that question when, 30 odd years ago, I studied the old Tower Building in lower Broadway, the first essay in the new mode of construction, and from the vantage ground of McKim, Mead & White's office I watched the experiments going on all over the country. I have been watching and pondering ever since, and observing that in the steel cage principle there is, after all, nothing inimical to architecture—granting that the right hands are at work. Distinctly practical elements have naturally always been to the fore in this matter and when Daniel H. Burnham took hold, in Chicago, it was primarily as a practical man that he won his resounding triumphs. In the making of an office building he saw that organization of plan was everything. He was strong in the management of circulation and illumination. In the long reflections on this subject to which I have ventured to refer, those phases of the problem have been intensely interesting. But if they have deepened my appreciation of architects as practical men they have also thrown me back with a stronger conviction upon consideration of their function as artists. There, in fact, lies the nubbin of the whole business. It is in proportion to his purely æsthetic gifts that the designer of tall buildings produces—architecture. Looking back over a crowded period, during which architecture has outstripped all the other arts in America, one is driven to the conclusion that the best buildings are those which not only embody good solutions of practical problems but, like our best paintings and statues, denote vision and personality. I emphasize a point which ought to be, perhaps, trite enough, because as a matter of fact so many architects seem to have thrown it overboard.

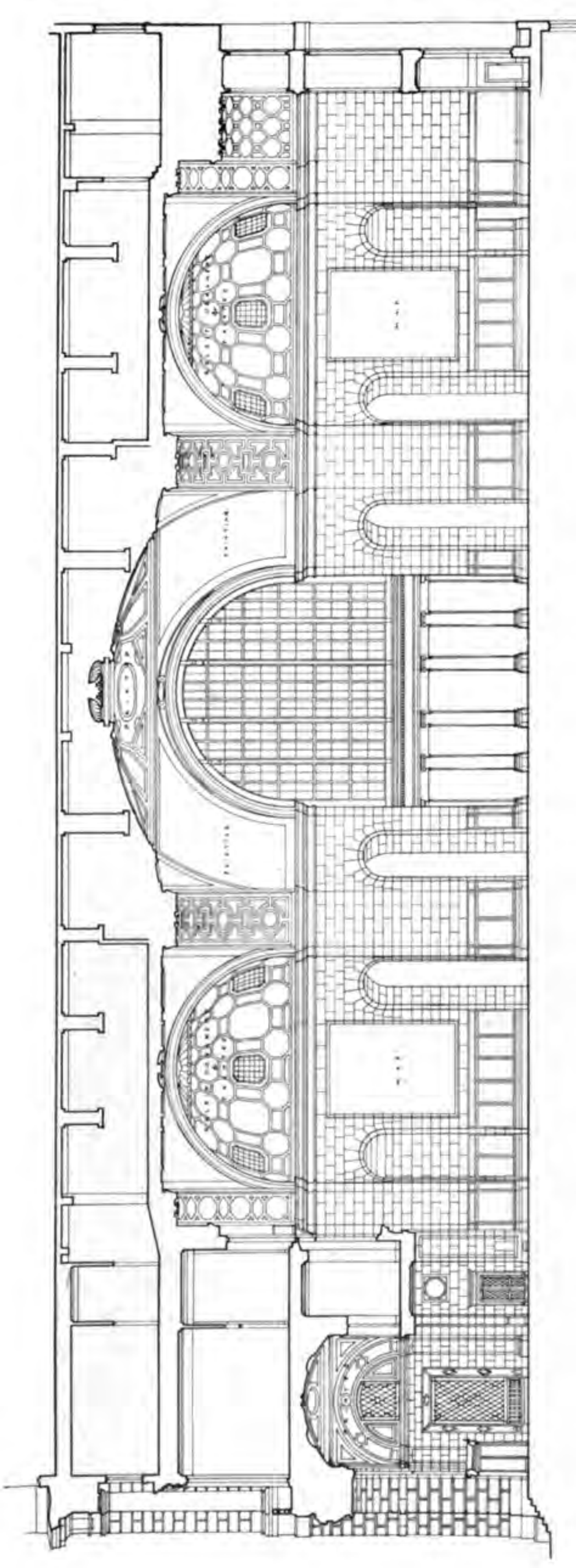
Not long ago I had the opportunity of seeing a group of buildings which I had known before only in photographs and drawings—the court house and jail designed by Richardson for Pittsburgh. It was a positively thrilling experience. To stand in the presence of these buildings is to feel the spell of organic architecture, of walls vitalized by the genius of a creative artist. Composition has here a recognizable purpose, a beginning, a middle and an end, fused in the light of reason. Memory of the superb tower, of the heroically conceived jail, is as moving as memory of a pile like Carcassonne. When I came, soon after, to the Cunard Building I had something of the same sensation. I knew at once that Mr. Morris, like Richardson, had had a creative impulse. I have been immensely impressed by the convenience, the ingenious handling of space, and all the nominally prosaic virtues of his design, but what makes it exciting is its beauty, the proof it affords that a skyscraper may be made a work of art.

It is fairly fortunate in its site, the site whereon New Amsterdam was founded. Bowling Green gives the thoroughfare some width just before it settles down to the straight and narrow constriction of Broadway, and, for once, a skyscraper may be seen in something like perspective. In respect to style, Mr. Morris might be said to have taken his cue from the Italian renaissance, but he must have been influenced also, I think, by the spirit of the institution he had set out to house. The Cunard Line is unquestionably an institution. The ships first set going between Halifax and Liverpool in 1840 can claim, in their way, an alliance with the imperial fleets. Their captains touch hands, so to say, with the early mariners who laid the foundations of England's sea power. Mr. Morris has kept this in mind. The first stages of his facade are exactly expressive in their simplicity and strength of a vast business historically identified with the sea, and rooted in a profoundly British tradition. The home offices of the Cunard Line in Liverpool, erected not long since, have a square-built, almost fortress-like aspect. Mr. Morris has followed in New York the same motives of weight and dignity. His massive courses of rusticated stone, broken by five monumental arches, may have an Italian precedent, but the perfect base they provide is in harmony with all the ideas of might lying behind the assertion that "Britannia rules the waves."

There is a charming decorative touch discoverable here. I say "discoverable," because one does not immediately notice the delicate carving on the two small window frames flanking the southern entrance arch. When you do find it you are struck by its modest felicity, by the manner in which the artist seizes a chance to lighten the mass. As you savor the grace and elegance of this ornamentation and its happy effect at the particular spot you realize also how "judgmatic" Mr. Morris has been. It is characteristic. He has placed decoration only where decoration has been fitting. There are no teasing details to disturb the calm of these noble walls. The arched base, like the pillared stage it carries, is refined very nearly to the point of austerity. As the facade soars to its height there are no decorative littlenesses to mar the broad and powerful sweep of the design. But all the time the architect has been studying modes of avoiding the arid, bare, box-like effect invited by the needs of fenestration. He recesses the facade slightly, along a width sufficient to embrace eight of the windows in his row of sixteen, and the composition reaches its renewal of pillared openings at the top without a moment's threat to its essential unity. He modulates his surface, if I may so express it, gains in light and shade, without having recourse to any specious "picturesque" expedients.

The cornice counts only on the central portion of the building, and the full force of an ideal climax is thereby renounced. I cannot help regretting this. A great cornice is a joy by itself. But Mr. Morris has made the best of the situation imposed upon him by the zoning laws and the stepping of the topmost stories. If he could not let himself go in a cornice worthy of the base on which

Detail of Lower Stories on Main Facade



LONGITUDINAL SECTION OF GREAT HALL LOOKING SOUTH

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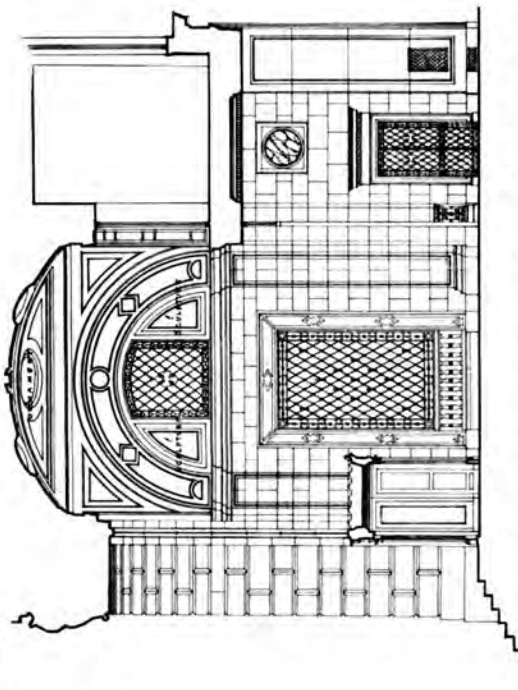

CROSS SECTION OF CUNARD VESTIBULE LOOKING SOUTH

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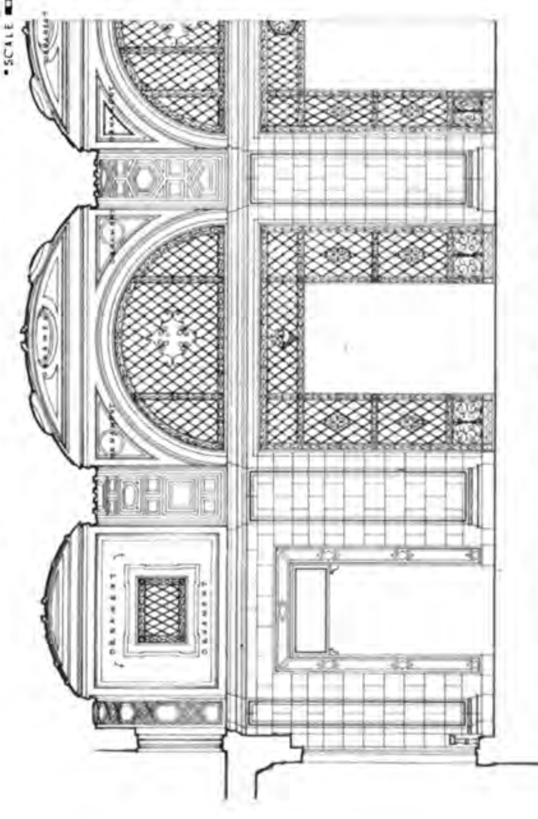


LONGITUDINAL SECTION OF CUNARD VESTIBULE LOOKING WEST

SCALE 0 5 10 15 FEET

Gate to Clerical Department of Cunard Line

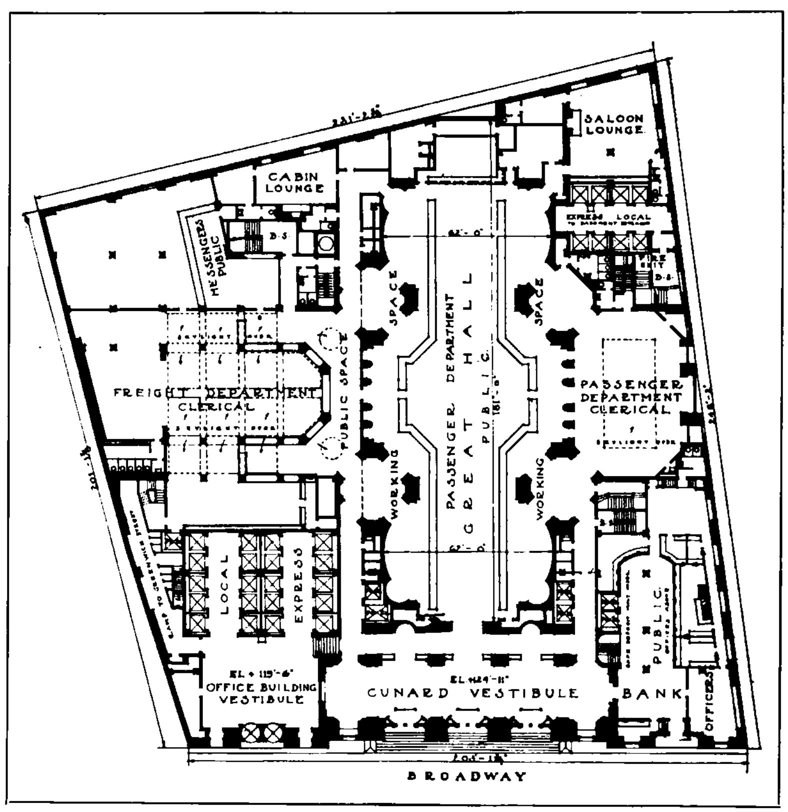
his building rests he has at all events played with his varied roof lines so skillfully that they hold together and adequately crown the whole. It is the whole that registers his authority, the binding of the building, line and mass, into one beautiful chord, not only just in proportions but lightly touched, with the living quality that in such designs is so rare. Gone is the deadness, the inertia, the banality, of the skyscraper to which allusion was made at the outset of these remarks. Gone is the empty gesture of adventitious ornament. This is indeed organic architecture. The facade holds you by its beauty and at the same time it persuades you that it is the outward, visible sign of an inward interest, a good plan.

One thinks again, as is proper, of the Cunard tradition, on entering the building. The northern arch gives access to a bank, the southern to the hall from which elevators rise. The three central arches are Cunard arches, dominating a vestibule which leads to the company's vast rotunda, and this vestibule might alone provide the theme for a homily on the genius of business. Business *is* business, as it is here understood. There are no extraneous facilities in the Cunard Building There is no restaurant. There is no barber shop. There are no booths for the sale of papers, theater tickets, flowers and what not. The vestibule with its coffered and delicately tinted ceiling is as purely monumental as the Italian palazzo interior it suggests. It includes, too, a feature which like the external carvings I have mentioned points to Mr. Morris' wise use of decoration when it is permissible. He has filled the spaces between the piers with magnificent iron grilles. Delicately designed, yet with the quiet force in them that befits the metal, they make the most discreet possible enrichment of the

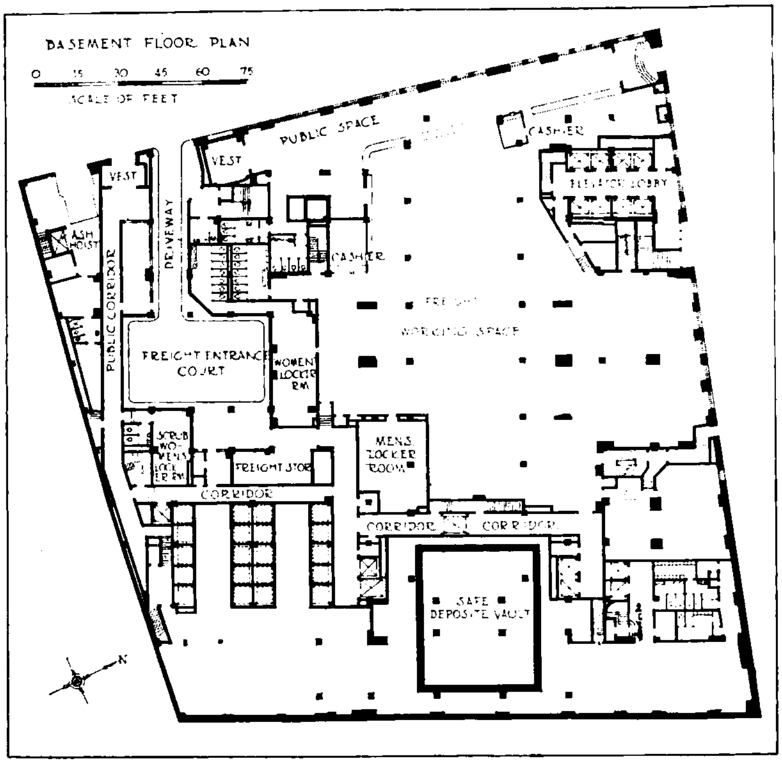
Detail of Mechanics and Metals National Bank, Cunard Building ensemble. I ought to mention at this point a detail in the floor plan which has a peculiar fascination. Crossing the vestibule we have to traverse still another parallel passage, much narrower, which terminates at right and left at passages running toward the center of the building. The usefulness of these extra channels for circulation is obvious and they have further a remarkable artistic charm. Sufficiently but not brilliantly lighted, they bring an almost romantic element into the scheme, vistas both intimate and mysterious. There is nothing more engaging in the development of the plan than these quiet aisles, unobtrusively enframing the rotunda.

The rotunda or great hall is an imposing tour de force. McKim was Roman when he conceived the grand spaces of the Pennsylvania Terminal. Mr. Morris has been Medicean in the conception of his Cunard hall, a deep, domed chamber extending through to the back of the building. Here all the splendors of the renaissance break out on walls and ceiling. The ceiling, nearly 70 feet from the floor, at once takes the eye and promises to keep it indefinitely; but I must confess that my own first impression took in as enormously important so humdrum a thing as the counter over which the public traffics for its tickets. It runs down the hall on each side, in straight lines, unbroken save beneath the central dome. The counter, like everything else in the room, is built of creamy travertine. It has a dark top, of cork. Strictly considered, it is one of the structural fundamentals of the hall, without which business could not be carried on, and it enters accordingly into the architect's imaginative purpose. The pure linear effect of the thing is very beautiful, telling incessantly in the web of design that Mr. Morris has worked out. The unity of the facade comes once more into mind. The domes rest majestically on their piers. The piers are so composed as to make a well knit sequence. From the four "luminary squares" which they form at the corners of the central dome, and from other sources, there comes an admirably diffused light. The travertine sets the whole in a mellow key and in Barry Faulkner's immense maps on the walls, showing the Cunard routes, and in Ezra Winter's paintings on the ceiling and the four pendentives, illustrating the history and mythology of the sea, this key is transmuted into sumptuous warmth. On the floor, in the center, the points of the compass are indicated in marble, encircled by figures in low relief, a bronze modeled by John Gregory. Yes, Medicean is the word. You have a sense of business raised to a higher power, taking luxury in its stride. In style and in spirit the room is an evocation of Italy. But it has stirred me as I was stirred by Richardson's tower and jail walls, feeling above all things the play of a genuine architectural inspiration, springing straight from the personality of the designer. Mr. Morris' imagination rather than his scholarship, I take it, is responsible for the fact that the hall is so new, so opulent, so well balanced, and, especially, like the facade, "all of a piece."

He has been fortunate in his painters, both graduates of the American Academy in Rome, and both exemplars of the principle which it is one of the particular aims of that institution to inculcate, the principle of artistic refinement. Mr. Faulkner's opportunity has been, in a measure, circumscribed. He had simply to map the continents according to Mercator's projection and to thread across the seas the paths of ships. His big panels are chiefly to be regarded as spots of color. As such they are rich, but as judiciously tempered as tapestries, governed by the sense of measure which seems to work like a "big magic" everywhere in this room. He has contrived to enliven his spaces, too, by the use of

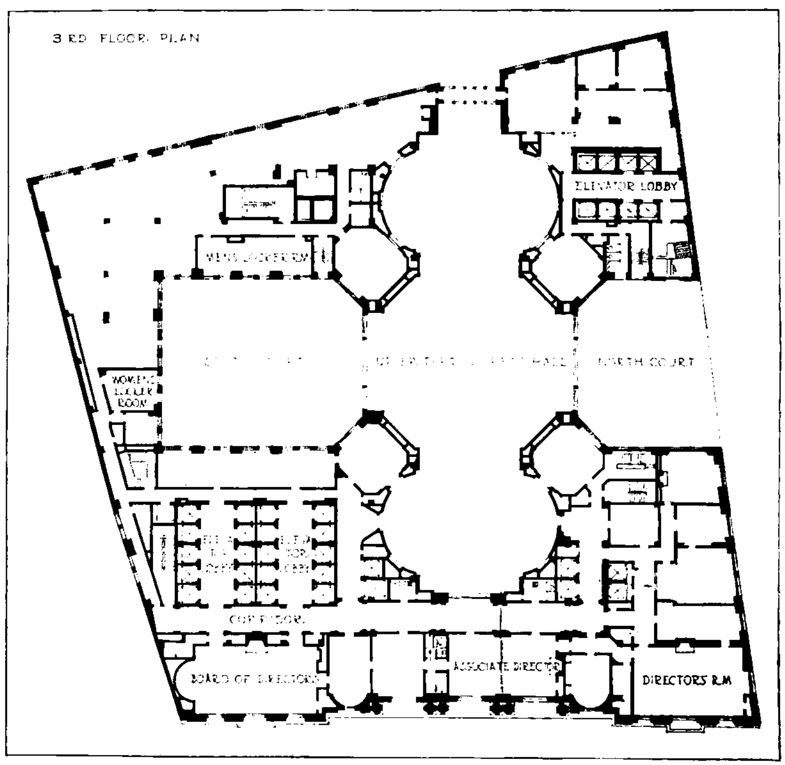


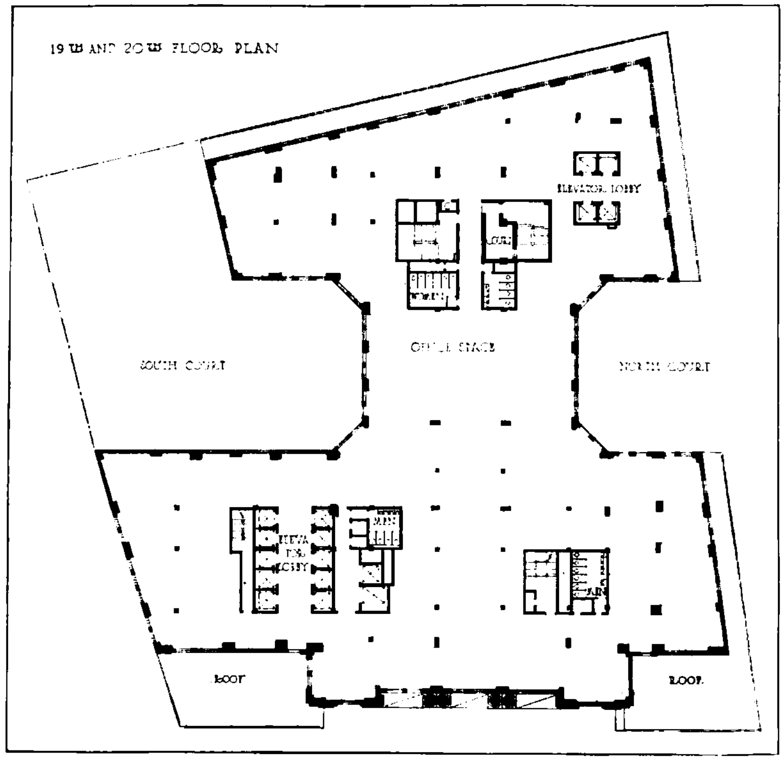
First Floor Plan



flags indicated here and there. To Mr. Winter was assigned a great task, the embellishment of the domed and vaulted ceiling pictorially and conventionally. The Italian origin of his project is clearly perceptible. In his formal decoration he recalls both Pinturicchio and Raphael. The influence of Raphael is especially apparent in the roundels of the central dome. But in the pendentives, portraits of historic types of ships, "on the inconstant billows dancing," he strikes a note of his own, and when you detach yourself from details, sweeping the whole performance at a glance, you are impressed by Mr. Winter's participation in that vitalized initiative to which one is always returning in this building. He is not the emulous disciple of the past alone, reconstructing an old motive; he is a modern painter, making a historic idiom his natural property.

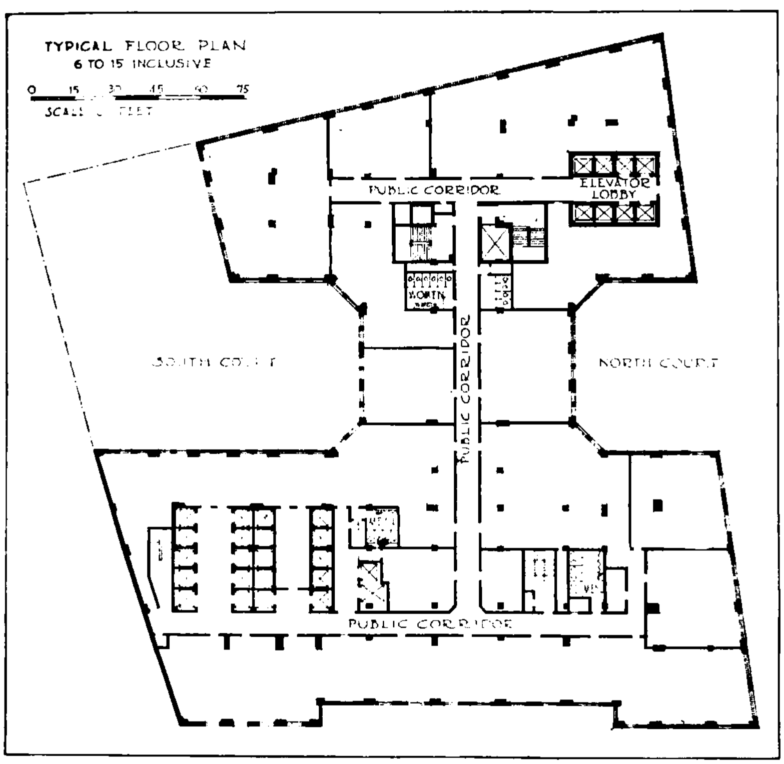
The ships in the pendentives illustrate even more eloquently than his more formal motives the thoroughly mural character of his art. They are the stout hulls of Leif Ericson, Columbus, Cabot and Drake, borne over high seas by swelling sails. The Spanish and British vessels are, of course, towering structures. The viking craft, though shallower, is sturdily built. Bold, pure color in each case enforces the accent of rude strength which belongs to the subjects. The pendentives are on a massive scale. Mr. Winter's compositions are precisely fitted to them in spirit—they fulfill an architectural purpose. Yet the air of the sea blows through them; there is life as well as a certain decorative serenity in them. So it is with the roundels, in which spirited figures of tritons, mermaids and the like are rather shrewdly but freely adjusted to the given spaces. The broad effect is glittering, gorgeous. Yet always—and this is where one recognizes at their best the influences of the Roman Academy—the painter's delightful fervor is kept wonderfully in check. His forms suggest that he has drunk deep of the lessons implicit in Raphael's great series in the Rospigliosi. The panels in which he has symbolized the winds and the seasons, in exquisitely modeled reliefs,





have alike a renaissance luxuriance and a renaissance restraint. He is the deft craftsman as well as the robust painter and I hardly know which is the more winning, his deftness or his easy, virile swing. He seems to me a kind of Giulio Romano come again, with a modern polish and an individual reserve force.

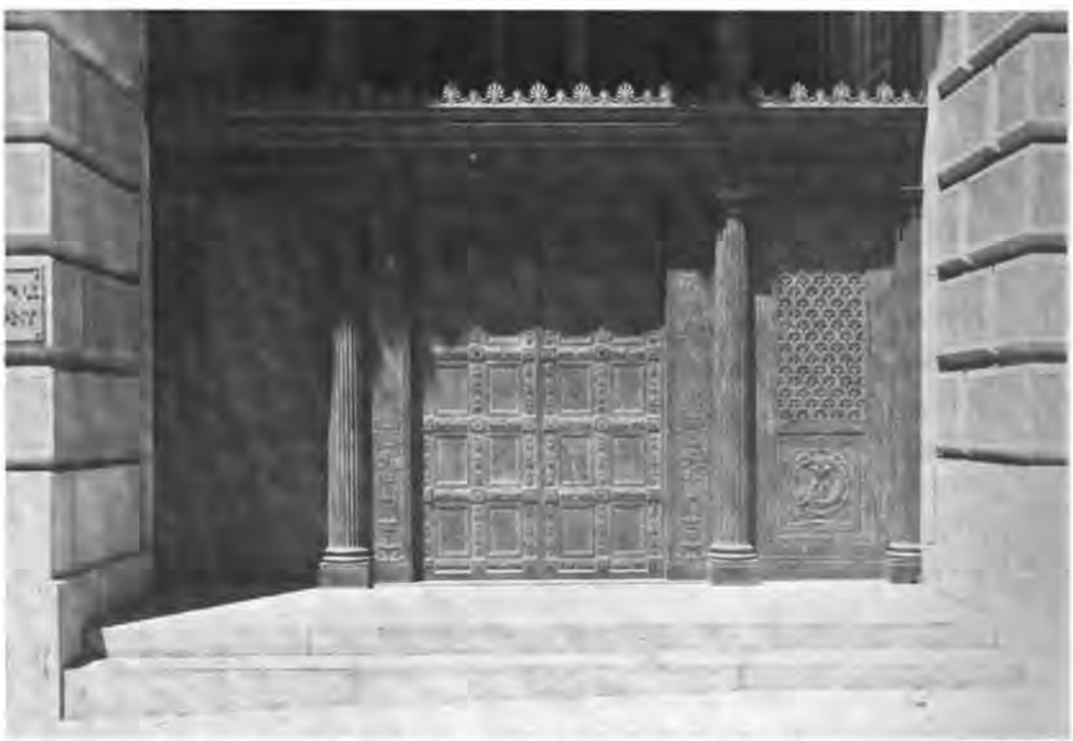
Mr. Winter's work makes its mark brilliantly and so conspicuously that it would be rather natural, I dare say, for the visitor to carry away an impression of it as supplying the *clou* of the building. And there are other kindred episodes, as we have seen—the maps, the compass with Mr. Gregory's antique but not by any means archæological procession, a bronze equally beguiling in design and in technique, and various grilles. In some minor offices tucked away in the western corners of the ground floor there are bits of stained glass which are well worth while. Decidedly there is decorative material and to spare. In the executive offices on the third floor Mr. Morris has been able to indulge himself in interesting paneling, mantelpieces and the like. The Medicean atmosphere continues, a tone of luxury being maintained through elements of spaciousness, stateliness, good proportions, good taste. But having noted all this, the factors that remain for comment revive the element of purely constructive design to which, in the long run, Mr. Morris owes the success of the building.



I have mentioned the æsthetic charm joined to the utility of the little aisles on three sides of the great hall. Charm necessarily disappears from the upper floors, but the utility persists in edifying form. I need not describe in detail plans which are reproduced in these pages. But I may at least pause upon the fine architectural rectitude of them all. The succeeding floors above those filled by the Cunard Company are linked with exhilarating adroitness to an indispensable resource,—the light. It is the architect's proud boast that there is not an interior office in the building, and I have seen how true this is. He has to thank the power of steel for the blessing. It permitted him to rear part of the structure directly above the dome in the rotunda, thus doing away with the usual central wall. The building has frontages on three streets,and,by good luck,contact with the light coming from a fourth. Deep courts in the middle of the north and south facades give to the offices in the center as good light as pours into the street fronts. This arrangement of the plan secures also the most economical disposition of space for corridor circulation. The clustering of elevators at the southeast and northwest corners also perfectly contributes toward the handling of this latter problem. There is no waste or awkwardness anywhere.

The sub-dividing of floor space is largely determined, of course, in these modern buildings, by the wishes of tenants. The spaces between corridors and window walls are cut up to please them. One firm will take an entire floor and, to a certain extent, frame its own plan. Exploring such a floor in the long series of 22, I noticed a change which is slowly establishing itself. The familiar ground glass was gone from the partitions. Clear glass had taken its place. It was as though the roof had been lifted from a busy hive, disclosing the activities in every last little cell. This transformation is due, I am told, to a development in latter-day "efficiency." It allows the executives to keep an eye on everybody, to see that the occupant of no desk is idle. There is really no petty watchfulness about it, I gathered from a banker with whom I discussed the subject. "It all makes," he pithily said, "for an increase in the solidarity of the corps. It is a matter of psychology." I find an incident of this sort somehow subtly humanizing to the whole spectacle presented by such an edifice as the Cunard Building. The thing is rooted in transactions that cover the habitable globe. It begins with the imperial traits of the great decorated hall. It rises through layer after layer of humming floors to a broad roof upon which one or two offices with huge fireplaces and picturesque loggias look down the bay toward the hurrying fleets. There broods over it the spirit of a veritable cosmos. Figures, queer statistical figures, accompany in the accustomed way this colossal fabric. We are told that the Cunard Building has frontages of so many feet, that it covers a prodigious area, rising to a total, when all the floors are counted in, of 660,000 square feet, and so on and so on. But irresistibly the merely human appeal of the thing strikes home.

What an epic Balzac could have devised with a building like this for his theme! All manner of far-reaching implications suggest themselves in the grandiose nature of the facade and the great hall; the ineffable power of the machine which the whole building constitutes, the tremendous potentialities of the business units populating the place—and perhaps, too, the moral of those clear glass partitions. You cannot regard such a cosmos as an insensate thing of stone and metal. You feel in it the force of a living organism. So, I believe, Mr. Morris imaginatively grasped the idea of the Cunard Building from the start, and he has bodied it forth, in a great work of architecture, alive and beautiful.



Broadway Entrance of Mechanics and Metals National Bank, Cunard Building

Mural Decorations of the Cunard Building

By EZRA WINTER

THE execution of the ceiling decorations in the vestibule and the great hall of the Cunard Building presented a number of problems, in the solution of which considerable ingenuity was required.

In planning the arrangement of decorations for such large ceiling spaces it became necessary to rely to a considerable extent upon the resources of sculptural relief and modeled ornament in order to make easy and natural the often abrupt transition from the plain, architectural surfaces of walls to the painted portions of the ceilings. The function of modeled ornament, in this instance, was chiefly to soften or modify what might otherwise have been the undue austerity of flat wall areas and equally flat ceiling surfaces.

What might be called the "time limit" was absolutely fixed and it was necessary that it be closely adhered to. Since the decorations of ceilings must obviously be governed by the completion of their construction, no more than four months could be allowed for work upon the paintings *in situ*. With this exacting time limit as the governing factor all the necessary plans and sketches were prepared, which provided for a judicious balance of decorative composition—sculptural relief, modeled ornament and spaces to receive ornamental painting—so that the entire work might be divided and distributed among various artists and craftsmen.

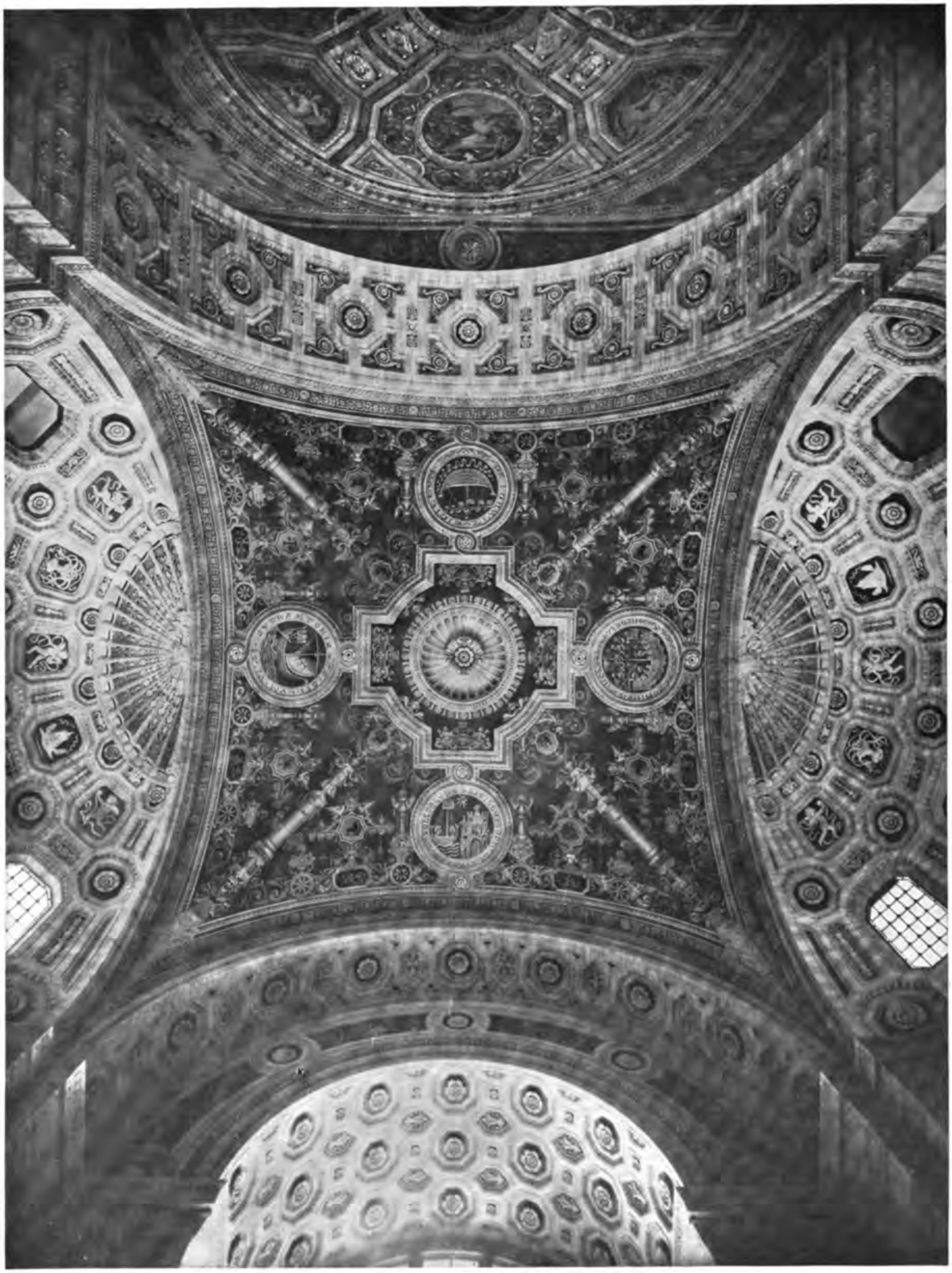
In preparation for the work fully two months were spent working at half-inch scale, and at this scale every detail was considered, including the pattern of the ornament and the subject matter of the pictorial compositions and sculptural relief. Careful drawings were made on tracing cloth of the plans of the various portions of the ceiling, from which white prints were made and on these different color schemes were studied. At the same time blue prints of these drawings were issued through the architect's office to the modelers, plaster workers and builders.

Then began the dividing up of the work; the ornamental relief and fields of painted arabesques were turned over to draftsmen to be developed and studied at full size. Sketches for the proposed sculptural decorations were turned over to the sculptor

Pendentives in the Great Hall
The Ships of Leif Ericson and Christopher Columbus. Painted by Ezra Winter

to be modeled at one-quarter full size, and at the same time the four large spandrel boat compositions and the four round compositions in the dome were carefully studied at the same scale. This occupied about three months, and during this time the character and pattern of the arabesque ornament were determined and full-size drawings for the modeled ornament were sent to the modeling shop together with the sketches prepared by the sculptor, to be modeled at full size. All work was then transferred to a temporary studio in the Cunard Building, and there full-size cartoons of the large pictorial compositions were prepared. To gain time, it was also found practicable to prepare plaster discs of the four roundels in the dome, on wire lath, so that they could be painted before the ceiling was built. This was done and, one by one, they were later lifted into place and anchored to the steel girders above, just as the sculptural panels were installed.

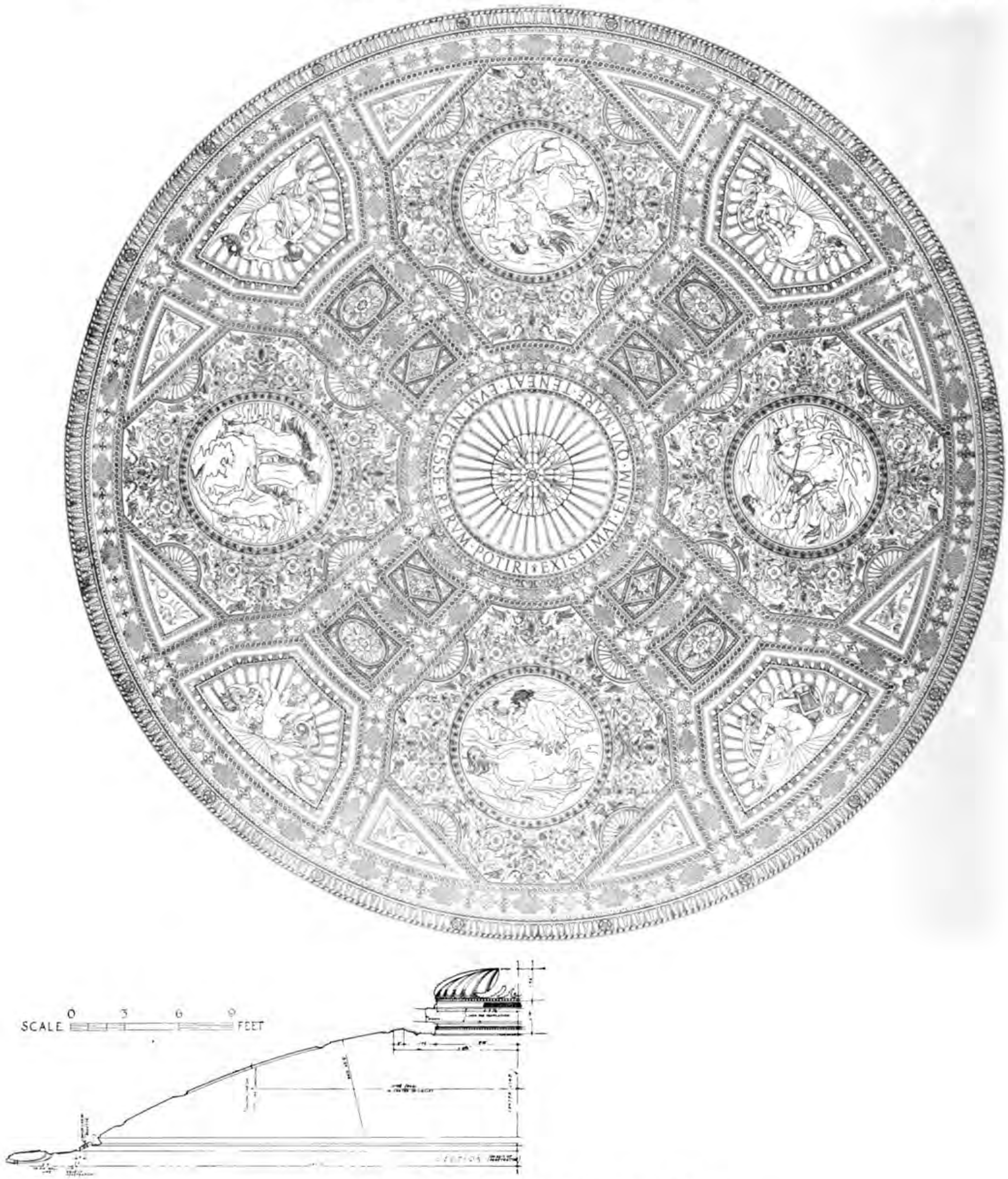
The next important detail to be considered was the choice of the medium to be used in painting the



VAULTED CEILING IN GREAT HALL, PAINTED BY EZRA WINTER

CUNARD BUILDING, BOWLING GREEN, NEW YORK, N. Y.

BENJAMIN WISTAR MORRIS, ARCHITECT, CARRERE & HASTINGS, CONSULTING ARCHITECTS



SECTION AND DEVELOPED PLAN OF DOME IN GREAT HALL

CUNARD BUILDING, BOWLING GREEN, NEW YORK, N. Y.

BENJAMIN WISTAR MORRIS, ARCHITECT, CARRERE & HASTINGS, CONSULTING ARCHITECTS

decoration. Owing to the character of the ceiling, which is all curved surface, it was impossible to consider painting the decorations in the studio on canvas and mounting them in place, as is done commonly by mural painters today, and because there are so many sources of light in the great hall it was felt that some medium should be used that would not have a shine or gloss to reflect the light. The time limit prevented the use of the renaissance method of fresco painting, and it was decided to use a variation of this method known as *fresco secco*, the difference being that the plaster, instead of being painted when it is newly applied and still wet, is allowed to dry and is then soaked with lime water before the painting begins. It is, perhaps, more like the Pompeian method of fresco in that milk or some albuminous substance is added to the lime to form the painting medium, while in the renaissance method the carbonization of the lime alone is depended upon to bind colors. The Pompeian decorators usually painted on a very smooth plaster and then rubbed it to produce the characteristic gloss or polished effect. This, however, was not desired in the case of the Cunard ceiling, and as a further precaution to prevent a shine or gloss, a sand finish was given to the plaster. The plastering is a very important part of this method of painting and since it was impossible to obtain enough old slaked lime for the execution of the ceiling, a well tried cement plaster was used rather than take the risk of using a hydrated or poorly slaked lime. It was finally decided to use a scratch coat of waterproof Portland cement and two coats of English Keene's cement as a foundation for the lime and colors used in painting.

Another problem which is always difficult of solution for the mural painter, when the heights are great and the spaces large, proved in this instance to be particularly serious. To carry on the work of decorating the ceiling spaces while the building was actually being constructed necessitated the successful handling of a complicated mechanical problem; it was necessary for the mural painters that a scaffold be built across the entire space of the dome, and yet it was equally necessary that the construction engineers have the floor beneath the dome unobstructed for their trucks to drive over, which would have prevented the building of staging for such a scaffold. This difficulty was satisfactorily solved by the engineers who provided a hanging scaffold which did not interfere in any way with the floor. In order that no interference might be had from cables attached to the ceiling, the platform was hung upon cables attached to steelwork above the dome and passing through spaces in the ceiling which were to receive plaster rosettes. This arrangement has another advantage in that if at any future time repairs are necessary, a scaffolding may be hung in the dome at any height without much difficulty or interference with the business which goes on in the great hall.

Ingenuity upon the part of the engineers solved still another problem. Upon the suspended platform which has just been described there had been

Roundel and Portion of Dome in Great Hall, Painted by Ezra Winter
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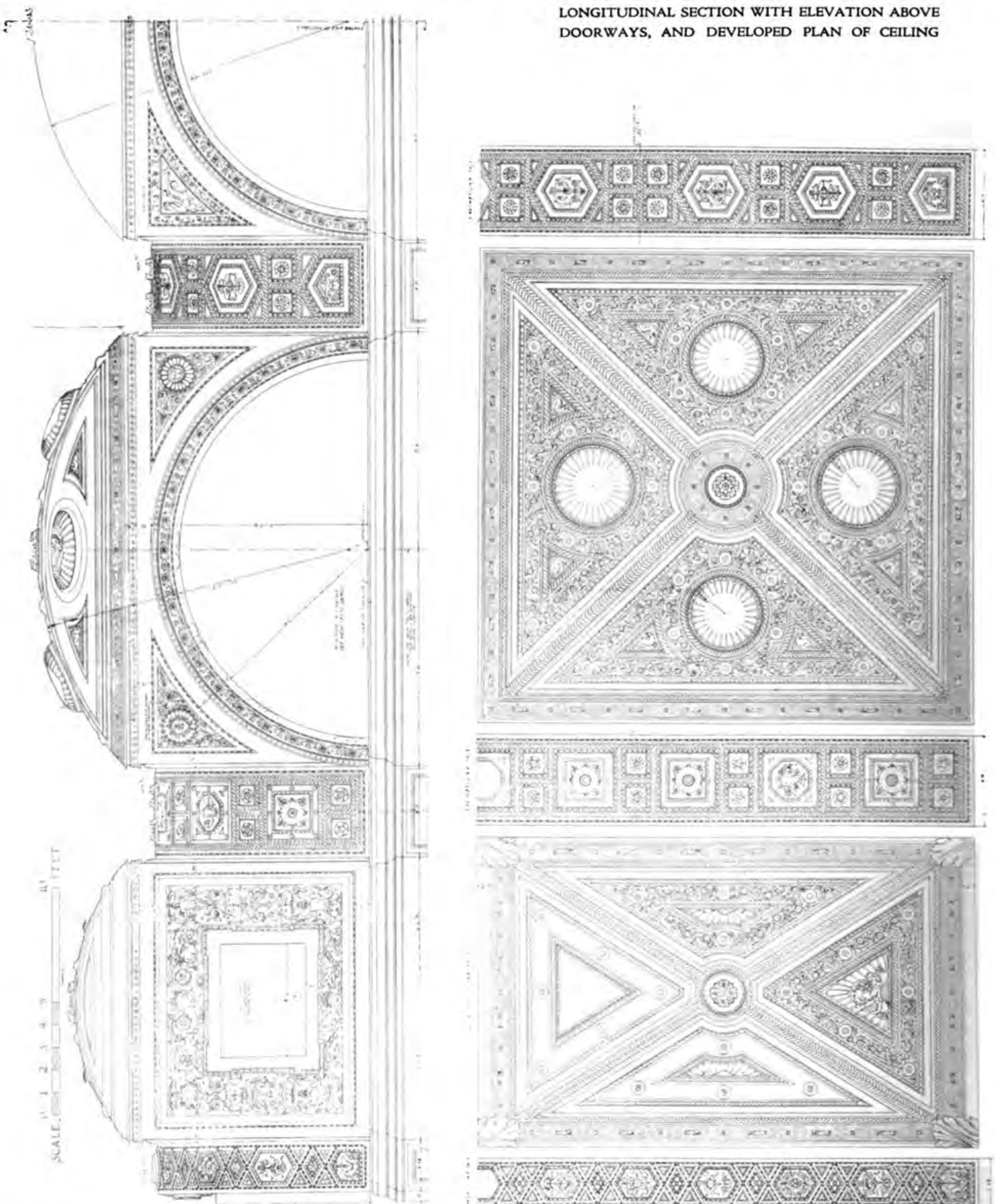
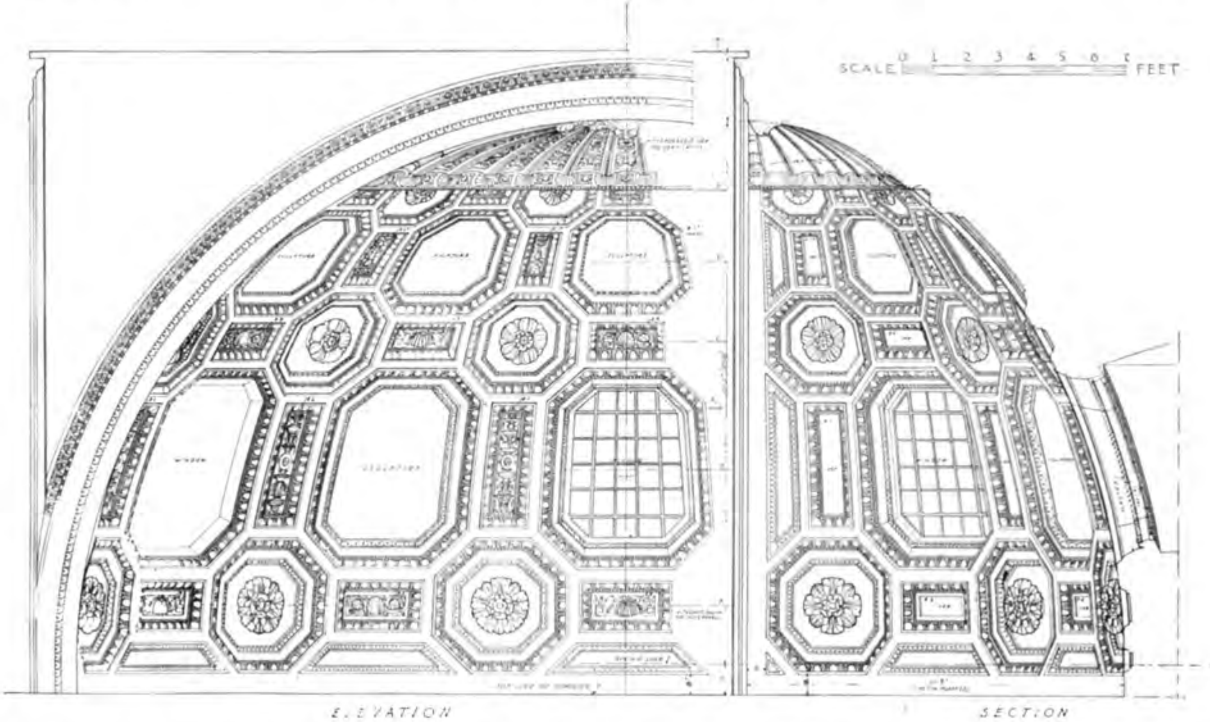
LONGITUDINAL SECTION WITH ELEVATION ABOVE DOORWAYS, AND DEVELOPED PLAN OF CEILING

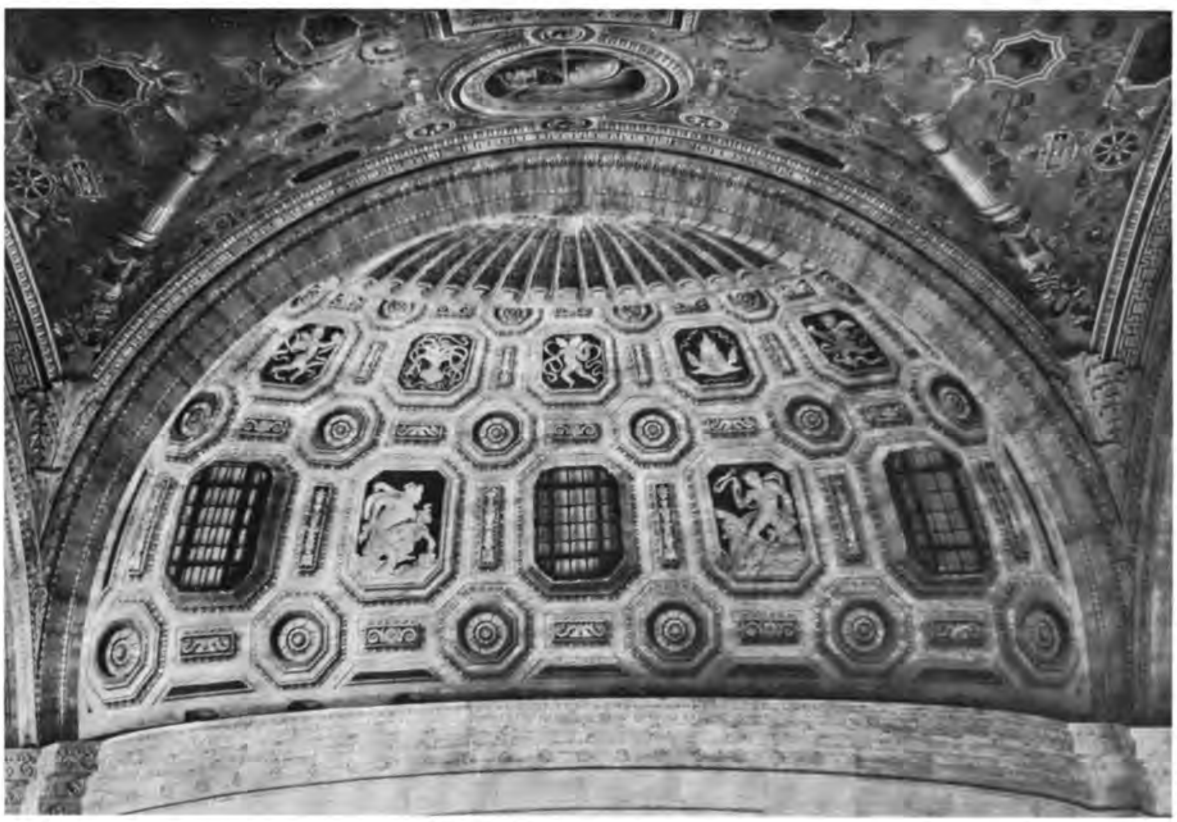


DRAWINGS FOR DECORATION OF CUNARD LINE VESTIBULE BY EZRA WINTER

CUNARD BUILDING, BOWLING GREEN, NEW YORK, N. Y.

BENJAMIN WISTAR MORRIS, ARCHITECT, CARRERE & HASTINGS, CONSULTING ARCHITECTS





ONE OF FOUR NICHES IN THE GREAT HALL

CUNARD BUILDING, BOWLING GREEN, NEW YORK, N. Y.

BENJAMIN WISTAR MORRIS, ARCHITECT, CARRERE & HASTINGS, CONSULTING ARCHITECTS

enclosed a studio, within which the work of decorating the ceiling went steadily on. This studio, however, required heating for the work was continued through the winter, and it was found to be impossible without heating for the mural painters to manage their brushes with the accuracy which was necessary. The difficulty was overcome when the builders installed a complete steam heating system in the studio upon the swinging scaffold.

The mural work in the great hall of the Cunard Building portrays the age-old romance of the sea or lure of travel. Painted in circular insets or modeled in medallions sea creatures of many kinds —tritons, mermaids and sirens—express the fascination which the sea has always possessed for the imagination of the world. Upon the great pendentives sail the ships of Leif Ericson, Christopher Columbus, Cabot and Drake, all being in a sense the forerunners of the Cunard steamships which travel some of the same ocean routes. The vessel of Leif Ericson is a viking ship with high prow ending in a gilded dragon, and upon its huge outspread sail is painted his emblem—the sea horse. The cross is emblazoned upon the sail of Columbus' vessel, and the ship of Cabot is a caravel of high decks and many colored striped sails. The vessel of Drake and the use of the Tudor emblems, the rose and three lions couchant, symbolize, perhaps, the far away beginning of what might be called the Cunard idea, for they represent the first manifestation of the vast maritime power of Great Britain.

The great hall ceiling is one of the few in this country in which strong, brilliant colors are used. There is too often a desire to execute mural work in grayed colors for fear that otherwise it will not hold its proper place. In this instance the great height of the ceiling and the enthusiastic co-operation of architect and owners gave a wide latitude in the use of color. The colors are disposed to lead the eye through progressive richness and brilliancy to the central dome. The pendentives are painted boldly, with the color of the sea providing a base. The vessels are in shades of brown with sails of lighter buffs, and insignia in bright reds and yellows. The enclosing borders show small spots of dark colors held together with interlacing bands of gold.

The east and west vaulted ceilings have a background of intense blue with a slight greenish cast. On this the renaissance ornament appears in tans and yellows, contrasting with the central panel which has a background of strong red approaching vermilion. The position of these colors is reversed in the central dome. The red becomes the background for the octagonal divisions, in which the roundels appear, and the blue is used only for the shell backgrounds of the sculptured panels. The prevailing color of the vaults is thus blue, and that of the dome red. The roundels are in light, pastel-like shades with sea green, azure and flesh color predominating. The modeled ornament, which outlines the pattern, is brilliant in light shades of yellow intensified with gold. The niches at the east and west ends and the soffits of the arches are largely in color and texture the same as the travertine walls below. Color is but lightly introduced, and is used only as a background for the modeled ornament.

Maps Painted by Barry Faulkner as Seen in Niches of the Great Hall
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Structural Features of the Cunard Building, New York

By S. O. MILLER, C.E.

IN looking at the completed Cunard Building, one is tremendously impressed with the vastness and magnificence of the "great hall." Producing this great open space and carrying the weight of building above it made necessary some record achievements of structural work, particularly the large plate girders across the long part of the span, which were the heaviest per foot ever fabricated at the plant of the company that furnished the steel. This feature of the work, however, from the standpoint of the designer, was not the most difficult; that part is now covered up and hidden and, to a large extent, already forgotten—the carrying of the structure over the double-track subway which traverses the building site from northwest to southeast on a curve, and which made it necessary to have many and complicated girders, bolsters and columns to carry the main loads of the building down to solid rock, independently of the subway's structure.

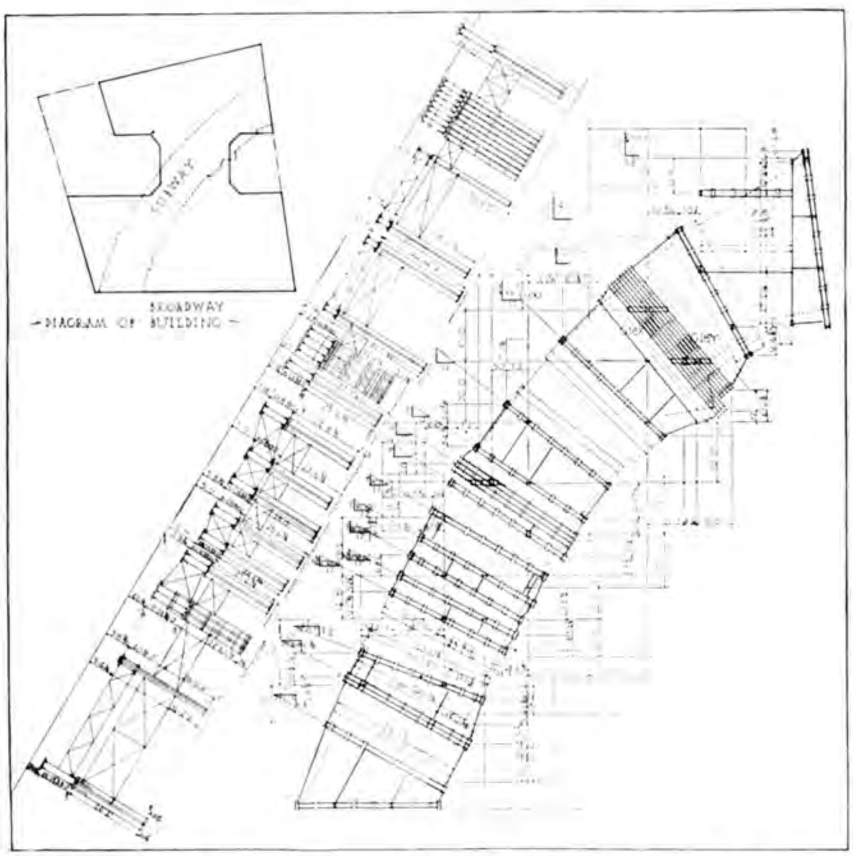
The property on which the building is located was assembled from a number of separate parcels of land; the subway engineers assumed that each piece of land would be improved by the erection of an individual tall building and they made column layouts to fit the requirements of each parcel, and provided in the roof of their subway structure, steelwork designed to carry these loads. When the column layout for the building, taking the plot as a whole, was made, as can readily be imagined, the positions of the projected columns did not fit the positions provided in the subway structure for the loads; it would have made necessary a jumble of complicated girders to take the loads at the points provided. The question of vibration in the building, from the subway trains passing underneath, was then taken up and some of the methods that had been attempted in other places to reduce such vibration, were gone into and discussed but they did not seem likely to produce good results. It was decided to put the weight of the building directly upon the rock and on footings entirely independent of those supporting the subway; this, it was felt, would produce less vibration than by using the subway structure and did not seem to involve much more in cost of steel. The building grillages in every case were carried down at least to the level of the adjacent subway footings. This, in many instances, necessitated sinking the footings far below the sub-basement floor. The result of this method of construction has so far proved entirely successful as the vibration from the subway trains is hardly noticed and the extra expense is fully justified as there was considerable anxiety on this account.

Referring to the plan of the subway girders (Fig. 3) it may be seen that these girders span the subway in a more or less haphazard manner. This was

Nine Girders in Foreground over Subway Carry Concentrated Load of 4,200 tons

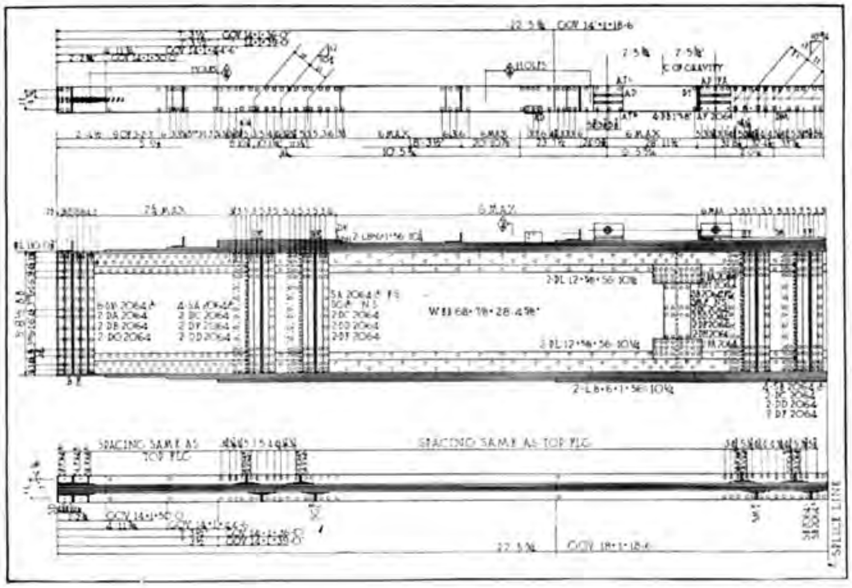
Detail of Framing over Subway Structure Near Greenwich Street
Hitch Angles May Be Seen on Tops of Girders

caused by an effort to carry the column loads of the building with the shortest possible spans over the subway, and also by the fact that the form of the subway structure was not only a curve but involved breaks of various kinds, some of which were particularly unfortunate in their locations. The floor levels of the basement limited the depth of girders that could be used for this purpose, and unfortunately, where the heaviest load came, imposed by the corner columns of the great hall, there was the least clearance and the longest span over the subway. At this point 3 columns came down above the subway structure, carrying a total load of 4,200 tons. To bear this load, 9 plate girders, side by side, spanned the subway supported by 18 columns, 2 columns being on the axis of each girder. These girders are marked on the plan G18X and G18Y, there being 4 of the Xs and 5 of the Ys. The main material of the X group was a web plate, 68″ x 7/8″, a total length of 66′ 10¼″; the flange angles were 8″ x 6″ x 1″, and 5 cover plates on each flange 14″ x 1″ thick, making a total cover plate thickness on each flange of 5″. The Y girders of this group have the same web and flange angles, but the total cover plate thickness is 3⅝″. The weight of one of the X girders was 29 tons, and the weight of the entire group of 9 girders with the bolsters, which distributed the load over these girders, amounted to 276 tons. The detail drawing of a part of one of the X girders is shown in Fig. 4.



Developed Elevation of Columns and Plan of Girders Spanning Subway (Fig. 3)

The system in supporting the other building columns over the subway was similar, but in no other case was there such a heavy concentration of loads, and from 2 to 4 girders were used as a unit spanning the subway. In each case the system of the group of 9 girders was followed, that is, to place a separate column under the end of each individual plate girder; these groups of columns, side by side, were fastened together with angles to make them one unit. The detail of one of these groups, consisting of 2 columns, is



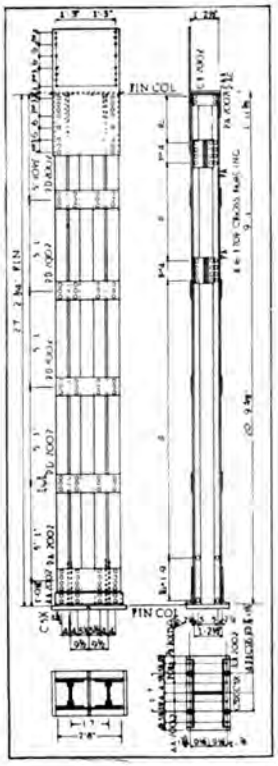


Fig. 4. Part Detail of One of Four Girders Marked X on Fig. 3.

Fig. 5 Detail of Group Columns Used around Subway. See Fig. 3.

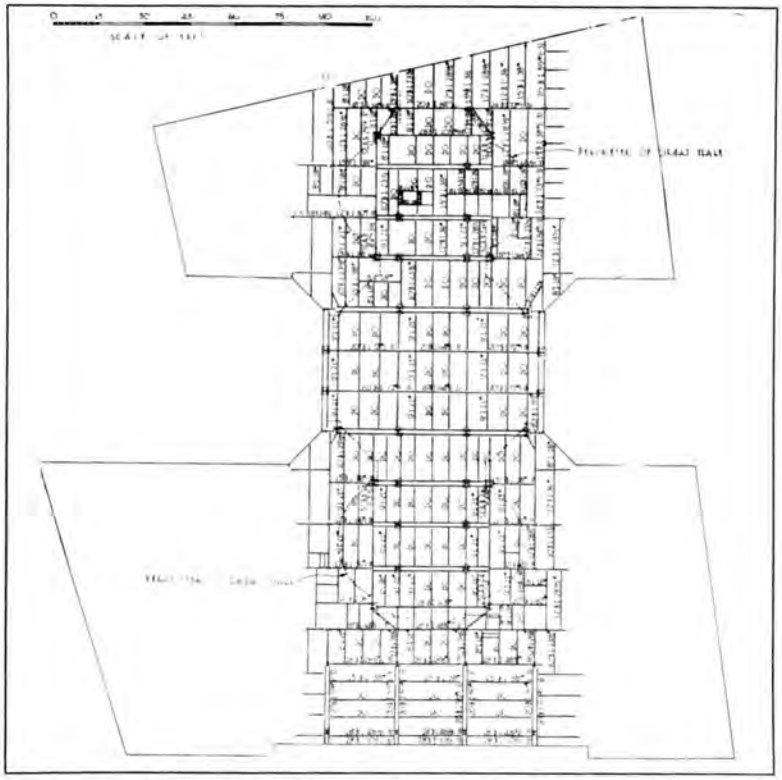
shown in Fig. 5. The groups of columns were braced by a system of vertical sway-bracing shown on the general plan (Fig. 3). This bracing was necessarily irregular in form and had to be placed in such positions as it could for architectural reasons. The total tonnage of steel in the subway girders, bracing and columns was 1,431 tons.

Referring to Fig. 7 of the 5th floor framing, showing the plan of the girders over the great hall, it will be seen that all the building columns coming down on this tier over the great hall had to be supported; for this purpose a system of double-plate girders was used, a pair of girders receiving 1 or 2 of the building columns as the case might be, with a heavy steel slab forming a bearing and distributing the load over the stiffeners of the girders. Two of these pairs were made up of girders of tremendous size and weight; the rivets used in fabrication were 1¼″ in diameter; the main material consisted of a web plate 120″ x ⅞″, the flange angles 8″ x 8″ x 1″, the side plates 12″ x 1″, and 4 cover plates on each flange 20″ x 1⅛″. The total span, center to center of bearings, was 64 feet.

An illustration of one of these girders loaded on the cars is shown by Fig. 6. The weight of each one of these individual girders was 60 tons, making the weight of a pair of supporting girders 120 tons. This illustration may give a clear idea of the large number of 1¼″ rivets used in fabricating the girder. It also shows the hitch angles which were used to lift the girder onto the cars and to raise it to its position in the building. The raising of these immense girders to a height of 74 feet above the street was quickly and safely accomplished by using two derricks, one lifting each end of a girder. The transportation of these pieces of steel through the streets was done on Saturday afternoons, Sundays and holidays, as the streets had to be comparatively clear to make it possible.

The 5th floor framing plan, Fig. 7, shows over the

120-inch Plate Girder for Fifth Floor of Cunard Building, Weighing 60 Tons (Fig. 6)



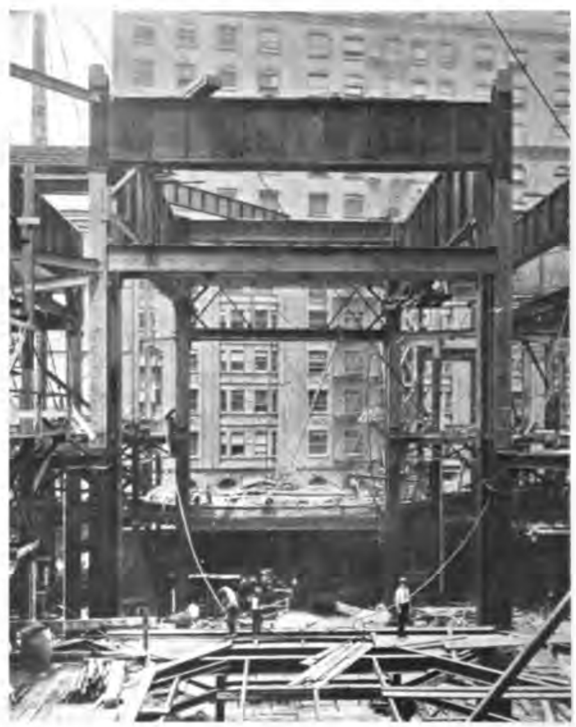
Portion of Fifth Floor Framing Plan over Great Hall (Fig. 7)

required the use of 1¼″ rivets driven in the field; this is probably the first time this has been done in a building operation, and good results were obtained by driving with two riveting guns, one to drive and one to "buck up." Wind bracing was introduced in such places in the sides of the great hall as the architectural conditions permitted. This was considered good judgment in view of the large hole which was cut in the building and intended to keep the great hall structure rigid under wind or other vibration. The details throughout the whole building were made very stiff without resorting to extra bracing members.

great hall area a number of other girders which were large and heavy but smaller than those just referred to. The riveting together of these at certain places

The writer had the privilege of being associated with Boller & Hodge as Consulting Engineers for the structural work and with Daniel E. Moran as Consulting Engineer for the foundations. Henry W. Hodge worked with the writer up to the day of his death, and thereafter Howard C. Baird gave advice and co-operation. Thus were the many unusual problems solved.

Showing 120-inch Plate Girders in Place



Heavy Framing over 70 Feet above Street

Special Problems in Foundations of the Cunard Building

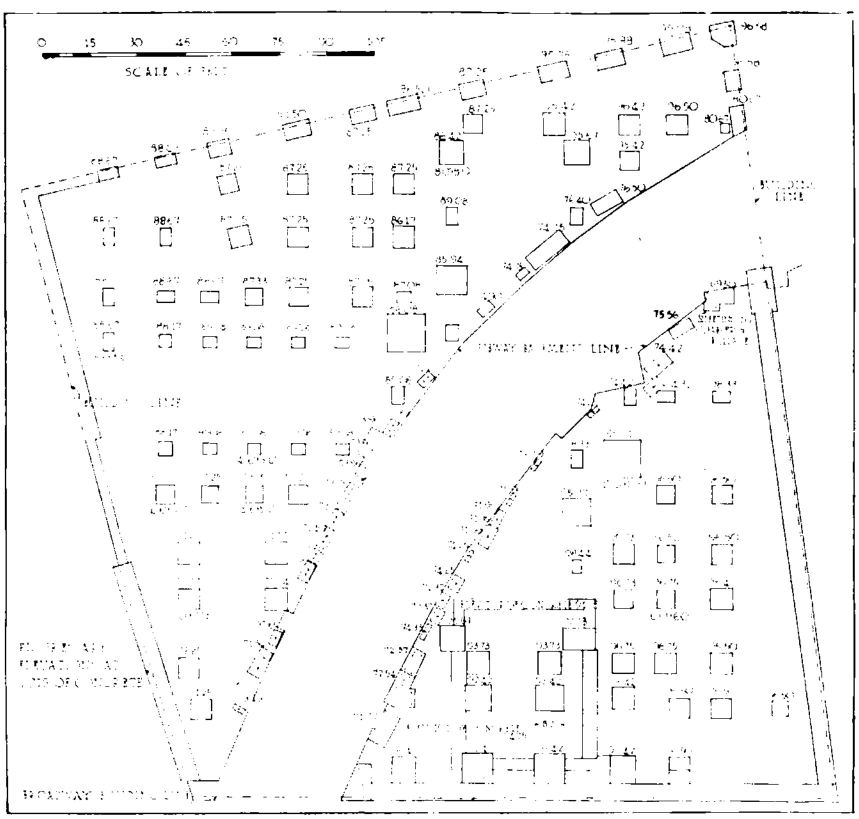
By CARLTON S. PROCTOR, C.E.
Moran, Maurice & Proctor, Consulting Engineers

IN the design of the foundations of the Cunard Building the engineers were confronted with the rather unusual feature of a site bounded on two sides by subway structures, with a third subway crossing diagonally. The topography of the rock surface showed a pronounced "hog back" running north and south at substantially the center of the site with a vertical drop averaging about 12 feet, the surface contours becoming rapidly higher to the west and lower to the east of this "hog back." This condition, together with the desire of precluding the possibility of subway vibrations affecting the building, and the underpinning of the diagonal subway at the southeast margin of the site, were other controlling features.

The walls and roof of the subway which crossed the site diagonally had been designed strong enough to carry column loads of any building which might probably be erected on the site, but although the column loads of the Cunard Building did not exceed the assumed loads in the design of the subway structure, it was found impracticable to dispose the column bases on the subway roof girders. Moreover, it was considered probable that if the columns of the building were placed directly on the subway girders vibrations would be transmitted to the building. It was therefore decided that the best results would be obtained by placing columns on each side of the subway structure and independent of it, these columns carrying trusses above the roof of the subway, which trusses in turn were to support the columns of the building in the desired arrangement.

The subway excavating having shattered the rock for some distance outside of the easement line, it was necessary to have the foundations of the adjacent columns of the building on undisturbed rock below the base of rail of the subway. Owing to the heavy loads on the trusses it was essential that the spans be the shortest possible, or, in other words, that the columns should be as near the lines of the subway as practicable. Had concrete piers been employed for the support of the bases of these columns, the centers of these piers, to give the required bearing area, would have been so far from the subway wall as to materially increase the lengths of the spans; therefore long and narrow grillages, with the long axes paralleling the line of the subway, were placed on the undisturbed rock below the level of the base of rail. This permitted the use of concentrically loaded areas of the required sizes with the minimum lengths of spans for the heavy trusses.

Owing to the weight of the building it was advisable to have the foundations on hardpan or on rock. As the rock surface at the westerly part of the building was above the required depth of the cellar, the foundations of this portion obviously had to be on the rock, and as it was considered preferable to have all the column footings on a uniform foundation bed, it was decided to have all foundations go to rock. The desired depth of cellar below ground



Foundation and Column Footing Plan of Cunard Building

water level required a cofferdam where the rock was low along the easterly and part of the northerly boundaries.

If an open cofferdam were employed the danger would be involved of losing material in sinkings through the existing stratum of New York quicksand, and a consequent settling of the Broadway subway would have resulted unless prevented by underpinning. This underpinning would have been necessary before the construction of the cofferdam had proceeded beyond the level of the base of rail.

In the opinion of the engineers it was deemed safe to sink pneumatic caissons without underpinning the subway on Broadway, and the subsequent construction supported this view, as no settlement whatever resulted. It was estimated that the saving in cost of omitting the underpinning would offset the increased cost of the pneumatic over the open method, and as the pneumatic method was considered safer it was adopted.

In the westerly portion of the site the rock surface was so high as to require a very considerable amount of rock excavation to meet the space requirements in the basement. On the other hand, the rock surface at the easterly side of the lot was below the sub-grade of the subway which crossed the site diagonally, and the underpinning of this subway near its intersection with the Broadway building line was necessary in order that the building column footings might go to undisturbed rock without endangering a settlement of the subway. This underpinning was done as a continuation of the Broadway cofferdam. The open method of construction was used for this work in lieu of the pneumatic, because, with the main cofferdam completed and supported, any run of material which might start in these small joints could be easily controlled and checked.

Furthermore, one of the columns adjacent to the subway occurred at the northerly joint, and it was necessary, as previously explained, to have this column close to the line of the subway and extending to firm rock, which at this location was considerably below the sub-grade of the subway. As the placing of this column would have been impracticable and expensive through the air-lock of a pneumatic joint, it was decided that this construction be done in the open, and by exercising due care no run of material resulted and a considerable saving in cost was effected.

The foundations of the Bowling Green Building, adjoining the site along the south side, are on rock to the west of the "hog back" previously referred to, and on hardpan east of that point. In order to build the adjoining foundations of the Cunard Building, it was necessary to underpin the north wall of the Bowling Green Building east of the "hog back," from the underside of footing to rock.

This was done by constructing a concrete wall 6 feet thick extending 2 feet under the Bowling Green Building. The wall was built in alternate short longitudinal sections, each section being thoroughly wedged to take the weight of the building before the next was started.

The finished wall then served the three purposes of underpinning, providing a foundation for the south wall columns of the Cunard Building, and closing the cofferdam.

Electrical, Heating and Ventilating Equipment
of the Cunard Building

By HENRY C. MEYER, JR.
Of Meyer, Strong & Jones, Inc., Mechanical and Electrical Engineers

ELECTRICITY for the Cunard Building is obtained from the New York Edison Company. A service connection extends to a switchboard in the basement which feeds three main riser shafts, with power feeders to the various banks of elevators, etc., and lighting feeders to the different floors.

There is nothing unusual in the equipment except in the manner of distribution, where an effort has been made to design a flexible system of wiring that could be modified from time to time to suit the varying demands of tenants with a minimum of expense and with a minimum of cutting. Owners of large office buildings are thoroughly familiar with the difficulty of making tenants' changes in the electrical equipment, and appreciate the importance of a flexible system of wiring.

Provision is made at each panel board, on rented floors, for the installation of meters. Panel boards on these floors are of the metering type which allow any circuit to be easily connected to any meter. Instead of the usual plan of having isolated branch circuits from panel boards to lighting outlets, plug receptacles, etc., a trunk system of conduits and junction boxes is used from which extensions are made to the various outlets. This arrangement is very flexible and considerably simplifies changes and extensions, and particularly simplifies the problem of metering where space is subdivided.

It often happens that a tenant requires an unusual amount of current at some one location, as for instance, to a large group of graphotype or addressograph machines, or for lighting a drafting room. With this system of conduits any such condition can be easily taken care of. The accompanying diagram shows a section of this trunk system with the conduits extended both to original outlets and to outlets which were added later to accommodate partitions that were not located in accordance with the expected standard arrangement. Such extensions were made by installing each wire in a small flexible conduit buried in plaster. These extensions constitute a considerable improvement over the usual method employed.

Ceiling fixtures of the semi-indirect type are installed throughout the rented floors. They provide sufficient illumination and are so distributed that desk lights are unnecessary. A large number of plug receptacles are provided throughout the building for fans, adding machines, dictaphones, etc. A storage battery with charging apparatus is provided in the basement with wires leading up each of the riser shafts so that any tenant may obtain battery service for annunciators, push buttons, etc., without having the annoyance and expense of dry batteries. Conduits are also run up the various riser shafts and from the riser shafts to several points on each floor to facilitate the installation of telephone messenger calls, tickers and telegraph and similar wiring.

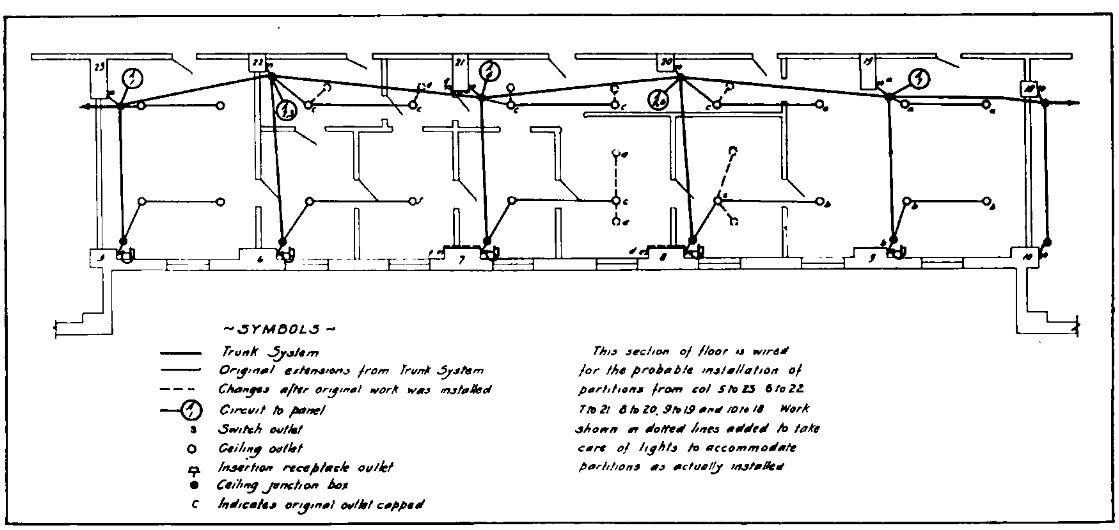
A network of conduits is provided in the floor of the quarters of the Cunard Company for connections to free standing desks, for telephones, etc. The telephones of the Cunard quarters are of the automatic type. Any instrument can be instantly connected with any other instrument without going through the switchboard, or an operator may be signaled from the same instrument and an outside number obtained in the usual way.

The Cunard Building is equipped with five horizontal tubular boilers of 175 h.p. each, furnishing steam for heating, and one boiler of the same type of about 80 h.p. that is used to furnish hot water for summer and winter use. The boilers are set with shells 6′6″ above the floor so that stokers may be installed at any time in the future. The boilers are provided with forced draft for use in emergency, should one boiler be shut down for repairs or cleaning, or when burning finer sizes of low grade anthracite coal. The coal bunker is of about 700 tons capacity, and is filled by means of a conveying belt system. Arrangements are made for the installation of a crusher and of a fuel oil system should it be desirable to install them.

The building is heated entirely by direct radiation and the vacuum system is employed. The total amount of radiation in the building is about 65,000 square feet. The radiators are bracketed to the walls in almost every instance so as to make it easy to clean beneath them. About 150 radiators are concealed, and automatic control is used to a considerable extent in the steamship company's offices.

There are eight separate ventilating systems in the building: one ventilating the mechanical plant in the sub-basement; a second ventilating the Cunard quarters in the basement and first floors, including the freight and passenger departments; a third ventilating the Cunard quarters in the second and third floors; a fourth ventilating the Mechanics and Metals National Bank quarters on the basement, first and second floors; a fifth supplies to the vaults in the basement and sub-basement, and three systems ventilate all the toilet and locker rooms throughout the building.

Each coupon room in connection with the safe deposit vault is provided with an independent supply inlet with exhaust outlets in the corridors, and a supply and exhaust is also provided for the main vault, the connection for it consisting of movable aluminum ducts entering the emergency door and so arranged that they can be swung out of the way when the door is to be closed. The air is supplied to the vault near the floor through registers in the base beneath the boxes, and it is exhausted through ceiling registers. The total amount of air moved by the ventilating equipment is about 315,000 cubic feet per minute and about 400,000 pounds of sheet metal work were used in the system.



Section of Floor Plan Showing Flexible System of Electric Wiring

Plumbing in the Cunard Building

By CLYDE R. PLACE
Consulting Mechanical and Sanitary Engineer

IN planning the Cunard Building the plumbing layout and specifications were given special attention and were prepared in the office of the consulting engineer. All fixtures necessary for an up-to-date plumbing installation were given careful consideration as to design and operating efficiency, combined with simplicity. The care in developing the plumbing plans was evident as the building progressed, because the materials and fixtures arrived early and correctly and were placed in their proper positions without delays.

The question of temporary water supply and fire protection for a building of this size while under construction is an important factor. In addition to supplies to meet construction requirements, temporary school sinks, which are a sanitary necessity for the use of the mechanics, were installed. Many unusual difficulties were experienced in the layout of pipes, due to the many levels and clearances occasioned by the subway loop under the building, as may be seen from an examination of the sub-basement plan. An ample water supply enters from the three streets bordering the property. These supplies are combined into a common header and carried to a large steel suction tank of 10,000 gallons capacity with two compartments.

The house and fire pumps were tested under actual working conditions before being shipped to the site. These pumps were installed early enough to permit their being used for the building construction, which resulted in a saving. The pipe for the cold water service is of standard and extra strong quality of wrought iron and is galvanized. The hot water pipe is brass throughout. The system of hot water circulation is overhead down feed. Expansion and contraction of the various pipes were carefully considered, and hot water can instantly be obtained at any fixture in the building.

The water heaters for the fixtures of the building requiring hot water, such as slop sinks, office and toilet basins, shower baths, etc., are of the storage type. There are three heaters, each of 3,000 gallons per hour capacity, and the piping is so arranged that any one heater may be shut down as may be required in case of emergency. There are two house tanks on the roof, each of 10,000 gallons capacity and the fire protection reserve of 3,500 gallons is maintained in each tank. The supply to all the fixtures in the building above the first floor is on the tank supply. The fixtures below the first floor are on street pressure with a cross connection on the supply from the house tanks.

Because of the excessive pressure on the water lines, due to the height of the building, pressure-reducing valves are used on the supplies below the 14th story. This method gives a uniform pressure at all fixtures. Each fixture has its individual valve control and in addition each group has a separate valve. The valves throughout the building are accessible by means of metal doors. There are 1,700 plumbing fixtures installed in the building and each fixture was inspected as to quality and approved before being shipped to the site.

While all the fixtures above grade flow by gravity to the public sewer, the waste from fixtures in the basement and sub-basement is carried to two ejectors which are discharged by compressed air. Each ejector has a capacity of 150 gallons per minute, discharged into the public sewer in Greenwich street. Sump pumps for handling the ground water and wastes of various drips are arranged in duplex outfits.

Electrical apparatus is so arranged that either one or both of the house pumps, the sump pumps or the compressors may work at the same time. The second pump is started when the load on the first is more than it can handle. The passenger elevators are of the high speed, overhead gearless traction type. They are divided into three separate banks for express and local service, thereby giving flexibility and quickness of operation. The local elevators serve up to and including the 14th floor and the express elevators from the 12th to 21st floors. The Cunard offices and the bank quarters have short rise elevators for their own service. These are of the geared traction type.

The starter for each bank of passenger elevators has complete control at all times over the elevators. An electric board, with buttons thereon, enables him to start, call back and cut out the signals, and by means of telephone he can call up any elevator operator, engineer or superintendent of the building. The shaftway doors are of the center-opening type with hand-operated, two-thirds vertical bar locks and center catches. Very heavy adjustable rubber bumpers eliminate the noise of opening and closing the doors. These doors are also equipped with a mechanism to prevent a person trying to force the door open, once the operator has started to close it. The elevators operating over the subway loop have safeties on the counterweights in addition to those on the cabs. The cabs are of such platform sizes as to insure very quick loading and unloading of the passengers.

The passenger elevators in the building provide for a floor get-away every 23 seconds and there are elevators in sufficient number to empty the building during the peak rush hours without undue congestion at any of the floors. The position of the operator in the cab is the same for all cases. He operates doors with left hand and car control with his right hand. This method provides for a quick and satisfactory change of operators.

ENGINEERING DEPARTMENT

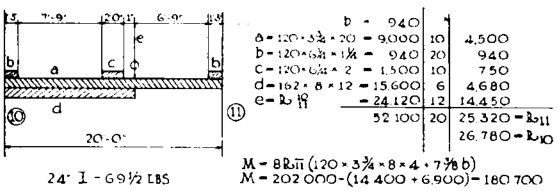
Charles A. Whittemore, *Associate Editor*

Steel Design for Buildings

PART I. THE DESIGN OF STEEL BEAMS

By CHARLES L. SHEDD, C.E.

IN making engineering calculations, it is important that they should be made systematically; the speed of the work will be increased, accuracy assured, and the calculations made available for reference afterwards by anyone familiar with the system. The method here described is based on that used by Purdy & Henderson, Engineers, of New York, but has been modified in some respects by the author where it seemed advisable for speed and accuracy. The design tables are taken from the Carnegie and Bethlehem Handbooks but are rearranged



Sketch for Example of Applying Calculations

by the author to give a system whereby the lightest beam may be readily chosen to fulfill any required conditions. The moments of resistance and allowable shear are copied directly from the handbooks mentioned, but the buckling is the allowable per lineal inch instead of per square inch as given in the Carnegie Handbook. The buckling for the Bethlehem beams is computed by the same formula as used by the Carnegie Handbook in order to give a uniform table.

The computation is shown here for a beam in a large office building, recently designed by the author, and will illustrate the method of arranging the computations. It is a spandrel beam, that is a beam between two outside columns of the building, carrying wall and floor loads. The beam is between columns 10 and 11 as shown in the sketch. The wall is of brick, 12" thick with two windows, each 7'9" wide, as shown in the sketch, and separated by a brick pier 2'0" wide. The story height is 10'0" and the height of each window is 6'3".

These figures are scaled from the drawings to the nearest 3", which is near enough to give accurate results. By accurate results is meant consistent accuracy. That is, if some factor of the computations cannot be ascertained nearer than 5% it is a waste of time to try to get other factors much nearer, for the result cannot be more accurate than the least accurate factor. Usually the least accurate factor in such calculations is the live load of the floor. This, while determined definitely by law in most large cities, is not actually very close to the truth, as being a variable it must be sure to err on the safe side. Then, too, the actual strengths of the beams vary slightly. This is shown by the range allowed in any specification for the results of the test pieces. The American Society for Testing Materials, for instance, allows in its specifications as given in the Carnegie Handbook an allowable variation for the tensile strength of steel between 55,000 and 65,000 pounds per square inch. This is a variation of about 18%.

The span of the beam is 20'0", as shown in the sketch. The uniformly distributed loads are shown by crosshatched areas while the concentrated load, *e*, is located by an arrow. The load, *a*, is the uniform load of brickwork under the windows, extending the entire length of the beam. It is 3'9" high and 12" thick. Brickwork is usually taken to weigh 115 pounds per cubic foot, but the author uses 120 pounds and neglects the weight of the plaster and the windows themselves. This is sufficiently accurate and is easy to use as it gives just 10 pounds for each inch of thickness of wall. These computations are shown in detail alongside of the beam diagram.

The *b* and *c* loads are the pier loads between the windows. Note that there are two *b* loads. In writing out these expressions for wall loads the author usually gives the load per superficial foot first, the height next and the length last. This is for simplicity in extending the figures. Using a slide rule it is best to use first the number which is common to most expressions, and the special figures last to avoid moving the slide too much, thus saving time. In this case, notice that 120 occurs in three of the expressions, and that 6¼ occurs twice.

The *d* load is a uniform floor load applied to the beam from column 10 to the point where a floor beam frames into it at *e*. 162 pounds is the load per square foot, including both the dead and live. The figures 8 and 12 in the computation are in feet. The first, 8, is half the span of the floor slab and the second, 12, is the length of the loading. The load *e*

TABLE I. ECONOMIC TABLE OF BEAMS AND CHANNELS

SHOWING MOMENT OF RESISTANCE, ALLOWABLE SHEAR AND BUCKLING PER LINEAL INCH

Sect.	*Wt.*	*Mom.*	*Shear*	*Buc.*	*Sect.*	*Wt.*	*Mom.*	*Shear*	*Buc.*	*Sect.*	*Wt.*	*Mom.*	*Shear*	*Buc.*
3″ [	4#	1.4	5.1	2.7	9″ BI	24	27.3	32.8	5.3	18″ I	60	124.7	99.9	7.4
3″ [	5	1.6	7.9	4.5	9″ [	25	20.9	55.3	9.8	21″ I	60½	156.9	89.8	4.5
4″ [	5¼	2.5	7.2	2.7	9″ I	25	27.2	36.5	6.2	15″ BI	64	118.2	90.7	8.7
3″ I	5½	2.2	5.1	2.7	10″ [	25	24.2	52.9	8.3	20″ BI	64	162.9	90.0	5.2
3″ [	6	1.8	10.8	6.3	10″ I	25	32.5	31.0	4.1	15″ I	65	113.1	102.9	10.4
4″ [	6¼	2.7	10.1	4.1	12″ [	25	32.0	46.8	5.3	18″ I	65	130.6	114.7	9.0
3″ I	6½	2.3	7.9	4.4	8″ I	25½	22.8	43.3	8.6	20″ I	65	155.9	100.0	6.0
5″ [	6½	3.9	9.5	2.7	12″ I	28	44.2	34.0	3.3	20″ BI	69	169.2	104.0	6.3
4″ [	7¼	3.0	13.0	5.4	10″ BI	28½	35.9	39.0	5.6	24″ I	69½	214.2	93.6	3.2
3″ I	7½	2.5	10.8	6.3	12″ BI	28½	48.0	30.0	2.7	15″ I	70	118.0	117.6	12.3
4″ I	7½	3.9	7.6	2.9	9″ I	30	30.2	51.2	9.1	18″ I	70	136.5	129.4	10.5
6″ [	8	5.7	12.0	2.7	10″ [	30	27.5	67.6	10.8	20″ I	70	162.6	115.0	7.4
4″ I	8½	4.2	10.5	4.3	10″ I	30	35.8	45.5	6.9	12″ BG	70	119.7	55.2	6.7
5″ [	9	4.7	16.5	5.4	12″ [	30	35.9	61.5	7.6	15″ BI	71	141.5	78.0	7.2
4″ I	9½	4.5	13.5	5.4	12″ I	31½	47.9	42.0	4.5	20″ BI	72	195.5	86.0	4.7
5″ I	9¾	6.4	10.5	3.1	12″ BI	32	50.8	40.2	4.2	15″ BG	73	157.1	64.5	5.5
7″ [	9¾	8.0	14.7	2.8	8″ BG	32½	38.1	23.2	4.1	15″ I	75	122.9	132.3	14.1
4″ I	10½	4.7	16.4	6.6	15″ [	33	55.6	60.0	5.0	18″ I	75	169.1	101.1	7.5
6″ [	10½	6.7	19.1	5.0	9″ I	35	33.1	65.9	11.7	20″ I	75	169.2	129.8	8.8
8″ [	11¼	10.8	17.6	2.8	10″ [	35	30.8	82.3	13.2	18″ I	80	174.9	115.9	9.1
5″ [	11½	5.5	23.8	8.2	10″ I	35	39.0	60.2	9.6	20″ I	80	195.5	120.0	7.9
5″ I	12¼	7.2	17.8	5.9	12″ [	35	39.8	76.3	10.0	24″ I	80	231.9	120.0	5.3
6″ I	12¼	9.7	13.8	3.3	12″ I	35	50.7	52.3	6.2	20″ BI	82	208.0	114.0	7.3
7″ [	12¼	9.2	22.2	4.8	15″ [	35	56.9	63.9	5.5	24″ BI	84	264.6	110.1	4.6
6″ [	13	7.7	26.4	7.0	12″ BI	36	59.8	37.2	3.8	18″ I	85	180.8	130.5	10.6
9″ [	13¼	14.0	20.7	2.8	15″ I	37½	72.1	49.8	3.7	20″ I	85	201.1	132.6	9.1
8″ [	13¾	12.0	24.5	4.4	9″ BG	38	50.6	27.0	4.1	24″ I	85	240.9	136.8	6.7
5″ I	14¾	8.1	25.2	8.1	15″ BI	38	78.7	43.5	2.6	18″ I	90	186.7	145.2	12.2
6″ I	14¾	10.6	21.1	5.6	10″ I	40	42.3	74.9	12.0	27″ I	90	292.1	141.4	5.3
7″ [	14¾	10.3	29.6	6.8	12″ [	40	43.7	90.9	12.1	20″ I	90	207.7	147.4	10.5
7″ I	15	13.8	17.5	3.5	12″ I	40	59.8	55.2	6.7	24″ I	90	248.7	151.4	7.8
9″ [	15	15.1	25.9	3.9	15″ [	40	61.8	78.6	7.4	26″ BI	90	305.3	119.8	4.2
10″ [	15	17.8	24.0	2.8	15″ BI	41	81.2	51.0	3.8	18″ BG	92	235.7	86.3	6.1
6″ [	15½	8.7	33.8	9.0	15″ I	42	78.5	61.5	5.2	20″ I	95	214.2	162.0	11.9
8″ [	16¼	13.3	31.9	6.2	10″ BG	44	65.1	31.0	4.1	24″ I	95	256.5	166.3	9.0
6″ I	17¼	11.6	28.5	7.6	12″ I	45	63.5	69.1	8.9	20″ I	100	220.7	176.8	13.3
7″ [	17¼	11.5	37.0	8.4	15″ [	45	66.7	93.3	9.2	24″ I	100	264.4	180.9	10.1
7″ I	17½	14.9	24.7	5.5	15″ I	45	81.0	69.0	6.1	15″ BG	104	216.9	90.0	8.7
8″ I	17½	19.4	17.6	2.8	15″ BI	46	86.2	66.0	5.7	24″ I	105	312.4	150.0	7.7
8″ BI	17½	19.1	20.0	3.3	18″ I	48	109.2	68.4	4.1	28″ BI	105	382.3	140.0	4.5
8″ I	18	18.9	21.6	3.7	18″ BI	48½	118.2	57.6	3.0	24″ I	110	320.4	165.1	8.9
8″ [	18¾	14.6	39.2	7.8	12″ I	50	67.4	83.9	11.2	20″ BG	112	312.3	110.0	6.9
8″ BI	19½	20.2	26.0	4.7	15″ I	50	85.9	83.7	8.0	24″ I	115	328.4	180.0	10.1
7″ [	19¾	12.6	44.3	10.1	15″ [	50	71.6	108.0	11.1	24″ BG	120	400.8	127.0	5.8
7″ I	20	16.1	32.1	7.3	18″ BI	52	122.2	67.6	4.0	30″ BI	120	465.7	162.0	4.9
9″ [	20	18.0	40.7	7.0	15″ BI	54	108.4	61.5	5.1	15″ BG	140	283.1	120.0	12.5
10″ [	20	21.0	38.2	5.5	18″ BI	54	124.7	73.9	4.7	20″ BG	140	391.3	128.0	8.6
9″ BI	20	25.2	22.5	3.1	12″ I	55	71.3	98.5	13.1	24″ BG	140	466.8	144.0	7.2
8″ I	20½	20.2	28.5	5.4	15″ [	55	76.5	122.7	13.0	26″ BG	150	528.6	163.5	7.7
12″ [	20½	28.5	33.6	3.2	15″ I	55	90.8	98.4	9.8	26″ BG	160	576.5	163.5	7.3
9″ I	21	25.1	26.1	3.9	18″ I	55	117.8	82.8	5.6	28″ BG	165	625.0	185.0	7.5
8″ [	21¼	15.9	46.5	9.3	12″ BG	55	96.0	44.5	4.8	28″ BG	180	691.9	193.0	8.1
10″ I	22¼	30.2	25.2	3.0	18″ BI	59	130.8	89.0	6.4	30″ BG	180	728.4	206.6	7.7
8″ I	23	21.5	35.9	7.1	20″ BI	59	156.3	75.0	3.7	30″ BG	200	813.4	225.0	8.8
10″ BI	23½	32.8	25.0	3.0	15″ I	60	108.3	88.5	8.6					

is brought in by an interior beam framing into the beam in question at the end of the *d* load. The reaction is copied directly from the calculations for this building where it is labeled R_{11}^{10}, denoting that that end of the beam frames into a beam between columns 10 and 11. These expressions are extended and placed below each other so that they can be readily added together, and as there are two *b* loads it is repeated at the top so that when they are added up the result, 52,100, will be the total load on the beam.

In the computation, between the two vertical lines at the right of these loads are placed the respective distances from the left hand reaction to the center of gravity of each load, and below the horizontal line the span of the beam. The numbers at the right of the second vertical line are the parts of each load which are carried to the right hand reaction. For instance, 15,600 divided by 20 and multiplied by 6 gives 4,680. Added together, the total 25,320 is the reaction at column 11, and this subtracted from the total load shows the reaction at column 10. This method also allows the decimal point to be found easily by inspection, thus avoiding errors.

The maximum moment on the beam is at the point of zero shear, that is where the algebraic sum of all the forces (loads and reaction) to either side of the section is zero. This can often be told very closely by inspection and verified by figures. In this case the load *e* is very nearly as large as either of the reactions which are about the same size. It therefore looks as if the zero shear were at the load *e*. The portion of the *a* load to the right of the *e* load is equal to 120x3¾x8, which is equal to 3,600 and which added to *b* gives 4,540, and this subtracted from R_{11} gives 20,780, which is less than *e*, therefore the zero shear is at that load. The expression for the moment is written out, first the reaction times its arm and then the uniform loading times its arm (4), and then the load *b* times its arm. These are extended and the results placed below each expression. The negative amounts are added together and their sum, 21,300, placed below the moment of the reaction. The difference between these, or the moment we are after, is then obtained, 180,700.

In a large office it is best for one man to write out the expressions with the sketch and hand it to a less experienced man who uses his slide rule until he finds the reaction. Another inexperienced man can check his work and return it to the first man who writes in the expression for the moment, and the other two men then extend this expression and return it to the designer who chooses the section to be used.

In choosing the section, Table I should be used. It will be noted that the weights of the beams all appear in order, therefore if the designer starts at the first of the table and examines the properties of each beam the first one he finds which fulfills the requirements is the lightest and therefore the most economical. In choosing a beam it is best to follow down the moment column. This gives the allowable moment in foot-pounds, the same as used in the calculations. The last two ciphers have been omitted. For this beam we require a moment of resistance of 180,700, and the first one we come to is the 24″ I 69 ½#, which has a moment of resistance of 214,200. The maximum shear on the beam is 26,780, while the beam is good for 93,600. The buckling need not be considered in this beam, but if one of the loads like the *e* load had been applied to the top of the beam, as in the case of a strut, then we should have had to use the last column of the table.

If the *e* load had been a strut load we would have to compute the necessary length of beam to use in distributing the load so as not to buckle the web in compression. The load must be distributed over a length not greater than half the depth of the beam plus the length on the top flange where the load is applied. To find this necessary length we must divide the load 24,120 by the amount in the table, 3,200, which gives 7½″ and from this subtract half the depth of the beam, 12″, but as this gives a negative result there can be no trouble. If it had been a larger load, say 109,000, we would have secured by dividing that by 3,200, 34″ and after subtracting half the depth of the beam, 12″, would have had 22″ left. If the strut had been composed of two 6″x4″x½″ Ls, for instance, with the 6-inch legs together and parallel to the web of the beam, we would have had either to put a base on the strut which would have distributed the load along the whole 22″, or used stiffener angles on the web of the beam.

Some designers prefer to use an I beam and channel to carry a wall. In such cases a table such as Table II will prove useful.

TABLE II

ECONOMIC TABLE OF AN I BEAM AND CHANNEL BEAM SECTION

Section		*Wt.*	*Mom.*
6″ I 12¼#	6″ [8#	20¼	15.4
7″ I 15	7″ [9¾	24¾	21.8
8″ I 18	8″ [11¼	29¼	29.7
9″ I 21	9″ [13¼	34¼	39.1
10″ I 25	10″ [15	40	50.4
do	10″ [20	45	53.5
12″ I 31½	12″ [20½	52	76.4
do	12″ [25	56½	79.9
12″ I 40	12″ [20½	60½	88.2
do	12″ [25	65	91.7
do	12″ [30	70	95.6
15″ I 42	15″ [33	75	134.1
15″ I 45	do	78	136.5
15″ I 50	do	83	141.4
15″ I 55	do	88	146.3
15″ I 60	do	93	163.8
do	15″ [35	95	165.1
do	15″ [40	100	170.0
do	15″ [45	105	174.9
do	15″ [50	110	179.8
do	15″ [55	115	184.7
15″ I 65	do	120	189.5
15″ I 70	do	125	194.4
15″ I 75	do	130	199.3

It is sometimes desirable to design beams with flange plates. This is occasionally done to save in the depth of the member, sometimes to provide a wider bearing for brickwork, and sometimes to reinforce beams already in place. Table III will show the values of a few of such beams in bending. Only the more common sizes have been included.

TABLE III

MOMENTS OF RESISTANCE OF BEAMS WITH FLANGE PLATES. ¾″ RIVETS STAGGERED

Sect.	*Net*	*b*	*t*=5-16	3-8	7-16	1-2	9-16	5-8	11-16	3-4
6″ I 12¼	7.6	4	14.6	16.2	17.7	19.3	20.9	22.4	24.0	25.6
		+1	2.5	3.0	3.6	4.1	4.6	5.2	5.7	6.2
7″ I 15	11.1	4	19.3	21.1	22.9	24.7	26.5	28.2	30.0	31.8
		+1	3.0	3.6	4.2	4.8	5.4	6.1	6.7	7.3
8″ I 18	15.5	5	28.2	30.9	33.6	36.3	39.0	41.7	44.4	47.1
		+1	3.3	4.0	4.7	5.4	6.1	6.8	7.5	8.2
9″ I 21	21.0	5	35.2	38.1	41.0	43.9	46.8	49.7	52.7	55.6
		+1	3.8	4.5	5.3	6.0	6.8	7.5	8.3	9.0
10″ I 25	27.6	5	43.2	46.4	49.6	52.8	56.0	59.2	62.4	65.6
		+1	4.1	4.9	5.8	6.6	7.5	8.3	9.2	10.0
12″ I 31½	41.3	6	64.8	69.6	74.4	79.3	84.1	88.0	93.7	98.5
40	52.7	6	75.7	80.4	85.1	89.9	94.6	99.3	104.0	108.7
		+1	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0
15″ I 42	68.5	8	110.0	118.5	127.1	135.6	144.2	152.7	161.3	169.8
60	95.6	8	136.0	144.3	152.7	161.0	169.4	177.7	186.1	194.4
		+1	6.2	7.4	8.7	9.9	11.2	12.4	13.7	14.9
18″ I 55	104.5	8	154.8	164.9	174.9	185.0	195.1	205.1	215.2	225.2
		+1	7.5	9.0	10.6	12.0	13.6	15.0	16.6	18.0
20″ I 65	139.3	8	195.0	206.1	217.2	228.3	239.4	250.5	261.6	272.7
80	176.8	8	231.0	241.9	252.8	263.7	274.6	285.5	296.3	307.2
		+1	8.4	10.1	11.7	13.4	15.1	16.8	18.4	20.1
24″ I 80	210.0	8	276.1	289.5	302.8	316.2	329.5	342.9	356.2	369.6
100	242.5	8	307.3	320.5	333.6	346.8	360.0	373.2	386.3	399.5
115	299.8	8	363.1	376.0	389.0	401.9	414.8	427.7	440.7	453.6
		+1	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0

For example, in this table an 18″ I 55# with two 8″x½″ plates, one on top and one on the bottom, would be good for a bending moment of 185,000 foot-pounds. If the plates were changed to 9″ plates the moment of resistance would be increased by 12,000 foot-pounds, making 197,000 foot-pounds. The plates need not go the full length of the beam but could stop at a point where the moment was 104,500 foot-pounds as in the column headed "Net."

It is best to put in as many rivets near the ends of each plate as are required to develop the full strength. These should be staggered and spaced about 3″ c.c. Between these two groups the rivets should be spaced not over 6″ c.c. In 6″ and 7″ beams the rivets should not be greater than ⅝″ in diameter, but in larger beams they can be ¾″ in diameter. Table IIIa, below, gives the number of rivets necessary to develop the various sized plates. For example, a 7″x½″ plate would require 17 ⅝″ rivets or 12 ¾″ rivets.

TABLE IIIa

Number of Rivets Required to Develop Flange Plates for Beams with Rivets Staggered

	Diam. Rivet = ⅝″				¾″							
t	*b* = 4″	5″	6″	7″	5″	6″	7″	8″	9″	10″	11″	12″
5–16	6	7	9	11	5	6	7	8	10	11	12	13
3–8	7	9	11	13	6	7	9	10	11	13	14	16
7–16	8	10	12	15	7	9	10	12	13	15	16	18
1–2	9	11	14	17	8	10	12	13	15	17	19	21
9–16	10	13	16	19	9	11	13	15	17	19	21	23
5–8	11	14	18	21	10	12	14	17	19	21	23	26
11–16	12	16	19	23	11	13	16	18	21	23	26	28
3–4	13	17	21	25	12	14	17	20	22	25	28	31

Where the beam is quite short and there is difficulty in getting the rivets in near enough to the ends of the plates, the rivets may be spaced closer together than 3″ or the plates may be made longer than necessary for the moment. It is best to get in a sufficient number of rivets at each end of each plate to develop it in at least as short a distance as one-quarter the length of the plate. Special cases may be investigated by computing the required pitch of the rivets from the formula: $p = \frac{vi}{sq}$ in which v equals the value of a rivet in single shear, i the moment of inertia of the entire section, q the statical moment of one plate about the center of the beam, and s the shear on the beam at the point considered. The value of a ¾″ machine-driven rivet in single shear is 4,420 and of a ⅝″ rivet 3,070. The moment of inertia of the entire section may be obtained by multiplying the moment of resistance in Table III by 12 times the depth of the beam, including the plates, and dividing it by 32,000. The statical moment of a plate is its net area multiplied by half the depth of the I beam plus half the thickness of one plate.

The minimum spacing for rivets, so as not to impair the strength of the plate, is 2 1/16″ for 6″ beams, 2 3/16″ for 7″ and 8″ beams, 2¼″ for 9″ beams, 2⅜″ for 10″ beams, 2 7/16″ for 12″ beams, 2 9/16″ for 15″ beams, 2 11/16″ for 18″ beams and 2 13/16″ for larger beams. This is determined by the gauge of the beams.

To illustrate the design of a beam with flange plates, let us consider the beam computed at the first of this article, between columns 10 and 11. It had a bending moment of 180,700 foot-pounds, therefore we could use a 15″ I 60# with 2 8x11/16 plates, which according to Table III is good for 186,100 foot-pounds. From Table I we find that a 15″ I 60# beam is good for a shear of 88,500 pounds, which is more than ample. The value of the net section of the I beam would be 95,600, from Table III. The moment 4 feet from column 11 would be equal to $4R_{11} - 120 \times 3\frac{3}{4} \times 4 \times 2 - 3\frac{3}{8}b = 94{,}200$, which would be very nearly equal to the net value of the beam. The moment 4′3″ from column 10 would equal $4\frac{1}{4}R_{10} - 120 \times 3\frac{3}{4} \times 4\frac{1}{4} \times 2\frac{1}{8} - 162 \times 8 \times 4\frac{1}{4} \times 2\frac{1}{8} - 3\frac{5}{8}b = 95{,}000$, which would also be about equal to the value of the net section of the beam. This gives the two points at which the plates may be cut off. The shear at the first point would be $R_{11} - 120 \times 3\frac{3}{4} \times 4 - b = 22{,}580$ and at the second point would be $R_{10} - 120 \times 3\frac{3}{4} \times 4\frac{1}{4} - 162 \times 8 \times 4\frac{1}{4} - b = 18{,}430$. From Table IIIa we find that 18 ¾″ rivets would be necessary to develop the full strength of one plate. If they were spaced 3″ c.c. they would occupy 4′6″. If we take the 4′0″ and 4′3″ which we found for the cut-offs of the plates and subtracted from the length of the beam 20′0″, we would get 11′9″ and

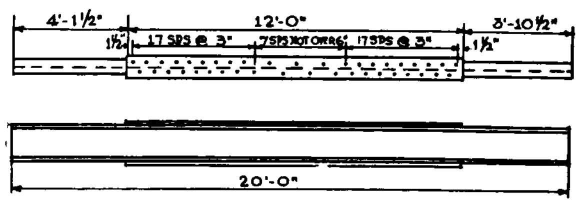


Fig. 1

adding 3″ for the two edge distances of the rivets would get 12′0″ for the length of each plate. The 4′6″ is more than one-quarter of this length, so we had better investigate accurately the required rivet pitch.

The moment of inertia $i = \frac{186{,}100 \times 12 \times 16.38}{32{,}000} = 1{,}140$

$q = 7.12 \times .69 \times 7.85 = 38.6$

$p = \frac{4{,}420 \times 1{,}140}{22{,}580 \times 38.6} = 5.8''$

which is more than the 3″, therefore it is all right to use the 3″. Fig. 1 shows the completed design of the beam.

Modern Floor Coverings

PART I

By E. H. HOWARD

IT IS interesting to note, with the development of building conditions, how various materials, as they are adopted for general use, pave the way for improvements in still different fields. This is evident in practically every branch of construction. For example, deformed bars and rods were not considered usable until the time when concrete became a commercial product. With the development of plaster work came wire and metal lath with their many modifications and suitability for use as reinforcing material for concrete construction.

It is indeed difficult to keep pace with all the materials which are continually appearing on the market, and to know the real merits of each product as distinguished from the claims set forth by the manufacturer, for there is sometimes a wide difference between the actual merits and the advertised merits of many materials. Another important matter is the ability required of the architect in determining and using the material suitable for special conditions. For example, there are some locations throughout the country where soft brass piping cannot be used for cold water. There is but little question but that brass piping is preferable in the majority of instances to any other kind of pipe for both hot and cold water, but the character of the material used must be adapted to local conditions.

Manufacturers of materials used for floor coverings have been extremely successful during recent years in developing new products, and these new materials are particularly to be noted in considering their adaptability to various uses. The typical floors of wood, such as maple, oak, birch or beech have changed but little since first adopted. From the "square-edged" days, wood floors have undergone a change to the use of narrow faced, tongued and grooved, and end matched, together with the use of varying thicknesses of wood, but in other types of floor, such as those of composite materials, we find radical differences and variety of developments in the field of covering materials, which formerly meant wood or marble.

About 35 years ago thin oilcloth for floor covering was placed upon the market. This came in yard and two-yard widths and was used particularly for covering kitchen floors. The English oilcloth very soon came into the market and appeared in 24-foot widths, making it possible to cover almost any room in one piece. It was used very generally, even on the best work, and floors of many office buildings during that period were covered with this material.

Gradually from the manufacture of this oilcloth the idea of linoleum was evolved. At first it was very thin and looked like oilcloth and had designs printed in the same general way and came in 8/4 or 6-foot widths. Later these widths were increased to 16/4 or 12-foot, and also appeared in several grades and thicknesses up to and including ⅛-inch. From the manufacture of this material the inlaid or tile linoleum was devised in 8/4 widths with the same various thicknesses, the color and design extending entirely through to the fabric or backing.

Cork carpet was very little used up to 15 years ago, but since that time has found an extensive market. It varies in thickness from ¼ to ½ inch, and on account of its elastic, resilient construction is exceedingly well adapted for many places where linoleum could not so well be used. Cork carpeting is practically noiseless; it is a little softer and less dense in composition than linoleum, and has been used in a great many installations of varying types with satisfaction. It is especially adapted for floors of large office buildings, auditoriums, churches and similar edifices. The places where cork carpet is to be used should be selected with considerable care, because the porous construction of the material itself renders it unadaptable for such places as kitchens where grease and stains may easily get on the floor. Unlike linoleum, cork carpet cannot be either waxed or stained, as such treatment immediately destroys its value.

When linoleum is applied to wood or concrete floors it should always be cemented with liquid cement. The type of this cement varies with the workman who is applying it. Some architects specify linoleum to be applied with waterproof cement; others simply specify a cement. Whenever the government uses the linoleum known and specified as the U. S. Standard Battleship Linoleum on ships, it is put down with waterproof cement. This is principally because it frequently comes in contact with moisture, and also because it is applied to an iron deck.

Experience proves that the best results in laying linoleum are obtained when a quick-drying cement, properly applied, has been the adhesive medium. Waterproof cement undergoes a chemical action when applied to concrete. Unless sufficient time is allowed for the evaporation of the volatile content, gases will form which cause puffs or bubbles to appear in the finished surface. To avoid this difficulty the linoleum should not be immediately placed in position as soon as the cement is applied. The exact time to be allowed between placing the glue or cement and laying down the linoleum can be determined only by experience.

When linoleum is applied over concrete and there is dampness present in the concrete, there is considerable likelihood that the backing may separate from the linoleum, causing the linoleum to bubble and eventually break through. This is particularly true where the concrete is deposited directly upon the earth. The solution of the problem is either to waterproof the upper surface of the cement or to have sufficient cinder fill under the concrete, with an applied coat of damp-proofing material on the top so that the moisture may not work its way through and attack the material which holds the burlap to the linoleum composition.

A concrete floor with a linoleum or cork carpeted surface is very satisfactory in that it is almost noiseless; it affords an insulating material between one floor and the floor below, and it is sanitary and can easily be kept clean. The most advanced method of laying linoleum is to cement a lining felt over the entire floor area to which the linoleum is cemented. When the material is applied in this manner to a concrete floor which is sufficiently dry, the most perfect results possible to obtain are assured, providing the concrete is sufficiently level and smooth. This lining felt comes in two widths and is similar to unsized building paper.

When linoleum and cork carpeting were first cemented to concrete floors, it was considered necessary that the entire floor surface should be rolled and heavily weighted with sand bags. This process of laying is not usually adopted today, particularly where the lining material must be brought into intimate contact with the entire surface to which it is applied and all air expelled. If the cement is properly applied and timed correctly there is little chance of the material separating from the floor. The floor covering should always be cut to approximate lengths on the floor and left to "weather" for a certain time before being applied. This will give an opportunity for the material to swell (there is little likelihood of shrinkage), and when laid it will remain inert.

Some architects also specify that all seams should be bradded. Usually linoleum, when laid with butt joints, is weighted down with sand bags along all seams. This is obviously desirable in order to hold in place the edges of the material which otherwise might have a tendency to curl. If the concrete is of the more or less porous quality, and if a quick-setting cement is used, a steel brad may be driven through the linoleum into the concrete with the assurance that the seam will stay in place. The brads best to use are approximately ⅜ inch long and have very small heads which make them practically invisible. If the workman cannot obtain this steel brad at the time needed, a worn phonograph needle can be used with very good results.

It is quite essential that the architect, when specifying such floor coverings, should be able to differentiate between the different kinds of materials. If, however, the material be purchased from a well recognized manufacturer there is little danger of a poor quality being used. It is well to see that the material is properly cured and to have it delivered at the building where it is to be used as soon as conditions warrant, so that it may be carefully examined and placed under observation for a period before being laid.

Some linoleums are made up of all sorts of adulterated materials, such as whiting, wood flour, sawdust and inert pigments. The U. S. Standard Battleship Linoleum is made with good oil, a proportion of pulverized cork, and a small proportion of wood flour, with a binder in which the color may be mixed. This linoleum may be treated with special stains or waterproofing finish in such a way as to make the surface practically impervious to the absorption of any material. For example, both ink and grease can be removed without leaving any stain whatever.

Cork carpet is made entirely of ground cork, oil and pigment, although some instances have been found in which wood flour and sawdust have been used on account of economy in manufacture. However, cork carpet made under these conditions would not be practical as in the presence of moisture the wood particles decompose and the value of such a carpet as a floor covering would be destroyed far too soon.

In recent years the designs which it is possible to obtain in linoleum, both printed and inlaid, cover a range so wide that almost any taste may be suited. Some of the effects that are obtained are of such a character that at a distance one can hardly tell the difference between the linoleum and a good rug. The pattern lines have been softened and producing the appearance of careful weaving has been so well studied that linoleum has established a place for itself never before obtained. Colors can also be had, suitable for any use.

In cork carpeting, designs are not so frequently used. Usually we see floors of this material of a solid tone, frequently, however, with panels or borders of different colors to break up the monotony of a single-color floor. In this material also considerable variety in colors is obtainable.

The widespread use of fabricated floor coverings in business structures and public buildings is in itself an indication of their excellence. These flooring materials are used because they are economical as well as particularly suited to uses of the most widely different kinds.

In addition to cork carpeting and linoleum there are various other composite floorings, which will be discussed in a later issue.

BUSINESS & FINANCE

C. Stanley Taylor, *Associate Editor*

The Direct Sub-Contract Method of Building

EXTENSIVE consideration has been given during the past year, through the editorial pages of THE ARCHITECTURAL FORUM, to the subject of contractual relations between the three interested parties in the average building operation—the owner, the architect and the building contractor. Various forms of building contracts which have been considered include the straight cost, cost-plus, the lump sum, the cost-plus-fixed-fee contract and various possible penalty and bonus clauses. Methods of selecting building contractors under each system have been analyzed, and it has been found possible under the cost-plus-fixed-fee form of contract to select builders on a fair competitive basis. Any consideration of this general subject would be incomplete without discussing the direct sub-contract method of carrying out a building operation, eliminating entirely the services of a general contractor. As most architects know, the findings of The American Institute of Architects include favorable consideration of a method of handling a building operation, in the course of which the architect, having completed his plans, divides the project into a series of sub-contracts. In behalf of the owner he then takes competitive bids on these various portions of the work and places directly contracts covering each part of the operation. The building then proceeds under the direct supervision of the architect, whose business it is to correlate the activities and interests of the different contractors.

In order that there may be no misunderstanding as to the attitude of The American Institute of Architects, which has expended serious study on this question, we quote from the recently published "Handbook on Architectural Practice," an official document of The Institute:

It is obvious that the duties falling on the architect under the separate contract system are much heavier than when the work is let under a single contract. Instead of conducting one bidding, asking and receiving bids from a few competitors, he conducts from 15 to 20 biddings on the separate parts of the work, asking and receiving bids from say 100 contractors; instead of guiding and supervising the work of one contractor, whose duty it is to bring the sub-contractors into co-operation, the architect must guide the work of the contractors for all the trades, harmonize their operations, be vigilant that they and their materials are ready when needed, see that they employ as large a force as can properly work, and settle differences between them. The architect must also keep more records of transactions and suitable books of account, and he must carry on a much heavier correspondence than under the other methods. He must himself be at the building more frequently than is ordinarily the case.

While this procedure saves the owner the profit on the entire work, to which the general contractor is entitled, on the other hand, since many of the contractor's duties devolve upon the architect, he must be paid for them. The Institute's "Schedule of Charges" (Appendix D) and the "Form of Agreement between Owner and Architect" (Appendix E) therefore provide for an additional remuneration to the architect when the separate contract system is employed.

It must not be supposed that when the architect directs the work of many contractors instead of a few his professional status is lost, or that he becomes in any sense a contractor. The owner signs the many contracts, just as he would the few, and the relation of the architect to the owner and to each contractor remains without change.

Those experienced in the separate contract system thus sum up its advantages:

(*a*) Exact knowledge, before any contract is let, not merely of the total cost of the work but of the cost of each of its important divisions. If the cost is to be cut, it can therefore be cut intelligently, the details being in hand and direct access to all who figure on the work being possible.

(*b*) Lower bids, because each contractor, as he deals directly with the author of the plans, may know exactly what is expected of him and may make contracts directly with the source of payment. This enables him to estimate more intelligently, with greater confidence, and consequently more closely, than in cases where he is obliged to submit his estimate to a number of persons whose financial responsibility he may doubt and who can offer no assurances that they will ever be in a position to let the work.

(*c*) Direct control of the selection of contractors for each branch of the work and direct distribution of payments to those who would otherwise be sub-contractors.

(*d*) The architect's more intimate relation with the construction of the work.

Under the separate contract system, the number and complexity of the architect's duties are such that a word of warning is necessary to architects who may think that they would like to work under that system. No architect, unless he be a capable administrator and have his office well organized for such work, should attempt it, nor should he imagine that the additional percentage will be a source of large profit. He will find that expenses of all kinds will be greatly increased and that his own burdens, and especially his responsibility, will be much greater than he would suppose.

In fine and in brief, if the separate contract system be well administered, it is admirable; if badly administered, it will result only in loss and annoyance.

The Growth of an Idea

It must not be thought that this method of handling a building operation directly through the architect's office is a new idea. It has been done for many years—in fact ever since the inception of architecture as a profession. It is the method through which buildings were constructed centuries ago, before the general contractor came into existence and at a time when the architect was the "master builder," in fact as well as in name. It is true, however, that general interest on the part of architects in this method of handling a building operation has developed in an almost unbelievable degree during and since the war period.

We find upon analysis that not only in the case of smaller housing projects, but even in the development of large building enterprises this method is being more extensively employed than ever before. Certain architects have in fact specialized in, and developed their organizations to render, this service to the client. In a measure the development of such an activity on the part of the architect has assumed the form of a defensive reaction, influenced by two causes:

1st: The fact that many contracting and engineering firms have established architectural departments in order that they may render complete service to the owner, a fact which has given the architect serious concern.

2nd: This method, with its resulting economy for the owner, has made possible the carrying out of many building projects which would otherwise have been delayed or abandoned.

The architect has discovered this activity as a means of increasing his revenue and maintaining his organization during otherwise dull periods. This has been particularly true in the Middle West, and the practice is gaining steadily in favor.

Naturally, the general contractor must look with disfavor upon this development and it is true that it opens up many possibilities which may act as a boomerang to those of the profession who may adopt this method of handling building operations. In discussing this matter with several architects who have been successful under such a plan, we uncovered an expression of opinion which is based on fact. There are two kinds of general contractors in the building business. One type includes large and small organizations which have developed efficient personnels to carry out building contracts, subletting only a small proportion, as in the form of sub-contracts. Such organizations are skilled in the buying of materials and the hiring of labor. Consequently the contractor's profit represents the fee which the owner pays to have his building constructed efficiently and under economical conditions. On the other hand there are many general contractors who are in effect brokers, taking a contract with the idea of re-letting most of the work in the form of sub-contracts, on top of which will be a profit for themselves.

In studying the development of interest on the part of architects in this subject, we find also that it increases proportionately as the size of the building project decreases. In other words, where the project is the construction of a moderate cost residence or several such buildings, the architect knows that this job can be divided into approximately six or seven sub-contracts, and that it is a comparatively simple matter to get estimates and bids on each of these divisions of the work, which in total will represent practically a guaranteed cost to the owner. Here there exist none of the usual complications, which grow in volume in size with the building project. It is found also, in these smaller operations, that the average contract is let to a carpenter or a mason, who in turn sub-lets four or five divisions of the work. We find, therefore, a condition in which the personal element plays a very important part. The size of a job, which may be carried out by the architect through the medium of letting a number of contracts on different portions of the work, depends entirely upon the capacity of the architect and his organization to control his work in an efficient manner.

The method of handling the operation naturally must rest with the owner, and the architect who wishes to handle the project directly is in a sense assuming the position of general contractor. He is not doing it in a manner which is unethical in any way. He becomes merely the broker acting in the interest of the owner, and there is much to be said in favor of this condition and the possibilities it offers in cutting down the cost of building by eliminating what might be called the "wholesaler's profit"—if we may use this commercial term. Owing to the fact that the element of personal ability and experience enters so extensively into this consideration, it is difficult for the architect to take any stand for or against the direct method of carrying out a building project under a series of contracts. If the architect can do this efficiently he will certainly save some money for the owner. On the other hand, if he cannot see his way clear to maintaining the proper relations between various sub-contractors and supervising efficiently the operation as it proceeds, it is better for him to recommend the general contractor method.

Allocating the Contracts

It has been found, in offices where the system is employed, that the size of the organization required naturally depends upon the size of the work to be carried out. We know of one architect who at this time is carrying out five individual dwellings, averaging $30,000 in cost. He has not only developed complete designs, working drawings and specifications, but has purchased practically all required materials and has let contracts covering the different branches of the work. In this case his fee for the work is 12% on the cost of labor and materials, and all the buildings are progressing to the satisfaction of the respective owners.

Each building project naturally divides into a series of logical contracts. It is the practice of the average architect who enters into an undertaking of this nature to draw up in connection with his specifications a careful outline of his sub-divisions of the work. For instance, in the case of one recent project involving the construction of six small houses, separate bids were received covering these different divisions:

1. Excavating, foundations, all masonry and rough plaster.
2. Carpentry work throughout.
3. Plumbing and heating.
4. Electrical installation.
5. Painting, papering and plaster finishing.

6. Grading, planting and other work on grounds.

It is necessary in this manner to allocate carefully the various sections of the work in order that bids may be taken. This should be done in such a manner that there can be no misunderstanding on the part of the bidder as to the portion of the work included under his part of the contract. Naturally, consideration must be given to the requirements of the various trades so that there will be no complications later. The question of purchase of materials also enters into consideration and, as far as the architect is concerned, this must depend largely upon the possibilities of obtaining bids on labor contracts only. Usually, and particularly in smaller operations, the individual bidder wishes to figure on both labor and material, as this introduces an additional element of profit to make the contract worth while for him. In any event, whether through direct purchase or under specifications, the quantity and quality of material must be controlled by the architect. In some instances it has been found advisable to work out a quantity survey under each contract division.

Arriving at a Guaranteed Cost

It is evident that if the preliminary work on building operations designed to be carried out by such a method is carefully done, so that the various contracts are properly allocated to cover the entire work, it is possible to develop a cost figure which represents practically a guaranteed price from the owner's viewpoint. The only element of uncertainty involved is that one or another of the sub-contractors may fail to carry out his agreement. If the selection of the contractor on each portion of the work is based on a logical cost figure, and on worthy past performances, this danger is comparatively negligible as we have now reached a stage of building conditions where it is quite possible for a sub-contractor to figure with a fair degree of exactness, both on material and on labor. Outside of the large cities building labor has been fairly well stabilized, in spite of all newspaper reports to the contrary. The American workman has to a great extent cast off the influence of the hectic conditions of the post-war period and is giving a good measure of production for each day's pay. In the average locality and in the average building trade there are more men than there are jobs. The law of supply and demand is functioning again and with it there has been developed among employers generally a degree of fair play and sound, businesslike consideration of the rights and interests of the workmen. Good employers in the building field are as a rule not finding any difficulty in obtaining good employes, and the sub-contractor on the average work now enters upon his duties with a fair degree of certainty that he can carry out the terms of his bid and receive a fair profit in so doing. Inquiry among sub-contractors brings out this interesting but natural condition: They are always glad to work for a general contractor, because they realize that the average general contractor understands their problems and will discuss such problems with them on their own level and in understandable terms. Their attitude toward working directly for architects involves again the personal element to a great degree. Some say that they do not like to work for architects because they have sometimes been placed in positions where architects have insisted on *talking down* to them without a proper understanding of the field problems involved in construction work. The architect may well give thought to this phase of the matter if he is to carry out successfully building projects in which he deals directly with the sub-contractors.

Controlling the Work

In a building operation carried out through direct contact of the architect with various contractors it may be seen plainly that the work must be controlled through efficient field superintendence, careful supervision of the contractor's work, and complete co-operation on the part of the office with the field. This involves, primarily, the selection of a capable and experienced field superintendent. This man acts directly as a representative of the architect, functioning, as far as the work is concerned, in the same manner as he would if he were employed by a general contractor. His experience should include past employment by general contractors and it is necessary that he be of a diplomatic nature in order that he may maintain proper relations on the work between the various sub-contractors. Usually he has one assistant, whose duty it is to keep the field accounts and progress charts, to expedite material deliveries and to act as *liaison* representative between the office and the work on all of the less important details. The architect, or a representative delegated from the designing department, usually carries out supervision of the work in the same manner as if it were under the direction of a general contractor. Evidently, it is of primary importance to allocate responsibilities in a common sense way and in accordance with the experience of the various individuals who may be employed in connection with the work.

After consultation with the various contractors, a complete estimating progress chart should be made out indicating the time at which various sub-contractors will begin their work and showing the approximate amount of time which should elapse until the work is completed. After these base lines have been developed on the chart, copies should be kept in the field office and in the architect's office. In this manner progress can be recorded in the field and reported for further recording in the architect's office. Special pressure can then be brought to bear at any point where the work seems to be lagging, thus eliminating the waste of delay which has been fatal to the successful carrying out of many building projects. The system of checking an account should be simplified as far as possible and the duplication of records should be avoided. The details of accounting should be carried out in the office rather than in the field, and it is particularly feasible to do this under a series of sub-contracts, such accounting being based on progress and delivery reports received from the field office.

Fees and Overhead Costs

Inquiries made in a number of offices where work has been carried out in this way indicate that the usual method of charging for the architect's time covers the entire project, including full architectural services, obtaining bids and letting contracts, purchasing materials wherever necessary, and general supervision of the work, including all necessary accounting. The charge for this complete service is made either in the form of a percentage on the total cost of the work, when it seems to vary from 8 to 15 per cent, depending on the nature of the work, or by agreement as to a lump sum for the complete service as described, this sum being payable about one-half during the preparation of working drawings and specifications, and the balance in approximately equally monthly divisions during the carrying out of the work. The amount agreed upon usually compensates the architect for all service rendered with the exception of traveling expenses for himself and his force, and the salaries of the field superintendent and his assistant, which are usually charged directly to the owner as part of the cost of the work.

In many instances it is found that owners are willing to consider this method of carrying out the operation, provided the total cost estimated on sub-contractors' bids is not beyond what they are willing to pay for the building. Accordingly, arrangements are usually made which define the amount of payment to be received by the architect for full architectural services up to the point of obtaining definite bids, and chargeable in case the owner does not elect to proceed with the job. The amount which the architect will charge for the work up to this point is debatable and depends entirely on conditions in his office and his personal willingness to gamble in the development of work. In a number of offices it is found that agreements are being made with owners to carry out the work up to the point of obtaining final bids from sub-contractors, on a basis which will cover the cost to the architect, but gives him very little profit unless the job proceeds.

Much depends, naturally, on the nature of the building operation. If it is a purely residential project, it is usually found that estimates can be made from sketch plans which will determine the owner's willingness to proceed and that it is unnecessary to carry out further details of the work except on the usual arrangement. On the other hand, if the project is of an investment or commercial nature and if the architect's office is not particularly busy, it is sound business to proceed with the necessary preliminary and detail work up to the point of obtaining final contract figures where the architect is reimbursed for the cost of such work, and gambles only on prospective profits. This serves a double purpose of maintaining an income to meet overhead expenditures, to support the organization, and establishing close relations with a work which may logically be expected to proceed, either immediately or at a time when refiguring will show a total within the owner's limit of investment.

It may be clearly seen that this method of handling business operations through an architect's office is but a natural outgrowth of the present unsettled conditions in the building field. From the owner's viewpoint it offers an opportunity for detailed study of his building project. Where lump sum contract figures are obtained, the owner's answer to such bids must be predicated upon the total amount submitted. If any of the bids are low enough to meet a favorable response the owner knows to a certain extent it is a gamble for the contractor of the building to carry out his agreements. Where sub-contract figures are obtained, however, it is possible to dig much deeper into the cost situation and where figures seem high it may be possible to bring about reduction through cooperation between the architect's office and the bidder. Certainly when an owner proceeds under several contracts for various parts of the work, the total of which figures makes up the entire cost of the job, he is reducing the element of chance as to the contractors' ability to carry out the work. This is true primarily because the amount of money involved in each individual contract is smaller and because each bidder is estimating in a field with which he is thoroughly familiar.

In a sense, this method of building may be considered as being in an experimental stage and its operation may tend favorably to eliminate the class of contractors who, after all, are principally brokers, dealing between the architect as representative of the owner and the sub-contractors who actually do the work. In line with many other interesting experiments which have developed under the rapidly shifting conditions of the construction industry, its outcome is to be watched with considerable interest. In bringing the architect into closer contact with actual field experience it must have a beneficial effect on the profession generally—an effect which, in working back through the sources of design, will tend to encourage standardization and economy.

It may be noted here also that never before has it been so important for architects to give careful study to price trends and conditions in the building material and labor fields. This study should extend also to a careful consideration of new uses of materials which may offer themselves as usable substitutes at lower costs. This same thought may also be extended to include closer contact with the real estate and mortgage fields. A definite knowledge of rental values and sources of mortgage money serves the architect well in times such as these.

The Restoration of the Fine Arts Building

OF THE WORLD'S COLUMBIAN EXPOSITION, CHICAGO

By GEORGE W. MAHER
Chairman, Municipal Art and Town Planning Comm., Illinois Chapter, A. I. A.

TO many who knew the World's Columbian Exposition, in 1893, the most notable of the structures was the Fine Arts Building. Extended at the edge of a broad lagoon it presented an appearance of antique magnificence, which was heightened at night when the low dome and the shallow loggias were bathed in soft amber light from concealed sources. It is of a pure type of classic architecture (Greek in spirit) and has been pronounced by eminent authorities one of the most noteworthy buildings of its kind in the world. It possesses generous proportions, wide extent of facade and beauty of central dome effect which, combined with the refinement of architectural detail and sculpture, make it a most stately architectural conception and worthy of preservation for all time. It was designed by Charles B. Atwood, architect, who was associated with Daniel H. Burnham, the directing architect of the World's Columbian Exposition. The central motif was suggested by Benard's "Grand Prix de Rome" drawing, but Mr. Atwood refined and changed the detail to pure Greek. He designed the balance of the structure in accord with the central motif, and produced a result unequaled since the days of Pericles.

It has been suggested in a general way that the building should be wrecked, since the Field Museum of Natural History, which has been housed in this structure since the close of the World's Fair, has been removed to its new home in Grant Park. The general impression has gained credence that the building is in a state of disintegration, due to the exterior appearance of the plaster work and ornament which, owing to its original temporary nature, is in a bad state of preservation. The facts, however, are that the building proper was not constructed as a temporary structure; the main walls are of solid brick and perfectly sound, and the foundations of brick and concrete and the entire structural features are in good condition.

Detail of the Fine Arts Building from the Lagoon, as It Appeared in 1893

General View of the Fine Arts Building, Showing Lake Michigan Beyond

The Illinois Chapter, A. I. A., through its Municipal Art and Town Planning Committee, and also in conjunction with the Illinois Society of Architects, has undertaken the responsibility of saving and perpetuating the building. They have submitted an expert report to the South Park Commissioners, covering in detail the cost of rehabilitating it and have also set forth the many purposes for which it may be used, among which might be mentioned a great community recreational and art center for social and educational purposes; a branch museum for the Chicago Art Institute, which needs additional space, and an appropriate museum for large architectural and sculptural casts and models that otherwise might be destroyed for lack of space and accommodations. In fact it might well become a great center for the Liberal Arts, and be a stimulus for creative and American art in all of its various branches, inclusive of music and the drama. The many art uses that this building could be advantageously employed to serve would materially assist in making Chicago the art center of America.

The report recommends that the entire exterior, including the statuary, be of waterproof Portland cement plaster, and that when restored the structure appear architecturally exactly the same as during the World's Fair period. The expert estimate for performing this work, inclusive of installing a heating plant, plumbing fixtures and new glass in the roof skylights, amounts to $1,640,000. The building as it stands today in Jackson Park occupies an approximate area of 4¾ acres. It has a probable value of at least $3,000,000. It is estimated that it would cost considerably more than this amount to erect the structure today, but that on the other hand, if wrecked, there would be no salvage and an additional expense for adjusting and leveling the park grounds would have to be met. The architects' committee is, therefore, assured that $1,640,000 for rehabilitating the structure is not extravagant, since the building could not be properly erected today for less than $10,000,000.

The Illinois Chapter, A. I. A., is much encouraged by the interest that has been awakened in its efforts to save the building. The leading newspapers in press reports and editorials, and also the city's leading clubs and civic and social organizations have endorsed the proposed project of restoration. There seems to be a universal desire on the part of the public to save this noble building from destruction. Around it cluster, and are interwoven, sentiments and memories that affect thousands of people and whose inarticulate opinion the architects are glad to voice in the hope of preserving this historic structure.

An interesting letter from Lorado Taft, dated November 25, 1920, explains the positive need of a museum in Chicago for the housing and perpetuating of great works of art and models that at certain times are easily obtainable if a place can be provided for their installation. At the present time there are no facilities or storage spaces for such works of art in Chicago, and as a result the art heritage of the city is hampered;—pathetically so, since the important work referred to cannot be accommodated and much is necessarily destroyed. The opportunity to supply this need is within Chicago's grasp; the old Fine Arts Building when restored will adequately meet the demands and requirements, since it possesses great size, height, skylight facilities and a satisfactory arrangement of plan. The building is located in an unequaled situation, for it occupies a commanding position in one of Chicago's most beautiful parks, in close proximity to Lake Michigan. When the proposed Lake Front improvement and great boulevard links are completed this noble edifice, one of the most beautiful classical architectural structures in the world, will become a necessary unit in this gigantic municipal improvement.

The Fine Arts Building is perhaps the best known structure in Chicago. It is loved and revered by tens of thousands of people in America and abroad. It possesses historic significance and sentiment that appeal to all and it is a cultural asset that any city should be proud to possess.

SOUTH FRONT OF BUILDING AS IT APPEARS TODAY

PRESENT VIEW OF NORTH PORTICO

FINE ARTS BUILDING OF THE WORLD'S COLUMBIAN EXPOSITION, CHICAGO

CHARLES B. ATWOOD, ARCHITECT; DANIEL H. BURNHAM, DIRECTING ARCHITECT

EDITORIAL COMMENT

PRIDE IN WORK WELL DONE

IN the consideration of works of architecture it is perhaps a natural tendency for those trained in the art to look not much further than the design for the reasons for a successful piece of work. The design, of course, is paramount; it is the visual record of the artist's conception of the building. The design, however beautiful it may be, is after all but a drawing; it may have excellence in line, proportion and pattern, but it remains draftsmanship; it must be executed to become architecture.

In the process of execution conditions arise that have power to affect the ultimate work for good or evil. The architect has exercised his talents in research, study and invention in producing the design, but duties fully as important rest upon him in controlling and directing the execution. We frequently hear dissatisfaction expressed with the methods of building today, but sometimes evidence appears to indicate that the finest results are obtained under these very same methods, and they lead us to ask if the full merits of present means have been discovered by those who criticize.

An example of this is seen in the Cunard Building. This structure, we feel, is generally accorded a worthy place in architectural achievement. Behind this, there is a story of the building which for interest and a record of modern achievement compares favorably with the romance and legends of cathedral building. It is a vindication of modern methods and points a lesson to architects that the success of their work will be more certainly assured if they recognize the necessity of means that have been developed as our attempts at building have grown larger, and govern their function of general directors to accord.

The Cunard Building was planned and constructed during the most trying times just following the war, when the labor and material markets were at the point highest in the world's history. In spite of the unfavorable circumstances, the complete designing and erection of the building was accomplished in less than two years. It was completed on schedule time, finer and larger than contracted for and within three per cent of the original cost estimate. The various mechanical and engineering features of the building were designed for the utmost efficiency in operation, and the successful co-ordination of these intricate details is indication enough of the co-operation that existed among those whose group effort produced the structure.

In writing of the building Mr. Morris has said: "Co-operation, courage, forethought, loyalty and persistence appear to me to have been the qualities conspicuously shown by the makers of the building, without which the whole performance would have been a very different thing. The example was given by the owning corporation and has been followed down the line to the humblest laborer, almost without exception. I feel safe, and take pride in the assertion of my belief, that in no other country, and in no other city, could this building have been built as and when it was built. The animating forces just mentioned seemed to produce a pervading sense of joy and satisfaction among us all. Hours of work by union labor were limited, of course, by the strictest regulation, but certainly in 'the field,' that is, on the job, I never saw any evidence of restricted output. It is commonly accepted among employers, if they are willing to admit it, that the amount of wages paid is, within reasonable limits, negligible in final cost, if the return given by labor is active, intelligent industry during the time paid for."

The work of directing an enterprise of this magnitude is comparable with the functions of a general in the army. Hundreds of firms and individuals are required to complete it, and the utmost precision must be observed in arranging details and instructions from the architect's office to be available in sequence with the work of the various trades. Then there is the contact of the office with the job. The architect is, of course, the final director but the detail work and the actual supervision are carried out by his representative — the superintendent. This man must have many of the qualities of the successful architect. He must be able to check plans and specifications to determine their completeness; he must know materials and workmanship, and above all things he must have the ability of handling men, whether they be clients, designers, contractors or workmen, for upon this qualification depends the speed or delay, the satisfactory or disappointing quality of the finished building.

It is through the generalship of the architect, carried out in co-operation with the various specialists, his own office, the field workers and the builders, that his personality reaches the workmen and the enthusiasm is created that makes a work of architecture in which all participating may take common pride. Thus is architecture made a living force and the profession lifted out of the cloister and into the light of day.

NOTE

We are pleased to announce that the strike of pressmen, which has interfered with the publication of THE FORUM since April 1, is now adjusted and that we will be able to regain our publishing date with the next issue.

The ARCHITECTURAL FORUM

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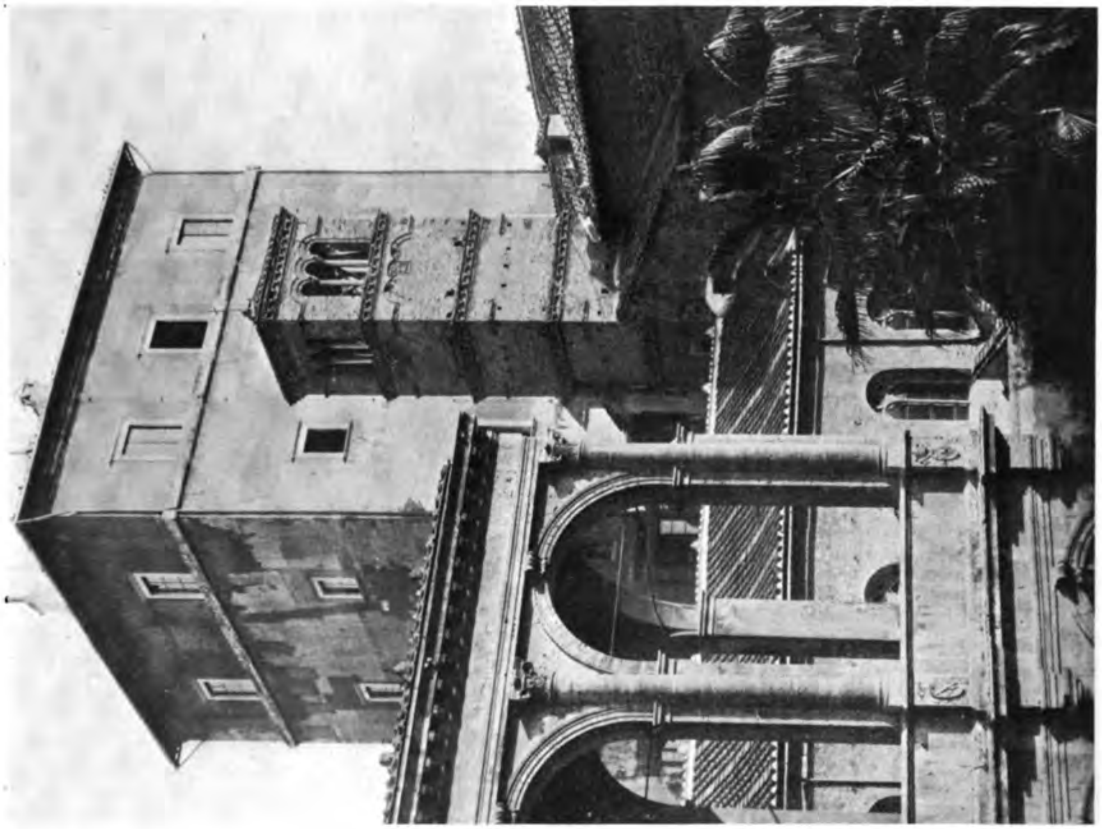
The Restoration of the Palace of Venice in Rome

By UMBERTO OLIVIERI

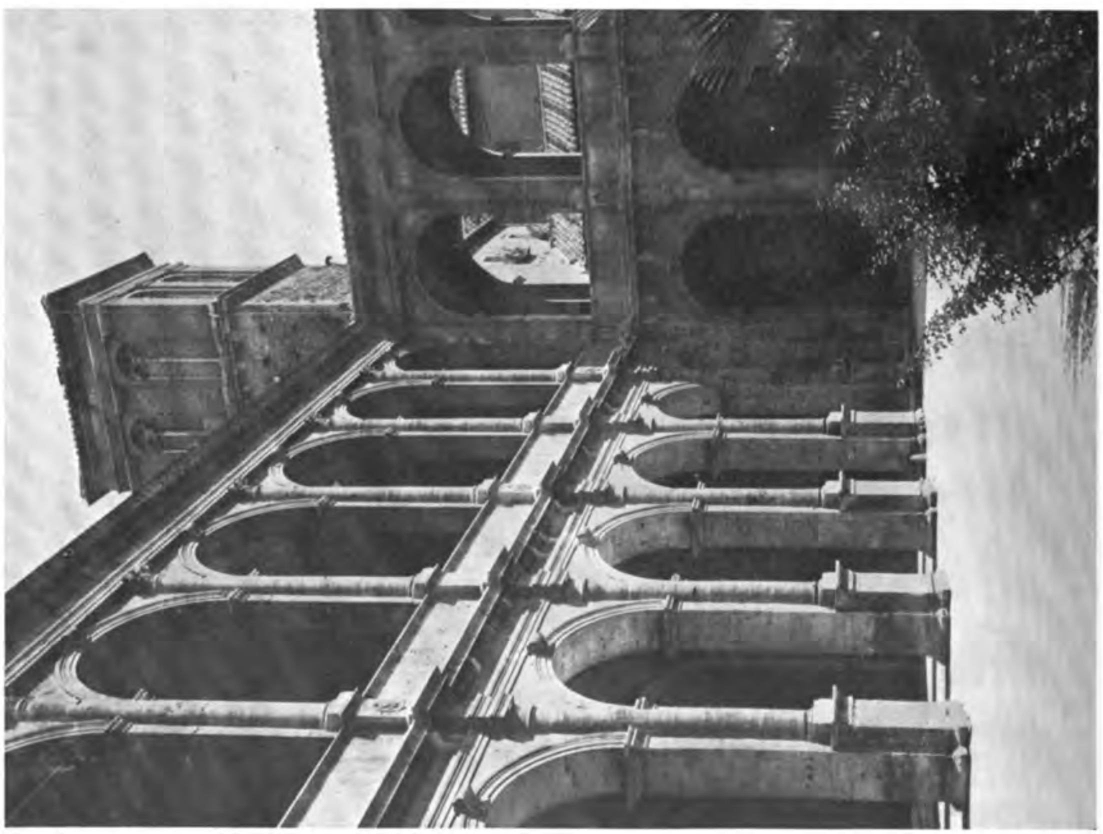
IN August, 1916 the Italian government, yielding to the general pressure of public opinion and in order to secure immediate partial compensation for the serious losses caused by the Austrians to national art treasures, such as the destruction of the fresco by Tiepolo on the vault of the Church of the Scalzi, decided to seize the Palace of St. Mark in Rome, commonly known as the Palace of Venice, or the Palazzo di Venezia, which had been since the Peace of Campoformio in 1797 in the possession of the Austro-Hungarian government, as the seat of the Austrian embassy to the Vatican. After having added this magnificent monument to the patrimony of the state, the government devoted it to a collection of works of art, and in order that it might perpetuate the name which suggests its origin and history, called it the Museum of the Palace of Venice. Thus this ancient and dignified building of the popes, which was later the sumptuous seat of the ambassador of the Venetian Republic, afterward of the Austrian representative, and since 1870 the symbol of the irredentistic aspirations of Italian youth, has now become for new Italy the symbol both of her victory and of the spiritual needs of the nation.

In order to understand its importance and how it came to be so coveted, it is necessary to review briefly the history of the edifice. Its dedicatory inscription by the Venetian cardinal, Pietro Barbo, establishes the year 1455 as the date of the construction of the eastern wing of the palace proper. The nucleus of the present palace, however, is the

The Palace of Venice, Rome



XII CENTURY BELL TOWER SEEN FROM COURTYARD



DETAIL OF COURTYARD LOGGIA

THE PALACE OF VENICE, ROME

ancient and glorious Basilica of St. Mark, still an important part of it, dedicated by the Venetians to the two saints, St. Mark the Evangelist, patron saint of the Adriatic, and the Pope St. Mark, and consecrated originally by the latter to the veneration of St. Mark the Evangelist in 366.

In the year 833, by order of Gregory IV, the basilica underwent a radical restoration; nearly at the same time as the construction of the palace, the church was transformed by Cardinal Pietro Barbo into the form which it still retains. To the fact of the pre-existence of the church and its dedication to saints so endeared to the Venetians, we owe it also that Barbo, learned and magnificent cardinal, chose this location for his luxurious abode. The church was by degrees wholly surrounded by the palace, and extends through it from the atrium, which opens onto the little Square of St. Mark, to the sacristy on the street called of the Plebiscito.

The first fruit of its recovered possession by Italy has been the recent architectural improvement of the church. The fine Loggia della Benedizione (or Benediction), placed just above the atrium or entrance of the church, lost long ago through the bad taste of a Venetian ambassador, has been restored and, as shown in one of these illustrations, the harmony of its three arches of the fifteenth century, which the ambassador walled up, is once more to

Facade of the Church of St. Mark, Part of the Palace of Venice
After the Walls Closing the Arches of the Loggia Had Been Removed

be seen. Today, by the intelligent direction of the Royal Superintendent of the Monuments of Rome, the loggia, as restored to its primitive splendor by the removal of the walls in the arches, is a proof of the artistic aspirations of our epoch, which, if it does not know how to create, at least intends to restore throughout Italy, to their original beauty, all the remains of the past centuries.

The little Gothic window which opens toward the Piazza San Marco, is a relic of the first enlargement made for the house of Cardinal Barbo, who meant to build his residence in the Gothic style throughout. Being a true man of the renaissance, the Venetian, Pietro Barbo, who afterwards became Pope Paul II, had the constant ambition, like that of a Roman emperor, of transmitting his likeness to posterity. Therefore at the head of the original staircase, which has been replaced during this last year by another more spacious and easier, was placed the bust of the pontiff, which has lately been brought back to the palace, after passing a few years in exile at the seat of the Spanish embassy in Rome. The ancient staircase on the side toward the Piazza Venezia has been left as it was. Narrow, not well lighted, severe in its sober architectural decoration, it proves by its original details the very primitive character of the building, still mediæval enough to look like a fortress with its towers and battlements, while the mass, strong and flat, already reveals the characteristics of the renaissance. It can properly be numbered among the lordly Roman palaces of the fifteenth century, with the grace of its magnificent *loggiato*, the enchantment of the *palazzetto* (or "little palace," called also St. Mark's Garden), its Gothic windows, and its spacious rooms, embellished with decorations which express the new born love for the art of Imperial Rome.

Who was the architect of the palace? At least to whom may we give the credit, among the bearers of the great names of Italian art, of even having co-operated in giving to this papal building a form of purest beauty? Vasari, about 1500, attributed the design to Giuliano da Majano, but his opinion is flatly disputed by architects and art lovers, inasmuch as Giuliano was only in Rome after 1465, when the building, which is the Roman equivalent of the Pitti Palace in Florence, was already under way. A biographer of Paul, Gaspare da Verona, extols the cleverness of a certain Francesco of Borgo San Sepolcro, as architect and director of the construction in the first years of this pontificate. Guiseppe Zippel, however, in his work on the Palazzo di Venezia, thinks that Francesco dal Borgo was not the author, but only one of many artists who quietly worked with others on this and other works to prepare the glorious splendor of Italian architecture. Many architects, artists and authors, such as Guiseppe Sacconi, Ettore Bernich, Domenico Gnoli, Guiseppe Zippel and Corrado Ricci, have thought that the conception of both palace and garden is due to Leon Battista Alberti. Zippel says: "The one who ruled undisputed lord in architecture in the Rome of Eugene IV and Nicholas V, was Alberti. In those very years when Pietro Barbo was thinking of the reconstruction of the district of St. Mark, this very learned Florentine composed and published that wonderful book 'De Arte Ædificatoria' (The Art of Construction), which was the first book on architecture written at the time, and formed a code for architects. Can we not believe that the Venetian Cardinal Barbo, cherished by Pope Nicholas, with whom he had in common both love for art and enthusiasm for great building plans, would naturally rely upon the learning and ability of this prince of architects, then in Rome? This is probable, inasmuch as Nicholas V himself derived the inspiration for the superb transformation of St. Peter's, the Vatican, and the Leonine City, from Alberti's doctrine. It is very likely, we

Secondary Entrance to Palace of Venice

think, that to Alberti is due a great part in the promotion and fostering of the building ambitions of Cardinal Barbo, as well as the realization."

Corrado Ricci, surely a great authority, says: "Both the architectural ensemble of the palace, St. Mark's porch, and some detached parts, as well as the conception of the garden, and several motives of decoration, in a word the whole building, regarded either as a mass or in its details, reveals in the one who first planned it, the innovator, the man who had conceived an original idea, after long studies, not only artistic, but also historic and literary; the humanist who had penetrated not only the forms of antiquity but also the spirit." And such a man in that day and place, could be none other than Leon Battista Alberti. That the search for his name in documents of that time might be fruitless, is easily understood; Alberti, and this is more than proved, did not always attend to the execution of the works for which he gave advice or drawings. He himself declared: "It is enough to give the right advice and drawing to whomsoever asks it of you." Alberti, as also Raphael later on, in things relating to architecture, was an artistic adviser of so much authority that to him there went for counsel or plan, popes and princes from all parts of Italy. The Venetian, Pietro Barbo, cardinal and then pope, his nephew, Cardinal Marco Barbo, Cardinal Domenico Grimani and many other prelates and pontiffs of the fifteenth century, especially Innocent VIII, took all possible pains to make splendid the building which gradually surrounded the ancient Church of St. Mark, taking the place of the very squalid houses then existing.

Detail of Ceiling in Church of St. Mark

Those in charge of the Palazzo di Venezia since its acquisition by the Italian government have done much to restore the interior to its original condition. The Sala Regia, which had been partitioned off into six rooms, is now its original size and here were found the original decorations, work of the end of the fifteenth century and attributed to Bramante. A long line of pilasters, decorations with candelabra-like ornament and set between panels of imitation marble, is painted on the walls and upholds a rich entablature of which the frieze contains winged figures of Fame, with trumpets. On the lower part shields are applied whereon are painted portraits of the Cæsars. The complete restoration of the Sala Regia and the Sala del Mappamondo, or Room of the Globe, to their original appearance and the renewal of the remains of the decoration in other of the state apartments are the heavy tasks confronting those in charge of the restorations. The problem deals chiefly with motives purely ornamental, and for that reason very well understood, while the few figures comprised therein are preserved nearly in their integrity. So, while it is planned to restore a genuine work of the fifteenth century and to discard the paintings of later restorations, the work will be executed with reverence for the memory of the famous painters to whom are due the original decorations.

Such a building, closely connected with Italy's art and history, could be properly used only for the purpose which has been determined by the government decree. A great museum of the arts in general, which is not merely a gallery for pictures or a fine collection of statues, has been lacking in Rome up to the present time. A comprehensive, permanent collection of furniture, glass, wood carving, arms, tapestry, ceramics, stuffs, and medals has never been assembled, nor is it possible to assemble it in any of the present Roman galleries. When in 1911 the successful exhibition of retrospective art was held in the Castle of St. Angelo in Rome, many Italians asked why it would not be possible to establish in Rome a permanent collection which would exhibit examples of the arts connected with every phase of human life, placing, for instance, a wrought iron bed or carved table alongside majolica plates, and near the work of some famous painter of the epoch, who, in common with the humble smith or the poor potter, enjoyed the artistic influences of that day.

In many other countries, especially in Germany and Switzerland, the perfect arrangement of such a museum does not make evident the really small amount of artistic material displayed therein. With the Italians, on the contrary, the extraordinary abundance of masterpieces in museums and private collections has resulted in a special point of view regarding certain arts, so that finally they have been called, unjustly, "minor arts." This has been encouraged by pseudo esthetics of a literary nature and by the survival of fixed ideas of art which arose at the beginning of the nineteenth century, during the neo-classic vogue. For this reason many of the best products, in which the immortal art tradition of the people of different Italian regions is expressed, are unfortunately lost to Italy through commercial dealers, often of little intelligence and less conscience. The exhibition in the Castle of St. Angelo gave to all lovers of art a broader vision of the possibilities of artistic education, but Italy was too soon upset by the war to accomplish anything in this field.

Now the acquisition of the Palazzo di Venezia has given a new impetus to this idea. The largest rooms of the pontifical apartments, renewed as to their fifteenth century decorations, will provide in the Italian capital a marvelous suite for official receptions, especially on the occasion of the visits to Rome of illustrious personages or the heads of states, and also might serve as the anterooms of the greater museum which might arise from the broad organization of which we have spoken. A few undoubtedly genuine pieces of rare beauty, proper proportions and correct dates will complete the furnishing of these great halls, part of the interest and attraction of which lie in their enormous sizes, unusual in modern edifices. Then will follow the sections of the museum proper, where paintings and sculptures of the renaissance will not be stored in cold rooms with iron bars at the windows, but will be placed just as they might have been in the house of one of the most magnificent patrons of the golden age, assembled with furniture and other precious things, all bearing the character of a taste educated to the worship of beauty.

What has been done so far in the Palazzo di Venezia gives, as we have said, great hope in one direction, but great fear in another. No fewer than six offices of state departments have been located in the old building of Pope Barbo, and those who know the inherent obstinacy of bureaucracy might fear that the cause of the museum is lost forever. Further danger of similar occupation was narrowly avoided; one ex-president of the ministry thought of making the palace a seat for a military club, with kitchens and all other appurtenances, while another wanted to arrange it for government archives or other purposes. But notwithstanding these and other similar attempts to spoil the beauty of the palace, there is still ample room left to begin with, and to prevent further encroachment there is the great enthusiasm and invincible determination of the director, Professor Hermanin. So, if faith and enthusiasm must necessarily look largely to the future, there is already such a good beginning made that hopes for final success have a secure foundation.

Elevation of Wall, Hall of the Mappamondo, Palace of Venice
Showing Montegna's Detail

Some Work of George Washington Smith

By WILLIAM WINTHROP KENT

IT has often been said that the most successful architecture in any country is that which is worked out in what was the original architectural type of that region. The early settlers of what is now the state of California, being Spanish, constructed their buildings in the Spanish style, slightly influenced in some few cases by Italian details, and by a happy circumstance this was exactly the architectural type best suited to the climatic conditions of the state. The early builders, therefore, set an example in the way of type, and the direct simplicity of their structures, which still exist after several centuries, points out the way to successful designing for architects who have come later. Many architects in California are today designing along the lines of Spanish or mediæval Italian architecture; many also trying to keep to simplicity in plan, elevation and detail whether in a purely Spanish, Italian renaissance or other vein. Of all these there are a few whose buildings are beautiful and successfully meet the exacting local conditions of climate, scenery, materials and labor, and among these men may be properly included George Washington Smith, of Santa Barbara.

It is easy to pursue too far any good style or character in design, especially when the designer feels, as many a Californian architect does, that he is traveling toward reform, if not actually on the path itself. The often subconscious impulse of the enthusiast is to go the limit or beyond, on the false theory that, if certain characteristics are good, their uttermost development must be better, and some Californian houses show the effect of this view. To expose the fallacy of such reasoning it is only necessary to remember that simplicity, for instance, which if properly followed is admirable repression, becomes, when unduly exploited, uninteresting crudity. Without emphasis of some sort a building cannot interest the eye. Remove too many mouldings and shadow-

Floor Plans of Casa del Greco

Casa del Greco, House of George Washington Smith, Montecito, Calif.


Two Views of Living Room in Casa del Greco

making projections and perforations from any construction, and the emphasis is lost. Mr. Smith has not made this mistake; although he is evidently a strong believer in getting back to certain first principles in house design, he is content with securing the characteristics of simple early Spanish or Italian architecture, and stops there, because he knows that these characteristics are all that are needed in the work he is doing.

By no means, however, is his work mere reproduction or adaptation of existing architecture in Spain or Italy, or in books and photographs thereof, but, starting with the usual inescapable given conditions, he merely works in this vein, because he believes that it brings the best results, and these results are, in toto, distinctly original. Like many another, he has looked ahead and seen that the average dwelling of the future must, from economic necessity, be kept free from all superfluity of plan, elevation and detail without, however, losing its interest for the owner and the society in which he moves. This is a progressive and wise view for, when our present economic upheaval has settled down, living conditions will make all illogical and overdone architecture more than ever ridiculous and impossible.

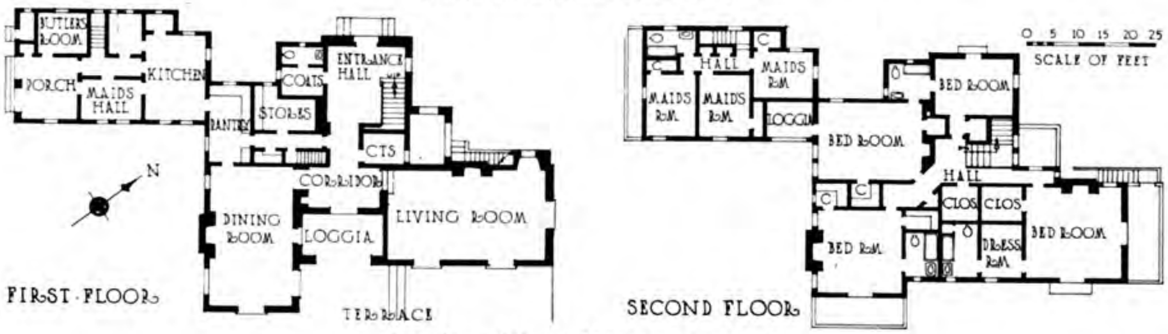
Let us see what we gain by building a country house in, say, twelfth century Castilian Spanish: First, the meeting of an owner's requirements by simplicity of plan; second, the logical use of available, substantial materials, such as stone or brick, or concrete, terra cotta and plain wood; third, simplicity in detail; fourth, the full utilization of the value of broad wall surfaces by careful study of openings; fifth, by cement stucco and hand finish, the harmonization of exterior with foliage, flowers and scenery in general, and of the interior with either richly carved or very plainly designed furniture. Briefly, all the design becomes a beautiful foil for some things or an appropriate accompaniment of others, and the chances are that with the growth of taste, both these qualities of contrast and harmony will be more and more appreciated by the general public.

It is always difficult to analyze design, to find wherein lies the charm of a good house, and harder


Two Views of Studio in Casa del Greco

still to indicate wherein an architect has done original work and has shown his individuality. The adaptation, however, of beautiful ancient forms to modern uses often tells this, and in the use of perforated ornament, suggested by the rustic patterns of open brickwork for small windows, intended only for ventilation or similar practical purposes, Mr. Smith has shown commendable taste and considerable originality. In the utilization of the thick walls for cupboard and bookcase recesses, one sees quickly that he has not only realized the practical use, but appreciated the beautiful effect of such recesses by his emphatic and correct location of them. To find equally instructive examples on the exterior, it is necessary to note the butting of a lean-to roof against the higher plain wall of a main building, as in the Lindley house. Again in the Lindley residence the effect of weight as well as strength and security against too great a drip from the eaves has been secured by a bracket-like projection of the wall along the entire eaves. It is a question, however, whether

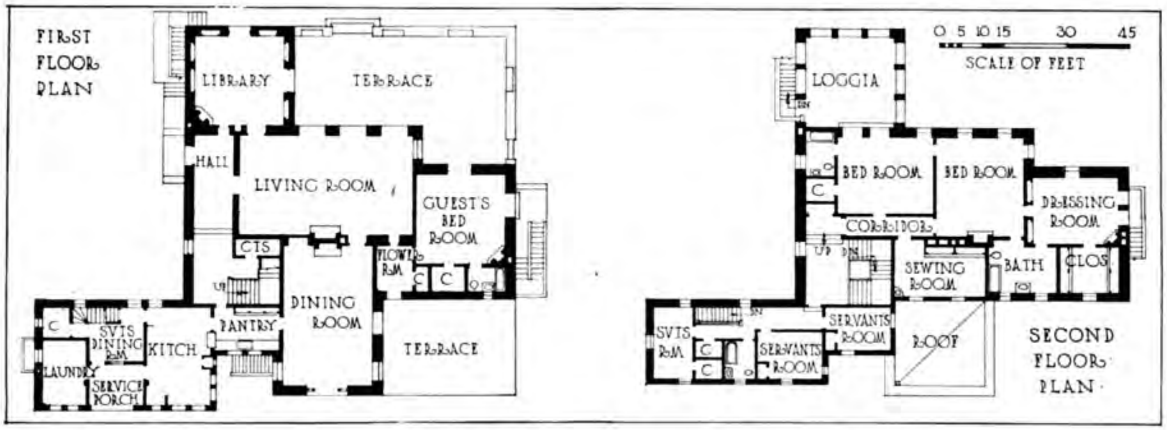
Detail of House of Mrs. De Witt Parshall



Floor Plans of House of Mrs. De Witt Parshall

Details of Entrance Front, House of Mrs. De Witt Parshall, Montecito, Calif.

HOUSE OF MRS. WILLARD P. LINDLEY, SANTA BARBARA, CALIF.
GEORGE WASHINGTON SMITH, ARCHITECT



Floor Plans of House of Mrs. Willard P. Lindley, Santa Barbara, Calif.

this detail does not involve the loss of much of the beautiful eaves-shadow, given by a greater projection of the tiles from a perpendicular wall. It is, however, in his unlabored designing of gently sloping tile roofs at different but logical heights, that he has secured some of his best effects in perspective. Anyone can cover simple walls with shed-like roofs, but to place those roofs so as to obtain picturesque and harmonious composition requires no small architectural ability. Sparingly has the curved line been used in Mr. Smith's work, either on plan or elevation, although on elevations, when the round or segmental arch is introduced, it is made effective by contrast with the lintel-supported openings of most of the windows; generally, however, the straight line and the rectangle are the controlling factors throughout.

The use of exterior staircases, for access to second story loggias and rooms, is made to contribute materially to the beauty of the exteriors by their carefully planned locations and treatment; the use of plain bracket forms to support landings is an aid in escaping the commonplace, and on the Lindley house a very broad and substantial air is secured at grade by continuing the terrace higher as a landing platform for the staircase. This landing turns the corner and reaches the lower terrace levels by a few more steps at front and back. If one might suggest any improvement in detail, which is not an essential factor in most of such work, it would be that the chimney pots offer a tempting chance to design more varied forms such as one sees a hint of at Capistrano, or might find in far-away Spanish Berlanga, Soria or somewhere in the wild province

Drawing Room Fireplace in Lindley House

House with Attractive Stucco Texture, at Santa Barbara, Calif.

of El Vierzo; but then again, one might not. However, Ruskin to the contrary notwithstanding, I believe in making a chimney pot as interesting as possible.

Also, it is well known that in metal working the Spaniards were from early days most famous, and in fertility of invention and beauty of execution not excelled, and possibly not equaled, by the Italians. Taking a hint from this, and from beautiful, but not intricate examples of balcony rails and window grilles, would it not be worth while to avoid the extreme simplicity of the usual plain iron bars, and design more decorative rails and window grilles, which could be made by local blacksmiths? Nothing of equally inexpensive character is of richer effect than that of well designed wrought iron against sunlit white walls, and a richer rural character might be preserved by its adoption, even in its less elaborate forms.

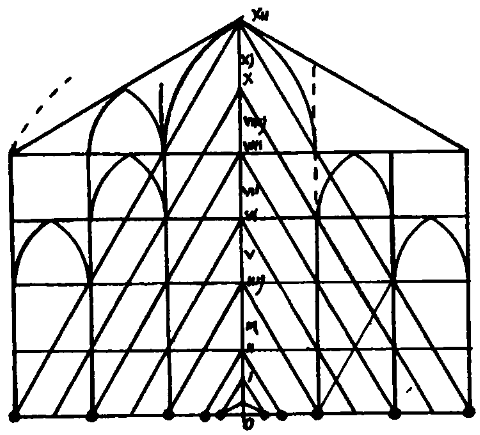
Eastern architects, who really appreciate the great beauty of much of the modern Californian architecture, are also apt to say, "Yes, it's charming, but we cannot do work like that in our climate." True, in one sense, but in another we can learn much from a study of its best characteristics and improve immensely on present work, by grasping why and how the best architecture of the Pacific coast is produced, for aside from the difference in climate, we can secure equally good results elsewhere, if sufficient effort be given to the work.

Gateway, Estate of Mrs. Mary E. Stewart, Santa Barbara, Calif.

Proportion in Architecture

By WOLDEMAR H. RITTER

EVERY architect and every intelligent critic of architecture will admit that a knowledge of proportion is fundamental for all good architectural composition. They will go further and grant that good proportion constitutes good architecture; that without it a building, no matter how convenient, how skillfully constructed, how well ornamented, is not architectural and that such designing is not a fine art. But when the architect or critic of architecture attempts an analysis of this fundamental element, proportion in architecture, the logic he used in defining the art deserts him, and he resorts to vague generalities. The architect, getting down to his problem of design in a given building, solving the utilitarian side of the project, gropes about like a blind man or strikes off a sketch as a gambler would flip a coin, to see if he can hit upon something. When he finally arrives at a satisfactory composition the route he has traveled has been long and tedious and the traits of character that have won the day are more likely to be perseverance and skill in elimination than that rare quality supposedly at the base of all good design, an intuitive sense of proportion.



Facsimile of Section through Milan Cathedral. Drawn before Construction in 1391 by Stornalocho

It never seems to occur to most architects or art critics of today that proportion in architecture is something to be comprehended and grasped and used as a science or a system, and not to be experienced as a dream or inspiration. It is a part of the architect's training to think of design as a trick of the trade. As a student he is asked to present a sketch for a commemoration monument. For such a problem he goes to the triumphal arch of the Romans or the Monument of Lysicrates, or to some other design that he appreciates as good, though he does not know why, and he works out a copy with a variation —what he would call in modern slang a "cold crib" —and the proportions may be right or wrong; he has no way of checking it up except by the verdict of those of more experience who may call his monument a "first mention," or pass it by without remark.

In our modern building we use mechanical methods undreamed of by the constructors of pyramids, temples and cathedrals. Never has there been greater activity in monumental building or greater skill in construction. But on the side of proportion we have made no advance; beauty has failed to keep pace with utility. Little of our work will stand the test of time artistically, and none of it will rank with classic precedent.

The thoughtful architect of today is questioning and is discovering. He knows that architecture is now acknowledged as a fine art, as one of the greatest if not the greatest of the fine arts. As an artist he is aware of the lack of good proportions in the buildings around him and conscious of the beauty of the best work of the past. Such a contrast stimulates his mind to inquire whether the good qualities of work in the past were obtained by lucky experiment or by some scientific method unknown to him. A definite question is in his mind. Was there not a body of rules or fundamental principles underlying the proportion of architectural forms in the past?

If he turns back to the one piece of documentary evidence of Roman times, to the book of Vitruvius, written in the golden age of the Roman Empire, he will read in the second chapter of the third book: "There is nothing to which the architect should devote more thought than to the exact proportions of his building, with reference to a certain part selected as a standard." But Vitruvius tells him only what was good to be done; he never explains how this can be done, assuming in us a familiarity with rules which at his time were the common property of the profession. Of the various attempts to formulate these principles the one most familiar to the modern architect is the article on "Proportions" found in Viollet-le-Duc's *Dictionnaire Raisonné*, Vol. VII, p. 532. In this discussion Viollet-le-Duc emphasizes the fact that good proportions depend not only upon the relations of cardinal dimensions, but also upon the relations between the primary and subordinate features of a structure. He crystallizes his ideas into the well known "theory of triangles." After marshaling an imposing array of classic specimens of architecture, he tries to prove that one of his set of three definite triangles was used as the fundamental figure of design by the creator of each.

Although Viollet-le-Duc suggested a splendid working theory, he has fallen short of the mark by failing to make it sufficiently general to be applicable to all forms of architecture. The fact alone that he limits his theory to three fixed triangles is a handicap; indeed the triangle as a ground figure is a poor choice since the eye can rarely comprehend at a glance all three apices of a triangle, and beauty of proportion cannot depend upon a number of points which the eye is unable to see at one time.

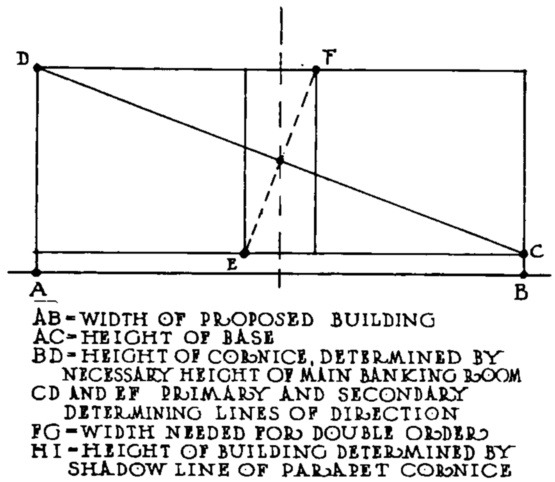
A present-day development, in reality an amplification of Viollet-le-Duc's theory, has been worked out by Prof. August Thiersch, who contends that good proportions are based upon similar rectangles, the diagonals of which are parallels, the two diagonals of any rectangle forming triangles, but not necessarily of Viollet-le-Duc's three types Prof. Thiersch brings forward a long list of examples to prove his contention, with illustrations taken chiefly from the monuments of Greece and Rome, but also from the works of the middle ages and from the renaissance period. He shows, for instance, that on the Temple of Athena at Ægina. the entablature, two adjoining stones of the architrave, the abaci of the caps, the triglyphs, capitals, and the mutules with their supporting bars, all form rectangles whose sides bear the relation of 1 : 6. Another of Prof. Thiersch's examples is the Villa Farnesina where the wing of the villa, the two orders, the windows and their architraves, all form similar rectangles, the ratio of their dimensions, however, being impossible of expression in simple numbers (See diagram.)

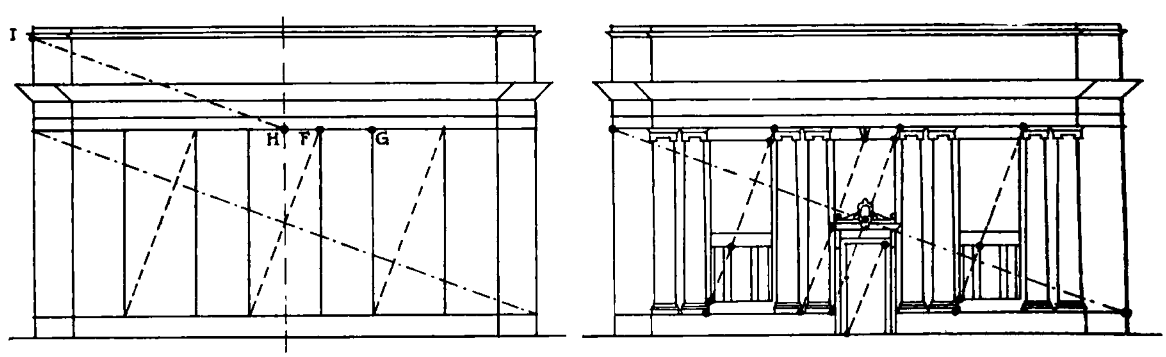
In discussing the problem Prof. Thiersch contends that harmony in design consists in the repetition by the subdivisions of the basic figure of the structure; in other words, in the analogy of the part to the whole. This ground figure, although not necessarily pleasing in itself, by repetition produces an effect agreeable to the observer, and the individual impressions received by the eye are merged into a pleasing composite. The simpler the relations of the parts to one another, and the oftener they are repeated, the more easily can the mind grasp the total effect. He adds, however, that mere repetition of similar figures, without contrast and variation, would soon become colorless and tedious, and that the mere application of a rule can never create a masterpiece.

This theory is an advance over Viollet-le-Duc's, for it frees us from the limitation to three definite triangles. Moreover it contains a new and more comprehensible idea, since it emphasizes the rectangle as the ground figure, and the rectangle is the constantly recurrent figure in architectural design. Yet it remains a theory based on a ground figure, and therefore only too often dependent on imaginary points.

One readily observes that the few other discussions of this problem, like the two already mentioned, concern themselves fundamentally with oblique lines, whether their proponents call these lines sides of triangles, diagonals of rectangles, or by any other name. This similarity is so striking as to lead to the belief that the advocates of all these have based their theories upon certain theoretical lines found in a number of mediæval drawings handed down to us, lines which we must feel were drawn for the purpose of determining the proportions of buildings of different types.

Take, for instance, the different cross sections drawn by Stornalocho in 1391 for the then proposed Cathedral of Milan, of which one is shown here. Into these cross sections are drawn a series of similar isosceles triangles. These have their bases on the floor line while their legs start either in the centers of the piers or of the aisles, and after passing through the spring lines of the vault arches, end in the

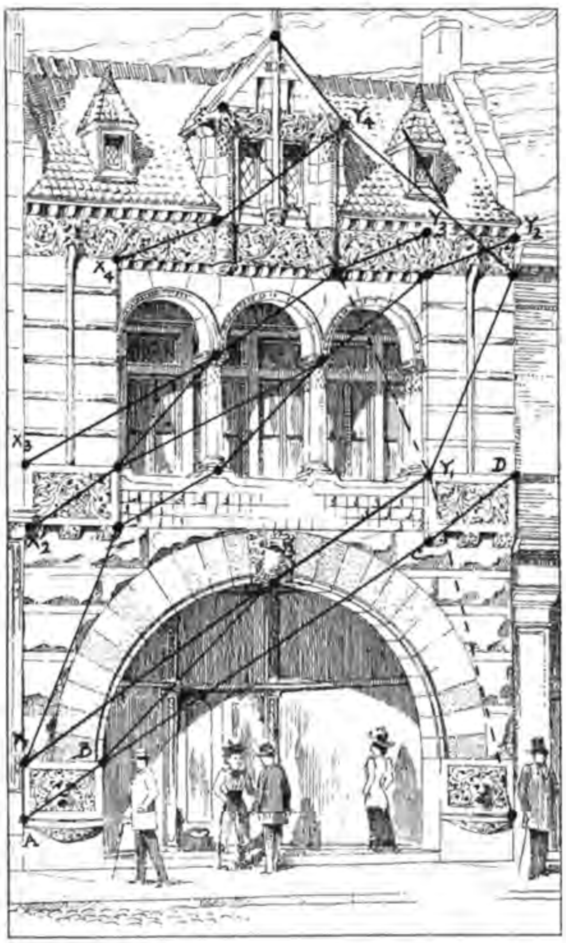




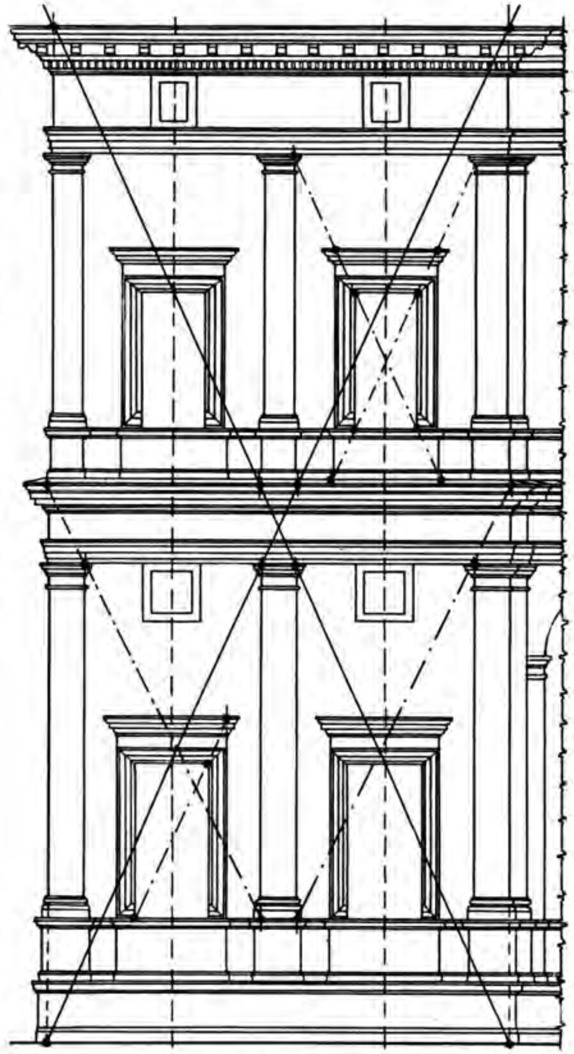
Diagrams Showing Development of Design of Building for Malden Savings Bank, Malden, Mass.

Monks & Johnson, Architects and Engineers apices of the vaults of nave and aisles respectively. Not only are such triangles or diagonals preserved in the few mediæval drawings we possess, but they can readily be drawn into sections and elevations of countless classic examples of architecture, as Viollet-le-Duc has amply shown, and this is true not because the architects of those buildings worked with mystic figures or numbers, but because they recognized a fundamental fact of psychology.

In everyday life this principle is constantly made use of. Take, for example, the checker board; everyone appreciates without effort its regularity and would instantly detect a unit dissimilar to the rest. Likewise, the windows of an elevation are arranged in horizontal and vertical rows unless the designer wishes to stamp some special feature upon the attention of the observer. When the eye views checker board or facade it does not travel back and forth along the horizontal or vertical rows of units, but instinctively sweeps the diagonals of these, attracted by the corners of the individual features, rather than by their fields. As each corner of a door or window is a fixation point for the eye, so every base, cap, buttress offset or similar prominent feature draws the attention. We call a window high or low according to the relation between height and breadth, *i.e.*, according to the pitch of the diagonal, which is but the resultant of these two dimensions. Through taking advantage of this habit of the eye and brain the architect can guide the glance of the observer by the design of his structure. If he arranges cardinal points on parallel oblique lines, the eye can travel along a natural path — the diagonal — gaining at a glance the resultant which is the relation of the two dimensions, height and breadth.



A, B, C, D, is a good "determining line of direction." The broken lines might easily have been straightened into "parallels of direction"

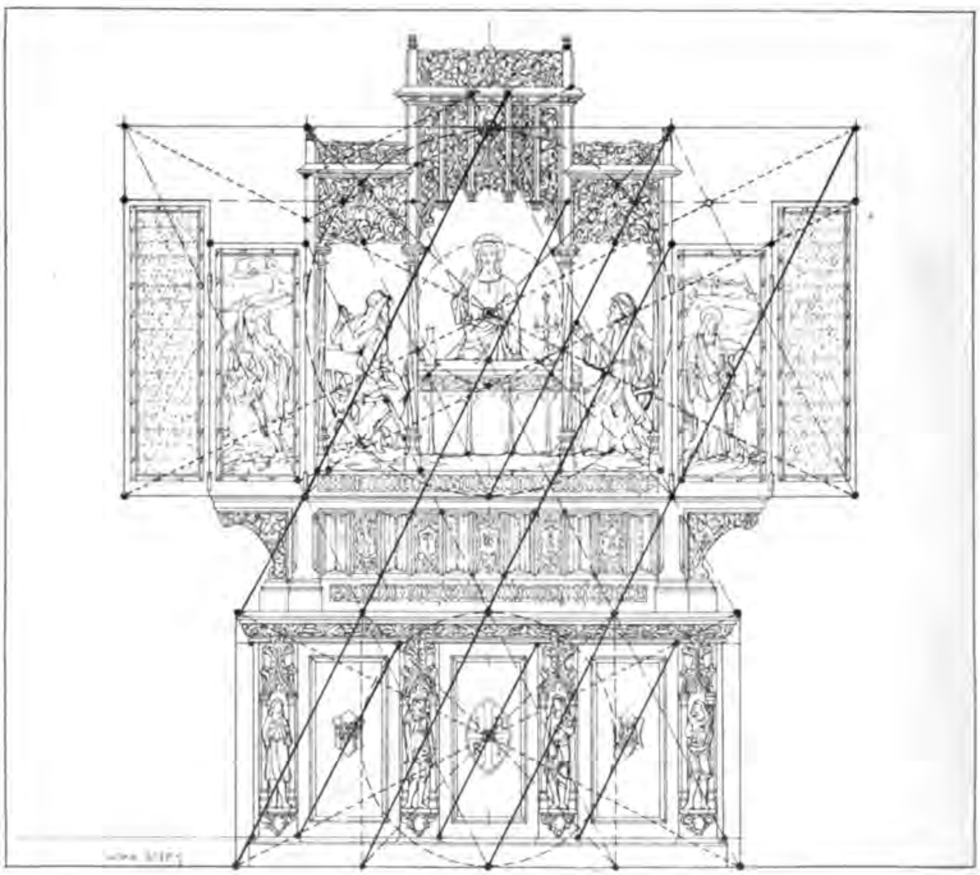


Wing of Villa Farnesina, Rome
Facsimile of drawing by Prof. August Thiersch

After sketching roughly a facade, and locating the features fixed by necessity, it is an easy matter to adopt a diagonal which shall serve as the "determining line of direction." (See illustration of bank design.) The chord of an arc, or the diagonal of a dominant rectangle furnishes in itself a decided oblique line. This determines the slant of the diagonals on which subordinate points must be located in order to give the observer the feeling of quiet and satisfaction called beauty. In addition to this primary oblique line or "determining line of direction," the perpendicular to it will prove useful. Parallels to these two lines might be called "primary and secondary diagonals," and important corners should be located not only in the path of the primary, but also of the secondary series, and their intersections. These two sets of lines are distinctly interrelated and helpful one to another. The use of these lines will save the designer endless experiment in locating belt courses, cornices, window levels or such ornamental features as he may wish to introduce into his elevations. To the practical man the application of these principles may at first appear a waste of time. After a little study, however, he will discover that he can save the time formerly spent in going over and over his drawings, feeling after something which can be had by the application of a simple rule.

Just as the "determining line of direction" guides the eye in its wanderings over a facade, a circle will naturally catch it and fix it upon a certain feature. If, therefore, it is desirable to confine the attention of the observer to a limited field, circles or a series of other concentric figures may be introduced; even the discredited square here becomes desirable. It is remarkable how often this form may be detected in classic buildings, carefully camouflaged it may be, but still there, to do its duty in the eye of the observer.

Every architect will admit that similarity of proportions and the proper arrangement of individual features are fundamental requisites of a pleasing picture — indeed they are elements of beauty. No rules will make up for a want of genius, and no application of a principle will create a master architect, yet a knowledge of such rules will be of service to talent and shorten the long and weary road of experimentation. The result of a little effort spent in arranging dominant and subordinate features of telling members on "determining lines of direction" is truly surprising. Such purposeful application of a few simple principles is sure to enrich the artist's design with the desired grace and harmony. No longer need the eye of the observer zigzag wearily hither and thither over a facade in the effort to comprehend its general effect. The eye will glide easily along the lines of least resistance, intentionally chosen by the architect for this purpose, and will receive one harmonious impression with that pleasure afforded by a successful design.



Altar and Triptych, Emmanuel Church, Baltimore, Md.
Woldemar H. Ritter, Architect
Note parallels of direction, both primary and secondary; also the two focal points in altar and triptych

Land Drainage

How It Affects Architecture and Landscape Architecture

By F. W. IVES

Professor of Agricultural Engineering, Ohio State University, and President of the Agricultural Engineering Company

THIS is the first of a series of articles to be presented in THE FORUM *by members of the Consultation Committee on their respective subjects. Others will appear in subsequent issues regularly.* — THE EDITORS.

THE success of a building project, whether it be a country house, a country club, or a farm building group, from an architectural standpoint, depends in no small measure upon the development of its surrounding plant life, and in turn plant life, roads, drives, building foundations and sewage disposal systems are dependent upon soil conditions for their success. Good drainage is the foundation stone of proper soil conditions upon which rests success or failure of any of the types of construction just mentioned.

When handling the drainage about farm or other country buildings, the questions of ground water and natural water table in the soil are likely to be left unsettled for the immediate problems of roof water, cellar drains, road drains and sewage disposal. Ground water is considered to be a matter for the agriculturist alone, as it is supposed to affect only plant growth.

As a matter of fact, however, if ground water is properly taken care of, the drainage of roads and buildings is a much simpler problem. The mere drainage of soil, from an agricultural standpoint, changes various soil characteristics and such drainage:

1. Raises soil temperature.
2. Aerates the soil, introducing nitrifying bacteria.
3. Oxidizes and makes available plant food.
4. Lowers water table permanently.
5. Establishes channels for flow of ground water.
6. Makes soil more friable.

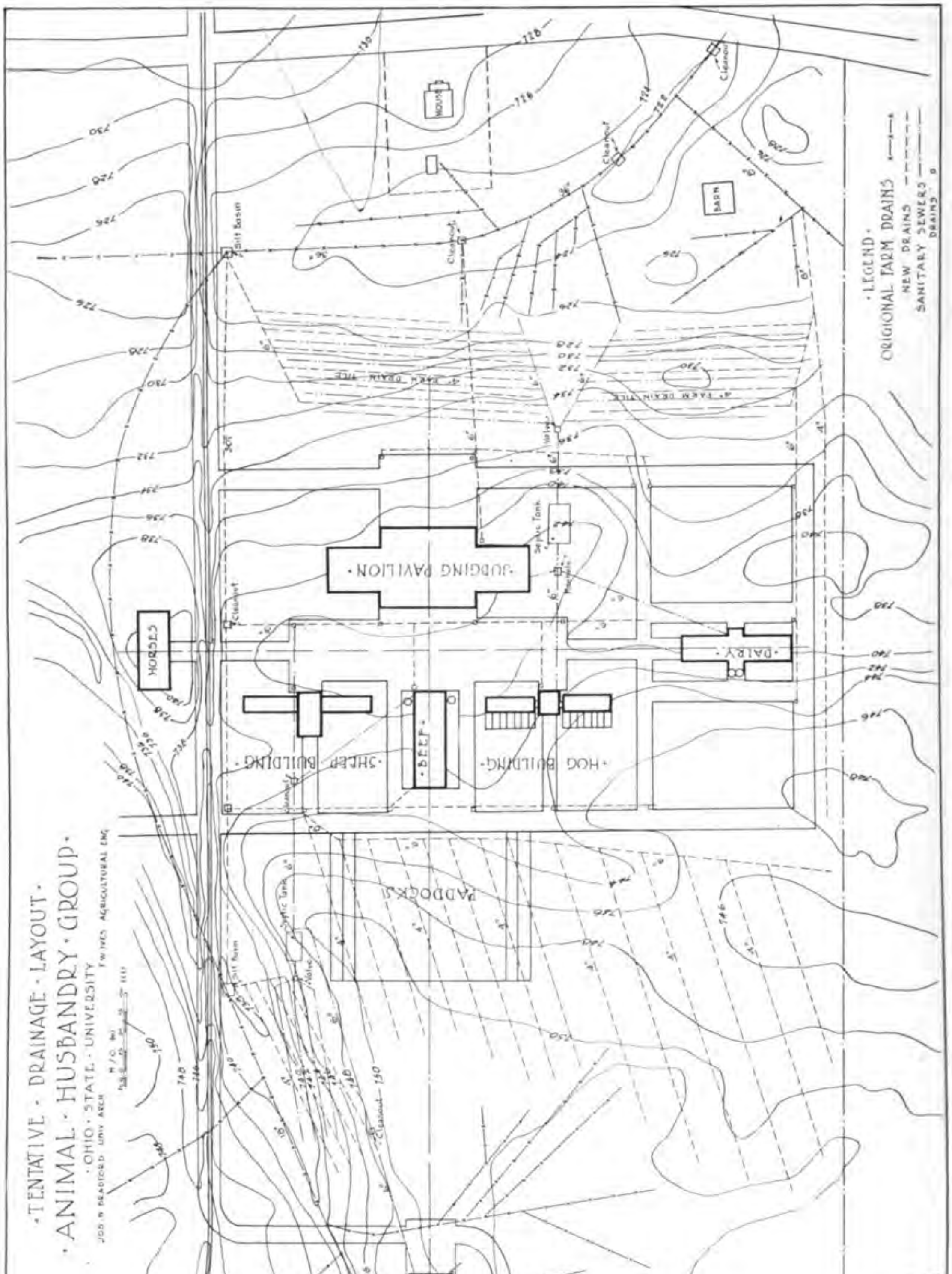
All of this has a direct bearing on construction and related activities:

1. Higher soil temperature aids landscape architecture by making possible earlier plant growth in spring; enables the architect and builder to start building construction and road work earlier in season.
2. Soil aeration assists in the sanitary disposal of household and barnyard wastes by the economic process of sub-surface irrigation secondary disposal systems.
3. Oxygen in the soil assists in final disposition of septic tank effluent.
4. Lowered water table makes better and more permanent road foundations; prevents dampness in cellars or basement stories; prevents large surface run-off by increasing absorptive capacity of the soil; affords better conditions for plant growth for practically all ornamental high ground shrubs and decorative plants.
5. Channels for flow of ground water are established within a year after installation of tile drains and make for rapid drying of tennis courts, golf grounds, roads, etc., after heavy or severe rains.
6. Drainage changes the nature of soil by making it more workable. The changed soil makes more easily cared for courts, gardens and other forms of landscape construction.

Another general consideration is the protection of water supply by artificial drainage. Such drainage may be used in several distinct ways, of which disposal of surface run-off and sewage wastes are the most important. The control of surface run-off consists mainly in taking care of the occasional freshets in natural water courses after a heavy rainfall, thus preventing flooding of springs and consequent fouling of water supply. The control of surface run-off also prevents erosion of natural or artificial landscape constructions. The sanitary disposal of sewage by the sub-surface irrigation method is quite satisfactory so far as irrigation and avoiding the pollution of air are concerned. In a very wet season, however, sub-drainage of the irrigated section must be installed in order to take care of excess water and direct its flow from channels leading to natural sources of water supply, such as springs and wells, and toward such channels as legal drainage restrictions may designate. The effluent from the sub-irrigated beds is generally not dangerous to health except under extraordinary conditions or because of poor design of the plant at the outset, but there is always a feeling, hard to overcome, of prejudice against waters emanating from such sources.

Other problems intimately associated with drainage in their solution are those of efflorescence on retaining walls; overturning of retaining walls and garden ornaments by action of frost; destruction of walks and drives by frost; winter damage to swimming pools, fountains and similar details; care of barnyard waste, sunken gardens and sunken farmyard courts; inundation of golf courses and country club grounds by streams.

The first care of the engineer in planning an adequate drainage system is to provide an outlet; the second step is a careful topographical survey of the whole drainage area and the next step is then a study, with the architect and the landscape architect, as to the location of buildings with respect to topography and their relations to one another. The last step before beginning construction is the prep-



MAP OF PROPOSED AGRICULTURAL SECTION OF OHIO STATE UNIVERSITY

JOSEPH N. BRADFORD, UNIVERSITY ARCHITECT; F. W. IVES, AGRICULTURAL ENGINEER aration of plans and details. The outlet is most important on account of state laws covering riparian rights and damage by artificial water courses, and also on account of sanitary rules of state and city boards of health. Almost as old as the ancient fence feuds are the questions of receiving drainage from the uplands of a neighbor. A topographical survey of the whole drainage area is necessary for three reasons: (1) To plan properly the drainage of the area under consideration. (2) To determine, so far as possible, the effect of run-off from land higher up. (3) To ascertain the legal restrictions pertaining to outlet on the property below. Many times the question of flow from higher property is more serious than that of the drainage from the site itself.

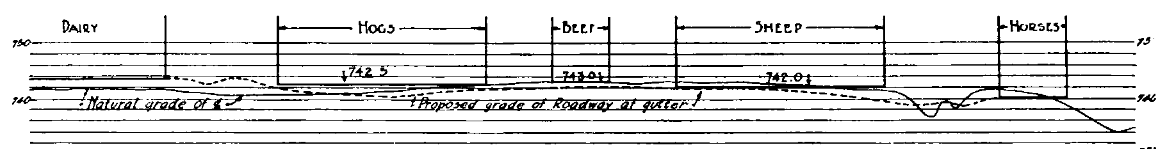
Naturally enough the architect, landscape designer and engineer must agree as to the proper relation of site and buildings. A few general principles on which to base agreements should be understood in connection with farm groups:

1. Drainage should be from residence to barn rather than from barn to house.
2. Drainage should protect all sources of water supply.
3. Southern or eastern slopes are most suitable for all farm buildings.
4. Prevailing winds determine to some extent locations of buildings, *i.e.*, stable odors should be carried away from the house.
5. Questions of drainage affect location of all drives, walks, tennis courts, sunken gardens and barnyards.
6. Economic working of farm plant, though sometimes overlooked in favor of a "picture farm," must not be neglected. Few country places pay money dividends, nevertheless many large estates do pay their own way, which doubtless contributes not a little to the peace of mind of their owners.

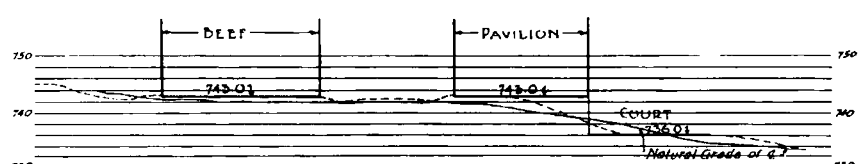
A typical drainage problem relating to a farm building group is found in the proposed group for the Animal Husbandry Department, Ohio State University. This problem involves run-off from property above, drainage of fields about the plant, drainage outlet, sewage disposal, drainage of disposal field, and omits only the drainage as affecting the water supply. The topography of the site, as shown in the map, is of a medium rolling character with no very steep slopes. The soil is a heavy clay, very dense and inclined to hold water. Drainage from approximately 400 acres above flows through a culvert under a railroad at the west of the tract. This flow was originally conducted in an ordinary field drain, not sufficiently large to carry freshets. The remainder of the original drainage on the tract is barely sufficient to permit the land to be cultivated, no pretense at complete drainage being made. In the consideration of this problem, the former drainage system has practically no bearing excepting that a portion of it will have to be replaced with units of larger capacity.

The building location and the relative positions of the various structures with respect to management, capacity and ornamentation and the preliminary studies for the building plans were worked out in the office of Joseph N. Bradford, University Architect, with the Departments of Animal Husbandry and Agricultural Engineering in consultation. The group and its location having been decided upon, the problem of drainage was then taken up. It was first thought that the drainage from the higher ground could be diverted along the railroad to another outlet, but this was abandoned after study. It was found that a 12-foot cut for a distance of 700 feet would be necessary. The railroad officials do not care to change the size of existing satisfactory culverts under a double track. Property owners receiving the increased run-off naturally expect a state-operated plant to pay large damages (alleged) to their property. In other words, riparian rights of a public utility and of individuals were involved.

Study of this problem indicated that a 30-inch



· PROFILE · SECTION ·
On North & South Axis or ℄ as shown on plan



· PROFILE · SECTION ·
On East & West Axis

sewer would carry the surface and ground drainage with a fair factor of safety. This sewer is provided with silt basins and clean-outs at points of change of grade, curvature and entrance of other drains. These are important matters in the carriage of waters laden with silt materials. Silt basins provide simply an enlarged and deepened channel where the abrupt entrance and exit of the water encourages the deposit of silt and sand. Man-hole and clean-out covers must be provided. The main sewer purposely follows the main roadway to take water from the gutters and surface inlets. At its lowest point the 30-inch main sewer is joined by a drain from some 200 acres to the north and then proceeds in a southerly course, passing under the river boulevard and finally into the river.

Four other typical drains are found:

1. Drains for water from roofs, paved courts and roadways.
2. Drains to lower ground water table about site.
3. Sanitary drains.
4. Sub-drainage of sanitary disposal fields.

The water from roofs, paved courts and roadways is carried by direct underground lines to the nearest convenient outlet. Regular inlets are provided at convenient intervals to guard against possible flooding. Six-inch tile are the smallest recommended for this service. Small tile are of little value as they soon become clogged and useless. Lawns and tempers are both ruined by tile replacement.

The drains for lowering water table serve several purposes in this particular case. The most extensive drainage is necessary just west of the group on ground of a higher elevation. These are ordinary 4-inch farm drains laid down the slope to a sub-main. Their purpose is to intercept ground water and to prevent surface water from reaching the courts and yards. It is believed that this drainage will better the grass in the large paddocks. Other intercepting drains are shown on the map. Since a dry yard is especially desirable in the case of sheep and dairy cows, underdrainage is very necessary.

The sanitary drains include vitrified sewer lines from the various buildings to the large septic tanks, of which there are two. The larger tank is designed to care for toilet and wash from the dairy barn, hog building and judging pavilion. The smaller of the two will take care of a comparatively small amount of waste from the sheep and beef cattle buildings and from the power plant, this latter built to include a small abattoir. Vitrified drains from the septic tanks to the dividing valve chambers are quite necessary in order to prevent pollution of the soil at that point. The disposal field consists of common farm drain tile, minimum size 4 inches in diameter. These tile are laid at a slight slope in cinders or gravel at a depth of about 18 inches from the surface. In closely compacted soils, the cinders or gravel should be 12 inches below the tile and 6 inches on either side, and should be covered with just enough soil to grow whatever crop is necessary. In gravel or sand, sub-drainage of disposal fields is not necessary unless some source of water supply is to be protected. In wet, heavy soils, particularly in regions of heavy rainfall, sub-drainage is extremely important. The heavy soil tends to become waterlogged and would soon kill off desired plant growth. Plant life over the beds to utilize the excess of nitrogen deposited by the sewage is necessary. Vigorous growth can take place only under favorable moisture conditions.

The map clearly shows three disposal beds of ample area. The sub-drainage is shown as a gridiron formation. The sub-drains may usually be constructed of 3- or 4-inch farm drain tile from 30 to 40 inches below the natural ground surface, depending upon the available gradient, and midway between the disposal lines. All sanitary lines must be laid with a grade of ⅛ inch per foot or more. Vitrified sewer lines must be carefully graded and laid with cemented joints. All disposal tile and all drainage and sub-drainage tile must be laid with loose joints. Valves are provided so that portions of the disposal field may have periods of rest, since a continuous flow would soon render the plant inoperative or at least not safe.

Economical construction of drains is a matter of interest to the architect and owner as well as to the contractor. Drainage excavators or trenching machines are more economical than hand work on all save the smallest jobs. The cost of an installation of the size shown on the map may be cut 30 to 50 per cent by the use of machines in place of hand labor. It is important that, so far as possible, parallel lines be employed and that these lines be as long as grade conditions will permit. A good operator can finish a grade to a smaller fall with greater accuracy than most hand workers, and with much less supervision and inspection.

Two kinds of tile are available — clay and concrete. Which is selected will be largely a matter of price, delivered at the site. Since freight plays a large part in present prices, the nearness of a tile kiln or a cement products plant will have considerable bearing on the price. Generally speaking, large sizes of concrete pipe are superior to the smaller sizes, while the reverse is apt to be true of the clay product.

These publications are of value in the study of design of drainage:

E. G. Elliott. *Engineering for Land Drainage*, John Wiley and Sons, Inc.

E. G. Elliott. *Practical Farm Drainage*, John Wiley and Sons, Inc.

J. A. Jeffrey. *Text Book of Land Drainage*, The Macmillan Company.

H. F. French. *Farm Drainage*, Orange Judd Company.

The Division of Agricultural Engineering, Bureau of Public Roads, U. S. Department of Agriculture, Washington, D. C., has issued much valuable material and research data on drainage and drainage design. Various state experiment stations have done much valuable work, data regarding results being available in bulletin form. Notable among these is the recent work of Michigan, Wisconsin and Iowa. The Proceedings and Journal of the American Society of Agricultural Engineers also contain much valuable material.

ENGINEERING DEPARTMENT

Charles A. Whittemore, *Associate Editor*

Steel Design for Buildings

PART II. THE DESIGN OF STEEL COLUMNS

By CHARLES L. SHEDD, C.E.

IN the May number of THE FORUM we considered the various types of columns and the points which were to be remembered in their design. In this number we will show a method of arranging the calculations for a column design and also the actual design of a column for a 12-story office building.

The loading on a column is made up of loads from several sources: 1st, the wall loads; 2nd, the live floor loads; 3rd, the dead floor loads; 4th, the column metal and covering, and 5th, any special loads such as from elevators, tanks, etc. In figuring these loads they are kept separate until the final summary is made in order that one can tell easily in that summary just how much of the total loading comes from each source. This may be especially useful in the designing of the foundations and in any case it makes the work systematic and easy to follow, and it also aids in estimating the effect of any changes and enables the person in charge of the work to look it over and note any possible error by comparison of the various totals.

In computing the wall loads, one sheet may be given to all the wall loads on all of the floors between any two columns. It is best to start at one corner of the building and work around the structure, taking each bay in order. The sketches for these wall loads are made in the same manner as those shown in the last article, where we considered the design of steel beams. Fig. 1 shows a typical sheet of wall loads. The wall is of brick, 1 foot thick, with a window 4 feet wide. The arrangement of the figures is similar to that in the design of beams but we stop when we have obtained the reactions and do not figure any moment. These calculations should be made before the spandrel beams are figured and then they may be used in conjunction with any floor loads to make up the sketches for the designing of those beams.

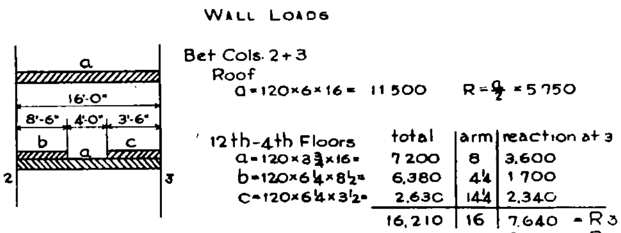


Fig. 1

NOTE.—This method of tabulation was explained in detail in a previous issue of THE FORUM

In Fig. 2 is shown a portion of a summary of these wall loads. This portion shows the summary of the wall loads for columns 1, 2 and 3. The building has 12 stories and the loads from the walls to the columns are all alike on the floors from the 5th to the 11th inclusive, so we bunch these all together to save time and space. The horizontal lines represent the spandrel beam at each floor and the vertical lines the columns, and the loads are entered from Fig. 1, etc. at each end of each beam and above it so that the work can be easily followed. Movable partitions are usually considered as part of the live load but permanent partitions may be figured and summarized with the wall loads. Column 3 has a load from a permanent interior partition, therefore there are 3 loads for that column on the wall load summary sheet. When these loads are all entered on the sheet they are added together for each column at each floor and the result placed below the horizontal line. It is convenient to let the vertical line pass between the hundreds and the thousands. The author usually

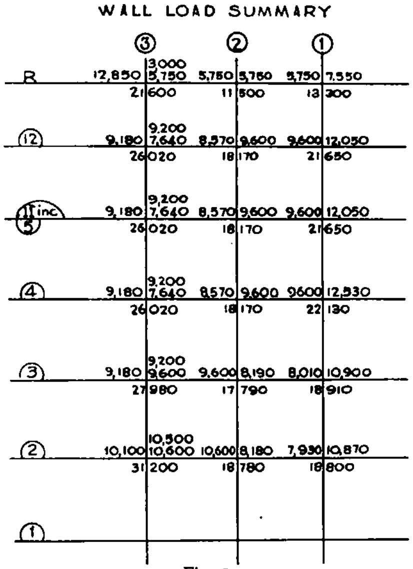


Fig. 2

makes the calculations thus far to the nearest 10 pounds, but when these are transferred to the final summary the nearest hundred or the next hundred above is generally used to facilitate adding up the items.

The live floor loads are figured as in Fig. 3, which shows a portion of such a sheet for the building we are using as an example. The 12th to 4th floors are all alike and are put together. The first vertical column shows the number of each column; the next 3 are areas of the various parts which make up the roof. These areas are figured from the plans and are the areas of floor in square feet which are transferred to each column. An easy way to figure these, where they are complicated, is to have blue

LIVE FLOOR LOADS FOR COLS.

Col. No	Areas: P.H. Landing @75*	Areas: P.H. Floor @75*	Areas: Main Roof @40*	* Roof: Total Load	12-4 Floors: Area	12-4 Floors: @75*	3d Floor: Area	3d Floor: @75*	2d. Floor: Area	2d. Floor: @75*	1st Floor: Area	1st Floor: @125
1			140	5,6	140	10,5	140	10,5	140	10,5	42	5,3
2			188	7,5	174	13,1	174	13,1	174	13,1	176	22,0
3	68		180	12,3	164	12,3	164	12,3	164	12,3	192	24,0
4	91		100	10,8	99	7,4	99	7,4	R60* 99	9,8	184	23,0

Fig. 3

prints of the framings made and mark quarter areas at convenient points on the plans similar to reactions of beams, and then follow them around, crossing off any as fast as they are divided into reactions nearer the columns. Finally the sheet will be covered with these numbers, crossed off excepting those around each column which may be added together on the blue print and that summary marked to distinguish it from the partials in some way, such as drawing a circle around it.

On the roof of this building, as in many similar cases, the areas were of 3 classes — a pent house landing, which came above the main roof; a pent house floor, at about the grade of the roof, and finally the roof itself, which includes both the main roof and the roof of the pent house. These are kept separate on account of the loadings per square foot which vary, one being 75 and the other 40 pounds, and also to make the calculations easy to follow afterwards. Each of these areas is multiplied by the proper load per square foot and the sum of the items placed in the vertical column marked "Total Load." The last 2 figures are considered as ciphers and are omitted to save space, and also to make the work more rapid and less liable to error. The various floors are figured in a similar way. On the 2nd floor of column 4 in the area column is an item marked R60. This represents an area of 60 square feet from a roof at this level in a light well or areaway. This is multiplied by 40 pounds per square foot, like the regular roof loads, and added to the area 99 multiplied by 75 pounds per square foot, giving 9, 8, that is 9,800 pounds.

Fig. 4 shows the final summary for column 2. The column number is shown in the first column, the floor in the second, and the live floor load in the third. Most building laws allow a reduction in the live load on columns where several floors are carried. By this is meant that the law takes into account that while some areas may be loaded up to the full live load designated by the law, it is unlikely that all areas or floors will be fully loaded at the same time. To take account of this when a column carries 1 floor, the full live load is used; when 2 floors are carried only a percentage is required to be used, in this case 75%, and when 3 floors are carried a still smaller portion of the full load is used, in this case 60%, and so on. As the building grows larger and more and more floors are added it becomes desirable to stop this reduction and use a minimum per cent; in this case for 6 or more floors 40% of the total live load is used. This method of reduction is apt to vary with different building laws and it is said that one of the objects of Mr. Hoover's present work is to promote a uniformity of the building laws throughout the country. The system used here is according to the Boston building laws. The live load for the roof is not allowed to be included in the live loads to be reduced and is, for convenience of tabulation, included in the column of dead floor loads as noted by the asterisk.

The fourth vertical column contains the per cent of live load used in each case and this multiplied by the partial summaries in the third column gives the reduced live load in the fifth column. The dead floor is figured on a sheet corresponding and similar to Fig. 3 and is transferred to the sixth column. The wall loads are transferred from the wall load summary (Fig. 2) to the seventh column and the column metal and covering (C. M. & C.) is entered in the eighth column of the tabulation. By column metal and covering is meant the weight of the steel column itself and the fireproof covering and plaster around it. In a 12-story building this will average about 2,000 pounds per story so that if this is used as in the present example we are on the safe side in the upper stories and about right in lower stories.

In figuring the wall loads we figured from center to center of columns. In so doing, at the corners of the building we omitted a small bit of wall at the extreme corner. This can be readily computed and added to the C. M. & C. of these corner columns. It usually about doubles the C. M. & C. for these columns.

The items in each column are added up at each floor, these totals being placed below the horizontal lines, and the totals, beginning with the reduced live load, are added up crosswise and entered in the ninth vertical column. An adding machine proves very convenient on these sheets to use after the entries have all been made and the live loads reduced. The tenth column shows the story for which each total load in the ninth column applies. The eleventh column shows the unsupported length of each column in each story and is usually about 1 foot less than the story height. The twelfth and last column contains the section required, taken from the standard sheet of tables which we will now describe.

As we noted in the May FORUM, different building laws use different column formulae. The formula used in this table is that most commonly used, that is 16,000-70 l/r. The maximum stress per square inch in this table is 14,000 pounds per square inch and the maximum l/r is 120. Various cities which use this formula vary these two limits. Excepting for these variations in limits this formula is used by the American Railway Engineering Association and the cities of New York, Chicago, St. Louis, Detroit and Seattle.

This table shows the allowable load in thousands of pounds for lengths varying by 1 foot for differing sections varying in area by small amounts. In order that the different portions of the column may be of equal strength the thicknesses of metal in any one section are made nearly equal. While the thick webs are not economical this is considered good engineering practice and some specifications require it.

Many offices have very little system in keeping their calculations, and while there may be others which are quite as good as that described in this and the preceding article, the author feels that this system has great advantages over the practice common in many offices. For instance, the building from which this data was taken had 229 pages of calculations on paper 8¼ x 11. The sheets having the beam calculations had 3 or 4 beams per sheet. The calculations were made in 368 working hours which included 101 hours for the author, chiefly in supervision and consultation with the client. This also included the time of a stenographer in making a copy of all of the sheets. The floor was a concrete slab on steel beams and columns. Drafting was not included in this time. The work was done by 5 men besides the author and their stenographer. Neither the men nor the stenographer knew anything about the system and no one but the author worked any time excepting evenings, Saturday afternoons and Sundays. Not including the time on preliminary consultation with the client and the days at the last in making the copy of the calculations, the work extended over 11 days. This will serve to give an idea as to what should be expected from a system of this kind when the work is a rush job.

In addition to the direct loading of columns there is often an eccentric loading. This may be caused by a load being applied off the center of the column or by wind stresses. In any case this loading may be expressed by a bending moment. The resultant stress in the column is equal to the moment in inch-pounds divided by the sectional modulus of the column section. In this form it is awkward to design the column section as the method would not be direct, but by changing the arrangement of the formula we may obtain an expression from which we can get the required area by a direct method. This formula for the required area would be:

$$\frac{\frac{My}{r^2}+P}{f}=A$$

where M is the moment in inch-pounds, y the distance from the neutral axis to the most stressed point of the column section, r the radius of gyration of the column, P the direct load on the column, f the allowable fiber stress and A the required area of the section. When the type of column has been decided upon it is quite easy to get the value of $\frac{y}{r^2}$ near enough as it varies but little for different areas of the same type of column, and this can be

COLUMN LOAD SHEET

Col	Fl	Tot Live	%	Red Live	Dead Fl	Wall	CM&C	Total	St	L	Section
2	R 12	 13,1			* 29,1 15,1	11,5 18,2	2,0 2,0	42.6	12	9	4-3"x3"x5/16" Ls 10"x5/16" pl.
	11	13,1 13,1	100	13,1	44,2 15,1	29,7 18,2	4,0 2,0	91,0	11	9	4-4"x3"x5/16" Ls 10"x 3/8" pl
	10	26,2 13,1	75	19,6	59,3 15,1	47,9 18,2	6,0 2,0	132,8	10	9	
	9	39,3 13,1	60	23,6	74,4 15,1	66,1 18,2	8,0 2,0	172,1	9	9	4-5"x3½"x7/16" Ls 10"x 3/8" pl
	8	52,4 13,1	50	26,2	89,5 15,1	84,3 18,2	10,0 2,0	210,0	8	9	
	7	65,5 13,1	45	29,5	104,6 15,1	102,5 18,2	12,0 2,0	248,6	7	9	4-5"x3½"x5/16" Ls 10"x 3/8" pl 2-12"x 3/8" pls
	6	78,6 13,1	40	31,4	119,7 15,1	120,7 18,2	14,0 2,0	285,8	6	9	
	5	91,7 13,1	40	36,6	134,8 15,1	138,9 18,2	16,0 2,0	326,3	5	9	4-5"x3½"x7/16 Ls 10"x7/16" pl 2-12"x7/16" pls
	4	104,8 13,1	40	41,8	149,9 15,1	157,1 18,2	18,0 2,0	366,8	4	9	
	3	117,9 13,1	40	47,0	165,0 15,1	175,3 17,8	20,0 2,0	407,3	3	9	4-5"x3½"x½" Ls 10"x9/16" pl 2-12"x9/16" pls
	2	131,0 13,1	40	52,3	180,1 15,1	193,1 18,8	22,0 2,0	447,5	2	10	
	1	144,1 22,0	40	57,6	195,2 19,4	211,9	24,0 2,0	488,7	1	16	4-5"x3½"x11/16" Ls 10"x11/16" pl 2-12"x11/16" pls
		166,1	40	66,4	214,6	211,9	26,0	518,9	B	9	

* Includes both Live and Dead Loads

Fig. 4

multiplied by the moment in inch-pounds and added to the direct load, giving the numerator of the fraction which is the equivalent direct loading. In some cases it is desirable to use a higher allowable stress for eccentric loading than for direct loading alone. It might be proper to use 16,000 pounds per square inch the same as for the extreme fiber stress in beams. If this were so, we can divide this equivalent direct load by the higher allowable stress, and also divide the direct loading by the usual allowable stress and use the greatest result for the required area. When the designer does not consider it prudent to use a greater allowable stress he may look up the required section directly in the design table (Fig. 5) already used in this article, using the equivalent direct load.

In computing eccentric loads it should be noted that they are not cumulative, one story below another as a rule, as the beams framing into the column at the two floors can form a resisting couple sufficient to take care of the eccentricity above. It should also be noted that even what may appear to be an eccentric load at one floor may be amply resisted by a beam framing into the column at that floor. This moment of resistance is usually equal to the value of the rivets in the top or bottom angles multiplied by the depth of the beam, or in the case of a web connection, to the resistance in tension of the heads of the rivets. As has been already noted, the author prefers a column connection for a beam consisting of a seat and top angle to a web connection, one of the reasons being here apparent that the value of the rivets in shear is more reliable than tension on the heads. Of course the resistance of the angles to bending has to be taken into account as well as the value of the rivets.

Columns for tall buildings are usually made in 2-story lengths, planed at each end. The upper end of each column is placed about 1½ feet above the floor line to allow splice plates to be placed on the flanges of the column below. These extend about 1½ feet above the top of the column, with open holes to be riveted in the field to the column above. For medium sized columns these plates can be made ⅜ inch thick and about 3 feet long, each containing about 8 shop and 8 field rivets. Some designers add a plate on each side of the web with 3 or 4 shop rivets and the same number of field rivets. While this adds to the rigidity of the splice, the author would not consider it necessary unless it were in columns having web plates of great size.

PLATE & ANGLE COLUMNS $16000-70\frac{l}{r}$ $\text{Max}\ \frac{l}{r}=120$

Section				Length in Feet																										
	4 Ls	10"x	12"x	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
3x3	5/16	5/16		141	134	126	119	111	103	96	88	81																		
4"x3"	5/16	5/16			159	153	147	141	135	129	124	118	112	106	100	94	88													
		3/8			167	160	154	148	142	135	129	123	117	110	104	98	91													
5"x3½"	5/16	5/16				185	181	176	171	167	162	157	153	148	143	139	134	129	124	120	115									
	3/8						208	202	195	189	183	177	171	165	159	152	146	140	134	128	122	116								
		3/8				223	217	210	204	197	191	185	178	172	165	159	152	146	140	133	127	120								
	7/16						243	236	229	222	215	208	201	194	187	180	173	166	159	153	146	139								
		7/16					252	244	237	230	222	215	208	200	193	186	178	171	164	156	149	142								
	1/2						276	268	261	253	245	238	230	222	214	207	199	191	184	176	168	161								
	5/16	5/16	5/16					286	279	272	266	259	252	246	239	233	226	219	213	206	200	193	186	180	173	167	160			
		3/8						294	287	280	273	266	259	252	245	238	231	225	218	211	204	197	190	183	176	169	162			
			3/8					318	310	303	296	288	281	274	266	259	252	245	237	230	223	215	208	201	193	186	179			
	3/8							344	336	328	320	312	304	296	288	280	273	265	257	249	241	233	225	217	210	202	194			
		7/16						350	341	333	325	317	309	301	293	285	277	269	261	252	244	236	228	220	212	204	196			
			7/16					372	363	355	346	338	329	321	312	304	295	287	279	270	262	253	245	236	228	219	211			
	7/16							400	390	381	372	363	354	345	335	326	317	308	299	290	281	271	262	253	244	235	226			
		1/2						405	395	386	377	367	358	349	339	330	321	311	302	293	283	274	265	255	246	237	227			
			1/2					429	419	409	400	390	380	311	361	351	342	332	322	313	303	293	284	274	264	255	245	236		
	1/2							455	444	434	424	414	403	393	383	373	362	352	342	332	321	311	301	291	280	270	260	250		
		9/16						464	453	442	432	421	410	400	389	378	368	357	347	336	325	315	304	293	283	272	262			
			9/16					484	473	462	451	440	429	418	407	396	385	375	364	353	342	331	320	309	298	287	276	266		
	9/16							510	498	487	475	464	452	441	429	418	406	395	383	372	360	349	337	326	314	303	291	280		
		5/8						519	507	495	483	472	460	448	437	425	413	402	390	378	367	355	343	332	320	308	297	285		
			5/8					540	528	516	504	492	480	468	456	444	432	420	408	396	384	372	360	348	336	324	312	301		
	5/8							564	551	539	526	514	501	489	476	464	451	439	426	414	401	389	376	364	351	339	326	314		
		11/16						572	559	546	534	521	509	496	483	471	458	446	433	420	408	395	383	370	357	345	332	320		
			11/16					594	580	567	554	541	528	514	501	488	475	462	449	435	422	409	396	383	369	356	343	330		
	11/16							619	605	591	577	564	550	536	523	509	495	482	468	454	440	427	413	399	386	372	358	345		
		3/4						628	614	600	586	572	558	544	530	516	502	489	475	461	447	433	419	405	391	377	363	350		

Fig. 5

Modern Floor Coverings

PART II

By E. H. HOWARD

IN considering the question of floor coverings it is well to realize fully the tremendous advance made in linoleum and cork carpeting. Some of the English manufacturers, prior to the war, made an inlaid linoleum which was an exceedingly good counterpart of terrazzo. The gloss in the marble chips appeared to advantage, as well as the duller color of the cement. This material was particularly satisfactory where large areas could be covered without the need of any paneling, but there are many instances where this linoleum was used with a panel and border composition which was very effective.

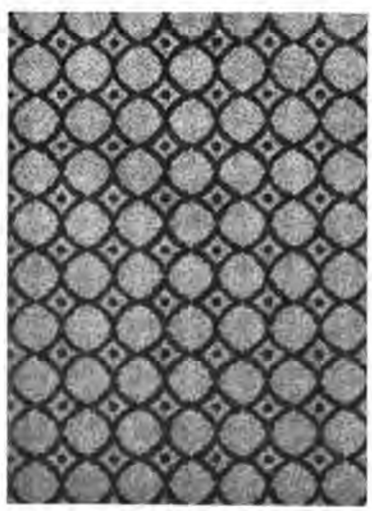
Many times in office buildings and places where the floors receive hard usage, it has developed that the linoleum has had excessive wear in some particular place, for example, before a door. If the linoleum in such a place is a plain color the only method of repair is either to patch the linoleum or to take up a full width and lay a new piece. This necessitates the waste of considerable good material and sometimes it is difficult to get the shade necessary to match the adjoining work. However, if the architect selects a pattern linoleum, it can easily be repaired, if worn, without any great expense.

Another interesting fact regarding linoleum is the statement made by an eminent biologist that it is "bacteria proof"; in fact he maintains that the presence of linseed oil in the linoleum has a distinct tendency towards disinfecting the room in which it is laid. Tests have been made which show that germs cannot live or propagate on linoleum. As a floor covering for hospitals it is exceedingly useful.

There are infinite variety and possibilities in the use of linoleum, and so it is with cork carpeting, which, as has been previously noted, has a much softer surface and texture than linoleum, and it is often used in work of a character different from that to which linoleum is adapted. Cork carpeting, for example, can be used with a large field and with a narrow border around it, such as one frequently finds in two-tone rugs. This gives a pleasing appearance and also satisfactory service.

No consideration of floor covering would be complete without a consideration of cork tile. This is of the same general composition as the "cork carpet" excepting that cork shavings are used and are formed into tiles under high pressure. As a result, the density of the tile is even greater than that of linoleum and still there is no appreciable loss of resilience. This material, in addition to being available in almost any color, shape, size or design, can be used in a wide variety of patterns, making it a material of considerable merit. The tile is impervious to almost any substance except grease, and is readily cleaned. As a floor covering its use is not limited to any certain character of work, but is adapted to almost any situation where a clean, sanitary, noiseless floor is desired. The illustration on the next page shows an effective installation of contrasting colors.

Linoleum and cork carpet have both been frequently used as covering for stair treads and are found very satisfactory for this purpose. Neither material offers a slippery surface under any conditions, and with a metal nosing or a safety tread at the edges the linoleum is protected from wear at its weakest point. Under certain conditions these same materials may be used for the risers as well as for the treads, sometimes improving the appearance.



An Indication of the Range of Patterns Available in Linoleum

Cork Tile Floor in a Boston Tea Room
Blackall, Clapp & Whittemore, Architects

There is a large variety of plain colors as well as the variegated surfaces. The coloring is carried throughout the entire thickness of the material, so that in event of wear the coloring is not destroyed. The characteristics of this type of floor covering are similar in every respect to those of rubber. It is soft and comfortable to walk upon and is noiseless and like a rubber surface it is hard enough to be impervious to liquids and stains.

In all the types of floor coverings that have been mentioned so far, the maintenance costs are negligible. Damp mopping or wiping up the floor is quite sufficient to restore it to a clean appearance and scrubbing is seldom necessary. Linoleum and carpeting are sometimes stained or painted, but this is not necessary with the rubber or synthetic flooring.

Cork tile seems to be better adapted to special forms of construction than the other carpetings. It may be moulded into special shapes, such as sanitary bases, and in stair construction may form a cove between tread and riser. With this material also a nosing must be used in order to protect the edges from damage. Cork tile requires a slightly different floor preparation from the carpeting. If placed on concrete the surface should be smooth-troweled. If placed on wood there should be a reasonably smooth surface and over this a layer of waterproof paper or felt. It is essential that cork tile be laid under such conditions that it will not be exposed to dampness from below.

As yet nothing has been said relative to rubber tile and similar materials. Rubber tile was originally an interlocking tile type, in which each piece was laid individually on the floor. Now this same composition is put together in sheet form, and can be arranged with border and field as desired. Sometimes burlap is used to hold the material together so it will not be damaged in either transit or laying. It also forms a key between the composition and the floor to which it adheres. Rubber tile has an almost limitless range of color, composition and pattern; it is practically noiseless on the floors and is a soft but durable and almost waterproof medium.

Another type of floor covering is the synthetic rubber, in which a variety of colors may be had. For example, a very good representation of Siena marble, black and gold and gray with a black vein, may be obtained. This is true also with terra cotta, white and black. In appearance this material departs radically from other floor coverings on account of its mottlings, grainings and colorings.

In discussing composition flooring one must always have in mind that some floors have a close similarity to concrete. Still, this analogy is rather remote because the surface is not so hard but still is dustproof and durable and is made of various materials. One of the basic compounds is magnesite, which adds the characteristic of an inert material. It is not susceptible to swelling or shrinking and when once in place is always in place as long as the under material remains unmovable. This material is put down in a plastic mass and can be carried up on the walls to form a dado, base, panels or any pattern.

In preparing the under floor for this sort of work it must be borne in mind that it can be laid on concrete or wood or practically on any surface with the assurance that it will properly adhere. When it is laid on wood a fine mesh wire on expanded metal is tacked down to act as a binder to hold the material together and to the floor. With concrete this is not necessary. In preparing a floor for linoleum or for cork carpeting where concrete is the basis to which the material is to be applied, the concrete should not have a smooth-troweled finish. The floor should be reasonably level and smooth, but if the concrete is a little rough it forms a better key for adhesion. However, when the composition is applied to a wood floor, the floor should be smooth, as otherwise the roughness is likely to show through the linoleum and the wear will be the greatest in the uneven places. With so great a variety of floor coverings available the architect will be able to make a selection which will satisfy every requirement of service and add an appearance of dignity.

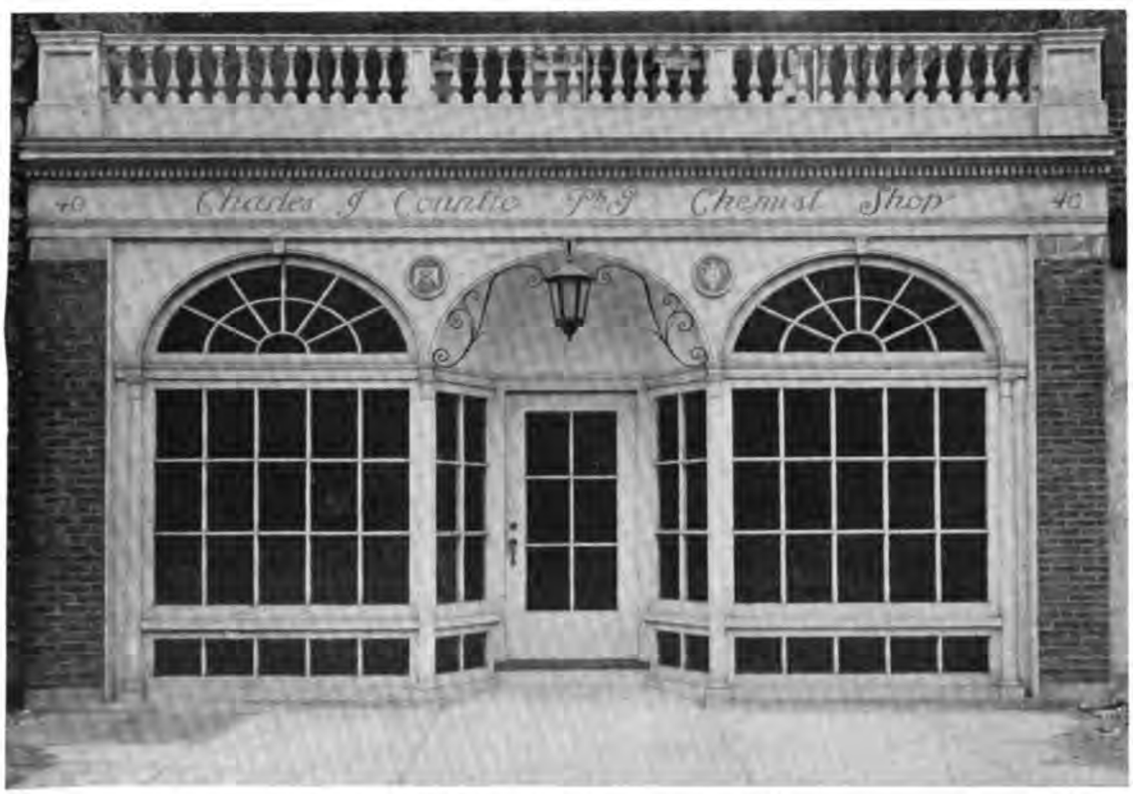
MINOR ARCHITECTURE
EXEMPLIFIED IN MODERATE COST BUILDINGS

Small Store and Apartment Groups

FOR various reasons the architectural improvement which is so marked in the designing of the small house, the usual apartment building or the average business structure, does not seem to have been extended to the designing of small store buildings or those structures containing stores and living apartments which are often built in suburban sections or in certain residence quarters in cities. Such commissions are seldom of a size sufficient to make them attractive to architects or to render them the subject of great effort, and in most instances the amounts which the owners are willing to expend are such that only

the barest fundamentals may be had; there is rarely opportunity for the expenditure of more than the amount necessary for securing the minimum of building for which there may be obtained the maximum of return.

In many instances such structures do much to either make or mar their surroundings, and it often happens that the architect into whose office is brought what may at first seem to be a rather forlorn hope is able to point out to the prospective owner certain possibilities which lie within reach, and thus there is brought about an enlargement of the project which may result in its being something more



Chemist's Shop for Coombs Real Estate Trust, Boston, Mass.
Dana Somes, Architect

than a dreary combination of utility and ugliness. In almost every village there is a demand for living quarters which may occupy one or two upper floors, or else such floors may be utilized for offices, thus increasing the possible revenue to a point which would warrant the building of a structure vastly different from that which the owner originally had in mind.

Much depends upon the encouragement which the architect holds out and upon the degree of interest which he feels in the undertaking, and consequently in the attention which he gives to the design. That the design counts for much is proved in the case of the small shop building illustrated upon page 65. The structure is but one story in height because of the extremely small depth of the property and the necessity of affording light to the rear windows of apartments built just back of the store and fronting another street. In this instance the owner, with as much enthusiasm and interest as the architect, tried to embody in this modest facade something of the architectural feeling of Beacon Hill, in Boston, at the foot of which it is located, and the financial value of a distinctive exterior was evident in the number of applications for rental long before the building was completed.

The three-story structure illustrated upon this page is on a corner in a New York suburb and the very prominence of its location necessitated a suitably dignified architectural treatment. The lower floor, as will be seen from the plans, is divided into a number of stores which accommodate most of the business activities of the village, while the two floors above contain 14 apartments of six rooms and bath. Each tier of apartments has its own front and service entrances and dumb waiter and the different tiers are separated by brick fire walls.

The business and residence structures shown in two other illustrations suggest other variations in the broad range of possibilities which such buildings present and prove anew that these buildings need not necessarily assume the stereotyped appearance which is usually given them. One of the buildings is a detail in a village which has grown up about a large manufacturing plant and is one of a group of structures, designed and planned with more than ordinary care, which serve to house the firm's operatives. Much of the interest of this building lies in the use of the colors—dull blue and burnt orange —which are used for exterior trim and upon the sign board before the "community shops." The other example of the store and residence group illustrates a method of treatment which would be suitable almost anywhere and the plan, which shows well arranged stores and studio apartments with baths and kitchenettes above, may suggest a form for a village development which would be advantageous from an economic standpoint besides forming a decidedly valuable architectural asset to any community in which it might be placed.

Village Stores, Great Neck, Long Island, N. Y.
James W. O'Connor, Architect

Details of Early Southern Architecture

INTERIORS OF SHIRLEY, JAMES RIVER, VIRGINIA

MEASURED DRAWINGS BY GODDARD M. WHITE

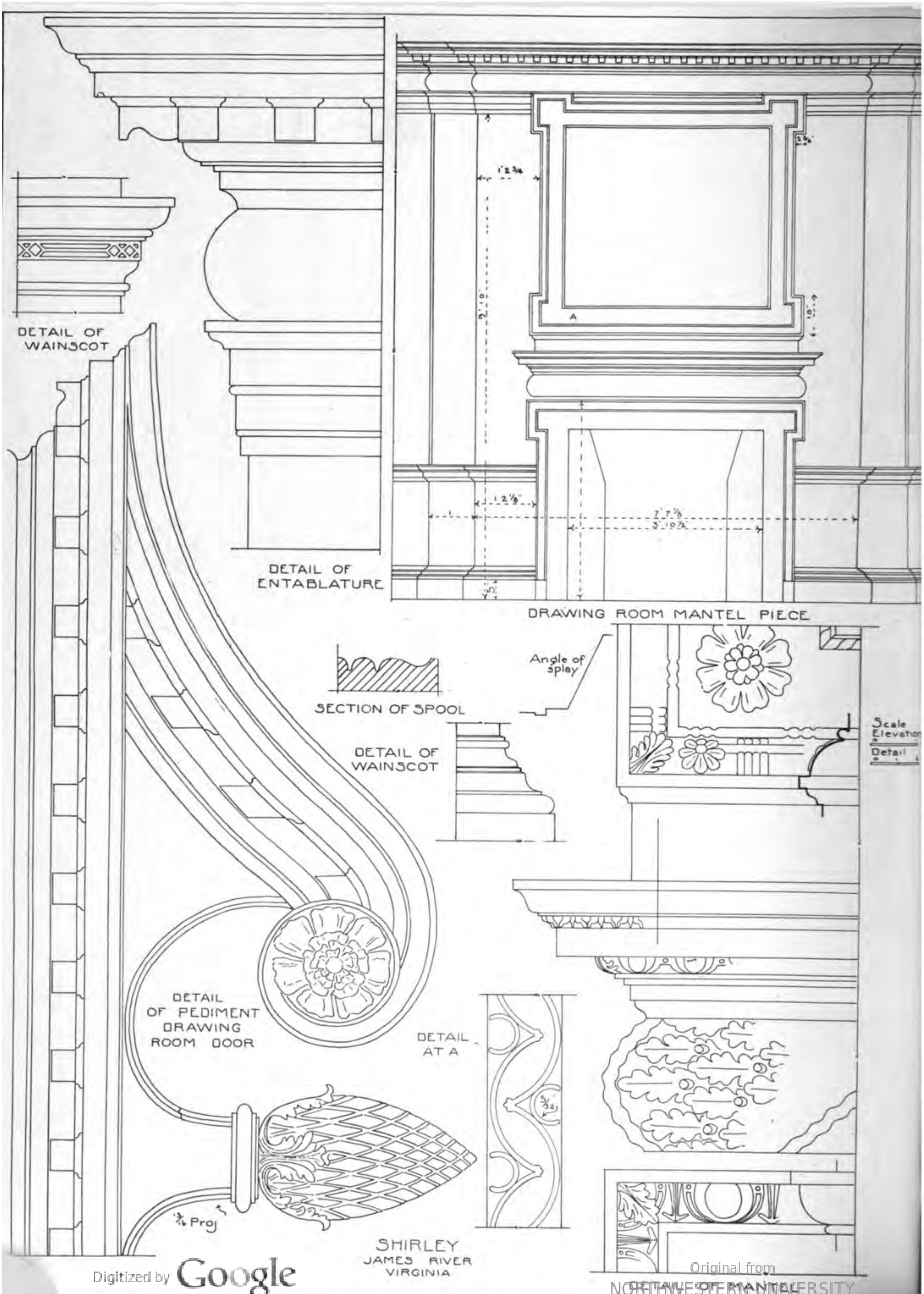
THE woodwork of old colonial houses in the south, and particularly the interior trim, is often surprisingly luxurious and of a somewhat heavier and bolder scale than similar woodwork of the corresponding period farther north, where a colder climate necessitated smaller rooms, involving a treatment generally simpler and more restrained. Sometimes, it is true, the southern woodwork exhibits the shortcomings which are apt to accompany the excellent qualities it possesses—an exaggerated scale, or an excess of lavishness of design—but in the main the trim of old houses in Maryland or Virginia affords an excellent basis of study.

Drawing Room Doorway

Shirley, one of the most famous of the Virginia plantation houses, presents a plan which is unusual in that instead of possessing the customary hall at the center, the hall is placed at one corner of the building and made of considerable size to accommodate the important stairway which is the most striking detail of the building. While the trim of all the most important rooms is comparatively rich and sumptuous, the stairway claims the chief attention of the student, owing partly to the unusual construction of the upper run which is entirely apart from the wall, as may be seen from one of these illustrations, and partly to the interest of its design and the excellence of its proportions. A stairway of the colonial type much over 4 feet wide is not pleasing because the handrail, to appear in proportion, must be impractically high. The eminent English architect, Peter Nicholson (1765-1844), records the fact that a handrail should be 33 inches above the center of the step. The stairs at Shirley are 4 feet wide and the rail is a fraction over 31 inches high, not far from Nicholson's specification and giving excellent proportions. The depth of the tread is 12 inches and height of risers 6½ inches.

Almost as interesting as the stairway is the drawing room door, of correct proportions, without which the colonial atmosphere is not present.

Details of Stairway and Door at Shirley


DETAIL OF WAINSCOT
DETAIL OF ENTABLATURE
DRAWING ROOM MANTEL PIECE
Angle of splay
SECTION OF SPOOL
DETAIL OF WAINSCOT
Scale
Elevation
Detail
DETAIL OF PEDIMENT DRAWING ROOM DOOR
DETAIL AT A
Proj
SHIRLEY
JAMES RIVER
VIRGINIA
DETAIL OF MANTEL

BUSINESS & FINANCE

C. Stanley Taylor, *Associate Editor*

Quantity Surveying; a Definite Element in Architectural Practice

IN the Service Section of the June issue of THE ARCHITECTURAL FORUM announcement was made of recommendations regarding the use of quantity surveys made by a joint committee consisting of members of The American Institute of Architects, The Associated General Contractors of America and The Engineering Council. Details from a preliminary draft of the report of this committee were given. Briefly, the use of a quantity survey in connection with a building project was highly recommended. It is quite apparent, therefore, that this action will serve to increase the interest in quantity surveying, which has been growing rapidly in this country during the past few years.

Such a survey, in itself, is merely an accurate record of quantities, carefully taken from the plans and specifications on which the contract is to be let. In some instances, where the architect's organization includes men capable of doing this work, a quantity survey may be prepared in the architect's office. As a rule, however, the services of organizations which specialize in quantity surveying are engaged, and payment is made at a cost varying from one-fourth of 1 per cent to 1 per cent of the total estimated cost of the project.

From the report made by the joint committee, already referred to, one section may be quoted:

"The cost to owners of preparing bids by existing methods, which make necessary wasteful duplication in estimating quantities by several bidders, is known to be much greater than the cost of preparing bids based on a quantity survey furnished by the owner, and therefore such existing methods are condemned and should be discontinued."

This leads to consideration of the various ways in which the quantity survey may be used by an architect:

1. The survey may be issued to bidders under a general contract and used by them as a check on their own estimates. In this way the architect protects the owner and deals fairly with contractors who are placed in a position to bid without introducing the element of cost where each must take off his own quantities, or the element of risk resulting from an error in figuring quantities — an item for which some allowance is usually made in the contractor's figures. Evidently under this system a closer bid may be obtained.
2. The survey may be kept in the architect's office and used for the purpose of checking up quantities with bidders who may be receiving consideration, before the contract is finally signed.
3. The survey may be made an actual part of the contract in which the contractor bids definitely on the basis of quantities given in the survey.
4. The survey may be made the required uniform basis for all bidders, specifying that the successful bidder will be given opportunity to verify the survey, and that if he proves errors in the survey may revise his bid correspondingly before signing a contract, or within a limited period of time. This method insures that all bidders are figuring on the same basis and makes it possible for them to submit figures more quickly if desired and at less overhead cost since they are not called upon to figure actual quantities on the job until the contract has been awarded.

It is quite evident that usually, when awarding a contract, reliance is placed on comparison of bids taken and of past performances by those contractors who may be under favorable consideration. In many instances these bids do not reflect the true requirements of the work, as various safety elements have been introduced. In many cases, also, bids are made under a loose system of figuring which is largely guesswork on the part of the contractor. In these days when it is so important to be certain of the cost and to develop the lowest possible cost figures compatible with the requirements of the work, the quantity survey offers a method of eliminating waste due to errors in estimating and duplication of effort.

Undoubtedly the average general contractor who has not given careful study to this question of using the quantity survey will be inclined to condemn it. Many contractors in the past have shown that they prefer to gamble on quantities or to trust to a favorable interpretation of plans rather than reduce these elements to a sound, businesslike basis of fact, assuming definite obligations based on definite requirements. Further consideration of the matter, however, seems to have convinced many contractors that operating under a quantity survey is a desirable condition. In this way competition for a contract is made much more businesslike as the foolishly low bidder is eliminated as well as the "safety first" bidder, who puts in a figure far too high. This leaves an open field for the contractor who seriously wants the contract and is willing to estimate fairly and carefully in order to get it.

The quantity survey has other elements of value from the architect's viewpoint. It can easily be understood that with a quantity survey the preliminary estimates will not be based on excessive quantities. In many instances figures received from contractors have been based on much higher estimates of quantities than have been necessary, in turn affecting the total estimated costs to such an extent that owners have been unwilling to go ahead with the projects. If the figures had been developed correctly, on the basis of the quantity survey, such overestimating of cost would have been eliminated and sound figures presented, which would have proved acceptable from the owners' viewpoint. Again, the quantity survey is of distinct value in checking up the architect's plans and specifications. It constitutes a practical test and service to eliminate any errors in plan or specification. The quantity survey is of particular value where an architect is operating under a separate contract method, as it serves to eliminate all guesswork in the various trades or group of trades to which may be given the separate contracts and separate quantity surveys. This naturally means no overlapping of contracts and no omissions. The architect who has his work laid out in this manner and is possessed of definite quantity figures for his separate contracts is usually in a far better position to execute a building project than the average general contractor whose bid has been based partially on guesswork.

We are told by one quantity surveying organization that on some contracts they have called to the attention of the architects over 100 items that were not definitely covered or which were palpably in error. Instances of this sort have included discrepancies between plan notes and ¾-inch detail, such as a 4-inch slab noted on plan but shown as 5 inches on section. Drawings have been submitted showing walls without foundations. Indefiniteness as to the extent of work of different kinds has raised such questions as where granite stops and limestone begins, the line between marble and tile, and other similar details. In many instances work is specified under several trades which might easily result in several payments being made for the same work. In one case which came to our attention copper louvres were specified under carpentry, sheet metal and miscellaneous items. Again, it was found that a contractor figuring on a plastering contract gave figures from 10 to 15 per cent too high, due to loose averaging methods of estimating. Framing lumber bills have been found as much as 10 per cent too high. On one intricate cut stone contract the architect had been told by prospective contractors that there were 30,000 cubic feet of stone. A carefully prepared survey, however, developed the fact that the work required only a little over 20,000 cubic feet — an excess of 50 per cent.

At a time when it is necessary to get a quick bid on a building project many an architect has found the quantity survey of value, as it served to check up with the bidders rapidly in order to close the contract. In one instance, after the figures in such a survey were turned over to the bidders they in turn went over their quantities and reduced their bids substantially, saving several times the cost of the survey. Another interesting instance was in connection with a large interior trim contract. What looked like a foolishly low bid on this item was investigated and accepted, the architect realizing that the figures of the quantity survey had been made known to the bidder. Ordinarily no assurances on the part of the bidder would have made the architect feel safe in accepting such a figure. He probably would have discarded the bid without considering it, when as a matter of fact, owing to having special stocks of material on hand, the bidder was able to submit an unusually reasonable figure.

These are times when an architect must employ every legitimate means to be certain of the accuracy of estimate and contract figures. In many cases the accurate knowledge developed by the quantity survey may serve as a means to insure the immediate carrying out of a project which otherwise might be postponed. The quantity survey is also a form of insurance which may serve to greatly decrease the chances of receiving bids which are too low for the contractor to carry out successfully. Experience has shown that even though the contractor may be financially able to stand a loss resulting from mistakes in his quantity estimates, he does not do so cheerfully and the consequent delay and dissatisfaction have their direct effect upon the owner's opinion of the services of the architect, even though he is not directly to blame.

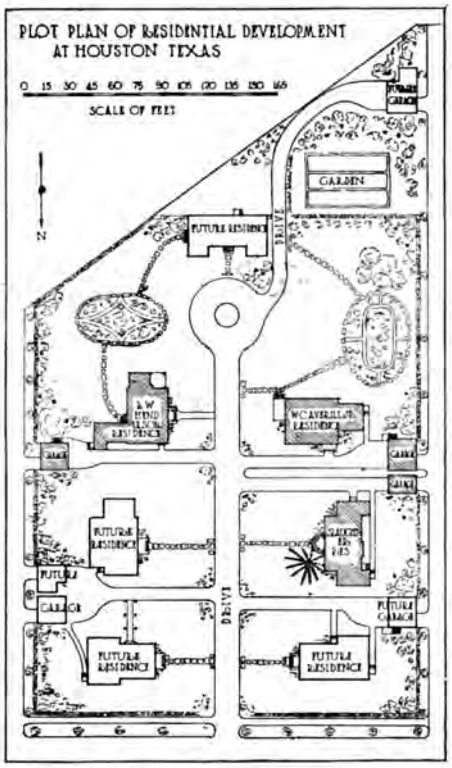
In other recent articles in this section of The Architectural Forum we have from time to time pointed out the advisability of securing a large number of sub-contract figures in order that a greater range of selection of contractors may be available; through this medium it is possible to obtain lower figures than in the case where a limited number of sub-contractors are asked to bid on a contract. This may be greatly expedited by the quantity survey, as ordinarily in many instances sub-contractors will put in bids largely on guesswork, adding a large percentage as a factor of safety. This is often because the sub-contractor is unable or unwilling to figure quantities with care. Naturally, if the quantities are provided for him he is in a position to make a quick and safe estimate which he will be inclined to do under these circumstances. This elimination of the vague "safety" factor in bidding is particularly to be desired.

If information is desired on specific points relative to this subject of quantity surveying the Service Department of The Architectural Forum will be glad to supply the required data.

A Texas Residential Development

J. W. NORTHROP, JR., ARCHITECT

THE residence project which is here described brings out in an interesting manner the point that sometimes there may be co-operation between prospective home builders without developing the property upon what is ordinarily known as a co-operative basis.

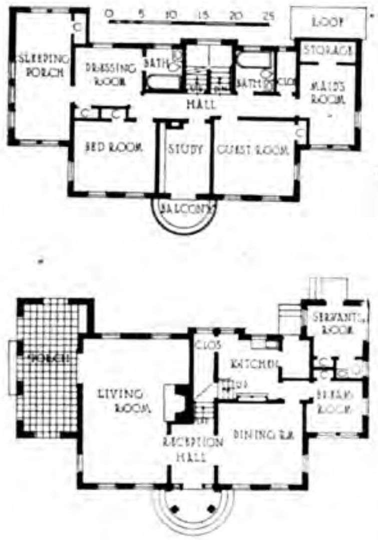


Early in 1920, J. W. Northrop, Jr., an architect, of Houston, Texas, suggested to a group of his clients, who wished to build homes at about the same time, that they unite in purchasing an entire city block, approximately 250 x 240. This block was selected by the architect and laid out in accordance with the plan which is illustrated here. The plot of land was divided to accommodate seven dwellings, grouped around a private driveway and developed in such a manner as to form a modern residential unit. It was found that owing to a great increase in automobile traffic the city streets adjoining this property were objectionable because of the noise and dust. For this reason the houses are arranged to back upon the city thoroughfares, and garages and servants' quarters face these streets which are used only for service and deliveries, but owing to the designing of the buildings and the careful placing of the garages this has not resulted in detriment to surrounding property. The method of laying out this space is interesting and attractive. The first result of co-operation on the part of the future home owners was found in the possibility thus provided of taking a large tract of land and arranging it more attractively and conveniently for those who planned their homes here.

The details of arrangement and financing are of interest. There were four clients who were interested in building upon this property. No company was formed to purchase the land, but each of the four furnished one-fourth of the cost of the equity in order to acquire the entire block. The land was then plotted into seven building sites, as shown upon the plot plan. Four of these were selected by the new owners, leaving three sites to be sold ultimately to others who might wish to join the colony. Three individuals who wished to build their homes immediately then paid off their proportions of the blanket mortgage on the land in order to clear their own lots, leaving only a first mortgage on the sites not to be built upon at once. Under the Texas homestead laws it is difficult to obtain building loans, as they are known in the north, and for this reason there was no definite financial problem as the three owners arranged to invest sufficient money to pay for the houses as they developed.

The project of building these three houses was placed entirely in the hands of the architect. Under his supervision separate contracts were let for the

View from Entrance Showing Grouping of Houses



First and Second Floor Plans

House of Dr. J. W. Slaughter, Houston, Texas

development of the land, including grading, curbs and gutters, and the necessary extension of sewer and water lines to the building sites. A central concrete drive and driveway returns were laid and brick and stone piers were erected at the entrance to the block. The cost of these improvements was divided pro rata among the seven building sites into which the original block was divided. Separate plans and specifications were made for each of the three houses erected, and competitive bids were taken on each so that a separate contract was let to the lowest reliable bidder for each house.

It was found that the method as thus outlined gave each owner complete freedom in developing his own residential property. There were placed necessary restrictions on the building sites which served to secure for each a maximum supply of light and air and lawn space and which guaranteed to the group of home owners a further growth quite different from that of the average speculative development in which buildings are placed too closely together or designed so that there is no unity of mass. It is interesting to note, from the financial viewpoint, that after the block improvements were made and all costs had been charged against each building site, it was found that the cost (approximately 40 cents per cubic foot) was about one-fifth less than the asking price of similar improved adjoining property. It would seem that the business details of this transaction were handled in an excellent man-

House of P. B. Miller, Esq., Houston, Texas
J. W. Northrop, Jr., Architect

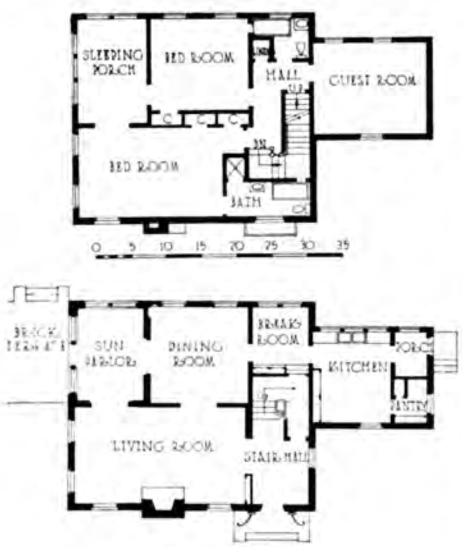
First and Second Floor Plans

ner by the architect, who conceived the plan, selected the land, and finally sold the idea to a group of prospective clients. Undoubtedly there has been a considerable saving upon all the details of this operation and the cost to the original owners will be reduced by the selling of the plots not already built upon.

Architecturally these dwellings indicate definitely the increasing interest in colonial design in residential construction and its constantly widening influence. The value of simple lines, studied mass effects and arrangement of exterior openings is always definite where such designs are carefully developed by the architect. In this instance the architect's problem was complicated by climatic conditions—in fact this operation probably represents one of very few successful attempts to adapt early American architecture to the peculiar climatic conditions of this section of the country, where a room not exposed to the prevailing southeast breeze is of little practical use in summer. It was necessary, therefore, to employ larger and more numerous exterior openings than would be necessary in buildings in the north and east. Careful provision also must be made to secure cross drafts. There were details of planning employed by the architect to solve exposure and air circulation problems, as will be noted in the floor diagrams, such as the provision of smaller or ell-shaped wings, together with careful orientation. For the exteriors of these houses a local rough surfaced face brick was employed, using shades of red and gray laid with light gray mortar, the joints being flush with the face of the brick. For one of the houses a deep red face brick of very rough texture laid in white mortar was used. Roofs are of green slate or of cedar shingles stained a soft gray-green. Three-coat plaster on metal lath was used for the inner walls throughout; rough sand finish was employed and a final coat was tinted by

Detail of Entrance to Henderson House

using a small amount of mineral pigment which provided finishes in gray and tan without the use of paint. A complete electrical installation in each of the three houses includes electrical heating, water heating system and electrical kitchen range. Another house under construction has an interior finish with canvas and paper on shiplap. The roof is of green slate shingles, and gas is used for range and automatic water heater. A hot water heating system is provided in this house. The costs of these houses averaged from 46 to 52 cents per cubic foot, varying according to specifications.



First and Second Floor Plans

House of W. C. Averill, Jr., Houston, Texas

J. W. Northrop, Jr., Architect

EDITORIAL COMMENT

WHAT OF THE INDIVIDUAL ARCHITECT?

ONE of the outstanding developments in the economic progress of the past few years is the movement toward co-operative effort. This has already attained such proportions in the business world that it has changed entirely some of the basic principles of business. Whole groups of producers, distributors and even retail dealers are associated for greater economic advantage; information of various kinds is freely exchanged among the members, on the theory that the ultimate benefit to the groups and to the individuals comprising them will result in putting the smaller elements in possession of the experience and knowledge of the larger and more powerful. Business has prospered under these new conditions, and it would naturally follow that associated effort is largely responsible. That there are dangers in such a course is obvious. Investigations in the field of building material supply alone have uncovered the ease with which the power offered by such combinations can be applied to selfish advantage through the elimination of competition, curtailment of production and other means designed to increase profits.

The architectural profession is not without a share in this modern tendency, and since several instances in various sections of the country have appeared it may be worth while to analyze their possible effect on the practice of architecture and the promotion of the art. The most recent activity of this nature to come to our attention is the Allied Architects' Association of Los Angeles. This Association was organized in the first week of July, 1921, with the purpose of providing the municipal, county, state and national governments with the group services of a number of architects in the designing of public buildings. It is the theory of this Association that its members can submerge their individual interests and collectively offer the civil authorities an opportunity of securing the highest quality of architecture in public buildings and at no greater cost than would be incurred in the employment of an individual architect. The Association is prepared to design and execute work of a public nature and will maintain the necessary offices and organization, entirely apart from the offices of its members and from their practice as individuals.

Upon an examination of the plan, from such reports as have reached us, it seems only fair to say that while the excellent intentions of the proponents of the idea are entirely praiseworthy, it is difficult to see in its operation—even under the most favorable conditions—any reasonable basis for hope for either a higher development of architecture or better service to the various forms of civil government to which the services of the Association are offered. Architecture is one of the most individualistic of the arts and it is hard to understand how it could be successfully carried on by following the "merger" methods which might be entirely successful in many forms of commercial effort. One could name scarcely a single example of highly successful architecture which is not the visible, tangible expression of the genius and daring of some individual architect, or which could have assumed its present form if worked out under a plan which would divide the responsibility among 30 or more. It would be quite as reasonable to expect a masterpiece of painting or sculpture from an effort in which a score or more artists were called into co-operation, each to have a voice in the determination of the result; the outcome would probably be a compromise, which would not represent the ideas or personality of a single individual.

There are other reasons why the plan, as we understand it, seems to be an unwise venture; among them might be mentioned its effect upon architects as a body—excepting those belonging to the Association—and upon the public at large. Discouraging indeed to the rank and file of the architectural profession must be a gathering into an exclusive body of many of the leading architects of any locality, which might well attract to itself any national, state or municipal commissions available, to the total exclusion of architects outside the body. There has been considerable expression among architects of a desire to claim a position in the community which would be a logical and fitting expression of the importance of the profession. This position, we feel, is amply deserved and if seriously and confidently claimed it will be readily conceded, but we doubt very much if the profession's claims, in the eye of the public, will be greatly strengthened by any such association of effort as is here put forth. The general public has formed its idea of what architecture stands for and this opinion will only be weakened and confused by any unwise move which would render vague or obscure its functions as generally understood.

Not that we undervalue or deprecate any form of practical co-operation. We are convinced more and more that this is the time when co-operation in every worthy form should be encouraged, employed and emphasized; nevertheless, we feel that there are some departments of effort, such as architecture, in which co-operation in unusual forms is hardly practicable, and among these forms, we fear, must be classed the effort which has been considered here.

The
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First American Flag on French Front

CARRIED BY AMERICAN ARCHITECTURAL STUDENTS

IN the turbulent days of August, 1914, among those leaving Paris to enter training and prepare to go to the front, was a group of American students who had been studying architecture at L'Ecole des Beaux Arts. Forced by their devotion to Liberty and to France, these men had enlisted in the Second Division of the Foreign Legion and as they marched through the streets of Paris above their heads floated an American flag which had been presented to them by a group of American women. They carried this flag with them to their first camp in Rouen and, when Rouen was menaced by the enemy, on to Toulouse. Returning from Toulouse to Paris on their way to the front they spread their flag on the side of the cattle car which carried them. After arriving at the front they were not allowed to display the flag of a neutral country but they always honored it and protected it and when they went over the top some one of them always carried it wrapped around his body.

Finally the time came when the United States took its place in the war. The little group of American volunteers was scattered; three were dead, one seriously wounded, one a prisoner in Germany. One of the survivors sent the flag to the Rector of the American Church in Paris, calling upon him to offer it to the French government as the first American flag on the French front.

The day for the presentation of the flag was set for the Fourth of July, 1917. The first detachment of American troops to arrive in Paris took part in the ceremony which occurred in the Cour d'Honneur de l'Hotel des Invalides. The day was cloudy and delightfully cool. The balconies were filled and the walls of the old building, which had already seen so many glorious spectacles, formed a remarkable background. All was arranged by the Military Governor of Paris and his staff, with perfect taste. In the center of the court stood the French President, the Minister of War, Marshal Joffre and other well known Frenchmen, surrounding the American Ambassador and General Pershing. Before them were ranged three groups of flag bearers. The American band played, followed by the French band. Then the American troops advanced, marching with their swaggering, rolling gait, a little like that of a sailor. They were spick and span and evidently husky.

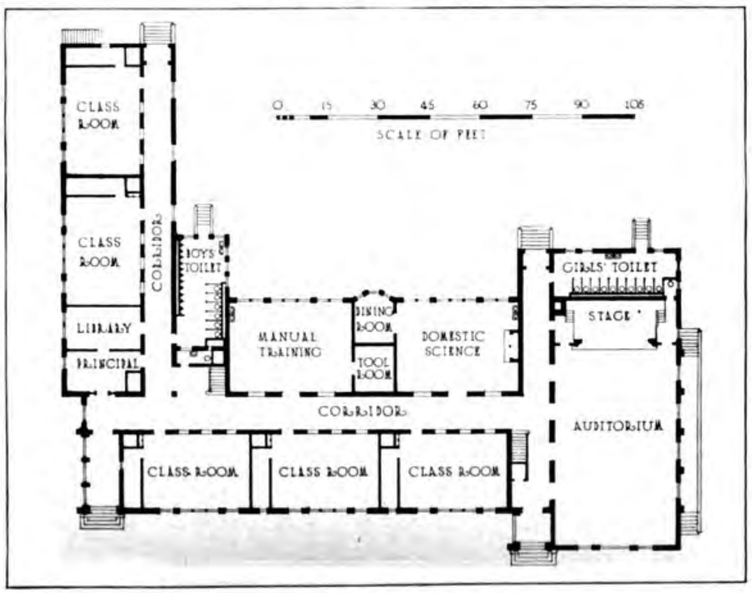
Then came the old territorials, muddy, in their faded uniforms. How dear they were to the Parisians, Frenchmen and foreigners, and how these old poilus were applauded, and how proud Paris was of them when they took their place, marching with the same quick, confident step they had in August, 1914! The American band played the "Marseillaise." The French band played the "Star Spangled Banner." Then General Pershing was presented with a girdon by the descendants of the soldiers who fought with Washington and Lafayette in the American revolution, and also with a banner made by the women of Puy.

Then came the moment for honoring these men of the Foreign Legion. The great American army had taken their place. The pioneers of Liberty could retire. The Rector of the American Church in Paris came forward, accompanied by Charles Carroll carrying the flag. The Rector spoke first to General Pershing, saying that this flag was being proudly given to the French by the men who were the pioneers of the American forces, now that it would be replaced by the new banner of his army. He confided to the General the finishing of the task so bravely started. Then the Rector turned to the noble veteran, General Niox, and presented the flag, saying that it was the prophet of the coming of America to the place where she was in spirit from the first.

In the heart of Paris, which is the heart of France, rests the first American flag which was carried on the French front in the great war. It is surrounded, protected by stone walls, stones unconscious of this honor—but the memory of those who carried this flag where it received its first baptism of blood, will be guarded in the hearts of us all, American and French, and will remain forever.

For these notes we are indebted to Rev. Dr. S. N. Watson, Rector of the American Church in Paris for ten years, including the period of the war. Dr. Watson was in charge of the commission organized by the French government in behalf of the orphaned children of France and was made a Chevalier of the Legion of Honor at the close of the war.—*The Editor.*

VIEW OF AUDITORIUM WING



FIRST FLOOR PLAN

TOWER AND LOGGIA ENTRANCE

LA VILLA SCHOOL, JACKSONVILLE, FLORIDA

MARK & SHEFTALL, ARCHITECTS; WILLIAM B. ITTNER, CONSULTING ARCHITECT

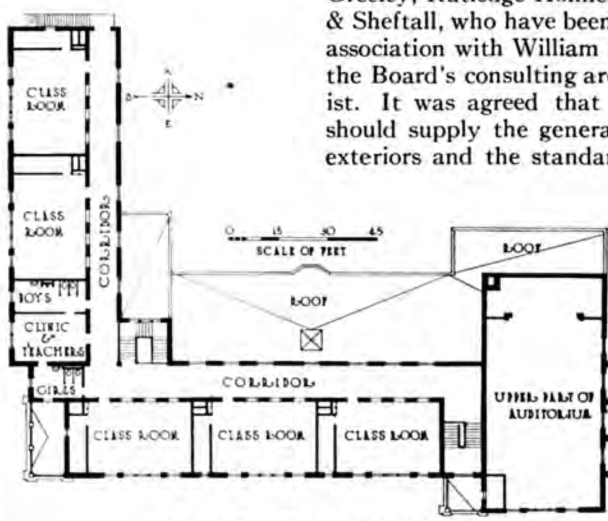
Some Recent Florida Schools

THE WORK OF WILLIAM B. ITTNER, CONSULTANT, AND COLLABORATING ARCHITECTS

THE building of schools throughout the country is a subject of importance today to local governing bodies. Not only is there an acute shortage of buildings because of the period of non-building during and since the war, but because the standards of public education have been so greatly raised and new subjects added to curricula there are countless schools that are now inadequate and must be replaced. We thus see large building programs being undertaken involving the construction of several schools in a community at one time. The design of schools has become largely a specialty with a number of architects, and it is becoming increasingly frequent to effect a working arrangement for the execution of a school program between local architects and a school specialist as consulting architect. The schools illustrated in these pages have been designed under such an arrangement and show eminently practical results.

Early in 1915 Duval County, Florida, voted $1,000,000 for the construction of a number of school buildings. The building program, as determined by the Superintendent of Schools, included the erection of 14 small schools in various parts of the county, varying in sizes from 2 to 4 rooms, while in Jacksonville, besides additions to four existing schools, there were to be four 8-room buildings and three schools having 12, 16 and 18 rooms respectively. Fully realizing the importance of securing economical construction and the utmost in architectural and practical value which could be had, the School Board selected a number of architects in Jacksonville, R. A. Benjamin, Mellon C. Greeley, Rutledge Holmes, H. J. Klutho and Mark & Sheftall, who have been in charge of the work in association with William B. Ittner of St. Louis as the Board's consulting architect and school specialist. It was agreed that the consulting architect should supply the general data for the plans and exteriors and the standardization of construction, finish, heating, ventilating and sanitation of the different buildings, the actual plans and supervision being supplied by the Jacksonville architects.

As a guiding principle it was agreed that all the school buildings, large or small, should be planned with a view to easy and logical en-



Second Floor Plan, La Villa School

General View of La Villa School, Jacksonville, Florida

Mark & Sheftall, Architects; William B. Ittner, Consulting Architect

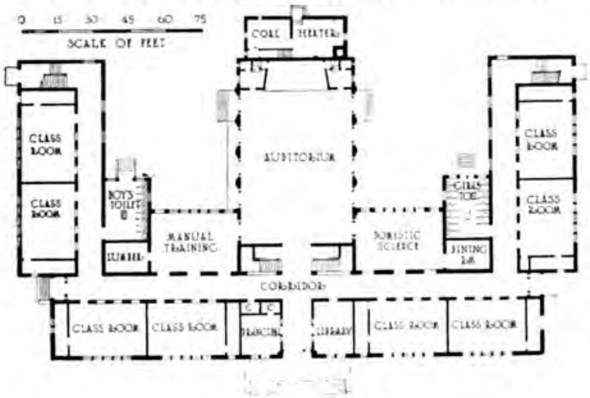
largement, and in view of climatic conditions it was thought best that an open plan be adopted and that classrooms be placed upon but one side of a corridor. It was found to be advisable that the smaller schools be developed as one-story structures and that larger schools be limited in height to two stories with the lower floors, under normal site conditions, raised from 3 to 4 feet above grade to insure dryness and to provide sufficient room for steam mains, ducts, etc. In order that due economy of cubic space be observed it was decided that the width of both main and side corridors be established at 10 feet and that classrooms be planned for a maximum of 40 pupils, the size being uniformly 22 x 32 with wardrobe spaces 5 feet 6 inches in width. Lighting and ventilation for classrooms were provided by windows placed upon only the long axes of rooms, with smaller windows for ventilation in the inner walls above the blackboards; outside light was recommended, wherever possible, for the wardrobe spaces.

A school building having 8 rooms or more was planned to include, in addition to the classrooms:

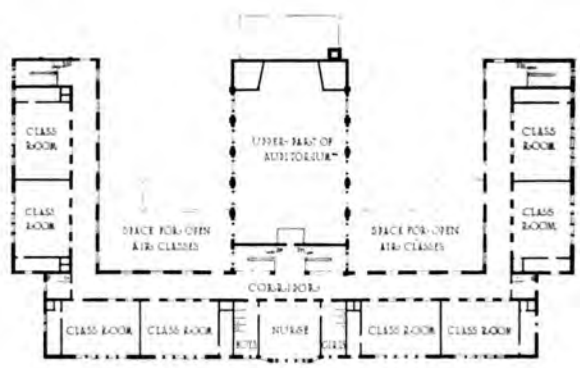
Principal's office.	Wood working shop.
Teachers' rest and work rooms.	School library.
Assembly room.	General and private toilet rooms.
Domestic science laboratory.	General storeroom.

Space for heating and mechanical plant.

Other details of planning were also systematized. The principal's office and teachers' rooms were approximately 13 x 16 in size and were placed, in each instance, upon the lower floor and near the main



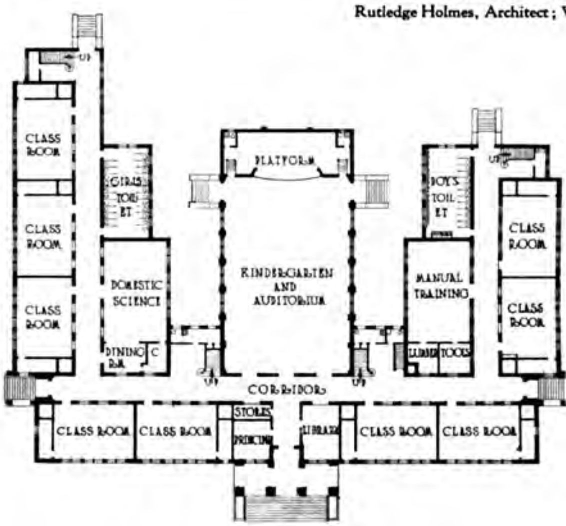
First Floor Plan



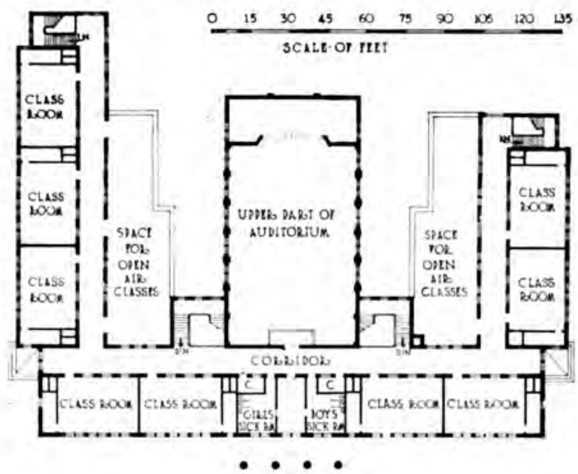
Second Floor Plan

South Jacksonville School, Jacksonville, Florida
Mark & Sheftall, Architects; William B. Ittner, Consulting Architect

General View, Riverside School, Jacksonville, Florida
Rutledge Holmes, Architect; William B. Ittner, Consulting Architect



First Floor Plan



Second Floor Plan

entrance for convenience of administration. The assembly rooms were really combinations of gymnasiums, kindergartens and auditoriums and were connected with the rooms upon the main floors devoted to domestic science or home economics. Each of the assembly rooms was equipped with a small stage and provided with adequate exits. For convenience of service the school library in each building was placed upon the second floor, opening directly to the main stairway and entrance.

Shop quarters were also worked out upon a definite plan, with a large, undivided area, 24 x 36, upon the main floor, to be subdivided if necessary by movable partitions into smaller shops. Toilet rooms in each school were planned for both floors, those upon the lower floor having entrances from the playground as well as from the corridor. Since there were no basements the boiler rooms were planned apart from the school buildings with their floors somewhat below the first floor levels of the schools.

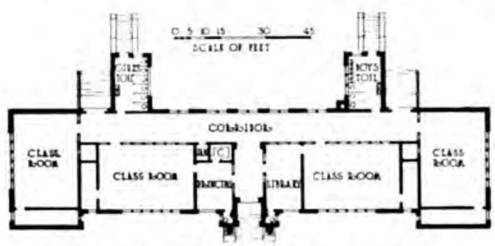
The St. Petersburg High School, located in one of the rapidly growing Florida communities, shows a more ambitious architectural scheme than the Jacksonville schools and was planned with a view to securing a structure adapted to climatic conditions and adapted as well to the accommodation of a fluctuating number of pupils. St. Petersburg is one of the most popular of the Florida winter resorts and the maximum enrollment is usually reached during the winter months. Although the building is not strictly of an open plan type, owing to the restricted site, maximum lighting and ventilation were secured by means of ventilating windows along the inner walls of classrooms. The building is three stories in height but this height is somewhat modified by reason of the fact that the pupils' entrances give directly to the first or intermediate

Grand Park School, Duval County, Florida
Rutledge Holmes, Architect; William B. Ittner, Consulting Architect

floor, while entrances to the front and rear give to the ground or auditorium floor level.

The building is rich in facilities and equipment, containing besides its classrooms a study hall, an excellent auditorium, a standard gymnasium, home economics rooms, commercial rooms, vocational shops, a full set of science laboratories, free hand drawing and music studios. The classrooms, 14 in number, are planned to accommodate 30 pupils each. One of the rooms, however, was enlarged for double classes. The study hall is located on the second floor. An interesting feature of this hall is that the inner portion is appropriated for reference library uses. This is accomplished by means of a partial partition in the form of an arcade. The auditorium extends through the ground and first floor levels, arranged in amphitheater fashion, and is without gallery. The stage is made of gymnasium size so that indoor games, large choruses, etc., are possible in full view of the audience. There are two laboratory groups, each including a lecture room and an instructor's office. One group includes the physics and chemistry rooms and the other the botany and physiography laboratories.

The prevocational activities for both boys and girls are well provided for. A cooking room, sewing and millinery room and a model housekeeping suite serve the girls. The school's cafeteria and lunch room connect with this home economics group. A one-story shop wing to the rear of the main building serves the boys. This wing is planned for easy enlargement in case an expansion of curriculum activities should demand it. The commercial rooms on the ground floor serve both boys and girls and include typewriting and bookkeep-



Plan of Grand Park and Woodstock Schools

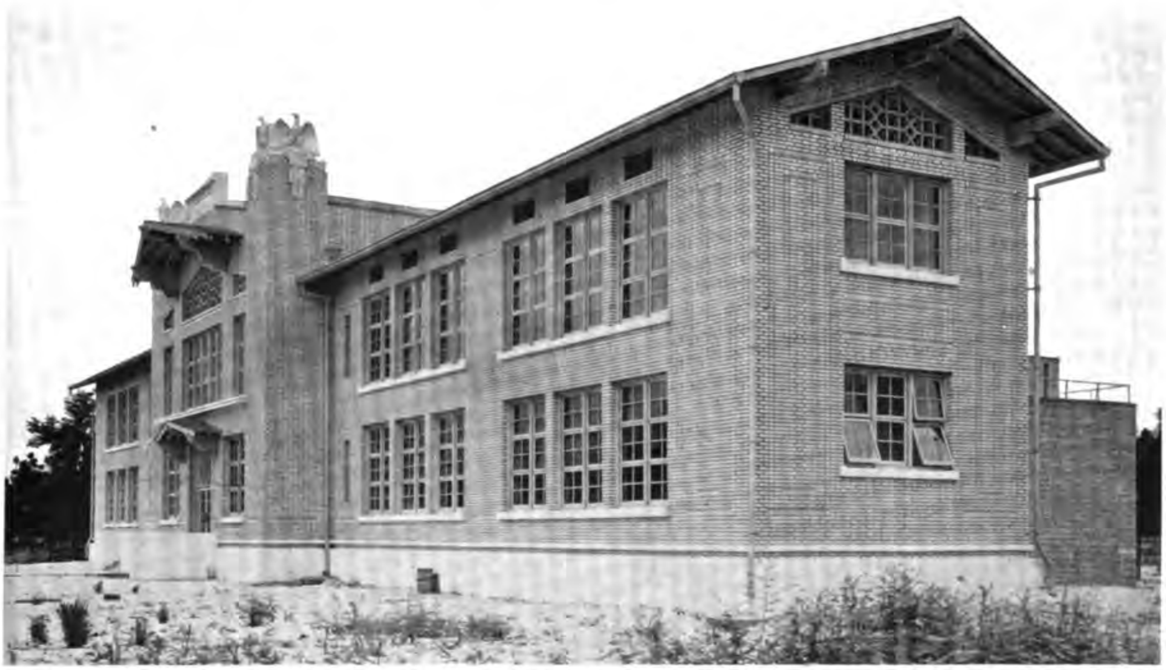
Woodstock School, Duval County, Florida
Rutledge Holmes, Architect; William B. Ittner, Consulting Architect

Stanton School, Jacksonville, Florida
Mellon C. Greeley, Architect; William B. Ittner, Consulting Architect
Accommodates 932 pupils and includes Auditorium seating 500

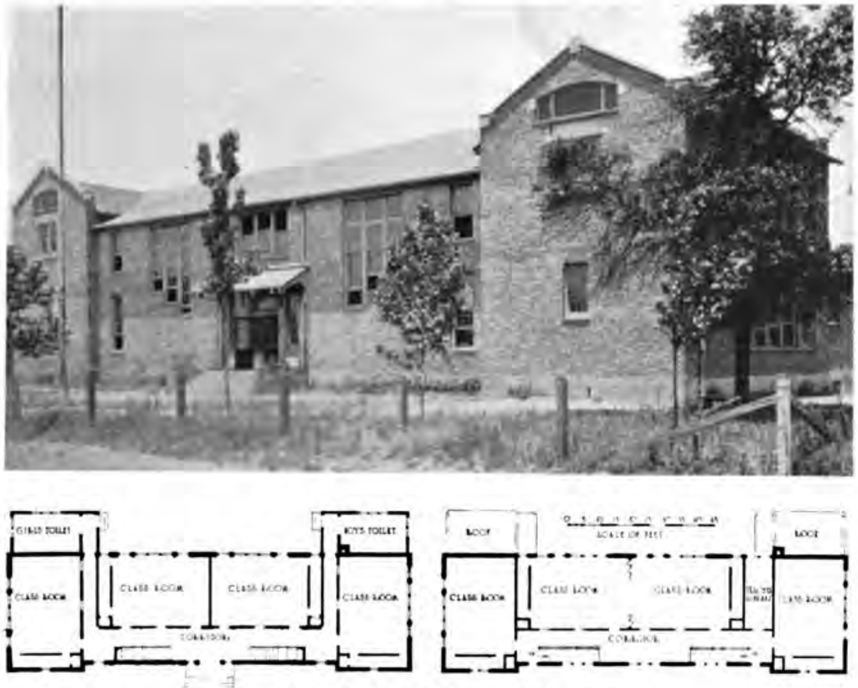
ing rooms. A school bank supplies an interesting addition to the latter rooms. Adequate locker rooms and toilets are located on each floor. Ample provision is also made for showers in connection with the gymnasium.

The building contains several administrative groups, all being located on the main floor. There are rooms for the Board of Education and the Superintendent of Schools. Aside from these, there is an office for the principal of the school besides a general office and the necessary storerooms.

The construction costs on the Jacksonville schools were remarkably low, even for the pre-war year 1917 during which the buildings were completed. The cubic foot cost figures were quite uniform and varied between 11 and 13 cents, which included all



Panama Park School, Jacksonville, Florida
H. J. Klutho, Architect; William B. Ittner, Consulting Architect
Accommodates 448 pupils and includes Auditorium seating 320



Exterior and Plans of Typical School for Colored Children
Mark & Sheftall, Architects; William B. Ittner, Consulting Architect

mechanical and sanitary equipment but not seating or similar furnishings which usually come under the head of equipment. These costs were possible largely through the standardization of plan, and also because of the choice of inexpensive yet wholly durable materials and the absence of elaborate architectural features, either inside or out. The principal purpose in the design of these buildings was to secure efficient school plants, well planned from climatic and administrative points of view; architectural effect was necessarily a secondary consideration, but has been nevertheless achieved to a satisfactory degree with only such elements as mass, general proportions, fenestration and simple cornices and trim as dictated by actual structural requirements, upon which to depend.

The single-story schools are of second class construction with wood floors, partitions and roof framing and solid exterior walls of brick or tile with stucco coating. The larger schools are of semi-fireproof construction up to the roof levels, the roof framing and ceilings of the second floors being of wood. Exterior walls are generally of brick as are also all bearing partitions; minor partitions between classrooms are of wood, stucco plastered. The floors are of varied types of reinforced concrete, some of beam and girder type with tile fillers where flat plaster ceilings were required, and others of concrete slabs and reinforced supporting girders. Interior stairs are of reinforced concrete with cement finish and equipped with safety treads.

The roofs are of simple, inexpensive construction with wood trusses where they are required; those schools with parapet walls have flat gravel roofs laid on wood boarding; the buildings with visible roofs are for the most part covered with asphalt shingles. Exterior trim and architectural detail on the larger schools are of cast concrete, and in the one-story schools, of wood.

The classrooms are severely plain, finished with tinted plaster walls and in some cases with face brick wainscots to the tops of the blackboards. The windows and doors are set in plaster reveals with no wood trim save a small moulding to cover the frames; all interior window sills are of face brick. Classrooms and corridors have upper floors of wood. The windows are of an open air type.

Fairfield School, Duval County, Florida
Typical of the eight-classroom schools

Two California Schools

WM. H. WEEKS, ARCHITECT

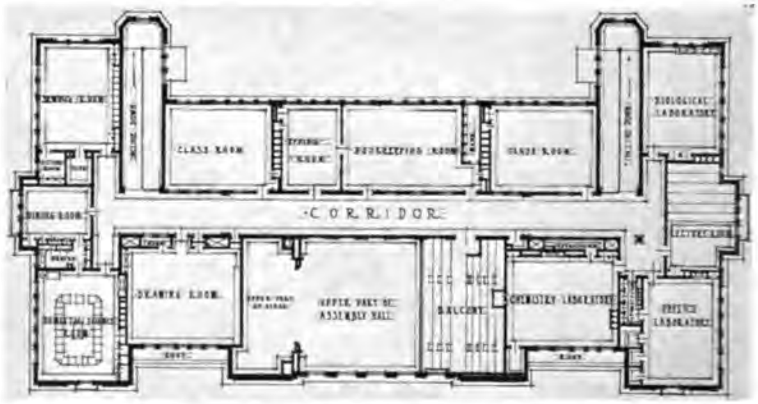
THE design and plan of school buildings, even under the exacting conditions which the past few years have imposed, are steadily attaining a higher development which will surely have an important influence in raising the general public standards of taste.

One particular tendency noted today, and perhaps especially in school buildings, is the use of architectural types which are especially associated with particular regions. In THE FORUM for February, 1921, there were shown views of the Tower Hill School at Wilmington, Del., built of brick and of a type which was frequently used in that locality during revolutionary days, and there are many interesting uses of the early New England styles for schools in the east; other parts of the country which have inherited well defined types of building are developing school structures according to their local traditions. No portion of the country is heir to a more marked and distinctive type of architecture than California,—the type in which the early Spanish settlers built their structures, many of which yet remain. These old buildings, which were often of considerable size, were developed in stucco which even the workmen of centuries ago were able to work into simple forms of ornament, and this type adapts itself well to building of concrete and to the use of ornament of terra cotta, cast concrete and other forms of plastic materials.

As recent and good examples of modern school buildings, planned in an architectural style which belongs by right of inheritance to the locality and constructed of materials which are in every way suitable and practical, are presented the two California schools illustrated in these pages. The breadth of scale and the wide expanses of wall with which the early Franciscans built their missions adapt well to use for buildings of more than ordinary size. The illustrations of the high school at Watsonville show a structure of marked Spanish characteristics with considerable use of oriental details such as abound in much Spanish work. The use of reinforced concrete with plain surfaces treated with waterproof cement coating for the walls and the massing of ornament of cast concrete about doorways, balconies and at certain other points, create that strong contrast, that play of light and shadow amid surfaces plain and unadorned, which has always been highly valued by Spanish builders. Entirely unbroken by dormers of any kind are the broad roof surfaces covered with tiles which project over the walls themselves to form wide soffits. The architect, in this instance, has been unusually successful in the treatment of window spaces. Particu-

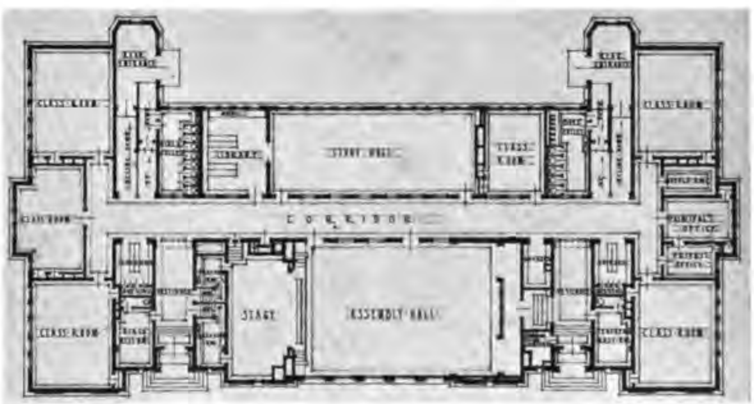
Plot Plan of Proposed Group at Watsonville

Rear of Watsonville High School Showing Expanse of Sash for Convertible Open Air Rooms larly in a school building large windows are necessary, but ordinarily they are so disposed that they give to school structures much of the appearance of model factory buildings. The use of color in various ways adds materially to the interest of this building. The rich color and texture of the brick used for steps and entrance platforms and for the foundations where they are exposed, afford an excellent contrast with the concrete walls. The cornices and the trim about windows are of gray-green.



Second Floor Plan, Watsonville High School

This is one of a group of three school buildings which will eventually form a notable educational center. The plan of the structure already completed presents an excellent arrangement for a school of this kind in which are taught all the subjects now generally included in the high school curriculum. A considerable portion of the main floor is planned as an assembly hall, seating about 600, with a stage and the usual dressing rooms, and since this hall is of full two-story height a balcony at one end provides additional seating capacity. This assembly hall embodies several interesting details of equipment. A portion of the floor is level, that it may be used for dancing or exercises requiring a level space; provision has been made for storing the seats in a space under the floor, and the electric lights in the ceiling are arranged to be lowered on cables for replacement or cleaning. The stage is arranged for the use of stage effects, and with provision for raising instead of lowering scenery. The use of motion pictures is similarly provided for.



First Floor Plan

Domestic Science Room, Watsonville High School

The liberal planning of the building makes possible such other departments as a study hall, a library, lecture room, laboratories for the use of the departments of chemistry, physics and biology, and an office and a private office for the principal. The larger of the rooms devoted to the teaching of domestic science is placed at one corner of the building and connects through a pantry with a dining room in which meals are served from the domestic science department. Study of the floor plans will show an unusually successful working out of entrances, particularly from the school playgrounds, with ramps or inclines instead of stairways between different floor levels. This use of ramps is said to be the first instance of their installation in a school and promises to remove entirely the possibility of stumbling with consequent loss of life in case of a panic; the ramps have a slope of approximately 20 per cent and are, furthermore, fireproof. An added factor of safety is the provision by which doors between classrooms and halls open *out* to facilitate egress from such rooms.

The building faces north and is so orientated that assembly hall, drawing rooms and laboratories take up this frontage, leaving the classrooms situated to receive direct sunlight. Arrangement and equipment of the various laboratories are unusually good and are the result of careful thought and attention to details. The chemical laboratory is a fireproof room having an artificial stone floor and concrete and metal walls. Every possible detail of equipment has been supplied to provide all facilities for the work of the department; numerous sinks are supplied with hot and cold water and the tops of the tables and counters are of material proof against injury by chemicals, acids or even careless handling. A useful feature is the installing of individual experimental hoods for the use of pupils, these hoods being connected with specially made exhaust fans for the removal of fumes. In the biological laboratory are glass topped tables, cases and sinks necessary for such a department, and all the laboratories are provided with the necessary rooms for the storage of supplies and apparatus.

Typical Ramp as Used in the Watsonville and Healdsburg High Schools
This Feature Has Won the Approval of Local Authorities

The rooms devoted to the teaching of domestic science, which have already been mentioned, are also unusually complete and besides the cooking room, pantry and dining room, include fitting and sewing rooms. In the cooking room the tables with tops of artificial stone, intended for the use of pupils, are placed about a hollow square, the instructor being in the center. Each pupil's table is provided with an individual gas stove. This cooking room is finished in white enamel and with its water heater, storage closets, cupboards, wash trays, sink, cooling closet and other items of equipment is complete with every detail which would ordinarily be found in a well planned kitchen. In the fitting and sewing rooms are lockers and exhibit cases, ironing boards, triplicate mirrors and divers other conveniences which aid in the effective teaching of the branches to which the rooms are devoted. The drawing room, which might perhaps be regarded as a part of the equipment for teaching domestic science, is fitted with exhibition cases and plate rail and has its walls covered with monk's cloth upon which to pin prints and drawings.

The woodwork throughout this school building, excepting where special finishes are required, is stained aluminum gray with a dull surface, and the walls are tinted.

By the use of specially designed windows it is possible to make every room an open air classroom. These windows are reversible for cleaning. Skylights are provided in north rooms so that sunlight can be

Elevation or the Healdsburg High School as It Will Appear with Pavilions at Either Side

View of Physical Laboratory, Watsonville High School

of much the same nature but extending over a somewhat greater area. Here there will shortly be built pavilions at either side of the main building and joined to it by covered passageways. One of these pavilions is intended for the teaching of wood working with shops, forge rooms and garage below, while the other pavilion will accommodate the departments devoted to domestic science in its several forms. This school is also equipped with ramps to be used instead of the usual staircases and there is the same ample provision for chemical, biological and physical laboratories which characterizes the school at Watsonville. In this Healdsburg school the assembly room is planned to do duty also as a gymnasium, while directly beneath space in the basement is intended to be used for showers and dressing rooms. The architecture here is of the Spanish colonial type; reinforced concrete has been used for walls and floors and also for the ramps which here, as in the Watsonville High School, are covered with cork linoleum cemented to the concrete. The details of ornamentation about the main entrance are of terra cotta and the rest of the exterior ornament is of cast concrete.

In planning both of these school buildings the architect has made full provision for athletic fields and playgrounds. The Healdsburg School was erected in 1919 at a cost of $100,000 and the Watsonville School for the same amount one year earlier.

introduced for sanitary reasons and additional light be secured on dull days. Heating and ventilation are provided by a plenum system in which the air from outside is forced over air warmers and into each room, providing an eight-minute change of air throughout. The air entering the rooms is under automatic control so that the desired temperature may be maintained. Oil burning equipment for the heating system includes apparatus for using the cheapest grades of crude fuel oil. One detail of the equipment consists of a large sized steel oil storage tank which is buried under ground to insure safety but which can be readily filled by gravity from an oil supply tank wagon. From this storage tank the oil is supplied to the burners by a small electrically driven oil pump. Plumbing throughout is of a type calculated to resist hard wear, always to be expected in a school. All of the piping and valves connected with the toilets are centered in a utility chamber and are exposed for quick adjustment or repair. Floors in toilet rooms are of metal and concrete construction and fixtures are of porcelain. These rooms are vented by means of an electrically driven fan changing the air every ten minutes.

The illustrations and plans of the high school building at Healdsburg, the main part of which has been recently completed, exhibit a different but equally successful arrangement of a structure planned for a school

View of Chemical Laboratory, Watsonville High School

The Effect of Zoning upon Living Conditions*

By HERBERT S. SWAN

MUCH theorizing has been indulged in as to the benefit zoning might accomplish, but what good has it actually achieved? That is a question we city planners must answer soon, for if the time has not arrived it is rapidly arriving when our theories must be backed up with solid achievement or both we and our theories will stand discredited.

The time during which zoning has been in effect, even in the cities which were the first to adopt it, has been very brief; indeed, much too brief to permit us at this moment to make a precise appraisal as to its ultimate value in solving our planning problems. It is, however, interesting to note that experience is rapidly accumulating to justify the earlier promises—and among them some of the most extravagant promises—as to what zoning would accomplish. From my own personal observation, I can tell of instance after instance where zoning has proved, and is proving, of the utmost value in improving both the technique and the art of living.

Preventing the Spoiling of Residence Districts

In Yonkers, for instance, the zoning ordinance took effect upon the same day that the restrictions in one of the largest and finest home sections of the city expired. Here was no fatal interim between the time the covenants running with the land terminated and those imposed by law began to operate. Unscrupulous speculators, waiting to exploit the suburban character of the district by putting up parasitic buildings, did not get a chance to file their plans, with the result that building under the zoning ordinance went right on where it left off under the private restrictions.

In Newark there was one unrestricted vacant lot in the very heart of a highly restricted neighborhood. The owner of this plot could put his property to any use he chose—to building an apartment, factory, store or garage; adjoining owners could erect only one-family, detached houses. Neighboring property owners repeatedly attempted to enter into an agreement with the owner of this plot, with a view to having him bind himself in the same manner that they had already bound themselves, but he paid no heed to their entreaties. The result was that all development within a radius of several hundred feet of this plot was paralyzed—no one dared to build himself a home next to this plot so long as he didn't know to what use it would be put. With the adoption of zoning in Newark, this lot was subjected to practically the same regulations as governed adjoining lots. Property that was formerly unmarketable is now being developed and improved on all sides of the un-neighborly neighbor, who is now powerless to give practical effect to his threats of erecting an objectionable building.

Preserving Uniform Building Lines

The requirements as to uniform building lines in front of houses are proving their value every day in such communities as have established them. In Newark, the first city in the United States to adopt a comprehensive plan for such control, owners who have made excavations for their cellars before filing their plans have, on several occasions, been obliged to dig new cellars farther back on their lots in order to comply with the building lines observed by neighboring property owners.

A few months after the adoption of zoning in White Plains, a member of the city plan commission proposed to erect an accessory garage upon his property. As his lot had a small terrace in front, he intended to construct the garage by digging it into the bank in front of his house. Had he done so, the roof of the garage would have projected some 5 feet above the level of his front porch. The zoning regulations which he himself had helped to frame, however, prevented his disfiguring his own home. To his present great satisfaction, the garage had to be constructed in the rear of the house.

Permanency of Districts

A frequent remark heard in unzoned communities concerning zoning is that the regulations and districts constitute merely the expression of a pious wish; that they will endure only until somebody wants them changed, and that the provisions of the ordinance will be juggled to suit everybody's convenience. Experience affords no support to such statements. Regulations adopted after full public discussion and conference with property owners become so deeply rooted in the community that they can be changed only when such change is thoroughly justified. The first year or two is always bound to be the most trying to enforcing a zoning ordinance. The newness of the regulations, the conflict of opinion as to how different areas should have been restricted and the lack of any building carried out in accordance with the plan, all tend to make the first year or so a critical period. And yet in communities that have adopted zoning, the changes in districts have been remarkably few. During the first 16 months of its operation, there have been but five minor changes in the districts laid down by the Newark ordinance. During the first 10 months of the Yonkers ordinance, there has been but one. The districts in White Plains are all identically the same today as 11 months ago under the original ordinance and other instances might be cited where results have been about the same.

* An address delivered before the recent National Conference on City Planning, held at Pittsburgh.

Exclusion of Dwellings from Industrial Districts

But maintenance of the original zones has not been accomplished entirely without opposition. An excellent illustration of what pressure an administration will withstand to uphold unchanged a zoning plan is afforded in Newark. The Newark ordinance, it will be recalled, excludes residential buildings from the heavy industrial districts. The area so restricted consists of meadow land, largely salt marsh, developed with chemical plants, tanneries, shipways, foundries, railroad yards, etc., and embraces about one-fourth of the entire area within the city. As a heavy industrial district, this locality is unequaled in the metropolitan area —low, level ground, held in large tracts; deep water, transcontinental railroads; close proximity to a large consuming public and an unlimited supply of stable labor—all afford it an unexcelled opportunity for attracting establishments seeking sites uniquely situated with reference to efficient large-scale production. To allow it to be gridironed with a rectangular street system and subdivided into blocks 200 feet wide and 600 or 700 feet long, with the land developed in 25-foot units, would utterly destroy the most magnificent industrial opportunity ever possessed by a community. The welfare of the future residential development of the city also demanded the exclusion of dwellings from this area. Any houses erected in such an environment would have been predestined to become slums.

Half a year ago, a manufacturer appeared before the Board of Commissioners with a petition to have a small portion of the district transferred to a zone in which residences would be allowed so that he might construct 61 houses for workmen employed at his plant. The petition was promptly denied. In refusing to grant the request the city fathers pointed out that the tract in question was so situated that it had practically none of the social conveniences indispensable to residential occupancy, being more than a mile from any store, church, school or moving picture theater; that it possessed none of the public utilities, neither water, gas, streets, sewers nor trolleys, and that to provide these utilities would only squander the city's resources upon improvements which would in the long run prejudice the growth of the city by forcing industries into localities less favorably situated.

Through the exclusion of dwellings from industrial districts and the exclusion of factories from residence localities, zoning is being relied upon in Hoboken as one of the chief agencies in the development of an industrial terminal. This plan includes, among other things, the complete revision of the street system throughout one-fifth of the city's area, abolishing more than half of the existing thoroughfares, widening others and laying out new streets. The plans for this area call for an industrial terminal equipped with facilities of direct rail shipment by every railroad, direct shipment by water from the docks immediately in the neighborhood, cheap power from a central station, and warehouses and factories erected to accommodate either single tenants or groups of tenants, with railway tracks connecting not only all the factories with one another but the piers and the classification yard and through the latter with the several trunk lines. Without zoning, it is questionable whether this plan could even be considered.

Percentage of Lot Area Occupied by Building

The provision limiting the percentage of lots which buildings may occupy is accompanied with so many benefits to the community, direct and indirect, that one can hardly suppress an exclamation of surprise when a long-time member of the conference waves it aside with a remark that it is "entirely superfluous," and that it "secures little if any extra advantage while it considerably increases the difficulty of applying the ordinance." Following out this theory, the zoning ordinance prepared by this member relies exclusively upon the provisions limiting the heights and regulating the sizes of courts and yards in restricting the bulk of buildings. So long as buildings conform to these general requirements they may occupy any proportion of the lot areas their owners choose. Everybody certainly agrees to the proposition that a zoning ordinance should be stripped of all superfluous matter; that provisions securing no extra advantage should be eliminated, and that the control exercised over building development should be as simple and direct as possible. These are axiomatic considerations. Nobody would for a single moment question them. But we do wish our zoning regulations to be adequate to the needs of the situation.

Under the ordinance just mentioned the regulations permit buildings to occupy from 50 to 70 per cent of the lots even in the districts that are now improved with private houses situated on lots having a width of 50 feet and occupying but 20 and 25 per cent of the ground. Under zoning ordinances adopted by adjoining communities similar types of development are limited to 30 per cent of the lots. This zoning ordinance, however, permits two-story buildings on lots 30 and 35 feet wide, generally speaking, to occupy from 45 to 55 per cent of the lots; on lots 50 feet wide, between 50 and 60 per cent, and on lots 100 feet wide between 60 and 70 per cent. The only limitations preventing buildings from covering the entire lots are the requirements relating to yards—a side yard of a width varying between 4 and 6 feet on either side of the building, a rear yard and a front yard in the case of buildings on streets less than 80 feet wide.

Are our best residence districts entitled to no more protection than is afforded by such regulations? The suburban character of a neighborhood, it is safe to assert, can never be maintained if buildings are to cover from one-half to three-quarters of the land. Requiring an open space of 8 or 12 feet in width between buildings is not in itself sufficient to maintain the amenities of one-family or two-family detached house districts. Additional space must be kept open, else the only distinction between our tenement districts and our home districts will be in the heights of buildings and the kind—not the amount of open space surrounding buildings. Far from being "superfluous," the provision limiting the proportion of lot areas which buildings may occupy is one of the most useful in our zoning ordinances. It affords additional light and air; it promotes family privacy; it encourages the maintenance of lawns with grass and trees; it provides additional play spaces for children, off of dangerous traffic streets, and it segregates homogeneous types of buildings.

For five years past I have at every opportunity, in and out of season, at the risk of being considered a crank, urged the necessity of limiting the ever-increasing congestion of population in our cities. When the New York ordinance was in its formative stages, I worked for the adoption of a provision limiting the number of families that might be housed to the acre. At that time, however, such a measure was considered too advanced to be taken seriously. Three years later, however, in framing the Newark regulations, I succeeded in having this provision incorporated in the ordinance, this being the first time that such a provision had ever been adopted in the United States, though Yonkers, White Plains, Cliffside Park, Glen Ridge and Montclair were soon to follow with similar regulations.

The over-development of a small percentage of a city's area may result in a few owners waxing rich, but their "hogging" the land and capitalizing congestion also results in making slaves of many more, saddling them with increased taxes and assessments and depriving them for years and perhaps forever from deriving any revenue from their property. Because a building houses 50 families, it does not necessarily follow that there are builders anxious to buy all the vacant plots in the neighborhood with a view of erecting 50-family houses on them. The contrary is more apt to be true. The fact that a 50-family house has been built where only a 25-family house should have been erected has the effect of causing other lots to remain vacant when they might otherwise have been improved, and of holding in abeyance the effective demand for them until the increased population again warrants the erection of a large multi-family house.

Objection has been raised to limiting the number of familes to the acre on the score that reducing the density of population will require the subdivision and improvement of a larger superficial land area. The less densely people are housed, the greater undoubtedly will be the actual length of the streets and the extent of public utilities required to serve them. But it is not to be expected that the cost of land per family will increase at all in the same proportion as the diminution in the number of families to the acre. The economies obtainable through narrower streets and lighter pavements, possible with a sparser population, go a long way—if not the whole way—in offsetting the greater length of roadways, sewers, etc., necessary to develop the land. The aggregate increment in values throughout a city will not be lessened by limiting in a reasonable manner the number of families that may be housed on a given unit of land. On the contrary, it will be increased, given a broader base and made more stable. And who would deny that, viewed in every way, it is more desirable that this increment should be shared by a large number of owners than by a mere handful?

There are persons who believe regulations directly limiting congestion of population to be superfluous, just as there are persons who believe provisions restricting the percentage of lots that buildings may occupy to be unnecessary, but the method is commending itself to an increasing number of cities,—Mr. Bartholomew having obtained its adoption in Evanston, Ill., Mr. Whitten in Lakewood, Ohio, and Mr. Comey in Milwaukee.

Suburban Zoning

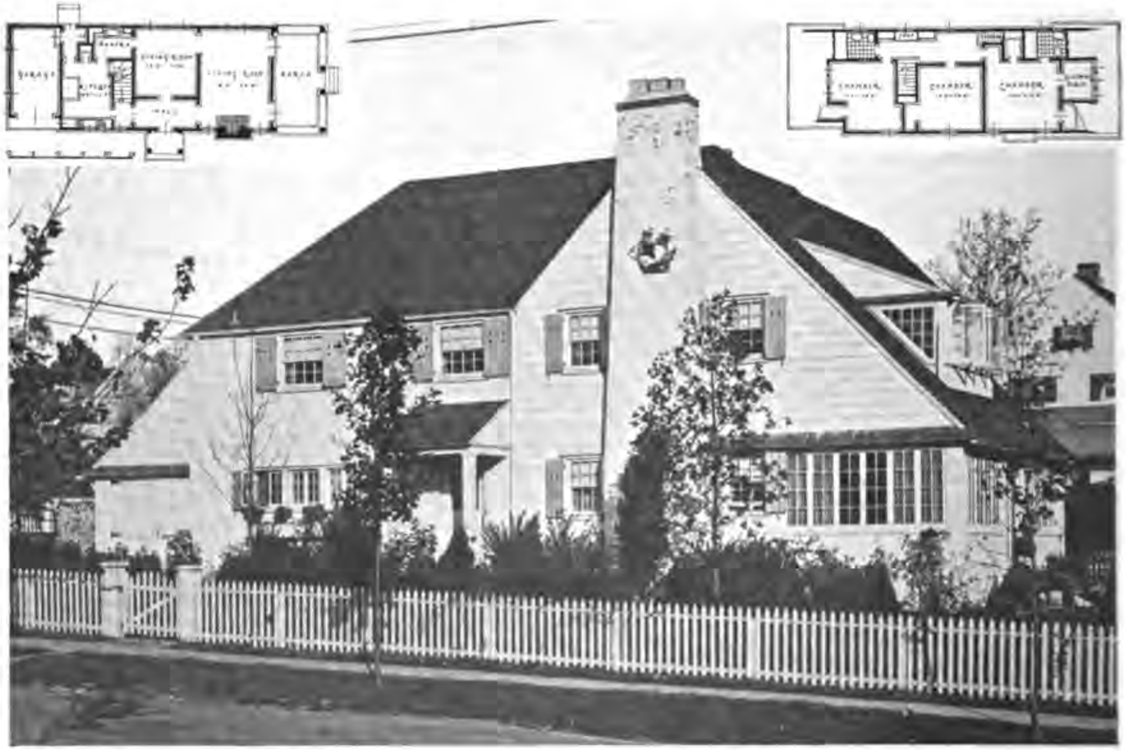
In the past our states have hesitated and delayed in passing welfare legislation on the ground that the enactment of laws relating to shorter hours of labor, the abolishment of child labor, the provision of old age pensions, compensation for industrial accidents, etc., would result in a situation where the state maintaining the lowest standards would enjoy such superior advantages in competitive markets as to make the adoption of such laws nothing short of disastrous to local industry. Whether this contention has or has not been borne out by experience is somewhat outside the scope of the present discussion, except insofar as it relates to the enactment of zoning regulations. Strange to say, when it comes to zoning this objection has never been raised; on the contrary, the general impression seems to prevail, and very justifiably so, too, that the unzoned community is at a very serious disadvantage as compared with the community that has adopted a zoning ordinance. Especially is this so in the cases of metropolitan areas with numerous suburbs.

In such instances, the prospective home buyer is more and more often asking himself the question, "Why should I buy my home in an unzoned town, where my house may at any moment be flanked with apartments, factories or garages and its value seriously impaired, when for the same price I can buy just as good a house in a town that thinks enough of its homes to protect them with the strong arm of the law against injurious neighbors?" The mortgage lender, too, is with increasing frequency asking himself, "Why should I lend my money on property which may at any time have its value so depreciated through the construction of objectionable neighboring buildings that I may be forced to institute foreclosure proceedings and buy the property myself in order to protect my equity, when in an adjoining suburb I can invest my money in real estate mortgages with the community itself guaranteeing the value of the property, as it were, against premature depreciation through precipitate and unwarranted changes in the building's environment by preventing the intrusion of undesirable development in the neighborhood?"

The practical effect of these considerations is most interesting. The zoned localities are not only absorbing the better grade of developments at the expense of the unzoned suburbs, but they are forcing the undesirable types of development into the unzoned towns. The builders, architects and real estate owners in unzoned towns are with increasing persistence urging their councils to adopt zoning so that they may have as good a sales proposition to make to prospective clients as competing builders, architects and real estate owners in zoned towns. An occasional sale lost now and then to a rival in a zoned suburb and the increasing reluctance on the part of lending interests to make loans on unprotected property—or if making loans, their discrimination in favor of protected localities with reference to both the interest rate charged and the amount loaned—considerations like these are proving more powerful than words in actually stirring unzoned towns to action.

Though these communities have done nothing to adopt zoning, it is not quite exact to say that they are unzoned. The adoption of zoning by neighboring communities has in a sense already zoned them. Without their knowing it, they have been placed, as it were, in the position of unrestricted districts to their neighbors. Though they themselves may not have moved, their neighbors have. Today, therefore, they are not at all in the position they were in years ago when building was unregulated everywhere. Then, due to the universal lack of control, they stood on a par with their neighbors—ownership of property within their boundaries was accompanied by neither privileges nor handicaps not accompanying it elsewhere. But now this has all been changed. The fact that property is protected elsewhere makes its ownership in those places more desirable; that it is not protected here makes its ownership locally less attractive. To permit our neighbors' garages and factories to locate indiscriminately in our residence districts, while they exclude ours, can have but one result—it destroys the marketability of our residence property at the same time that it makes our competitors' more salable.

Zoning is both a positive and a negative factor in the development of a community—it encourages superior types of development; it discourages inferior types of development. Its mandatory provisions oblige things to be done which otherwise would not be done; inhibitions prevent things from being done which would otherwise be done. It stimulates, checks, guides—all to the benefit and lasting good of the community and this benefit will become increasingly apparent with the passing years.



House at Bronxville, New York. Julius Gregory, Architect

The Prevention of Heat Losses

By WHARTON CLAY

HEAT loss through exterior walls has long been taken as a matter of course by architects, builders and owners alike, so there is much room for investigation and a crying need for prompt application of such lessons as have already been taught by scientific discovery. When one realizes that it has been proved from actual tests that there is a difference of 221% in the heat insulation properties of two widely used materials for exterior walls, together with a relatively similar difference in coal bills, it is apparent that accurate information is needed by the profession and that study of the subject will richly reward the architect who considers the economic as well as the artistic interests of his clients.

The lack of information regarding loss of heat through exterior walls is well illustrated by the statement of John R. Allen, in reporting on the research work of the American Society of Heating and Ventilating Engineers, that more coal is used per room in Texas and Georgia than in North and South Dakota. These latter states have given more consideration to efficient methods of insulating exterior walls. Many tests of thermal conductivity have been made in the past, but they have been largely concerned with either walls for refrigeration purposes or pipe covering, or else they have compared the specific values of different types of insulation. Hence, an elaborate series of tests on full sized models of common exterior walls, using common building paper in several different ways, brings the series "down to brass tacks," as the results can be applied directly in ordinary, everyday practice.

The basic principles of heat insulation must be fully understood in order that certain popular misconceptions may be avoided. If we turn to any school book on physics we will find there is no such thing as "cold"; it is merely the "absence of heat." Heat is a form of energy which comes from friction, and from chemical combinations producing what is commonly known as combustion.

Heat travels by three distinct and different modes—conduction, radiation and convection—and regarding each a brief explanation should be given.

1. Conduction. This may be illustrated with a teaspoon or the handle of a coffee pot. Heat travels through hard bodies such as metals and earthenware more easily than through wood, paper or fabrics. That is why we use metal and earthenware cooking utensils and stoves—because we want the heat on one side to quickly and easily travel through the material to the other side. But if we want to insulate the heat—in a flatiron, for instance, or a tea pot—we put a wooden handle on it. Part of the heat of a building escapes by conduction and we must use slow conductors in the wall to save the loss in this manner. Wood studs in the exterior walls are excellent for this purpose as they combine both strength and non-conductivity. Earthenware and metals, being rapid conductors of heat, should be avoided when so placed that any part forms a continuous bridge through a wall. A sure loss of heat by conduction will result, unless a radically different method is used.

2. Radiation is the second method of heat transference and is the process by which heat waves are carried through space. When one stands before an open grate the heat travels to one by radiation. Thus the name of the steam radiator is derived, because the heat of the steam, passing readily through the thin metal shell by conduction, is radiated in all directions. This action has little value in construction, and any difference that occurs in this manner is due to the texture and color of the exterior and varies with weather conditions. A smooth surface, being less radiating than a rough, and a white surface less radiating than a black, the difference is the same for the same color or texture of surface, regardless of the internal construction of the wall itself.

3. Convection, therefore, is last but in many respects the most important form of transference, especially in all types of hollow walls. Surely it is the form least generally understood. This is the method of transfer of heat which is exercised when air is heated; it rises because of its lighter weight; comes in contact with a colder surface; loses its heat; falls, due to its greater weight when cooled, and when it is again heated, rises to repeat the process of circulation. It is this circulation of the heated air which warms a house from a furnace or makes the upper part of a room warmer than the part near the floor.

The application of convection to hollow walls comes, therefore, in the effect of the air currents within the hollow spaces. The popularly styled "dead air space" is a fine insulation—*if it is "dead"!* But if it is "live," that is, wide enough to permit circulation, the "air space" is the worst thing possible, as this moving air is a splendid means for assisting the inside heat to escape to the outside shell of the hollow wall. The effect of the size of the air space is illustrated by a swarm of flies in a large cage in which they have room to fly around—live air space; but bring the walls close together and they will be confined and held in place—that is the dead air.

As the effect of walls upon passage of heat has heretofore been carefully studied chiefly in relation to cold storage and refrigeration, let us turn to the *Journal of the American Society of Refrigerating Engineers* to see what effect the width of air space has, and how narrow such hollows must be in order to be "dead" and therefore a benefit rather than

Fig. 1. Layout for thermal conductivity tests, showing sample (A) on insulated box (B), with electrical connections for thermo couples. Arrow points to reading microscope

an actual detriment to insulation. Air itself is a good insulator but it must be so confined that it will not circulate and actually aid in heat loss by carrying the heat of the inside to the outside—"convection."

Under the subject "Testing Thermal Insulators," Dickinson and Van Dusen, of the United States Bureau of Standards, say: "Heat is transmitted from one surface to the other by radiation, air conduction or convection. Convection and conduction are, in the case of vertical air spaces, inextricably connected. Convection depends upon the width of a space, its height and the temperature difference between the boundaries." In comparing one type of wall with another this temperature difference should be figured as the same, because the difference between the outdoor atmosphere and a room at comfortable temperature would be the same if any type of wall were used.

"Important variations of the apparent conduction through air spaces occur with change of width, *although it has often been assumed* that all air spaces have about the same conduction. To represent these changes adequately, a very large number of observations have been made with air spaces of many different widths from 1/16 inch to 3 inches.

"For very narrow spaces, *i.e.*, less than 1 cm. (3/8 inch), the *resistance* to the passage of heat increases almost in proportion to the thickness. Beyond this the resistance increases less rapidly until it reaches a maximum beyond which a *greater* thickness offers *less* resistance to the passage of heat.

"Plain convection plays no appreciable part in the conduction of air spaces of less than 3/8-inch width when 8 inches high. It is a fact, however, as shown by some of our experiments, that a vertical wall made up of two 3/8-inch air spaces, with paper to separate them, gives about the conduction of a similar thickness of cork board."

Or, to quote Prof. J. C. Peebles, of Armour Institute of Technology: "For a given height of air space there is a critical thickness beyond which thermal resistance becomes less and not more. For a height of 8 inches this critical thickness is about 1/2 inch, while for a height of 2 feet the critical thickness is in the neighborhood of 1 inch."

They then continue to show that the air can be confined, even with paper. But a correct view must be taken, *i.e.*, different from many preconceived notions. Air spaces are not valuable unless of such narrowness that convection is entirely eliminated.

This will suffice for the abstract theory. Let us now describe the exhaustive tests made by Prof. G. F. Gebhardt and Prof. Peebles at Armour Institute of Technology, and analyze them in the light of the scientific reasons for the showings made by the various spaces.

The research was begun to learn the relative value of the metal lath and stucco wall on wood studs to that of other standard fire-resistive walls generally used for stucco. Although it was found that the plain back-plastered wall ranked very high as an insulator and was superior to those which popularly are accorded higher position, the re-

RESULT OF TESTS SHOWING HEAT LOSS CALCULATIONS

Sample No	Base B.t.u. Loss	% added for Flues	B.t.u. Loss when in Vertical Position
1	.31	7½	.333
2	.323	7½	.347
3	.394	7½	.4235
4	.418	7½	.449
5	.413	10	.454
6	.422	7½	.454
7	.510	7½	.548
8	.557	0	.557
9	.510	10	.561
10	.510	15	.586
11	.626	10	.689
12	.508	10	.559
13	.626	15	.719
14	.508	15	.584
15	.642	10	.706
16	.642	15	.738

Fig. 2

search was continued to include various methods of inexpensive extra insulation that are possible of incorporation in the hollow section of the metal lath wall while it is being constructed. The constant heat loss, winter after winter, that is incurred through lack of accurate information is appalling and the information derived from this series of tests, if utilized, can be made to save hundreds of thousands of dollars yearly.

The tests were made on full sized samples of the ordinary run of materials, purchased in the open market. They were all erected in accordance with common trade practice by mechanics in the respective trades and under the supervision of Prof. Peebles and a capable contractor. The stucco was made with Portland cement, and wherever furring or lathing was used on the interior it was always with the same kind of metal lath and with the same thickness of hard wall plaster so that no variation in results could occur on this account. The method of testing was to lay each sample (42 inches square) in turn upon a carefully insulated box which contained a series of electrical heating coils. This is illustrated in Fig. 1.

The entire construction was installed in a room of constant temperature. An electrical current was sent into the coils to produce a temperature of 68° difference between the box and the room,—that is from one side to the other of the wall section. This difference was chosen as representing the same heat difference between a room at 68° and at zero outdoors—the maximum continuous difference in the Northern states and frequently used by heating engineers. This electrical current was measured by instruments and adjusted until the heat difference of 68° was maintained for many hours without necessity of varying the current. The necessary electrical energy in-put represented exactly the heat that was being constantly lost through the wall. This was then reduced to British thermal units (B.t.u.) and then to B.t.u. per square foot of wall, per degree difference in temperature, per

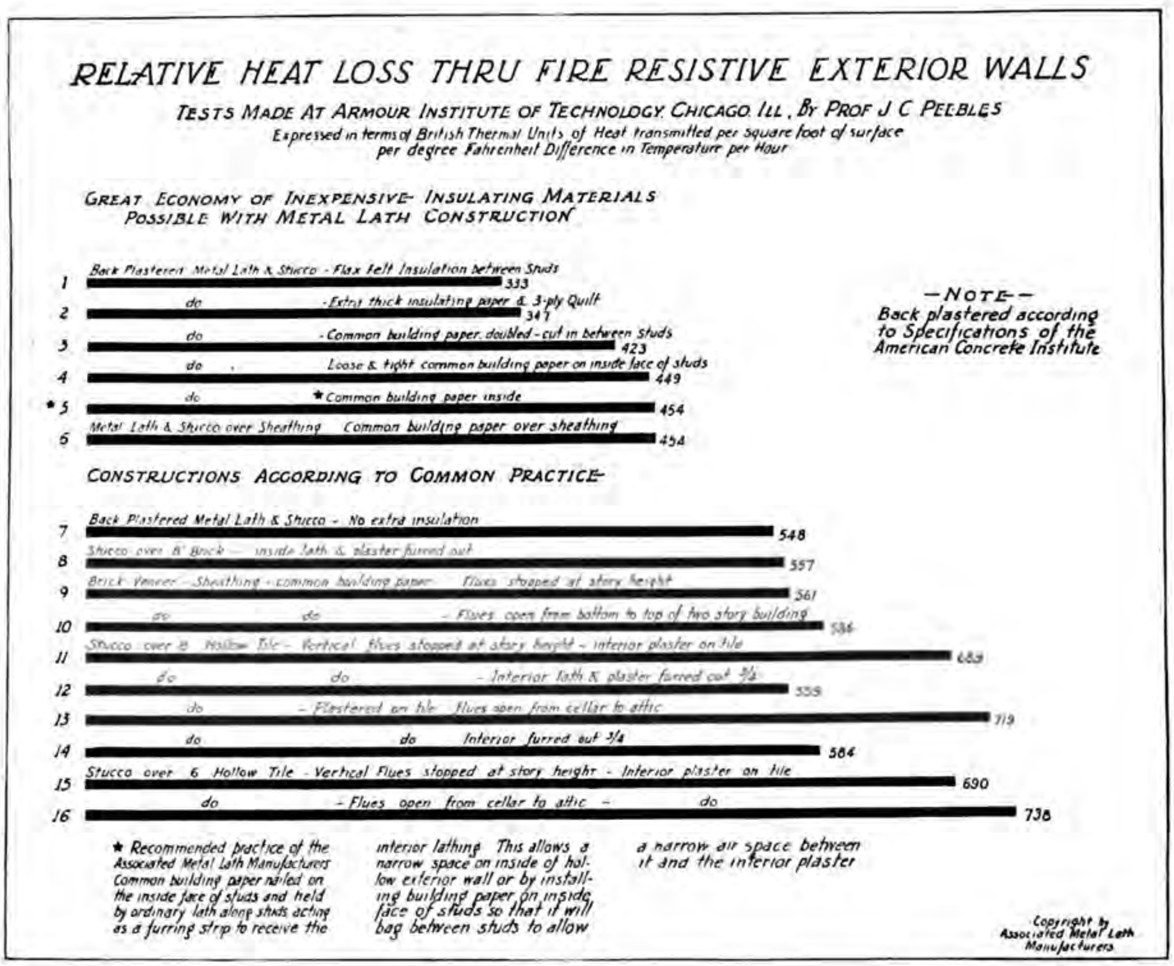


Fig. 3

hour—the time unit upon which all American heating formulæ are based. All samples were similarly tested and recorded for comparison. (See Fig. 2.)

"In discussing these tests which we have made," writes Prof. Peebles, "it seems that the following points may well be emphasized: These figures are not the result of estimates or computations but were obtained from careful experiments, conducted on full sized sections. The circumstances of the tests were such that conditions could be maintained constant throughout. The work was done by experienced investigators who have no interest other than arriving at the facts in the case; therefore, the results must be accepted as a conscientious effort to obtain correct relative figures on the conductivities of the various examples. (See Fig. 3.)

"And now in regard to the conductivity of glass as compared to these walls. Many people seem to have the idea that glass is not a particularly good insulator and that the chief reason it is used in windows is because of its transparency. As a matter of fact, this is far from being the case, as glass is an excellent insulator both thermally and electrically. If this were not the case it would be next to impossible to heat a building having a large proportion of glass surface. Most people familiar with the subject will concede that pure cork board is a good insulator and yet, thickness for thickness, glass is nearly three times as good."

It is well known that overcoating a house with metal lath and Portland cement stucco creates a narrow air space between the overcoating and the original wood siding of the building. Prof. Peebles' tests show that this reduces the conductivity of the exterior wall by 15 7/10%, with a corresponding decrease in the coal bill. This decrease in the coal bill will be approximately 13 3/10% because the wall area takes up about 85% of the total exposure. This 13 3/10% saving is more than enough to pay the interest on the cost of overcoating any house.

Here let it be said that never before has such an exhaustive series of tests been reported and that many of the constants now in use are based upon calculations, or estimated from tests of component parts such as brick, wood, plaster, etc., and must be revised in the light of these tests upon actual construction examples. Even Prof. Peebles writes concerning a quotation from one of his works made prior to these experiments: "The figures given (previously) were the results of estimates only. You are no doubt well aware that there are certain formulæ which the heating engineer uses. . . . However, when these figures were submitted we had conducted no tests upon an 8-inch brick wall. . . . Results quoted (previously) were substantially those obtained from the theoretical formulæ (in present use), and our later experiences in making these tests show that the results were too low. There is no doubt that the same is true for a good many other values for estimated heat flow."

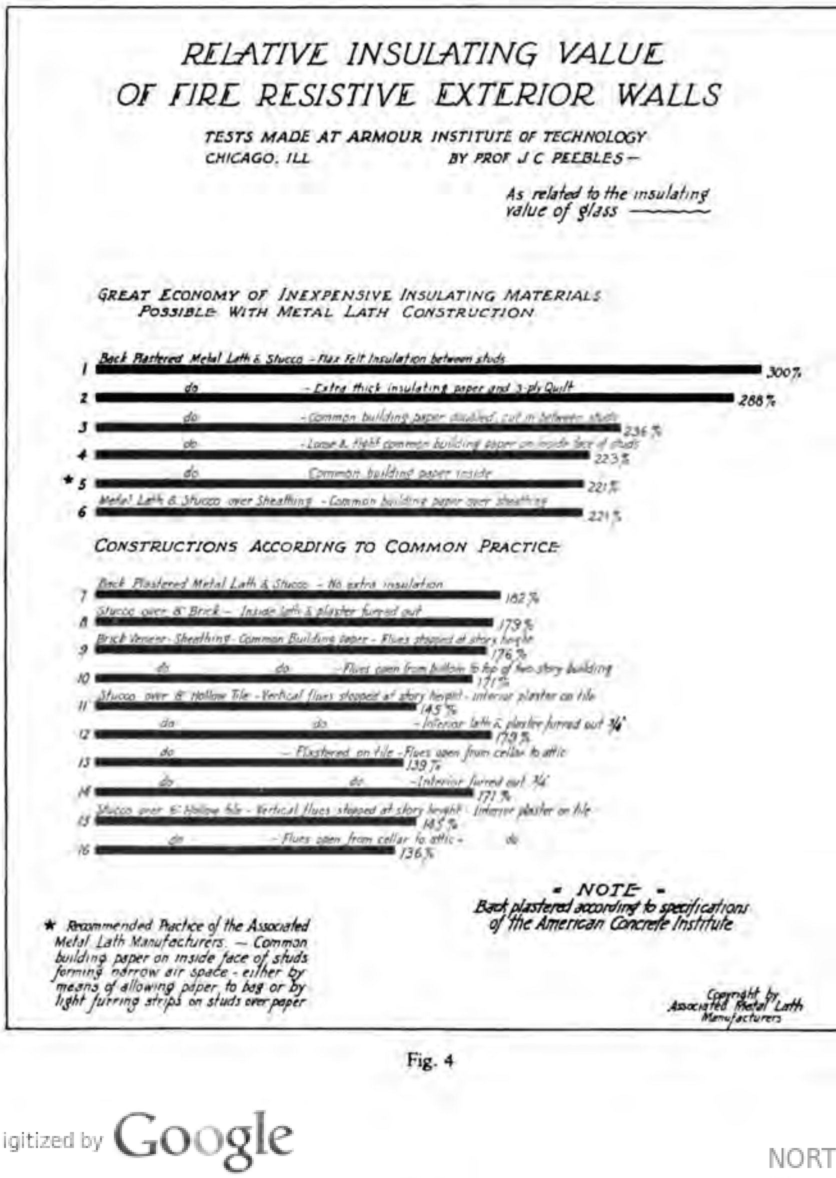


Fig. 4

Every facility for scientific accuracy was given in making these tests and they represent the last word on the subject. They extended over a period of two years and tests were frequently repeated with variations of 2%, but accuracy of about 5% is guaranteed.

"We have neglected the effect of wind on an exposed wall surface, a factor which is difficult to reproduce accurately in an experimental investigation. It is a fact well known to every engineer that even a solid brick wall is porous and permits considerable infiltration of air. This causes an appreciable increase in the conductivity in a wall of such construction. The use, however, of building paper or similar material eliminates this weakness to a considerable extent. The heat insulating properties of paper can be readily utilized in back-plastered stucco construction."

All tests were made, for convenience, in the horizontal position, but enough were made in both horizontal and vertical to correct the readings for vertical positions, and this is the way they are given herewith.

"Any increase in heat flow from conductivity," says Prof. Peebles, "will affect all of the hollow wall types, depending upon the vertical dimension of the air space. Where this distance is approximately 9 feet from floor to ceiling, the increase in heat flow would probably be about 10% over that shown in our tests. If, however, this distance is stopped by a horizontal bracing, which we understand is the recommended practice of the American Concrete Institute and the Associated Metal Lath Manufacturers for back-plastered stucco construction, the increase would probably not exceed 7 or 8%. On the other hand, in certain cases of hollow tile construction with vertical webs (or hollow brick walls) this air space may extend from foundation to attic, in which case the increase may be as much as 15% or more. A better practice would be to use a joist support in which case the vertical flue would be reduced to about 9 feet in height and the increase in heat flow to about 10%.

"The recommended practice of the Associated Metal Lath Manufacturers of laying a strip of metal lath covered with a layer of mortar in every horizontal course of hollow tile will reduce the vertical distance to about 12 inches. In such construction there would probably be but little increase in thermal conductivity over those shown by our tests."

The tiles tested by Prof. Peebles had a single set of cells from face to face in the 6-inch size and a double set in the 8-inch size. In other words, there was no web parallel to the face of the wall in the 6-inch, but there was a web parallel to the wall in the 8-inch tile. The air space in the 8-inch tile, therefore, has two advantages over the 6-inch tile; one is that the air space is narrower, and therefore less convection can set up; the other is that there are two air spaces and therefore the convection set up in air space No. 2 is only affected by

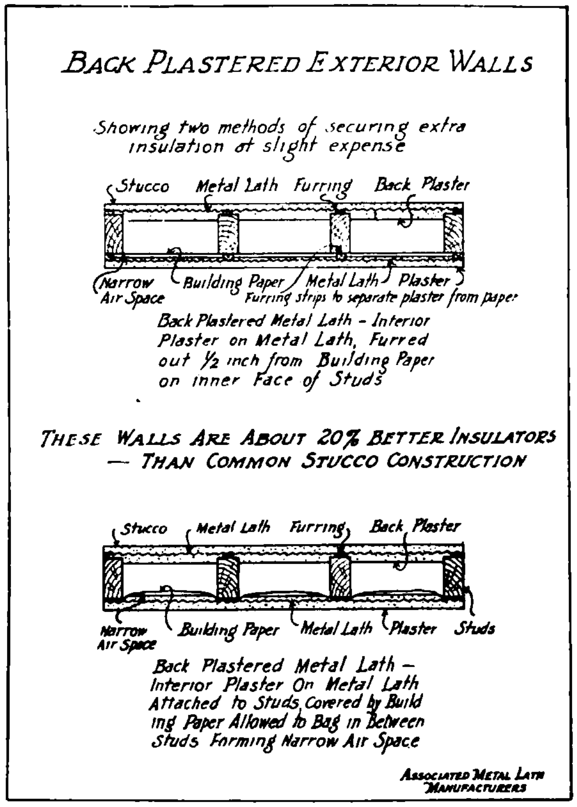


Fig. 5

the temperature of the interior web and not by the temperature of the exterior web. Thus, there are two good reasons why the 8-inch tile is better than the 6-inch.

"The temperature differences used in these tests averaged about 68° Fahr., which is near the maximum for this latitude.

"True thermal conductivity through solid portions of the wall is practically proportional to the temperature difference, but the effect of air circulation in hollow wall increases more rapidly than the temperature difference. It therefore becomes a much more important factor, relatively, at a temperature difference of 68°, say, than it would be at 38°, which is near the mean temperature difference for this latitude.

"The effect of internal air circulation on heat flow is considerably increased if, through structural imperfections, the external air is allowed access to the interior of the wall. It is important, therefore, that the structure be tight and free from cracks, especially at the bottom of the wall."

These different points must be kept constantly in mind to correct preconceived erroneous notions:

1. Heat is transferred in three ways—by conduction, radiation and convection.
2. The loss by simple conduction is chiefly through those members which extend from side to side of the hollow example, such as wood studs or tile webs, and in the solid examples by the entire mass. The loss by this method is proportional as the webs or studs are good or bad conductors. The loss through the shell, such as the stucco in

back-plastered type, or through the faces of tile, is small and about equal.

3. The loss by convection is very serious, and is frequently neglected, as the Bureau of Standards authorities note.
4. There are air spaces which insulate and others which are not as valuable as if solid. The value of different sized air spaces is well illustrated in the case of hollow tile where the large air spaces of the tile wall, when unfurred, show great heat loss, but when furred—producing a small air space between the plaster and tile—the heat loss is brought down to the range of other standard walls. This amply justifies the use of furring on the inside of 6- and 8-inch hollow tile walls, and the preference for one or more dividing webs parallel to the face of the tile.
5. The height of the channel or flue has great importance, if wider than 1 inch. This is well known in connection with chimney construction—the higher the chimney, the greater the movement or draft. Cut down the flue height.
6. If the flue extends from cellar to attic the increased heat loss is proportionally 15%; if stopped off at floor level the increase is 10%; if midway between floor and ceiling, 7½%.
7. The material used in dividing the wall into air spaces is of little consequence, ordinary building paper proving to be one of the best materials when properly placed so that the air spaces are narrow. This is illustrated again by the furring, as the thin plaster is of no great insulating value in itself, unless it acts to confine air in a narrow space.
8. Advantage of the extra insulation of especially manufactured insulating materials can be taken when the walls are hollow, as in the wood frame protected by stucco reinforced with metal lath.

Therefore, to sum up: Exterior walls should be designed for efficiency, like any other structural unit. Wood-studded stucco walls, even without extra insulation, are very efficient, but by the inexpensive device of creating a narrow, 1-inch air space, extra insulation is greatly increased.

This can be accomplished cheaply by either of two methods: (1) Placing common building paper over the inside face of the studs; either nailing ordinary lath over the paper along the studs to act as furring for the interior lath, or (2) installing the paper loosely, allowing the paper to bag into the hollow space, placing the interior lath directly on the paper-covered studs.

How to Use New Figures

Fig. 3 represents the heat loss through exterior walls and it will be noted that the common practices for stucco construction are very close when furring is used on the walls. However, the opportunity of using extra insulation should be taken advantage of more frequently. There is over 200% difference between the heat lost through the back-plastered wall with the flax felt between the studs, and that lost by some of the other standard constructions not susceptible to extra insulation. This is all loss and goes on year after year.

Fig. 4 presents a more graphic illustration as it is given in terms of heat insulation, the best insulated wall being represented by the longest line, and that least insulated by the shortest line. The relation is given as compared with ordinary window glass, which by many experimenters has been recognized to be one B.t.u. per square foot per degree difference in temperature per hour. In other words, the lines represent the relative heat loss as compared with window glass as a base.

Fig. 5 shows the final results of the investigation and illustrates two methods of producing an air space of about 1 inch in back-plastered stucco construction at a minimum of expense. It represents a saving of 20% of heat loss over other common constructions of either hollow or solid masonry walls, and over 34% when masonry walls are not furred.

These rules for calculating heating are frequently used in the United States for a maximum of 80° difference in temperature:

1 foot of radiation for every 300 cubic feet of contents, plus

1 foot of radiation for every 15 square feet net exposed wall surface, plus

1 foot of radiation for every 2 square feet of single glass surface, plus

1 foot of radiation for every 30 square feet of ceiling area for all rooms with plastered ceilings and unheated air space between ceiling and the roof, plus additions for skylights, absence of attics and other incidentals.

These rough and ready rules are based upon ordinary construction with a loss of about .560 B.t.u. The principal reason these rules work out satisfactorily is that even the "careful" architect frequently adds 50% to the heat loss and lets it go at that. With Prof. Peebles' determinations, however, it is possible to substitute in the second part of the formula 1 square foot of radiation for every 12 square feet (instead of 15 square feet) net exposed wall surface, when back-plastered metal lath and stucco is used with building paper on the inside studs, or to substitute 8 9/10 square feet for the 15 square feet if the best insulation, shown in Fig. 2, is used.

Working this out for a large residence in Winnetka, Ill., recently completed, these figures are given:

Wall and exposed ceiling of the top floor	6,622 sq. ft.
Area of glass	1,389 " "
Total exposure	8,011 " "
According to the given rule of thumb there would be:	
1 sq. ft. of heating surface for 15 sq. ft. of wall and roof	440 sq. ft.
1 sq. ft. of heating surface for 12 sq. ft. of glass	695 " "
1 sq. ft. of heating surface for 300 cu. ft. of air	250 " "
Total radiation	1,385 " "
If the heat loss in the walls were cut in half by using the back-plastered construction with the best type of insulation, as against the ordinary, common practice for masonry and other walls tested, deduct	220 sq. ft.
Gross radiation by more scientific construction	1,165 " "
Or a reduction of 16%	
Saving on the cost of installation and cost of boiler, radiation, piping, etc.:—12% of the cost of $4,620	$554.00
Saving on the operation of steam plant in vicinity of Chicago: 3 tons of hard coal for 100 sq. ft. of radiation per heating season;—41½ tons at the present price of $15 per ton	$623.25
16% saving is equivalent to	$99.68 per year
This represents a continuous loss each year, or capitalized at 6%, represents the interest on	$1,670.00

ENGINEERING DEPARTMENT

Charles A. Whittemore, *Associate Editor*

Steel Design for Buildings

PART III. THE DESIGN OF A PLATE GIRDER

By CHARLES L. SHEDD, C.E.

IN the June number of THE FORUM we discussed the general features of plate girder design. We give here the computations for the design of a single-plate girder which carries a column load of 309,700 pounds and a uniform load of 28,000 pounds on a span of 14 feet and 6 inches. The arrangement of figures for determining the re-

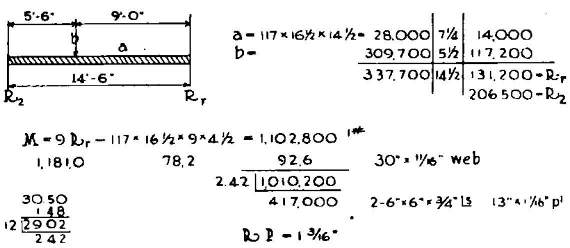


Diagram Showing Application of Figures

actions and bending moment is the same as for those described for beams in the July number.

The greatest reaction is 206,500 pounds which is the maximum shear. It is usual to allow 10,000 pounds per square inch in shear on the gross area of the web. Table I shows the gross areas for various sized webs. Along the top of the table are given various values for "t," the thickness of the web plate, varying by sixteenths of an inch from 5/16" to 7/8", and for various depths of web plate from 30" to 60", varying at intervals of 2". Plates are most easily obtainable in widths which are multiples of 2" although intermediate sizes are rolled. A few years ago it was the practice to use the net area of webs, but recent tests have given results which warrant engineers in the use of the gross areas with the usual spacing of rivets. In this case we have chosen a web plate 30"x11/16" which is good for 206,300, according to the table; this is only one-tenth of 1% less than required, which of course is near enough for practical purposes.

It is generally allowable to use one-eighth of the area of the web with the area of the flange in designing the flanges. Table II gives the values of the same webs as given in Table I for bending. It gives the product of one-eighth of the area of the web, 16,000, and the depth of the web less 3" which gives the moment of resistance of the web in foot-pounds. This is a little on the safe side in most cases as 3" is generally more than need be used, as will be seen by Table IV where it is described. The total moment on the girder is 1,102,800 foot-pounds and we can deduct from this the value of the web in bending which we find in Table II to be 92,600 foot-pounds, leaving 1,010,200 foot-pounds to be taken care of by the flange angles and cover plates.

If we assumed that the effective depth of the plate girder was 3" less than the depth of the web, or 27" which is 2.25 feet, we can divide the moment remaining by 2.25 on the slide rule to get the flange angles and plates approximately. This division on the slide rule gives about 450,000 as the total flange stress to be taken care of by the angles and cover plates. Table V gives the allowable flange stress for various sections. If we used 6" x 6" x ¾" angles the thickness of the 13" cover plates would be about 1¼". We can now correct the effective depth by using Table IV. This table gives the distances from the backs of the angles to the centers of gravity of the various flange sections. The effective depth required is the distance between these centers of gravity. The backs of flange angles are usually placed ½" further apart than the depth of the web plate and in this case would be 30.5". The trial

GROSS AREA OF WEBS										
d \ t	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8
30"	9.38	11,25	13,13	15.00	16,88	18,75	20.63	22,50	24,38	26,25
32"	10,00	12,00	14,00	16.00	18,00	20,00	22,00	24,00	26.00	28.00
34	10,63	12,75	14.88	17.00	19,13	21,25	23,38	25,50	27,63	29,75
.36	11,25	13,50	15,75	18.00	20,25	22,50	24,75	27,00	29,25	31,50
38	11,88	14,25	16,63	19,00	21,38	23,75	26,13	28,50	30,88	33,25
40	12,50	15,00	17,50	20.00	22,50	25.00	27,50	30.00	32,50	35.00
42	13,13	15,75	18,38	21.00	23,63	26,25	28,88	31,50	34,13	36,75
44	13,75	16,50	19,25	22.00	24 75	27,50	30,25	33.00	35,75	38,50
46	14,38	17,25	20,13	23.00	25,88	28,75	31,63	34,50	37,38	40,25
48	15,00	18,00	21,00	24.00	27,00	30.00	33.00	36.00	39,00	42,00
50	15,63	18,75	21,88	25.00	28,13	31,25	34,38	37,50	40,63	43,75
52	16,25	19,50	22,75	26.00	29,25	32,50	35,75	39,00	42,25	44,50
54	16,88	20,25	23,63	27.00	30,38	33,75	37,13	40,50	43,88	47,25
56	17,50	21,00	24,50	28.00	31,50	35,00	38,50	42,00	45,50	49,00
58	18,13	21,75	25,38	29.00	32,63	36,25	39,88	43,50	47,13	50,75
60	18,75	22,50	26,25	30.00	33,75	37,50	41,25	45,00	48,75	52,50

Table I

section which we found gives in Table IV as the distance from the backs of the angles to the center of gravity of the trial flange section .60″ which, multiplied by 2 and deducted from 30.50, would give 29.3″ or 2.44 feet. If we adjust our slide rule so as to use this instead of 2.25 we find that 1 1/16″ cover plates could be used. We can correct the effective depth to check this section and find it to be 2.42 which gives a required flange stress of 417,000 pounds. In Table V the allowable flange stress for this section would be 419,400 pounds, which shows that our section is satisfactory.

	1/8 W I B × 16,000 × ((d−a)/12)										
d	(d−a)/12	t = 5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8
30	2,25	42,2	50,6	59,0	67,4	75,8	84,2	92,6	101,0	109,8	118,0
32	2,42	48,4	58,1	67,8	77,5	87,2	96,8	106,5	116,3	126,0	135,8
34	2,58	54,8	65,8	76,7	87,7	98,6	109,6	120,6	131,5	142,5	153,5
36	2,75	61,8	74,2	86,5	98,9	110,2	123,6	136,0	148,3	160,8	173,0
38	2,92	69,3	83,1	97,0	111,0	125,0	138,8	152,3	166,5	180,1	194,0
40	3,08	77,0	92,4	107,9	123,2	138,8	154,0	169,8	185,0	200,1	216,0
42	3,25	85,2	102,1	119,1	136,0	153,0	170,2	187,5	204,2	221,5	238,2
44	3,42	94,0	112,9	131,8	150,5	169,1	188,0	206,5	226,0	244,1	262,5
46	3,58	102,9	123,4	144,0	164,8	185,2	206,0	226,5	247,5	268,0	288,2
48	3,75	112,5	135,0	157,6	180,0	202,6	225,0	247,5	270,0	292,3	314,5
50	3,92	122,2	146,8	171,1	195,8	220,0	244,5	269,0	294,0	318,0	342,0
52	4,08	132,8	159,0	186,0	212,0	239,0	265,5	292,0	318,0	345,0	372,0
54	4,25	143,2	172,0	200,5	229,5	258,0	286,5	316,0	344,0	372,0	401,0
56	4,42	154,8	185,8	216,2	247,5	278,0	309,5	340,0	371,0	402,0	433,0
58	4,58	166,0	199,2	232,2	266,0	299,0	332,0	365,0	399,0	432,0	465,0
60	4,75	178,2	214,0	250,0	285,0	320,5	356,2	392,0	428,0	463,0	499,0

Table II

t =	5/16″	3/8″	7/16″	1/2″	9/16″	5/8″	d.s
3/4″ϕ	4.690	5,630	6,560	7,500	8,440	—	8,840

ALLOWABLE SHEARS FOR VARIOUS R P (d s.) 3/4″ RIVETS																			
EFF. DEPTH	1 1/8	1 3/16	1 1/4	1 5/16	1 3/8	1 7/16	1 1/2	1 9/16	1 5/8	1 11/16	1 3/4	1 13/16	1 7/8	1 15/16	2	2 1/16	2 1/8	2 3/16	2 1/4
1.3	122,6	116,1	110,3	105,1	100,3	95,9	91,9	88,3	84,9	81,7	78,8	76,1	73,5	71,2	69,0	66,9	64,9	63,0	61,3
4	132,0	125,1	118,8	113,2	108,0	103,3	99,0	95,0	91,4	88,0	84,9	81,9	79,2	76,7	74,3	72,0	69,9	67,9	66,0
5	141,4	134,0	127,3	121,2	115,7	110,7	106,1	101,8	97,9	94,3	90,9	87,8	84,9	82,1	79,6	77,1	74,9	72,7	70,7
6	150,9	142,9	135,8	129,3	123,4	118,1	113,2	108,6	104,4	100,6	97,0	93,6	90,5	87,6	84,9	82,3	79,9	77,6	75,4
7	160,3	151,9	144,3	137,4	131,2	125,5	120,2	115,4	111,0	106,9	103,0	99,5	96,2	93,1	90,2	87,4	84,9	82,4	80,1
8	169,7	160,8	152,8	145,5	138,9	132,8	127,3	122,2	117,5	113,2	109,1	105,3	101,8	98,6	95,5	92,6	89,9	87,3	84,9
9	179,2	169,7	161,2	153,6	146,6	140,2	134,4	129,0	124,0	119,4	115,2	111,2	107,5	104,0	100,8	97,7	94,8	92,1	89,6
2.0	188,6	178,7	169,7	161,6	154,3	147,6	141,4	135,8	130,6	125,7	121,2	117,1	113,2	109,5	106,1	102,9	99,8	97,0	94,3
1	198,0	187,6	178,2	169,1	162,0	155,0	148,5	142,6	137,1	132,0	127,3	122,9	118,8	115,0	111,4	108,0	104,8	101,8	99,0
2	207,5	196,5	186,7	177,8	169,7	162,3	155,6	149,4	143,6	138,3	133,4	128,8	124,5	120,5	116,7	113,2	109,8	106,7	103,7
3	216,9	205,5	195,2	185,9	177,4	169,7	162,7	156,1	150,1	144,6	139,4	134,6	130,1	125,9	122,0	118,3	114,8	111,5	108,4
4	226,3	214,4	203,7	194,0	185,2	177,1	169,7	162,9	156,7	150,9	145,5	140,5	135,8	131,4	127,3	123,4	119,8	116,4	113,2
5	235,8	223,3	212,2	202,1	192,9	184,5	176,8	169,7	163,2	157,2	151,5	146,3	141,4	136,9	132,6	128,6	124,8	121,2	117,9
6	245,2	232,3	220,6	210,1	200,6	191,9	183,9	176,5	169,7	163,4	157,6	152,2	147,1	142,4	137,9	133,7	129,8	126,1	122,6
7	254,6	241,2	229,1	218,2	208,3	199,2	190,9	183,3	176,3	169,7	163,7	158,0	152,8	147,8	143,2	138,9	134,8	130,9	127,3
8	264,0	250,1	237,6	226,3	216,0	206,6	198,0	190,1	182,8	176,0	169,7	163,9	158,4	153,3	148,5	144,0	139,8	135,8	132,0
9	273,5	259,1	246,1	234,4	223,7	214,0	205,1	196,9	189,3	182,3	175,8	169,7	164,1	158,8	153,8	149,2	144,8	140,6	136,7
3.0	282,9	268,0	254,6	242,5	231,4	221,4	212,2	203,7	195,8	188,6	181,9	175,6	169,7	164,3	159,1	154,3	149,8	145,5	141,4
1	292,3	276,9	263,1	250,6	239,2	228,8	219,2	210,5	202,4	194,9	187,9	181,4	175,4	169,7	164,4	159,4	154,8	150,3	146,2
2	301,8	285,9	271,6	258,6	246,9	236,1	226,3	217,3	208,9	201,2	194,0	187,3	181,0	175,2	169,7	164,6	159,7	155,2	150,9
3	311,2	294,8	280,1	266,7	254,6	243,5	233,4	224,0	215,4	207,4	200,0	193,1	186,7	180,7	175,0	169,7	164,7	160,0	155,6
4	320,6	303,7	288,5	274,8	262,3	250,9	240,4	230,8	222,0	213,7	206,1	199,0	192,4	186,2	180,3	174,9	169,7	164,9	160,3
5	330,0	312,7	297,0	282,9	270,0	258,3	247,5	237,6	228,5	220,0	212,2	204,8	198,0	191,6	185,6	180,0	174,7	169,7	165,0
6	339,5	321,6	305,5	291,0	277,7	265,7	254,6	244,4	235,0	226,3	218,2	210,7	203,7	197,1	190,9	185,2	179,7	174,6	169,7
7	348,9	330,5	314,0	299,0	285,5	273,0	261,7	251,2	241,5	232,6	224,3	216,5	209,3	202,6	196,2	190,3	184,7	179,4	174,0
8	358,3	339,5	322,5	307,1	293,2	280,4	268,7	258,0	248,1	238,9	230,3	222,4	215,0	208,1	201,6	195,4	189,7	184,3	179,2
9	367,8	348,4	331,0	315,2	300,9	287,8	275,8	269,8	254,6	245,2	236,4	228,3	220,6	213,5	206,9	200,6	194,7	189,1	183,9
4.0	377,2	357,3	339,5	323,3	308,6	295,2	282,9	271,6	261,1	251,4	242,5	234,1	226,3	219,0	212,2	205,7	199,7	194,0	188,6
1	386,6	366,3	347,9	331,4	316,3	302,6	290,0	278,4	267,6	257,7	248,5	240,0	232,0	224,5	217,5	210,9	204,7	198,8	193,3
2	396,0	375,2	356,4	339,5	324,0	309,9	297,0	285,1	274,2	264,0	254,6	245,8	237,6	230,0	222,8	216,0	209,7	203,7	198,0
3	405,5	384,1	364,9	347,5	331,7	317,3	304,1	291,9	280,7	270,3	260,7	251,7	243,3	235,4	228,1	221,2	214,7	208,5	202,7
4	414,9	393,1	373,4	355,6	339,5	324,7	311,2	298,7	287,2	276,6	266,7	257,5	248,9	240,9	233,4	226,3	219,6	213,4	207,4
5	424,3	402,0	381,9	363,7	347,2	332,1	318,2	305,5	293,8	282,9	272,8	263,4	254,6	246,4	238,7	231,4	224,6	218,2	212,2
6	433,8	410,9	390,4	371,8	354,9	339,5	325,3	312,3	300,3	289,2	278,8	269,2	260,2	251,9	244,0	236,6	229,6	223,1	216,9
7	443,2	419,9	398,9	379,9	362,6	346,8	332,4	319,1	306,8	295,5	284,9	275,1	265,9	257,3	249,3	241,7	234,6	227,9	221,6
8	452,6	428,8	407,3	387,9	370,3	354,2	339,5	325,9	313,3	301,7	291,0	280,9	271,6	262,8	254,6	246,9	239,6	232,8	226,3
9	462,1	437,7	415,8	396,0	378,0	361,6	346,5	332,7	319,9	308,0	297,0	286,8	277,2	268,3	259,9	252,0	244,6	237,6	231,0
5.0	472,0	446,7	424,3	404,1	385,7	369,0	353,6	339,5	326,4	314,3	303,1	292,6	287,9	273,8	265,2	257,2	249,6	242,5	235,7

Table III

We will now describe Table V more fully. The sections given here are all for two 6″x6″ angles with 13″ cover plates or no plates at all. The upper line gives the thickness of the angles, varying by 1/16″ from 3/8″ to 7/8″. Larger than 3/4″ are usually avoided. The second horizontal line gives the gross areas of these angles. The third horizontal line gives the net areas of these angles with one hole deducted for each angle. In this case 3/4″ rivets are used. The hole is actually 1/16″ larger than the rivet before driving and 1/16″ more is allowed for injury of metal, giving 7/8″ to be deducted in all. In 1/2″ angles the area deducted in each angle would therefore be 7/16″ or 7/8″ for two angles which, as the decimal .88, gives the difference between 11.50 the gross area of the angles and 10.62 the net area with one hole deducted in each angle. The fourth horizontal line similarly gives the net areas with two holes deducted. The next line gives the allowable flange stresses with no cover plates, which are obtained by multiplying the net areas with one hole deducted by 16,000, the allowable stress per square inch. The columns below give the allowable stresses in a similar manner for these same angles with cover plates, which are obtained by adding the net areas of the angles with two holes out to the net areas of the cover plates and multiplying by 16,000. These of course are the allowable flange stresses for the tension flanges. This, as we have noted, is the usual limiting feature in the design of a flange.

The rivet pitch should always be determined and not left until later as it is frequently found that this rivet pitch is so small that the material would be injured by the holes being too near together. This can be determined from Table III. This gives the various allowable shears for pitches varying by 1/16" from 1 1/8" to 2 1/4" for various effective depths, varying by 1/10 foot from 1.3 to 5 feet, for 3/4" rivets in double shear. The rivets are in double shear if the thickness of the web is 5/8" or more. Along the top of the table will be found various values for 3/4" rivets in bearing on webs of different thickness and also for double shear. If the thickness of the web is less than 5/8" the value of the allowable shear in the table should be reduced by dividing by the value of a rivet in double shear (8,840) and multiplying by the value of the rivet in bearing on the web used. With an effective depth of 2.4 we find that a rivet pitch of 1 13/16" is good for 214,400 shear, which is a little greater than the 206,500 shear on the girder. If necessary this required shear may be reduced by taking into account that part of the moment which is taken by the web. This is usually not done, however. If the uniform load were applied to the flange this also would have to be taken into account as the shear on the rivet would then be the resultant of the vertical shear from the uniform load and the horizontal shear due to the flange stress in the girder.

Table III is derived from the formula:

$$p = \frac{Vd}{S}$$

where V is the value of one rivet in double shear or bearing as the case may be, d is the effective depth in inches, and S the shear at the point on the girder where the rivet pitch, p, is required. When the uniform load is applied directly to one of the flanges this formula should be modified by substituting for S the quantity $\sqrt{S^2+a^2d^2}$, where a is the uniform load per lineal inch of girder.

When it becomes necessary to figure the rivet pitch closer than is given by these formulæ by taking into account the portion of the bending taken by the web, we may increase the rivet pitch obtained by the formula just given by using the formula:

$$\frac{A+a}{A}p = p'$$

where A is the area of the flange angles and plates, a the area of one-eighth of the web, and p' the revised rivet pitch.

This is as far as it is necessary for the designer to go as the detailer in the shop can take care of the rest of the design if the loading is given him. It is possible, however, for the estimator to figure

BACK OF L8 TO C G FLANGE (INCHES)																			
t OF PLS			0	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/8"	1 1/4"	1 3/8"	1 1/2"	1 5/8"	1 3/4"	1 7/8"	2"	2 1/8"	2 1/4"
6"×6" L8	13" PLS.	3/8	1 64	98	84	71	.57	.47	.36	27	17	.08	-.01	-.08	-.13	-.25	-.33	-.41	-.49
		7/16	1 66	1.05	91	79	65	55	.44	35	25	16	07	00	-.05	-.17	-.25	-.33	-.41
		1/2	1 68	1.12	98	.86	73	63	52	43	33	.24	15	.07	-.02	-.10	-.18	-.26	-.34
		9/16	1.71	1.18	1.05	93	80	70	.60	50	40	.31	23	14	06	-.03	-.11	-.19	-.27
		5/8	1.73	1.24	1 11	.99	87	.77	67	57	47	.38	30	21	13	04	-.04	-.12	-.20
		11/16	1.75	1.29	1 16	1 04	93	.83	73	63	54	45	36	28	19	10	.03	-.05	-.13
		3/4	1.78	1.34	1.21	1 10	99	89	79	69	60	51	42	34	25	16	.09	01	-.07
		13/16	1.80	1.38	1.26	1 15	1.04	.94	.84	75	66	.57	48	40	.31	33	15	.07	-.01
		7/8	1.82	1.42	1.30	1.19	1.09	99	.89	80	71	.62	54	45	.37	.29	.21	.13	.05

Table IV

ALLOWABLE FLANGE STRESSES									
2-6"x6" L8	3/8"	7/16"	1/2"	9/16"	5/8"	11/16"	3/4"	13/16"	7/8"
Gross A	8.72	10.12	11 50	12.86	14.22	15 56	16.88	18 18	19 46
Net A	8.06	9.36	10.62	11 88	13 12	14 36	15.56	16.76	17 92
do 2h	7.40	8 58	9.74	10.90	12 04	13 16	14.26	15 34	16 40
Flg St No Pls	129,0	149,8	170,0	190,0	210,0	229,8	249,0	268,2	286,8
13"×5/16	174,6	193,4	212,0	230,6	248,8	266,8	284,4	301,6	318,6
3/8	185,9	204,7	223,3	241,9	260,1	278,1	295,7	312,9	329,9
7/16	197,1	215,9	234,5	253,1	271,3	289,3	306,9	324,1	341,1
1/2	208,4	227,2	245,8	264,4	282,6	300,6	318,2	335,4	352,4
9/16	219,6	238,4	257,0	275,6	293,8	311,8	329,4	346,6	363,6
5/8	230,9	249,7	268,3	286,9	305,1	323,1	340,7	357,9	374,9
11/16	242,1	260,9	279,5	298,1	316,3	334,3	351,9	369,1	386,1
3/4	253,4	272,2	290,8	309,4	327,6	345,6	363,2	380,4	397,4
13/16	264,6	283,4	302,0	320,6	338,8	356,8	374,4	391,6	408,6
7/8	275,9	294,7	313,3	331,9	350,1	368,1	385,7	402,9	419,9
15/16	287,1	305,9	324,5	343,1	361,3	379,3	396,9	414,1	431,1
1	298,4	317,2	335,8	354,4	372,6	390,6	408,2	425,4	442,4
1 1/16	309,6	328,4	347,0	365,6	383,8	401,8	419,4	436,6	453,6
1 1/8	320,9	339,7	358,3	376,9	395,1	413,1	430,7	447,9	464,9
1 3/16	332,1	350,9	369,5	388,1	406,3	424,3	441,9	459,1	476,1
1 1/4	343,4	362,2	380,8	399,4	417,6	435,6	453,2	470,4	487,4
1 5/16	354,6	373,4	392,0	410,6	428,8	446,8	464,4	481,6	498,6
1 3/8	365,9	384,7	403,3	421,9	440,1	458,1	475,7	492,9	509,9
1 7/16	377,1	395,9	414,5	433,1	451,3	469,3	486,9	504,1	521,1
1 1/2	388,4	407,2	425,8	444,4	462,6	480,6	498,2	515,4	532,4
1 9/16	399,6	418,4	437,0	455,6	473,8	491,8	509,4	526,6	543,6
1 5/8	410,9	429,7	448,3	466,9	485,1	503,1	520,7	537,9	554,9
1 11/16	422,1	440,9	459,5	478,1	496,3	514,3	531,9	549,1	566,1
1 3/4	433,4	452,2	470,8	489,4	507,6	525,6	543,2	560,4	577,4
1 13/16	444,6	463,4	482,0	500,6	518,8	536,8	554,4	571,6	588,6
1 7/8	455,9	474,7	493,3	511,9	530,1	548,1	565,7	582,9	599,9
1 15/16	467,1	485,9	504,5	523,1	541,3	559,3	576,9	594,1	611,1
2	478,4	497,2	515,8	534,4	552,6	570,6	588,2	605,4	622,4
2 1/16	489,6	508,4	527,0	545,6	563,8	581,8	599,4	616,6	633,6
2 1/8	500,9	519,7	538,3	556,9	575,1	593,1	610,7	627,9	644,9
2 3/16	512,1	530,9	549,5	568,1	586,3	604,3	621,9	639,1	656,1
2 1/4	523,4	542,2	560,8	579,4	597,6	615,6	633,2	650,4	667,4

Table V

closer if more information is given, especially the lengths of the cover plates.

We found that $1\frac{1}{16}''$ of cover plates was required. It is customary to use at least $\frac{3}{8}''$ plates and not over $\frac{3}{4}''$. In this case a $\frac{1}{2}''$ and a $\frac{9}{16}''$ plate could be used, placing the $\frac{1}{2}''$ plate next to the angles. To find the point where we can cut off these plates we must find what the strength of the girder would be with the $\frac{9}{16}''$ plate omitted, and also with both plates omitted. If both plates were omitted we would have left at that point the two angles with two holes out of each and the web plate to resist bending. This moment of resistance would therefore equal 14.26x16,000x2.42 + 92,600, or 644,600.

The moment of resistance of the girder with only the angles and $\frac{1}{2}''$ plate can be found by looking up the allowable stress in the flange in Table V and multiplying it by the effective depth: thus, 318,200x2.42+92,600=863,600.

We must now find the moment on the girder at various points and interpolate between them to find the point where we can drop off the cover plates.

The moments on the girder at 5, 6, 7 and 8 feet from the right hand reaction are found thus:

$$5R_r - 117x16\tfrac{1}{2}x5x2\tfrac{1}{2} = 631,800$$
$$6R_r - 117x16\tfrac{1}{2}x6x3 = 751,300$$
$$7R_r - 117x16\tfrac{1}{2}x7x3\tfrac{1}{2} = 972,800$$
$$8R_r - 117x16\tfrac{1}{2}x8x4 = 988,100$$

By interpolation we find that both plates can be omitted 5′ 1″ from the right hand reaction, and the $\frac{9}{16}''$ plate can be omitted 6′ 6″ from the right hand reaction. It is good practice to run the plates slightly beyond these points so as to get in enough rivets before the point is reached to enable the plates to do their work. It is common practice therefore to extend the plates about 1′ 3″ beyond the theoretical points of cut-off.

In a similar way we may find the moment on the girder at points 3, 4 and 5 feet from the left hand end, thus:

$$3R_l - 117x16\tfrac{1}{2}x3x1\tfrac{1}{2} = 611,300$$
$$4R_l - 117x16\tfrac{1}{2}x4x2 = 811,600$$
$$5R_l - 117x16\tfrac{1}{2}x5x2\tfrac{1}{2} = 1,008,300$$

By interpolation we find the cut-off of the plates to be 3′ 2″ and 4′ 3″ from the left hand end. Therefore the $\frac{9}{16}''$ plates will be 6′ 3″ long and the $\frac{1}{2}''$ plates 8′ 9″ long.

The rivets in the stiffeners over the end columns and under the middle column will be in double shear and be worth 8,840# each. By dividing the reactions and column load each by this value we obtain the number of rivets required in the stiffeners in each case, thus:

$$309,700 \div 8,840 = 35$$
$$131,200 \div 8,840 = 15$$
$$206,500 \div 8,840 = 24$$

The stiffener angles themselves are designed as small columns having an unsupported length equal to half the depth of the girder, which in this case would be only 15″. From a table of two angle struts we may pick out the required sizes for these angles.

The web of the girder we designed as 30″ deep while the angles for the flanges had 6″ legs which would leave $18\frac{1}{2}''$ in the clear between the angles. If the rivets were spaced $2\frac{1}{2}''$ apart we could only get 7 rivets in a line between the flange angles, which with two in each angle would give 11 in each stiffener. Therefore under the middle column we would have to have at least three lines of rivets. To make these symmetrical we would use four lines or eight angles in all for stiffeners. This could be done by using eight 5 x $3\frac{1}{2}$ x $\frac{3}{8}''$ angles.

If the girder was placed on the tops of the columns which carried it and they carried no other load we can design the end stiffeners from the data already used. We will use two angles at the extreme end and four over the inside of the column similar to those shown in the June number of the THE FORUM. The two end angles we will design to carry one-half of the load while the two inside angles will be designed to carry two-thirds of the load. One-half of the left hand reaction is 103,250, which will require two 5x$3\frac{1}{2}$x$\frac{9}{16}$ Ls, while two-thirds of the reaction would be 138,000 which would require four 5x$3\frac{1}{2}$x$\frac{3}{8}$ Ls. At the other end one-half of the reaction would be 65,600 which would require two 5x$3\frac{1}{2}$x$\frac{3}{8}$ Ls, and two-thirds of the reaction would be 87,300 which would require four 4x3x$\frac{5}{16}$ Ls, or we could use only two 5x$3\frac{1}{2}$x$\frac{7}{16}$ Ls. It is often preferred in shops to use fewer sizes than this and to throw away a small amount of material for the sake of the uniformity and simplicity of the shopwork, and this is regarded as good practice.

As we noted in the June number, there are a great many rules as to the use and spacing of intermediate stiffener angles. One rule is that when the depth of the web between flange angles (in this case $18\frac{1}{2}''$) is more than 60 times the thickness of the web (in this case only 27) then stiffener angles must be used and they cannot be spaced over 6 feet apart even if the formula gives a greater distance. The formula for this distance is:

$$d - \frac{t}{40}(12,000 - s)$$

where d is the spacing required in inches, t the thickness of the web in inches, and s the shear on the web in pounds per square inch. This formula is conservative and safe to use. If for any reason it is inadvisable to use as small a spacing of the stiffener angles and this distance is not over the maximum 6 feet allowed, we can increase the distance between them by increasing the thickness of the web, which would of course decrease the shear per square inch.

Modern Floor Coverings

PART III

By E. H. HOWARD

IN the discussion of composition floors the type made of magnesium salts was mentioned; it would not be sufficient, however, to refer to this type of flooring merely "en passant." It has in many instances furnished a floor covering which has won it a place in the catalog of materials worthy of full consideration where a durable, sanitary, inert surface is required. The color possibilities and pattern arrangements offer a wide field for study. Laying it in squares with surrounding lines of another color, is one effective method of using this composition. The colors are permanent, if properly used, and can be varied in the mixing to match almost any shade. In the standard colors the red is the most likely to give trouble, and that only by slowly fading.

There is now in the process of development still another variant of the magnesium floor covering. It is not yet on the market, commercially, but it has been tested by many months of actual hard wear. This material is a combination of magnesium salts, from which the chlorides are entirely absent, and ground cork. Possessing as it does the inertness and durability of magnesium compositions, with the resilience and sound-proof qualities of cork, it merits attention.

The cork is ground, not pulverized, and mixed with the magnesium salt in a plastic mass. To this is added the color pigment, which, by the way, does not color the cork, and when the whole mass is of the proper consistency it is placed in moulds under high pressure and cured. After being cured, the moulds are removed and the material is cut into tiles and ready to lay. These tiles have been used for trucking surfaces and so far have developed no defects. The surface is non-absorbent, so that grease does not penetrate, and washing with any cleanser or soap will thoroughly clean the surface.

They may be cemented directly to concrete with a waterproof cement or may be laid on a wood floor. When the under surface is wood there should be a layer of coarse cloth tacked to the wood floor, and to this the tile is attached by means of a special quick-setting cement. The cloth serves merely as a protection in case of shrinkage in the wood. This material may be used in large sheets as well as in small tile, and therefore can be used as a dado on the wall. It is also possible to use it in the form of a sanitary base.

There is still another form of floor covering which is made in colors, patterns, shapes and sizes to suit the designer's requirements. The foundation and principal component is cement. All architects are familiar with the cement tile which was on the market a few years ago. It was not a material to appeal, excepting in occasional low cost work. The tile we are now considering is, however, far different and should not be confused with the old cement tile.

Without doubt, it will be a surprise to many to know that some of the fine "old" Spanish tile floors which are seen in some of the southern estates and in Cuba are manufactured of modern cement.

Panel of Simple Pattern Showing Veining

Decorative Rubber Flooring in Piano Warerooms of C. C. Harvey Co., Boston
Kilham, Hopkins & Greeley, Architects

This new product, having the appearance of marble, can be employed in varied architectural patterns and is noiseless and resilient under foot

Cement Tile Floor in Pasaje Hotel, Havana, Cuba
Each unit is composed of four similar tile

The illustrations presented here will give an idea of the great opportunities for securing fine copies of old tile and the wide variety of color and design which are at the command of the architect or engineer, if he elects to employ this type of floor. Cement floor tile* is no new product, nor is it a material which has not proved its value in the test of time. There are in Havana today some floors which are as tight and flush as new work, but which have been laid and used for over 125 years.

Cement tile is simple in manufacture but requires skilled artisans to make the designs in the tile in proper manner. Steel moulds are used and this assures even sizes, true forms and square edges. The moulds are filled with cement and the designs are pressed in. The tile is then subjected to a pressure of 4,500 pounds to the square inch. The tiles are "seasoned" with water and are then "cured" for a definite time, depending on the size and character of mixture, in a storage room kept at a fixed temperature. The whole process results in an exceedingly dense, compact, hard substance, not subject to action of heat or cold and free from danger of swelling or shrinkage.

If the tile is to be laid on a concrete floor the concrete should be kept about two inches below the finished surface. The structural floor should be smooth, but not steel troweled. Upon this under surface is laid the tile bed of approximately 1⅛ inches of cement mortar, and then the finished product is placed in position. From this point the process of laying the floor is the same as for ordinary tile. After the floor has been thoroughly washed a light coat of floor wax is applied and wiped off with a cloth. One more wax treatment six months later is recommended as all the finish the floor will need to give a fine, hard sheen.

Floor coverings play so vital a part in modern construction that an exhaustive study of the characteristics of the various materials is of great importance. Linoleum, cork carpet, cork tile, rubber tile, synthetic rubber and composition floors have been discussed and presented in a manner, but not so thoroughly as the subjects deserve. The analysis, however, will tend to give the architect a starting point for his own personal investigations. Facts have been presented which may at times be at variance with the salesman's talk, but facts are unalterable.

In reality there is little need of expressing the truism that a floor may make or mar an otherwise beautiful room. It is obvious. The profession has been interested in trying to secure something for floors which would be "wear-proof," noiseless, artistic, sanitary, easily cleaned and of low maintenance cost. We cannot prophesy what shall be in future, but one can easily look back and note the progress that has been made in the last decade and hope, perhaps not in vain, that the future will bring us a material which will be even superior to those we now possess.

There is a vast field opened up in the supplying of materials suitable for flooring of buildings of different kinds, for substances of various sorts are required for buildings serving different uses. The ingenuity of modern manufacturers may be relied upon to meet the demand and the market offers a range of materials broad enough to fulfill the need of flooring suited for different purposes. The adaptability of the floor coverings which have been described in these pages is the reason for much of their popularity, for they are to be had in units of such flexibility that they may be laid without difficulty.

Cement Tile Floor in National Bank of Cuba

*We are indebted to Mr. A. L. Hutchinson, architect, of Mobile, Ala., for some of the data on the cement tile and for the illustrations included here.

BUSINESS & FINANCE

C. Stanley Taylor, *Associate Editor*

Straight Talks with Architects

I. HOW CAN I GET MORE BUSINESS IN MY OFFICE *NOW?*

THE other day a good friend of ours came into the New York office of THE FORUM. He is not an architect; as a matter of fact he is the owner of a department store in one of the smaller cities near New York. He brought with him, however, certain suggestions regarding business getting which should be of practical value to every architect.

It happens that his interest in architecture is confined to the building of a residence, for the planning of which he retained an architect about two years ago. His experience in this problem of building a home was similar to that of many architects' clients who hoped to build in 1920. After the plans were completed and bids taken he found that the house would cost him eight or ten thousand dollars more than he was willing to spend. After making certain of the cost, he refused to build. Naturally this was a disappointment to the architect, and the plans for this house were filed away, with many others, in the hope that a happy day would come when costs would be low enough to meet the clients' approval.

About a month ago an enterprising sub-contractor (who had figured this contract a year before) visited the architect's office and asked if there was any chance to re-figure it. The architect told him that there was no chance. Spurred on by a need of work, however, this sub-contractor went to the owner and told him that he would like to re-figure his part of the work, as he felt that a substantial saving might be made over last year's bid. When the owner asked him why he thought this might be the case now, the sub-contractor replied that there were several reasons, among them being:

1. Somewhat lower prevailing prices for materials.
2. Possibility of securing the right kind of mechanics.
3. The increase of efficiency of workmen in the building trades.
4. The market for both labor and materials being steadier, and it not being necessary to add any large contingency fee.

The prospective owner of the house, being a shrewd buyer, realized the soundness of these reasons and told the sub-contractor that he would be glad to have a new figure, although he felt that it would probably be a waste of time. Much to his surprise, however, the figure which came in showed a really substantial reduction in costs. Convinced that this condition might bear investigating the owner went to his architect and instructed him to get both general contract and sub-contract figures from the same firms or individuals who had figured before. The net result (to the surprise of both owner and architect) was that where the cost of this house last year totaled approximately $30,000, the same house this year would cost less than $22,000. On this basis the owner was willing to proceed and the house is now under construction.

It may be noted here that the architect's eyes were opened and that he proceeded at once to give these figures to two or three of his clients who for some time had been talking about building new residences. The net result has been that two other contracts have been awarded from the office of that architect. Certainly no credit is due to this particular architect for possessing an instinct for the development of business. It took an insistent sub-contractor and a keen merchant to anticipate and recognize conditions of which the architect himself should have been cognizant.

This will explain the attitude of the merchant in question who, when we had told him that business was slow in most architects' offices just now, replied in no uncertain terms that if, from a sales viewpoint, he ran his department store in the way that most architects conduct their businesses he could not pay interest on the mortgage. We could not help but recognize the truth of his statement and into our minds there came the memory of a question asked by a capable architect just a few days before—the question which constitutes the heading of this article. It was asked in a tone of pathetic hopelessness, as much as to say, "of course you cannot tell me."

It is true that we cannot tell any architect exactly where to go in order to get a new commission today. We know, however, that certain architects' offices *are* busy and we know *why* they are busy. In most cases it has not been luck or a fortunate social connection, but it has been the attitude so well expressed in the slogan, "1921 Will Reward Fighters." These architects who are fortunate enough to be busy have kept closely in touch with market conditions; they have noted the increasing efficiency of labor in the building construction field and they have analyzed the business needs of their clients and have spread wide a drag-net for sub-contractors' figures, which have in many cases been much lower than those quoted in the average market figures—lower, in fact, than the architects themselves had anticipated.

Now, in the episode of the merchant and his house, the ideal condition would have been that the architect himself might have ferreted out the fact that this house could be built for a substantially lower price. According to this ideal he would have brought this fact to the attention of his client, whereupon he would have received an order to proceed with the work.

Why did he not think of doing this?

Why is it that, with so many possible building projects in view, the average architect is content to spend his time damning conditions in the building industry, when perhaps in his office there are tentative plans or projects which would proceed immediately if the architect used the right tactics with the owners?

When the average architect reads these statements he may probably sit back and say, "Oh well, it is easy enough for a writer to tell about these things, but it is not practicable to do them." We believe that the principal reason that architects as a rule are not good business getters, and consequently are usually numbered among those "who wait to be called," is because the average architect does not appreciate the fundamental business conditions which affect the building industry. Consequently, when a client tells him that he is waiting for prices to go back to pre-war levels the architect can only sigh and hope for the happy day when building costs will reach the levels of the depressed period of 1913.

On the other hand, we believe that practically every architect is receptive to ideas, particularly at this time when every office needs more business. Therefore a review of the general conditions, showing the trend of building construction costs and the important facts affecting the stabilization of material and labor prices, should prove valuable data in discussing building conditions with clients.

The only way that the so-called buyers' strike in the building field can be broken is for every architect to enlist himself actively in disseminating the market information which the prospective building owner should have. THE ARCHITECTURAL FORUM feels this condition so strongly that at the present writing a questionnaire is being sent to every architect in the United States asking him for a list of the number of possible projects which are dormant in his office because of this same buyers' strike. The information thus obtained is to be used in the proper channels to help correct false impressions as to building activities when market conditions become more stabilized.

Only the architect, however, has opportunity for the necessary contact with his clients who, in sum total, make up his division of the building field, and it is certainly the architect's duty to acquaint himself in every possible manner with conditions of building costs in order that he may discuss this question definitely and intelligently with his clients when they are seriously considering the advisability of building.

A review of the facts as to present and future conditions in the building industry may in a sense be termed "dry reading," but at the same time this is the sort of information which any architect can use and which, if it does not result in the development of immediate work, will certainly impress the prospective client with the fact that the architect is giving careful consideration to his problems and business interests.

From several sources it is learned that the average cost of building construction is today about 100% higher than in 1913, which is usually referred to as the pre-war period. The index figure of wholesale prices of building materials, as prepared by the United States Department of Labor, indicated for July, 1921, a figure of 200 as compared to a figure of 100 in 1913 and 333 in July of 1920. In other words, the average cost of building materials has come down more than half way from the peak to the pre-war level. It may be noted also that the *Engineering News-Record* has recently developed an interesting method of figuring an index figure of construction cost. Briefly, this is done by taking the total annual production of steel, lumber and cement, together with the total number and wage of common laborers in the United States, exclusive of farm laborers. To convert these factors into terms of money, 1913 was selected as the base whereby index figures were prepared for every year following, using the material prices quoted at the given time together with the average number and wage of common laborers in 20 representative cities. A careful study was made of the relative quantities of these materials and amount of labor used in construction work, and this basic index figure was then developed:

2,500 lbs. structural steel, $1.50 per 100 lbs.	$37.50
6 bbls. cement, $1.19	7.14
600 ft. b. m. pine, $28.50	17.10
200 man-hours, $.19	38.00
	$99.74

The index figures of construction development in this manner since 1913 are:

1913	$99.74
1914	92.99
1915	98.26
1916	137.29
1917	189.02
1918	202.77
1919	207.81
1920	238.79
1921 (7 months)	214.39
July, 1921	194.82

This index figure of July, 1921 also shows approximately 100% higher cost of construction than in 1913.

We may introduce at this point, however, the question as to whether it is fair to take the construction cost of 1913 as a pre-war level and expect building costs to come back close to this figure before there will be any general resumption of building activity. R. C. Marshall, Jr., General Manager of the Associated General Contractors, has given careful study to this matter. It is his opinion that the building costs of 1913 and 1914 do not constitute a normal price level. He declares that for 20 years prior to the world war all wholesale prices were steadily increasing at the rate of about 2½% a year and that this increase, except for the war, in all probability would have passed the so-called normal of 1921 at the level which is now designated as 120 in the scale of indices.

At the present time (August, 1921) the index figure prepared by the United States government stands at 148 for general wholesale prices and at 200 for wholesale building material prices as compared to the standard of 100 set in 1913. It must be realized that the year 1913 was a year of considerable depression and that wholesale building material prices at that time were sub-normal. Considering the fact that all wholesale prices have been advancing approximately 2½% a year, it is but natural to believe that, even if there had been no war, wholesale building material prices would have advanced at least that much which would bring the index figure to 120. Added to this is the fact that the index figure of building material costs of 1913 was sub-normal. It is therefore fair to believe that if the war had not intervened the general increase in labor costs and other factors contributing to increased prices would have brought the normal index figure of building materials at least to 130, if not somewhat higher. We find, therefore, that building costs today are approximately 70 points higher than the established normal for 1921.

There is another factor to be considered—the line of stabilization of prices. At first thought it might seem that prices should stabilize at the so-called normal level. Considering this matter we may turn from this question for a moment to analyze the accompanying illustration (Fig. 1) which is merely a chart showing the wholesale price fluctuation in the United States for 110 years. It will be noted that after the war of 1812 and after the civil war it took periods of about 20 years for prices to reach the pre-war levels. Naturally, building construction cannot be expected to decrease in cost any more than in proportion to the general decrease in all commodities and labor costs. We may therefore expect not only that the ultimate reduction in cost cannot be greater than an index figure which normally would be 30% higher than in 1913, but that we must allow a period of a few years for all costs to reach a normal level. Granting that through the Federal Reserve Bank (and other recently established means of controlling economic adjustments during a re-construction period) this period will be considerably shortened as compared to similar periods following previous wars, it is plain that we cannot expect a return to a so-called pre-war level or to a normal index figure in less than eight or ten years. The consensus of opinion seems to be that building should proceed when costs have become stabilized. Evidently the line of stabilization will not be a straight line drawn through normal points for the next ten years, but will bear a direct relation to the falling of all wholesale prices and labor costs.

Fig. 1. This diagram, prepared by The Russell Sage Foundation, illustrates the fluctuating of prices during 110 years. The contour of the curve of prices is a condensed version of the economic history of the country.

Leonard P. Ayres, Vice-president of the Cleveland Trust Company, has this to say in a recently issued bulletin entitled "Price Changes and Business Prospects": "We may lay down six general rules with regard to price movements":

1. Wholesale prices move first and farthest.
2. Retail prices move more slowly and less violently.
3. Wage levels change more slowly than levels of prices.
4. Manufactured articles, having a high labor content, change their price levels more slowly than do raw materials, having a low labor content.
5. Salaries change more slowly than wages.
6. Rents change more slowly than prices, wages or salaries.

Evidently, the cost of building has still to feel the reaction of the reduction of wholesale prices which is being followed by a reduction in retail prices of building materials. An important decision on wages of building labor just rendered by Judge Landis (described in detail in the Service Section of this issue) bids fair to establish a precedent in the reduction of building labor costs. In view of these facts we may expect the point of stabilization for the year 1922 to be fairly between the normal index figure of 130 and the present index figure of 194.82. In other words, it is approximately 170 now and will descend during the next few years in relation to all gradually falling prices. It may be expected that the line of stabilization in building costs will gradually fall to meet what might be conceded as the normal, in 1930.

We can see ahead, therefore, a period of building activity started by those who really need buildings and who realize that there is nothing to be gained by waiting over a long period of years for such reduction in costs as may be anticipated along the line of stabilization just described. The second diagram shown here (Fig. 2) indicates how the cost of building increased disproportionately to

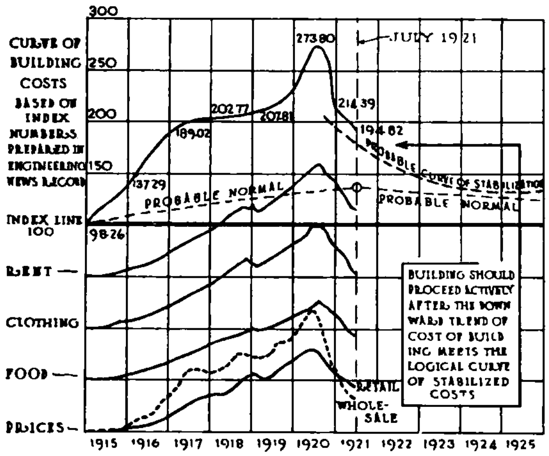


Fig. 2. **This chart shows a comparison of the changes in the cost of building, rents, clothing, etc., since 1915. A line showing the probable normal cost of building if there had been no war; also a probable curve of stabilization, based on information by Leonard P. Ayres, Vice-president, Cleveland Trust Company.**

the various elements which enter into the cost of living. This, of course, was due to the unusual demands of the war period and it will be seen that the line of building costs is now approaching the same tangent of reduction shown by the lines of the elements which enter into the cost of living. Before many months these lines will be running approximately parallel, and that is the time when building costs will be definitely stabilized. It would seem that the breaking of the buyers' strike in the building field is but a matter of a comparatively short time, when the public will realize that it is not a question of waiting for building costs to reach the so-called pre-war level, but for the cost of building to maintain a balanced relationship with rents, clothing, food, wages and salaries.

Another point which is encouraging in regard to investment building is that in entering a long period of falling prices the value of the dollar is increasing. This point is brought out strongly in deductions made by Leonard P. Ayres as a summary of the results of his investigations of price changes and business prospects, from which we quote:

1. Business prosperity depends on the prices of things, of services, and of money, and on the relation of each to the others.

2. When prices are changing, wholesale prices move first and most, retail prices next, wages next, and rent last and least.

3. Any considerable change in the general price levels of other countries is reflected by corresponding changes in the price levels of this country. We are no longer economically independent. The prosperity of each country is in part dependent on the prosperity of other countries.

4. While price inflation and reduction have been serious here, they have been far more violent abroad. We are less hard hit in this period of readjustment than is any other important nation.

5. Three times during the past 110 years the general wholesale price level has reached the 1920 figures. In each of the two previous cases the peak of high prices has been followed by about 30 years of irregularly falling prices, and then by about 20 years of rising prices.

6. It is probable that we are entering upon an extended period of falling prices, broken by occasional shorter periods of rising prices. The conduct of business in such times presents radically different problems from those to which Americans have become accustomed during the past quarter-century of rising prices and shrinking dollars.

7. During times like the present, when prices are high, but falling, plant extensions should be avoided unless greatly needed; financing should be on short maturities, if possible; debts should be paid before the dollar gets still more valuable, and hence harder to secure; the accumulation of stocks of raw materials should be avoided; bank balances should be built up; bonds should be purchased.

8. So long as the dollar continues to increase in purchasing power, debts, rents, and taxes will be harder to pay. Business transactions or investments, through which stated sums of money will be received at periodic intervals in the future, will prove more profitable than present standards would lead one to believe, while agreements to pay fixed amounts at future dates will be more difficult to live up to than present conditions and past experience would indicate.

9. In the long period of falling prices following the civil war wages declined far less than did prices. In that same period the productivity of labor greatly increased as the mechanical means of production were improved. The future course of wages depends largely on the degree to which the per capita output can be increased, through improvements in management, processes and machinery.

10. The immediate prospects of business at any given time can best be judged by studying the development of business cycles, which progress through phases of prosperity, forced production, liquidation, and readjustment, back to a revival of prosperity. They are most accurately foretold by the changes in the market prices of industrial securities. At present we are passing through the latter stages of liquidation, and have entered upon those of readjustment.

In order that a graphic presentation of some of the points brought out in this article may be available, we have prepared from various sources of data the chart shown as Fig. 2 which indicates the relative fluctuations in wholesale and retail prices, the cost of food, the cost of clothing, the cost of rent and the cost of building since 1915. We have also indicated on this chart a proper approximate normal line along which building costs would have passed if there had been no war. We have indicated also the probable curve of stabilization of building costs. This is based on its local relationship to generally falling costs, and when the curve of the cost of building comes slightly farther down to meet this curve of stabilization it may be expected that we are entering upon an era of active building construction. Probably this will not be a building boom, but will be a steady period of activity, which is much more desirable. It may be noted with additional interest that due to better control of economic conditions and to the intervention of the Federal Reserve Bank during the reconstruction period, that in about two years the cost of living will have come down as far as it dropped in five years after the civil war. This fact is significant in that it promises a much shorter period of decreasing prices and consequently a more rapid recovery from the effects of the war than was enjoyed after either the war of 1812 or the civil war. Is it not evident that the period between the fall of 1921 and the time of the return to stabilized building costs, which is indicated for some time next year, should be one of planning? If the architect can demonstrate to a prospective client that the time to plan his building is drawing near, this should mean the development of additional work in many offices. Certainly those who are forced to build will feel better if their plans are ready, in order to take advantage of the first period of stabilization in the building market.

Plate Description

THE CHARLES T. MILLER HOSPITAL, ST. PAUL

C. H. JOHNSTON, ARCHITECT

THE tendency of the modern hospital is away from the traditional, stereotyped development which made a hospital a dreary place and toward another form of treatment which is making it as attractive and inviting as its character and purpose permit. This tendency has been noticeable for some years and in widely separated sections of the country, and the Charles T. Miller Hospital, recently erected at St. Paul, exemplifies this difference in treatment and presents some interesting solutions of unusual problems.

The considerable area which the hospital occupies fronts upon three streets of radically different grades—Summit avenue, one of the chief thoroughfares of the city, College avenue and Rice street. The placing of the main entrance upon College avenue is due partly to the more favorable topographical conditions and partly to avoid the congestion of traffic which blocks Summit avenue. Such placing of the building brings the greater part of the hospital into a position where it receives the greatest possible amount of sunshine, and the arrangement of administrative and service departments near the main entrance renders the first floor available for wards and patients' rooms overlooking a lawn upon the Summit avenue side. This placing of the present structure upon the property leaves space for future buildings.

Free beds, of which there are 50, are arranged in small wards containing one, two, four or six beds. The remaining 166 beds which the hospital contains, are entirely in private rooms, most of which are equipped with private baths, the rest having individual lavatories and toilets. The planning of the building places the service departments of each floor, such as diet kitchens and service rooms, near the central part of the structure to make as easy as possible the distribution of food and to afford every convenience for examinations and the handling of surgical dressings, this section of the building being served by electric elevators, which connect the diet kitchen with the auxiliary kitchens upon each floor. The passenger elevators extend to the roof of the main building, where convalescent porches and other features for outdoor treatment will be provided. Upon the fourth floor the north wing contains the operating rooms, obstetric section and laboratories. The rooms for operating and their accessory rooms, complete with all surgical equipment, are at the north end of the wing, and delivery, wash-up and sterilizing rooms, with the nursery, are at the opposite end. This separation of the nursery from close proximity to rooms for maternity patients in the south wing has proved to be advantageous.

Connected with the main building by pipe and service tunnels is the two-story structure which contains the power plant with its equipment upon the lower floor and the laundry upon the floor above. Heating is supplied by a two-pipe vacuum system making use of exhaust steam from engine units. In the boiler room are placed two 250-h.p. water tube boilers, and the pump room contains vacuum, boiler feed water and service pumps, feed water and domestic water service heaters. The main facade of the hospital presents a well designed treatment in the renaissance style, of dark red brick trimmed with Indiana limestone.

View of the Miller Hospital Showing Service Building and Ambulance Court

EDITORIAL COMMENT

THE ARCHITECTURAL PROFESSION AND FIRE PREVENTION

THOUGHTFUL writers and economists have repeatedly pointed out the colossal annual loss in property and lives which is incurred in America through fire, and the pressing need for so ordering our methods of building that this drain upon the country's resources may be lessened. It has been frequently set forth that during the past few years when building has been greatly curtailed, owing to conditions during and following the war, the losses through fire have continued unchecked with the result that new construction has scarcely equaled that destroyed. Considerably more than $300,000,000 goes up in smoke every year and some 18,000 human lives are lost as a contributing result. In addition to this vast loss in property and lives there must be considered the enormous cost borne each year,—not for fire prevention but merely for fire protection,—only as a safeguard against the actual spreading of fires already started. This vast expense, which might at least be greatly reduced, is adding yearly to the crushing weight of taxation already being carried upon the patient shoulders of the American public.

Reflection on our fire losses is once again brought to mind by the approach of "Fire Prevention Week" beginning October 9, a date selected because of its being the anniversary of the memorable Chicago fire. Public attention thus focused on the problem has a special meaning for architects. In this era of progress in so many directions and at a time when it is claimed that certain evils hitherto regarded as necessary have been overcome, it is hardly to the credit of the architectural profession or the building trades that the country continues to build by methods and with materials which have already involved a ruinous loss of property and a far greater loss in human lives than all the wars in which the United States has ever been engaged. That the greater portion of this is needless is attested by the fire records of Europe, where the per capita fire loss is only one-tenth that in this country.

Fortunately, the way to safer and more dependable methods of building is not difficult to find. For many years the manufacturers of building materials have been bringing continually to the attention of architects improved methods and means of constructing relatively or actually fireproof buildings. The possibilities offered by these methods and materials have undoubtedly led the way to better building, which is a long step in the right direction, but there seems to be little reason why a much larger proportion of the country's buildings should not be so constructed that fire, if not wholly preventable, would at least be so confined and localized by use of modern "slow burning" construction that loss of life would nearly always be avoided.

It cannot be claimed that use of these advanced building methods or the employment of fire-resisting materials are precluded by reason of their costs. The rapidity with which American forests are disappearing and the small progress which is being made in reforestration have caused a steady dwindling of the lumber supply and a correspondingly steady increase in the cost of frame construction, while during exactly the same period the introduction of improved methods into the manufacture of clay products of different kinds and their standardization and production on a larger scale have caused the prices at which they are sold to drop to a point where their cost is but very little more than that of lumber, and this small difference in cost is more than offset in a few years by the smaller expense of upkeep and the reduction in the cost of fire insurance. Frame construction is not necessarily to be condemned, because proper precautions in design and construction will make it proof against rapid combustion and hold fire within prescribed limits.

A great responsibility — that of leadership — belongs to the architectural profession in America. The average client knows comparatively little about building and even less of the relative costs of building and upkeep and the merits of different building materials. It is because of his limited knowledge that he requires the architect. The client rightfully regards his architect as a master of the science of building and is prepared, ordinarily, to follow his advice, much as he would obey the direction of his physician or his lawyer were the question medical or legal, and the architect's function should be correspondingly more than supplying an excellent floor plan clothed with a pleasing exterior.

Leadership in an advance toward improved forms of building could hardly be expected of the building trade, the function of which, ordinarily, is to execute or construct what is designed and planned by the architect. The use of steel construction, which makes possible the huge buildings being erected all over the country, if it was not invented by an architect at least owes its phenomenal development largely to the architects who have availed themselves of the advantages which it offers, and the wide use of fireproof construction will be promoted when the architects of America definitely assume the responsibility of leadership toward that end. It may be said that the development of steel construction was an absolute necessity for the growth of American cities, but equally necessary—and vastly more important—is the prevention of the losses of property and human lives which go on unceasingly under present methods of building.

DECORATION *and* FURNITURE

A DEPARTMENT
DEVOTED TO THE VARIED PROFESSIONAL & DESIGN INTERESTS WITH SPECIAL REFERENCE TO AVAILABLE MATERIALS

IT WILL BE THE PURPOSE IN THIS DEPARTMENT TO ILLUSTRATE AS FAR AS PRACTICABLE MODERN INTERIORS FURNISHED WITH ARTICLES OBTAINABLE IN THE MARKETS, AND THE EDITORS WILL BE PLEASED TO ADVISE INTERESTED READERS THE SOURCES FROM WHICH SUCH MATERIAL MAY BE OBTAINED

VIEW OF CORTILE TOWARD STAIRWAY ARCADE AND LOGGIA

HOUSE OF HENRY FORBES BIGELOW, ESQ., BOSTON

BIGELOW & WADSWORTH, ARCHITECTS

The walls are cream colored stucco with architraves and caps in gray cement and floor of red brick

Interiors Adapted from the Italian

PART I

By WALTER F. WHEELER

OF the many qualities which unite to render the arts of Italy so enduringly satisfying there is none which is stronger than what might be called the combining of practicability in its highest form with beauty of appearance. While this admirable quality appears in many of the arts it is particularly evident in domestic architecture, for in much of such work the necessary utilities are so clothed with a garb of architectural grace that the result is a well balanced and finished work, never overdone or made futile and fussy by the addition of unnecessary details.

It may be this practical quality which commends the Italian style for use in modern American homes, and since the success of architects and decorators in its interpretation is having the effect of causing its wide use, a study of some of its characteristics may be of interest. Italian Domestic Interior Architecture would be a topic upon which volumes might be written, but what is intended in these pages is an inquiry into the interior architecture of the country villa or the simpler forms of the urban palazzo as it existed in Northern Italy during the fifteenth and the early part of the sixteenth centuries, a type which is especially adapted for use in America today. It is the purpose of these articles to point out some of the characteristics and possibilities of the use of this style, to explain proportions, methods of treatment of walls, ceilings, doors and other details which may be of help, and to present illustrations of notably successful work which has already been done in America.

The dwelling of an Italian family, whether in city or country, and today as well as in former centuries, is intended to be first of all a home. In either location the plan of the house would not present essential variations. The entrance doorway probably opened into a hallway which led straight to what was usually the heart of the house—the courtyard or *cortile*, generally at the center of the building and open to the sky. The rooms of all floors fronted or opened upon this courtyard or upon the colonnade which often surrounded it, the plan of the house thus making it complete in itself and more or less shut off from the outside world; even the windows facing the street, when the building was a city home, were often mere loopholes—narrow, vertical apertures in the walls—unless for the sake of architectural emphasis larger openings were desired; as already said, the building was a home, and was regarded as belonging primarily to the family.

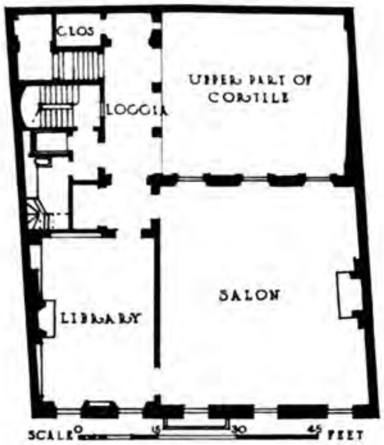
The ground floor of an Italian home—the space not taken up by the *cortile*—would be arranged to serve various domestic purposes; here would be the kitchens, serving rooms, store rooms and the living quarters for servants and other household departments, sometimes entered from a separate doorway but quite as often reached from the entrance which led to the main quarters. From this ground floor a stairway, somewhat modest and placed between two walls in most instances, would lead to the main floor just above, where would be placed the important rooms of the house, the family sleeping rooms being often upon another floor, with possibly still another story higher up containing additional sleeping rooms or quarters for servants. Such, in brief and in the main, was—and still is—the plan of the Italian home, whether in city or country.

In Italy there has always been the preference, which obtains today in America, for a few rooms of ample size rather than a larger number of small rooms. Unless the building were the home of a family of considerable importance, or of some ecclesiastic of exalted rank, the rooms might not exceed in number those required by an American family today. The ceilings, however, particularly upon the main floor, would be of considerable height, which is desirable in a climate where the temperature frequently rises to a scorching heat, and windows, at least such as opened onto a *cortile* or an interior loggia, would probably be of ample size, opening nearly to the ceiling. Upon this main floor the Italian architect would make the most of the area which conditions placed at his disposal, the aim being to gain the full effect of space where it existed and to simulate its appearance where actual space was lacking. A well planned Italian house always affords ample spaces between openings in the walls. Much of the reserve or reticence which is characteristic of the style consists in the use of a few appropriate and carefully selected fittings rather than of a multiplicity of small objects, and the skill with which they are placed adds greatly to the general excellence of the effect; a successful arrangement, particularly when the pieces used are of characteristic Italian broad and generous lines, requires wall spaces of suitable dignity to afford fitting backgrounds.

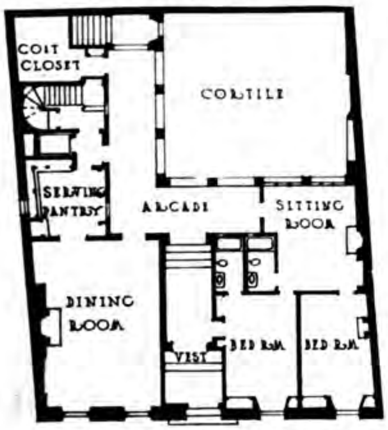
As an unusually attractive example of excellent proportions, and having the added merit of being such as are adaptable to American use, there is included here the plan of a residence in Boston built upon the model of an urban palazzo of moderate size. The planning as well as the fixing of the proportions is the result of careful study of many of the best examples of the period. The size and shape of the city plot in this instance made impossible the extending of the building around the *cortile*, but in accordance with excellent precedent the structure is planned upon two of its sides, the walls upon the remaining sides being stuccoed. To relieve their severity these walls are paneled and hung with wooden trellises, and as a concession to the cold of an American winter the *cortile* is roofed with glass. This plan shows the stairway placed where it is readily accessible and yet not given the elaborate and monumental treatment which developed in a later period; here its function is to serve as a means of passage from floor to floor, and not as a vehicle for architectural or decorative enrichment.

The Italian style depends for success almost wholly upon care in handling proportions to create an effect of spaciousness, and the use of good judgment in selecting materials which afford judicious contrasts. As representative of a room in an Italian house of the type under discussion an analysis of the interior illustrated upon this page may be helpful. This drawing room corresponds to the chief formal apartment of an Italian palazzo. As may be seen from the plan of the main floor, page 115, the room is of excellent proportions, the three windows facing south into the *cortile* being far more important than three other windows facing the street. All door and window openings are placed where they preserve the formal effect, but with an intentional disregard of exact symmetry. Wall spaces are not so cut up that opportunity for the suitable arrangement of furnishings is lost. The chimneypiece is placed where it secures the architectural balance of the room as seen from either of the doors through which it might be entered; dimensions of the fireplace opening, 5 feet high by 5 feet 6 inches wide, are entirely correct for an interior of this type and size, and above the fireplace is a simple but extremely well designed mantel of cement. The walls of this spacious drawing room are of rough troweled plaster of a color which varies between a pale gray and a deep cream and possesses texture which gives no suggestion of bareness but seems rather to be intended as an effective foil for the richness of the tapestries and portraits hung against it. The color of the plaster is varied because it was obtained by coats of different tones, the last of which was wiped off, exposing the underlying shade. Woodwork of windows is treated with extreme simplicity and although almost hidden in the deep plaster reveals is painted to match the walls about it. The baseboard is merely a narrow fillet to protect the walls. The floor is of wide chestnut boards possessing vigorous grain, secured with wooden pegs and finished in low color tones.

Drawing Room or Salon in House of Henry Forbes Bigelow, Esq., Boston. Bigelow & Wadsworth, Architects
The wall shown is about 42 feet long with a ceiling height of 18 feet



Main Floor Plan



Ground Floor Plan

Stairway from the Cortile, House of Henry Forbes Bigelow, Esq.

The ceiling of this room is of open timbers; the heavier beams which cross the room at right angles divide the area into nine spaces of almost equal size, these spaces being subdivided by smaller timbers upon a higher level. All this woodwork, which is of chestnut with very little finish, is polychromed with a moderately rich renaissance decoration in which red, blue and other colors are combined. There is no striving to produce a gorgeous and lavish effect, but the atmosphere is that of restrained and thoughtful luxury.

The characteristics of Italian architecture of this type may be summed up under several headings:

Spaciousness. Italian architecture places the greatest value upon simplicity of plan and spaciousness of rooms. Better by far one or two rooms of ample dimensions than a larger number of rooms too small to be effective from an architectural point of view and too contracted for practical use. By the use of good proportions and comparatively few furnishings this appearance of spaciousness is often created.

Ample Wall Spaces. Where use is made of only a few carefully selected pieces of furniture it is highly important that these few be arranged with considerable care, and this makes necessary the provision of broad wall spaces. An Italian architect would always visualize the appearance of a room when furnished, planning for the maintaining of balance and placing utilities such as doors or windows where they would not interfere with the architectural composition.

Severity. Since this style depends upon success in handling contrasts it follows that severity often provides the most effective foil for objects which may be more elaborate. Severity, however, need never be bareness, and even the most severe object may be architectural by reason of its beauty of texture and its fine restraint of such lines as it may possess.

Proportions. More than many architectural types the Italian villa style demands excellence of proportions; this is particularly true since it does not often employ decoration to an extent which would make it the chief consideration. For this reason the architect who would succeed in interpreting this apparently simple but very exacting style must give heed to dimensions of his rooms and even to what might seem to be minor details. The proportions given in these pages are excellent for rooms of their several types.

Crudity of Finish. It would be a mistake to carry out the finish in rooms of this type to the point where every surface or line is worked out to a mathematical smoothness or evenness. Refinement, to be successful in work of this character, should take the form of discrimination in regard to design and scale; particularly in large domestic interiors, the effect gains greatly from a slight crudity in execution.

A Principal Room in the Famous Davanzati Palace, Florence

Plaster. The various plaster finishes which are useful in developing interiors in houses of this type are produced with the trowel in the same way which the plasterer used in the sixteenth century. Dry color mixed with plaster was employed at that time and is still used, and for interiors which are but sparsely furnished or where but few objects are to be hung upon the walls, polychrome in all-over design is particularly helpful.

Color. The unusually large scale in which Italian domestic interiors are often designed, and the ample sizes of rooms, permit a use of far more color than might be desirable in decoration of some of the more intimate types. There are no colors which are particularly suitable, therefore any may be used, subject only to the restraints and limitations imposed by good taste and careful judgment.

A Low, Vaulted Refectory of a Florentine Palace, Typical of Minor Apartments in Large Italian Villas
This form of interior permits of effective frescoes

Scale. Because rooms of this character are of larger area and greater height than rooms of most other architectural types used for like purposes in American houses, a much bolder and more vigorous scale must be adopted. Ordinarily architects and decorators fear to use a scale sufficiently robust and the result is apt to be over-refined to the point of weakness. It would perhaps be better, if an error must be made, to err in the opposite direction by establishing a scale over-robust. There is nothing more important in architecture of this type than the use of suitable scale.

Vigorous Mouldings. Closely allied to scale, in architecture of this character, is the question of strong, vigorous mouldings, highly necessary to interiors where walls are so often of plain, rough troweled plaster. One function of a moulding is to cast a shadow; another function is to relieve the eye wearied by too great expanses of wall, and these offices are fulfilled only when mouldings are crisp, bold and virile. Such mouldings may be seen in some of these illustrations and details of a few will be given in later articles of this series.

As an aid to adapting architecture of the early renaissance to modern living there are now being made excellent reproductions of Italian furniture. Certain modern craftsmen are faithfully reproducing original pieces with much of the finish which makes them valuable, not with the idea of deception by reproducing patina and even worm holes, but in the hope of placing within reach of the many what are now, or else long have been, the prized possessions of a few great museums or of a few princely Italian families. The American furniture workers who are making possible the use in modern homes of furniture which possesses the symmetry and grace of that produced in Italy during the fifteenth and sixteenth centuries, are not the only craftsmen who have caught something of the inspiration which produced the original work. Makers of fabrics, wrought iron, tiles, pottery of many kinds, stained glass and workers in all the arts which had a part in creating the Italian villa or palazzo, are producing work which rivals in excellence the work of the older craftsmen, and since in a sense all of these arts are the servitors of architecture, it is its part to choose and employ, to select and to use, the work of them all. Such accessories of architecture will receive due attention in these articles, the hope being that there may result some definite help to architects who may be working in the Italian styles.

Dining Room in the House of J. Theus Munds, Esq., New York. James E. Casale, Architect
This lower story room with glassed-over cortile beyond suggests the usual Italian treatment

The Execution of Furniture and Decoration Commissions

ABOUT one year ago a limited survey was made by THE ARCHITECTURAL FORUM to determine the interest of architects in the question of furniture and decoration. As a result of the interest manifested at that time the Decoration and Furniture Department of THE FORUM was instituted at the beginning of this year. Incidentally, a more complete analysis has been made and it is now possible to give facts and figures regarding the handling of furniture and decoration commissions in architects' offices.

Information received from approximately 1,000 offices in various sections of the country indicates use of four methods of carrying out interior decoration commissions under the supervision of the architect. These include:

1. The recommendation and employment of a high class firm of interior decorators to carry out the entire project in co-operation with the architect.
2. The employment of an interior decorator who acts in the capacity of a professional buyer.
3. Direct purchasing of all furniture, fabrics and objects of art by the architect himself.
4. Purchasing by the client, in consultation with the architect.

Our analysis shows that approximately 70% of the large volume of furniture and decoration controlled by architects is carried out through methods 1 and 2 as outlined here. In dealing with high class decorators, who to a great extent maintain their own show rooms, the procedure calls for conferences between the architect and the decorator and the presentation of sketch suggestions by the decorator in accordance with general requirements provided by the architect. Accompanying these sketches and suggestions are price keys which indicate the total cost. The general requirements of the architect are of course based on consultation with the owner, and the final sketches are submitted to the owner for his approval. The architect then obtains orders for the decorator to proceed with the work and supervises the carrying out of the contract in a manner somewhat similar to his supervision of the actual building construction.

In operating under method 2 the general layout of the rooms, together with any necessary interior sketches, is prepared by the architect and submitted for the approval of the owner. The architect then employs a professional purchaser who brings to his office all necessary samples of fabrics, wall paper and other decorative materials. When this display is properly arranged the client is called in for final decision. From many offices we have reports that this method of executing an interior decorator's commission is highly satisfactory. The interior decorator usually profits by the discounts allowed, while the architect is paid a direct commission for design and supervision in a manner similar to that covering the actual building operations. Approximately 20% of this work is carried out completely by the architect, including the purchasing.

Another interesting method which we have found is used to a limited extent, and which might well be encouraged, is that in which the owner (or else the owner's wife) assumes the part of the professional purchaser and submits for the opinion of the architect samples of fabrics and types of furniture which have been selected.

Almost without exception we find the architect's opinion favorable toward controlling choice of furniture and decorations, and it is evident that many architects who have never before given serious consideration to this phase of architectural practice are now recognizing the possibility of controlling the finishing touches to the buildings which they have designed. Not long ago, in order to determine the trend of thought on this subject, we selected at random 20 houses, already built, ranging in cost from $60,000 to $100,000. We approached the architects who had designed these houses and asked them if it would be possible to get photographs of the living rooms. 17 of the 20 were unwilling to have photographs published because the effect of the interior architectural designs had been almost ruined by indifferent decorations and furniture. In one of the remaining three cases the decorations of the living room had been carried out under the supervision of the architect and were entirely satisfactory; in the second, the interior decorations had been done in a very attractive manner by a firm of interior decorators who were not employed through the architect but kept their work in harmony with his design, while in the third instance the furniture and decorations had been controlled by the owner who happened to be a man of excellent taste and understanding.

Inquiring further regarding the 17 examples of architects' interior designs ruined by unwise decorations and furnishings, we found that in 15 instances the architects had not even suggested to their clients the idea of their supervising decorations and furniture and that in two cases the work had been done wholly by professional decorators who evidently did not know their business. In almost every instance we found that the policy of the architects, who in previous years gave no consideration to the handling of the interior decorations, had changed with a realization of the importance of controlling this feature of architectural design.

We have been surprised by the number of letters from architects which report that invariably the furniture and decoration problems of large buildings are placed under their supervision, often as a part of their original contracts. There are still many unsettled business problems affecting this activity, including not only methods of charging the owner for service rendered but the relations between the architect and the wholesale trade. Various points involved in this connection will be discussed in succeeding issues of THE ARCHITECTURAL FORUM.

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New York's New Architecture

THE EFFECT OF THE ZONING LAW ON HIGH BUILDINGS

By AYMAR EMBURY II

"THE law was framed to stabilize and conserve property values, to relieve the rapidly increasing congestion in the streets and on the transit lines, to provide greater safety in buildings and in the streets, and in general to make the business of the city more efficient and the life of the city more healthful and agreeable."

Thus writes George B. Ford, the Consultant of the Commission which framed the law. Nero doubtless wrote to much the same effect, after he had burned down some of Rome, for he found that the narrow streets of the old city were so jammed with the tenants of the six- or seven-story tenement houses that a considerable portion of the population of Rome was burned up; since many of these people were useful to him and since it was practically impossible for him to enjoy the spectacle of their death, he made and published a law which was not at all dissimilar from our "modern and novel" idea, prohibiting the construction of buildings of over stipulated heights in streets of given widths, and assigning definite areas to certain trades.

I have not happened to find what the people of Rome thought about their zoning law, and I do not suppose that what they thought mattered very much; but, amazing though it may seem, our law seems to be in a fair way to accomplishing its purposes, while the fears openly expressed by the Commission, that the law would work real hardship on some owners of real property, have fortunately been negligible—nor has the law interfered greatly with people who desired to alter or rebuild existing structures, mainly because the "use" districts were made as nearly as possible co-extensive with the sections of the city which had grown naturally into specialized districts of one sort or another. So this law, which was received very doubtfully, and considered as a radical experiment, has shown itself to be conservative in its action, and has awakened practically no active opposition. To the benefits anticipated by the framers of the law have been added others of considerable interest and importance to the architectural profession, which were certainly not obvious on the face of things. One cannot help suspecting that the architects on the committee must have perceived at least their possibility, although as these were æsthetic rather than practical, one can imagine that they were not particularly urged as reasons for the passage of the law since any purely æsthetic reason is received with suspicion and doubtfully regarded as a detriment by our sound business men. The first, and thus far the most obvious, result has been to increase greatly the possibilities of interesting treatment in the upper stories of high buildings; the second, which is as yet a tendency rather than an accomplishment, is to produce a certain unity in our street facades through the limitation of heights, and it is of these two factors that I wish chiefly to write.

The aspect of any city depends upon several unrelated factors, each of which may redeem what would otherwise be a very ugly place. Paris, for example, is generally cited as being a beautiful city, and in speaking of it, architects are apt to attribute its pleasing appearance to the uniformity of the cornice heights throughout the city and to the similarity in the design of the greater part of its buildings. My own opinion is that its beauty is largely due to the great number of trees which diversify its streets, and that Paris without the trees would be a dull, monotonous city, not so stupid as New York in the brownstone period, but not so much better, either. On the other hand, in New York we have to get along without any trees at all, so that our irregular street facades, with buildings of all conceivable sizes, utterly unlike in use, material, color, scale and precedent, are revealed in their raw disregard of one another's rights to artistic consideration. Trees would help the appearance of New York more than any zoning law, for these unfortunate discrepancies would be masked to some extent, but if our city is to be beautiful, we will have to depend on the buildings themselves.

Now the appearance of any city, or of any street of a city, is dependent upon the appearance of the average of all the buildings which face it; an ugly street cannot be made beautiful by one or two beautiful buildings, nor destroyed by one or two architecturally ugly structures, although the influence on a neutral street of one or two examples of extreme excellence, or the reverse, is surprisingly potent for good or ill. Furthermore, it is true that entire uniformity, even of excellence, is not particularly inspiring, and is perhaps even less attractive than the unrelated conglomeration of buildings that forms our usual street facade in New York. The thing to be sought is rather variety within quite definite limits, and it is precisely this that the zoning law, plus the natural working of economic factors, is bringing about in New York.

The zoning law operates in two ways to bring this about: first in its definition of "use" districts, the segregation of manufacturing plants from retail dealers, and of both from the residence districts; and in the limitation of heights in various parts of the city and on various streets. The limitation of uses tends to uniformity, because each class of activity requires buildings of generally similar characteristics; but the natural desire for individuality keeps these buildings from being standardized to monotony; likewise the limitation on heights tends to establish a definite cornice line on any street within the limits of a height district, although it does not tend to establish uniform cornice heights within an entire district, since the height requirement is dependent upon the street width and not upon any arbitrary figure. Perhaps it should be explained that the law divides the city into districts, in each of which the allowable height of the street facade has a definite relation to the width of the street, this varying from street width to 2½ times the width of the street, so considerable variety of height is possible.

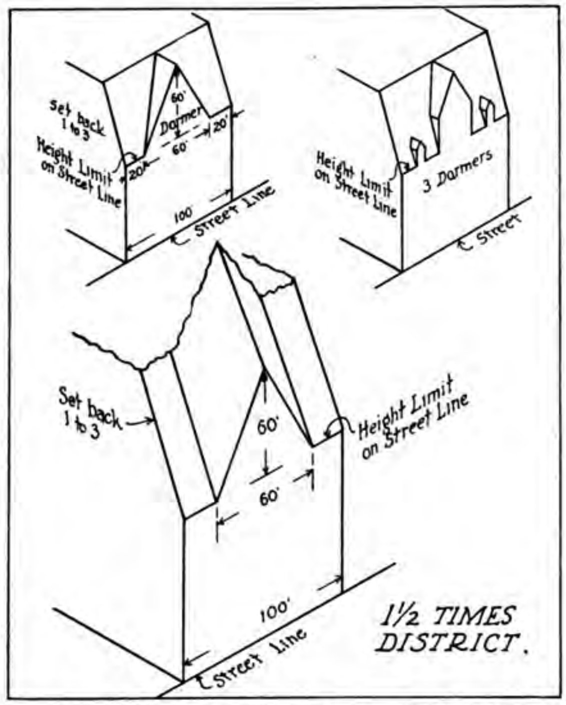


Diagram Showing Provisions for Dormers, New York Law

View of Heckscher Building, Looking North on Fifth Avenue
Warren & Wetmore, Architects

But the most interesting (to the architect) of all provisions of the zoning law is the peculiar and most effective manner in which heights are limited. The limit is not on the total height of the building but on the vertical height at the building line. Above that height, buildings may be extended providing that portions above the limiting height do not extend beyond a diagonal line drawn through the center of the street and the limiting height at the street line. Dormers of considerable extent are permitted, and other provisions of less, although very real, importance affect the height on the rears of lots, on courts, side streets, etc.

Roughly speaking, the law provides that above the height limit all structures must be contained within a cone of about 75° slope, so that a very large building may have considerable space above the height limit, while the small building has practically none. Here is

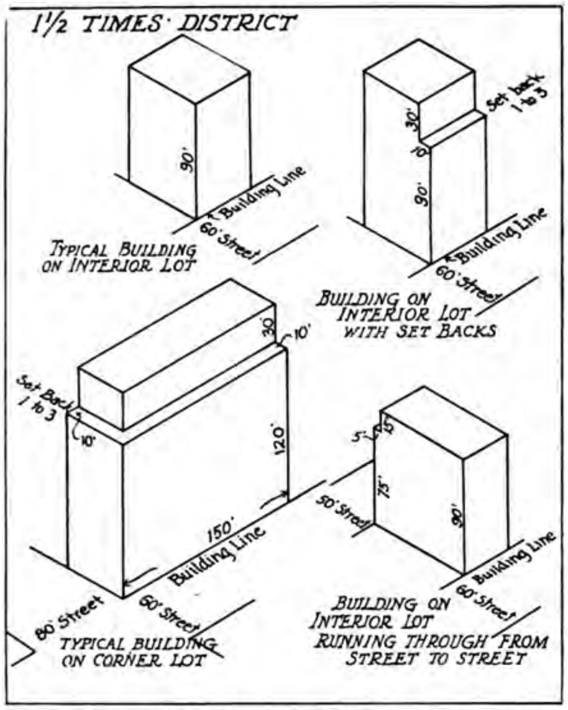


Diagram of Height Limits in 1½ Times Districts

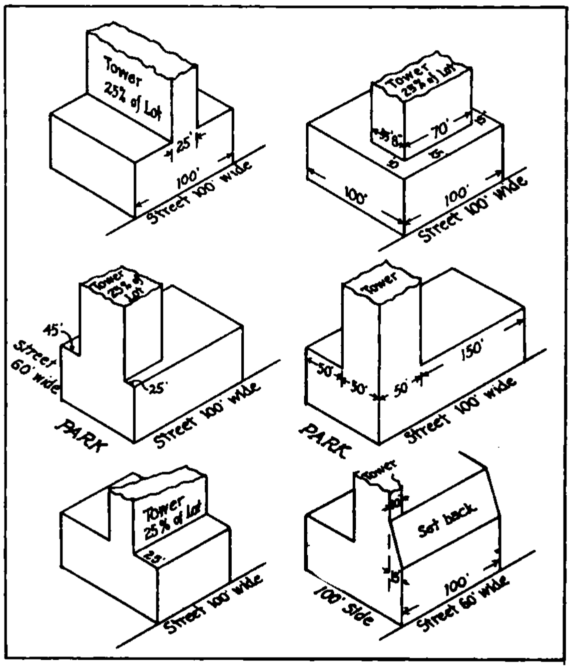
where the principal new architectural problem is found, a twofold problem in that very great skill in plan is needed to make it economically desirable to build small structures at great heights, with the necessary elevator service, and that once more our designers of New York buildings have an opportunity of designing in three dimensions instead of two—to design buildings and not facades.

From the economic point of view the problem is genuinely difficult; in the first place, it is obvious that the more floor space one is able to obtain, the more elevators are needed; floor space can be increased by adding stories, but additional elevators need area and decrease the available square feet of rentable space. It is also true that a given area on an upper floor requires more elevator capacity than the same area on a lower story, because of the time required to get to and from any considerable height; so that if we utilize our cone above the height limits to its fullest capacity, the upper story or two would contain nothing whatever but the elevator shafts.

Very few architects can or will design a structure with no reference to its appearance, so that the design of the stories above the height limit is generally a compromise between the silhouette which the architect wants and what seems economically best. The actual volume permitted by the law could be enclosed within slanting roofs were the maximum of space the sole consideration, but the multitude of small, superposed dormers required for lighting such space would be neither architecturally nor practically satisfactory. It would also be quite possible to step back each floor so that it comes within the limiting line, but this would be extremely difficult to manage in a satisfactory architectural manner, and the practical difficulties in such construction would make the cost incommensurate with the available office space obtained; the spacing of the main columns in the lower stories would have to be arranged primarily with regard to the loads at the top of the building and not for economical steel construction or convenient room arrangement on the principal floors, a thing manifestly impracticable. Thus far the buildings have been treated in a series of irregular steps, varying in height from one to five or six stories with the horizontal step-back generally equal to the column spacing.

It can be seen that on a square or symmetrical lot, or on a lot which is not excessively irregular, an exceedingly interesting terminal motive is possible; the problem offers a far wider range of treatments than did the facade on one or two streets, which used to be our problem, and the value to our skyline will be incalculable if for no other reason than because our buildings will be finished on all

View of Heckscher Building from East 57th Street
Warren & Wetmore, Architects



Principles Governing Design of Towers, from New York Zoning Law

sides, and not left with raw and naked sides and backs. Unfortunately, symmetrical lots are not always possible, and in such cases the architects are up against a problem not entirely dissimilar to the old problem of facade, since they are compelled to choose one facade, or rather one point of view, from which the building is most commonly seen, and to develop that appropriately, letting the back or the back and one side take care of itself. Carrere and Hastings and Shreve, Lamb and Blake had exactly such a problem in the Fisk Building, and very properly considered the northern side of the building, which can be seen from many parts of Central Park, and from Eighth avenue, Columbus circle, and Broadway nearly in full elevation, as of great importance and demanding a symmetrical treatment; while the south side of the building, which can be seen only at acute angles, and from certain rather restricted viewpoints, was comparatively disregarded. Even the satisfactory northern facade was possible only after a special ruling on the part of the authorities, for the design as finally executed technically violated the law, although practically it shut off less light and air from the surrounding properties than would a building which adhered literally to the restrictions of the Code. This was due to the boundary streets having different widths which would have imposed two cornice heights and created an unsymmetrical mass. The Commission accepted a solution in which the heights were averaged. Fortunately, the law permits deviations from its literal reading where such variations are manifestly for the public good, and the board is willing to consider these in a broadly intelligent manner; however the path to the board is purposely made difficult, so that it can be reached only if the object to be attained is of real importance.

The other building designed by Carrere and Hastings and Shreve, Lamb and Blake and illustrated in connection with this article, the Liggett Building on the corner of 42d street and Madison avenue, is situated on a piece of property of somewhat irregular shape, but of which a sufficient part is nearly enough symmetrical so that the portion of the building above the height limit can be treated as a symmetrical, tower-like structure. The height limit of this building occurred at the 16th floor, where the principal cornice of the building is placed, and the small tower-like corner extensions of the 16th story are made possible by the provision regarding dormers. The sloping limits of the cone enclosing the part above the height limits are tangent, or nearly so, to the cornice of the 16th floor and of the 22d floor. Above the 22d floor another step-back would have been necessary, but the architects evidently felt that the available office space, which would remain after the stairs, elevators, toilets, etc., had been deducted, would not repay the owners for further construction in height. It may be argued that only a portion of the battery of elevators need necessarily go higher, thus saving a certain amount of space; but the practical difficulties of operating only a few elevators to certain stories, and these for a comparatively small number of tenants, made further extension not worth considering.

The Heckscher Building is the latest of the New York structures to be completed under the provisions of the new Code, and, like the Fisk Building, was designed to be considered especially from the north, where it faces Central Park and is a very prominent object in the city skyline for several miles. The property on which this structure is built is of sufficient size so that the building could be agreeably designed from the sides as well as from the front, and the principle on which the building is stepped back is readily to be seen from the illustrations. In this case the cone enclosing the part of the building above the height limits is in part actually constructed as a roof of the tower, and the silhouette of the building is perhaps as attractive as that of any in the city with the exception of the Woolworth Tower.

The Ambassador Hotel is the only tall building constructed under the Code, other than an office or loft building, which occurs to me and since this hotel is on a lot which is in the main square but with the northerly Park avenue corner extremely narrow, the treatment of the upper stories in plan must have been much more difficult than would appear from the completed structure. Here only a comparatively small extension above the height limit was made, perhaps because the hotel was large enough for economical operation without additional rooms, or more probably because the more or less complicated plan of the modern hotel made it impracticable to raise the structure very much and still give proper rooms. It can readily be seen that an office building offers a much easier problem in this connection than a hotel or an apartment house, since in very large offices a considerable amount of artificially lighted space can be used without inconvenience for storage, for foyer halls, or other purposes of that kind, so that the total thickness of the mass of the building may easily be 60 to 80 feet, while in hotels or apartment houses, where all rooms must have outside light, the thickness of any wing will be determined by the width of two rooms plus the necessary corridor and elevator space, etc. This will amount, as a rule, to not over 44 feet, and it is impossible to get a step-back of more than one or two stories which will comply with the law and which will leave space for rooms.

Fisk Building from 58th Street

The architectural treatment of the tall building has never had the final word said about it. The Woolworth Building, perhaps the finest example of tall building in America, is, as far as its exterior treatment goes, more expensive than is commercially practicable for the average building; nor is this expense entirely unnecessary to the result, since the great difficulty of architectural composition in the tall building is that the window openings themselves are extremely small as compared with the mass of the building and the frequent duplication of small openings with narrow piers between, on a mass of great bulk, is extremely difficult to handle in any of the traditional styles excepting Gothic, and that is obviously the most expensive style in which to work. In the classic styles the proportion of openings must bear some definite relation to the size of the order employed, and the architects of tall buildings have endeavored to solve the problem in several ways; of which none has been completely satisfactory. The superposition of orders, as in the case of the St. Paul Building and the American Telephone & Telegraph Building, is completely unsatisfactory, even when the orders themselves are as beautifully proportioned as those of the latter building. A more common attempt at solution has been to endeavor to include within a single order several stories of windows, with large masonry openings, the floors and partitions between rooms being cared for by metal mullions and transoms within the masonry openings. The most successful of all buildings of this type is probably McKim, Mead & White's alteration to the old New York Customs House, but even this building, although not very tall, cannot be said to be completely satisfactory. The most common treatment of our later buildings has been to indicate the classic character of the building by orders applied at the base and less often at the crown with a plain shaft pierced with undecorated

Upper Stories of Younison Building, West 35th Street, New York
Geo. & Edw. Blum, Architects

windows. This is in a way begging the question, because the order is used purely as an ornamental appendage, although its use as an ornamental motive is perfectly defensible. When this use of the order was comparatively new, it was objected to on the grounds that the steel framework of the structure was insufficiently expressed. Now that we have been accustomed to this, and from seeing examples of steel construction in constant progress before our eyes we have learned what the skeletons of our tall buildings are, we have become used to the conventional form of covering these structures and it no longer seems unreasonable.

Now whether the conventional facade is really the best that could have been obtained is no longer of such great importance, since we are again compelled to design in three dimensions; but I am by no means sure that the few buildings which have been built under the new zoning law are steps in the right direction toward a proper solution of the problem, although certain features are unquestionably right. These new buildings seem for the most part to be adaptations from the facade designs of tall buildings. In other words, the upper order has been wrapped around the four sides of the structure, not supporting the cornice on the street facade, but stepped back on a sort of platform; and we are having a series of buildings set one upon another, rather than single buildings decreasing in size as they mount. Whether this solution is the only one practicable because of the expense of any other form of design, I am not prepared to say, although it seems very likely; but so far none of our tall buildings exhibits quite the continuous growth from base to summit that an architect would like to see. The nearest, perhaps, to this ideal is the Cunard Building,* but I am informed that the zoning law had little effect upon its design. Of the other new buildings, the Heckscher Building most nearly approximates the ideal—at least there is unity of design apparent from the base to the summit; the scale appears from the street level to be unchanged throughout its height, and the silhouette is excellent. The problem was however much less difficult than in the case of either the Fisk or the Liggett Building, and the necessity for the extreme of commercial economy of space was not apparently necessary.

One of the happy by-products of current design is the elimination of wide overhanging cornices; a reminiscence of the time when every building was supposed to be crowned by a cornice which bore a very direct relation to the height of the facade. With the increase in height of our office buildings the size of the cornice was increased so tremendously that its cost overbalanced its questionable artistic value. I think we can safely say that the wide projecting cornice has been done away with for good and I, for one, am glad to see it go. Its usefulness had been long outlived.

Upper Stories of Aronson Building, West 36th Street, New York
Schwartz & Gross, Architects

Another difficulty in the design of our tall buildings is the overwhelming amount of glass required for show windows on the lower stories, and these have been in no way affected by the zoning law. Its principal benefits have been the standardization of the heights of buildings, thus eliminating the bare, unfinished sides which have so long been eyesores in New York and have made our buildings look like stage scenery, and the enhancement of the silhouette above the cornice line. The experiments thus far made, great as they are in expense, have been comparatively few in number; but the skill of our architects has so increased in the past 20 years that these more or less tentative efforts have a certainty and a rightness of design that earlier architectural experiments in new fields were not able to show.

The accompanying illustrations have been selected to give a representative idea of the work thus far completed under the zoning law restrictions. They are restricted to office and loft buildings, of necessity since construction of other types of building has been very limited; they illustrate a variety of methods of design, however, and provide a good basis for work in the future.

*The Forum, July, 1921.

Making the New York Zoning Ordinance Better

A PROGRAM OF IMPROVEMENT*

By HERBERT S. SWAN
Executive Secretary, Zoning Committee, New York

THE 25th of July this year marked the fifth anniversary of the beginning of zoning in New York. Five years is not such a very long time, yet it is sufficiently long to permit the merits and demerits of a legislative measure to evidence themselves. An appraisal of the actual effects of the law, at this time, may prove of value not only in strengthening and improving its provisions but in cautioning other communities, which have not yet adopted zoning, what to avoid if they are to derive the maximum benefit from the operation of a zoning ordinance. The object of this paper will be, therefore, to point out steps which will tend to facilitate the administration of the law, to simplify its provisions so that they may be more readily understood by the architects, builders, real estate men and owners who must daily apply its regulations to concrete cases, and to suggest measures for remedying some of the defects and weaknesses which experience has shown the law to possess.

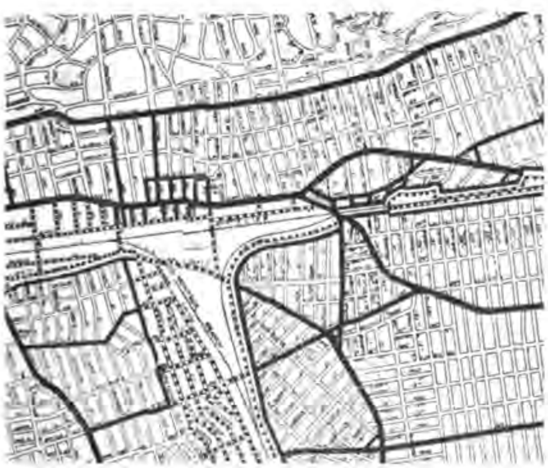
The numerous benefits conferred by the law will not be recounted here. Although our discussion will frankly be a critical inquiry into the shortcomings of the law, we do not wish our position misunderstood, for zoning has proved and is proving of incalculable benefit to the city. That it has positively demonstrated its worth in stabilizing and enhancing property values, and that it is directing the growth of the city along constructive and intelligent lines are matters of such common knowledge that it is superfluous to dwell upon them. Everybody agrees that zoning has justified itself in practice—even the skeptics, who doubted the expediency of adopting it.

THE COMPLEXITY OF THE ORDINANCE. A criticism repeatedly lodged against the zoning ordinance is that, viewed simply as a piece of bill drafting, completely ignoring the wisdom or unwisdom of its substance, the ordinance is so involved and complicated in its form and method of statement as to render its meaning obscure and sometimes unintelligible. This comment may probably not be altogether unwarranted for it is not an infrequent occurrence to find people who differ fundamentally in their interpretation of the ordinance, and upon occasions to find some persons interpreting the ordinance in radically different ways at different times.

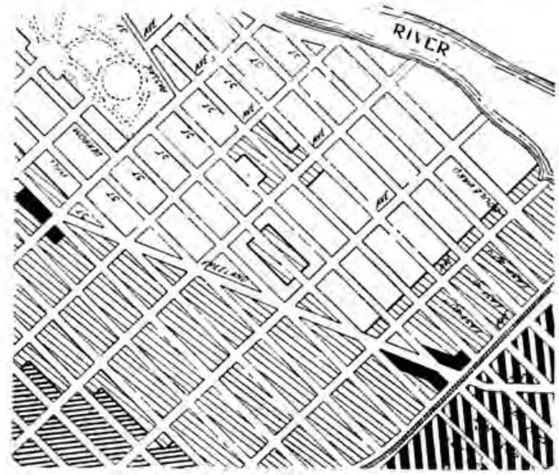
It is quite true that this uncertainty in interpreting the law has resulted in untold enbarrassment to both administrative officials and the public. Officials have wished to enforce the law, but not being clear as to its provisions, have hesitated and done nothing; owners have wished to obey the law but, failing to understand it, have ignored it. It is not true that the zoning law is not enforced in New York; the zoning law, being what it is, is probably enforced as well as can reasonably be expected—the point is that, were the law more definite and precise, it could be administered far more effectively, easily and satisfactorily than is done at present.

Take the rules governing the application of the map designations as an illustration. The different zones in New York are not laid out and bounded upon a map; instead, different symbols are used to designate the streets, each street or part of a

*The opinions expressed in this paper are the writer's own personal views



Part of the Borough of Queens Use Map. There are three zoning maps in New York, the height, use and area maps, each independent of the other, with overlapping zones and different map designations.



Part of the Paterson, N. J., Zone Map. The height, use, area, building line and family per acre limitations are all combined in one set of regulations. Zones are shown within block lines instead of street lines as in New York.

A Suggestion for Simplifying the New York Zoning Map street constituting a zone or part of a zone, according to the sphere of influence exercised by the symbol or symbols used in the adjacent street. The complexity of these rules may be suggested by mentioning the fact that in the zoning commission's report, the ordinance itself, containing all the regulations, occupies but 13 pages while the 26 rules relating to the map designations and the 38 illustrations demonstrating their application, occupy 10 pages. Without these rules and the illustrations accompanying them, nobody could possibly define the areas situated in different zones, and even with them, some people experience the greatest difficulty.

The simplicity and directness of method used in constructing a zoning map proves of inestimable help in enforcing an ordinance. The method used to designate the different zones should certainly be simplified at the first opportunity. Symbols in the streets with spheres of influence should be entirely abandoned and in their place designations applying to the land itself substituted. When so much of each block as may be within a different zone is shaded or cross-hatched in a different manner, every property owner will know exactly how his property is zoned. In Newark, for instance, rules defining the extent of the different zones occupy exactly eight lines of type. Their brevity and clarity not only enable everybody to understand and remember them, but to determine instantly in what zone any parcel is located.

The New York ordinance contains three separate and distinct sets of maps,—one for each of three sets of zones, one for the use regulations, and one for the area regulations. When it is recalled that each of these maps outlines from three to five different kinds of zones, not co-terminous with one another, the complexity of the regulations becomes apparent. Theoretically susceptible of 75 separate and distinct combinations, the regulations are actually applied to the ground in such a manner as to form 36 kinds or classes of zones.

The Advantage of a Single Zoning Map. If the height, use and area provisions could be combined into a single set of regulations and the zones shown upon a single map as has been done in some of the more recent ordinances, as in Montclair, for instance, the administration of the law would be very appreciably simplified. Instead of having to examine three different maps to ascertain how the zoning regulations affect his plot, the property owner would have to examine but one.

Desirability of Establishing a Fourth Use Zone. The ordinance establishes three classes of use zones. The residence zones exclude all kinds of business and industry; the business zones all kinds of large manufacturing establishments occupying buildings more than one story high, and nuisances. Nuisances, unfortunately, are not excluded from the industrial zones. The effect of this provision is to afford insufficient protection to manufacturing. If a factory requires more than 25 per cent of the floor area in a building, or a floor area in excess of the lot area, whichever is the greater, it is forced into the unrestricted zones containing all kinds of nuisances.

To put manufacturing establishments and nuisance uses into the same classification has produced many unhappy compromises, as every unrestricted zone was the result, more or less, of a balance struck, on the one hand, between the just claims of the district for factory development and, on the other hand, the protection demanded by neighboring residence and business zones against nuisances. In some instances, nuisances were allowed where they would do great harm for no better reason than that the locality was naturally a manufacturing district; in other cases, factories were prohibited on the ground not that *their* admission was undesirable, but because the nuisances that might slip into the district with them would prove a serious menace to adjoining business or residence zones. Four classes of zones — residence, business, manufacturing and nuisance — should be established at the first opportunity to correct this defect in the ordinance.

Factories in Business Zones. At the same time that a fourth zone is established to protect light from heavy industry, it would seem desirable to modify the rule governing manufacturing in the business zone. At the present time, a one-story factory may locate anywhere it chooses in the business zone. The admission of such factories to business zones deprives business of much needed protection. It also acts as a standing threat to the security of such residence zones as may adjoin the business zones.

The provision permitting 25 per cent of the floor area in a building to be used for manufacturing, where such an area exceeds the lot area, was included in the ordinance to permit such manufacturing in business zones as may prove necessary as an incident to the conduct of a retail business. As a general proposition this proportion of the floor area has proved ample for the manufacturing needs of retailers, though there are cases on record where it has worked distinct hardship to businesses admittedly desirable in business zones. The fault to be found with the provision is not so much on the ground that it unnecessarily cramps milliners, modistes, custom tailors, etc. in the space they may occupy for their workrooms, as that it permits out-and-out manufacturing in business zones, whether or not it is an incident to a retail business. Then, too, the provision is all but impossible to enforce. A reasonable rule to follow would seem to be one which permitted as much or as little space to be used for manufacturing purposes as might prove essential to the conduct of the retail business to which the manufacturing should be an incident.

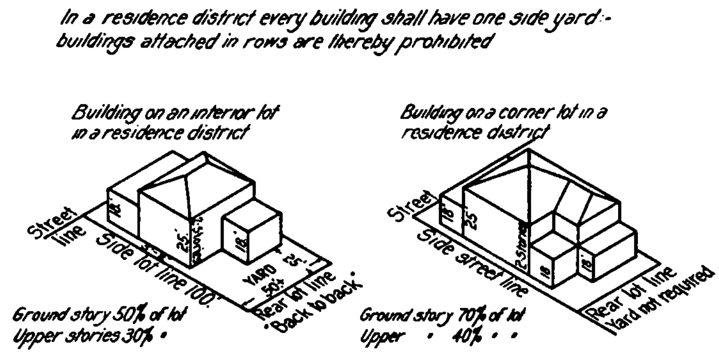
The "E" Area Zones. Much has been written and said about the "E" area zones. Some people frequently refer to them as the "30 per cent zones," although this is a misnomer, for instead of being limited to 30 per cent of the ground area, buildings may, in the case of interior lots, cover 50 per cent of the ground and in the case of corner lots, 70 per cent of the ground. At a height of 18 feet above the curb, these percentages are respectively reduced to 30 and 40 per cent of the ground.

It was hoped that the large amount of open space required around buildings in the "E" zones would exclude apartments. In the main, this hope has been realized since but one apartment has been built since the adoption of the ordinance in an "E" zone. The fact that one apartment has been built is, however, portentous for the future. Certainly it would seem wise to devise more effective means of excluding the apartment from private house zones than a zoning restriction which affords the possibility of erecting buildings covering 30 per cent of the lot up to a height of once the street width, and covering 25 per cent of the lot to any height above once the street width as the builders might choose. There is no means of knowing when a private house area, even though situated in an "E" zone, may be transformed into a district of towering apartments.

Different means may be resorted to in guaranteeing a more assured and stable future to private homes. A lower height limit, if a flat one, would in itself go a long way in this direction. The highest class residence suburbs in the vicinity of New York, such as Glen Ridge and White Plains, for example, prevent buildings in their best zones from having a greater height than 35 feet. This excludes buildings more than 2½ stories high. In addition to this, these suburbs limit the number of families to the acre, eight, nine or ten families to the acre being a very common restriction in the most highly protected zones. This provision, of course, makes the large apartment impossible. Surely private houses should be afforded as much protection within the city as neighboring suburbs under the same conditions accord them. In this matter, then, it may prove advisable to review not only the percentage of the ground area which a building may occupy, but also the provision requiring but one side yard. Many communities in the vicinity of New York, having a development no better than that found in various sections of the several boroughs, demand two side yards and limit buildings at the ground to 25 or 30 per cent of the lot areas.

Building Lines. A subject that should also receive immediate attention in these districts is that of establishing building lines. At the present time, buildings may be built out to the sidewalks even in the most protected zones. New York may well profit by the example set by Paterson, where no building in the residence districts may project beyond the average setback line at present observed by the buildings on the same side of the street within the block. Where there are buildings now on only one side of the street within the block, then the setback line on the vacant side must be the same as the average setback line on the improved side. Where there are no buildings on either side of the street, a uniform setback line suited to the requirements of the type of building anticipated in the district is established on both sides of the street.

Families per Acre. The great outstanding bane of New York life is the congestion of population.



Typical Examples of Building in Area "E" Districts (Residential) in New York

Bad as it is, one would scarcely believe that it could become worse, and yet this is the appalling fact. A density that was deemed "bad" a few decades ago is thought "good" today; what was intolerable then is now rapidly becoming the average. The worst conditions affecting land overcrowding in 1921 would have been thought beyond belief a generation ago and still the process keeps right on, scores being jammed into the same space formerly occupied by tens, the houses built bigger and taller, the rooms both narrower and shorter, and the apartments containing fewer and fewer rooms. This evil the zoning ordinance leaves untouched. Tenements may be built substantially the same as before the enactment of the law.

Other cities, commencing with Newark in 1919, have decided that such congestion should not be allowed within their borders and that there is a limit to the number of families that can live on a unit of ground beyond which they cannot be housed decently, and that this limit shall not be transgressed. If the number of families to the acre is limited *now*, large areas in the Bronx, the greater portion of Brooklyn, practically the whole of Queens and all of Richmond can still be saved to civilized standards of living. Let the opportunity of doing something pass now and it will only be a question of time, provided the population of the city continues to increase, until east side conditions will extend to every part of the greater city.

Dwellings in Industrial Zones. The "A" area zones in New York are practically unrestricted zones. No open spaces of any description are demanded—buildings may occupy the entire lots. In these zones the only requirement governing the erection of buildings is that any court or yard provided as the sole means of lighting or ventilating rooms shall not be less than one inch in width for each foot of building height.

The "A" zones embrace, as a rule, all the localities set aside for industrial purposes. Now, it is perfectly proper not to exact as much open space from industrial structures as from residential buildings, but the regulations governing the "A" zones affect the two classes of buildings in identically the same manner. In other words, the "A" zones have unwittingly been made asylums for all classes of residential buildings which may feel themselves unduly oppressed by the area requirements exacted in the B, C, D and E zones. Residential buildings should positively not be allowed in industrial zones unless they conform to as high standards in the way of courts and yards and other open spaces as are required in the least restricted residence zone. To demand lower standards for dwellings in the industrial zones than in the residence zones can in the long run only result in creating the very kind of a situation zoning is designed to remedy.

Rear Yards. The New York ordinance requires rear yards only in the cases of such interior lots as are back to back with other interior lots. Interior lots backing upon corner lots need not provide rear yards, nor interior lots the rears of which happen to be within 55 feet of any street. Corner lots, no matter how large or how situated, as well as through lots, are also exempt from the rear yard requirement. With the exemptions the law allows, it is possible to build up entire blocks without providing a single rear yard. In many instances where the law does demand a rear yard, the requirement may be such an isolated instance as not to serve any real purpose.

In residence sections it would seem eminently fair to exact a rear yard in the case of every lot, other than a through lot having a certain depth, whether the lot is an interior lot or a corner lot, a lot back to back with another lot or a lot back to side with an adjoining lot. In business and industrial districts, situated as these are in New York, the provision requiring a rear yard could very well be eliminated entirely. To insist on a rear yard in the case of every interior lot would seriously hamper the erection of efficient business buildings. With blocks only 200 feet wide it is, of course, absolutely necessary to permit buildings to run through the block from street to street as it would be impracticable to limit the depth of large stores, theaters and office buildings to 100 feet. When this concession is made to through buildings, there is little object in requiring all buildings that do not run through the block to be equipped with rear yards. Rear yards, provided on isolated lots scattered here and there through the block between through buildings or corner buildings, do not help the ventilation in the block any more than inner courts.

A deep building, however, with three dead walls, obtaining all its light and air from but one side, is a bad structure. Daylight and ventilation, other than that coming through the front windows, must be provided to obtain a satisfactory building. But this result can be accomplished by limiting the maximum per cent of lot area that the building may occupy and leaving the choice of the open space used, whether it be an inner court, an outer court, a side yard or a rear yard, to the builder.

Operation of the Height Regulations. It is quite natural that the provision in the New York ordinance to attract the most widespread popular attention should be that regulating the height of buildings. As the time since the adoption of the ordinance lengthens, and the number of skyscrapers erected under the law multiplies, the more conspicuous is the effect of this provision. Each new high building, because its facade must be set back in steps, terraces or mansards with each unit of increased height, tends only to enhance the public's interest in the height regulations of the ordinance.

Though the effect of the height

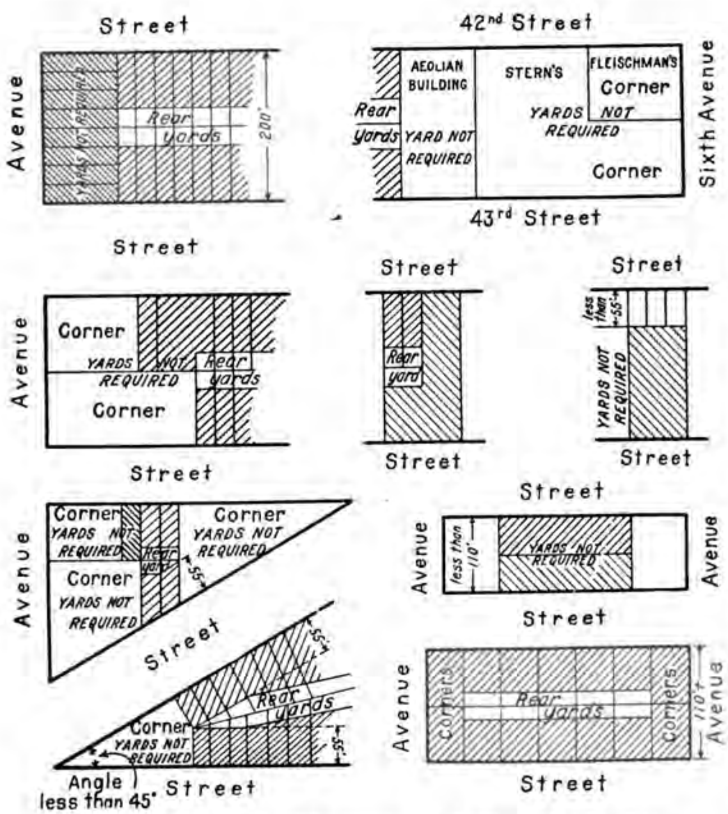


Diagram Showing Rear Yard Requirements under Various Site Conditions (New York Law) regulations may be the most outstanding result of the New York ordinance to the casual eye, especially to the occasional visitor who seldom gets out of the Times square district, this is in reality far from the truth. The height regulations benefit but part of a single borough; the use regulations benefit all the boroughs. Below 59th street, in Manhattan, the height regulations are certainly leaving their stamp upon the city's architecture; the front of nearly every new building erected in this section of the city recedes from the street line at a height varying between 120 and 250 feet above the curb. Outside of the section below 59th street in Manhattan, the effect of the height regulations, however, is not nearly so conspicuous; in fact, it is a rare building that is affected by them at all, for the reason that the height of buildings allowed up to the setback plane is higher than the average person cares to build.

The height regulations in New York cannot be described accurately as height limits for they do not limit the height of buildings; they merely regulate the manner of erecting high buildings. In no part of the city is an absolute height limit imposed upon buildings—a limit beyond which no building may be erected higher. On the contrary, buildings of unlimited height are permitted in all parts of the city. The basis for the regulations in the different zones is a multiple of the street widths. In the least restricted section, buildings may be built at the street line to a height 2½ times the width of the widest abutting street. Beyond that point, they are permitted to go up to any height their owners choose, so long as their facades are set back at the rate of one foot horizontally for every five feet of building height. The multiple of the street width used in the different zones varies, there being five height zones. The multiple in the highest is 2½ times the street width; that of the lowest, once the street width. The multiples used in the intermediate zones are twice, 1½, and 1¼ times the street widths. The setback ratio above the limiting height plane at the street facade is twice that of the street multiple, being 5 to 1 in the 2½ times zone, 4 to 1 in the 2 times zone, 3 to 1 in the 1½ times zone, 2½ to 1 in the 1¼ times zone, and 2 to 1 in the 1 time zone. For the purpose of the regulations, no street is deemed less than 50 feet wide nor more than 100 feet wide.

Excepting in the older parts of the city, few streets are less than 60 feet wide. The major streets, of course, greatly exceed 60 feet in width, many of them being 100 or even more feet in width.

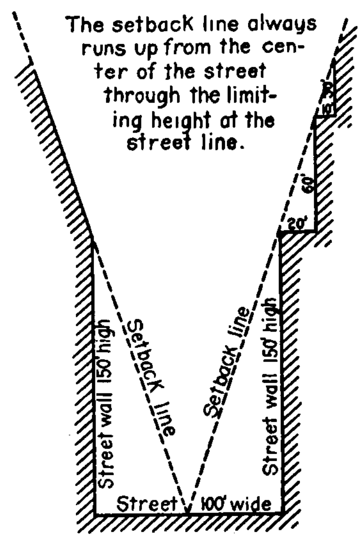


Diagram for Determining Angle of Setback
Typical Example in 1½ Times District

Towers of an unlimited height are allowed in all zones. The ruling provision governing their erection is that they shall not occupy more than 25 per cent of the lot area and that they shall not be nearer than 75 feet to the center of any street.

THE SETBACKS. A setback obviously admits more light and air to the lower stories than a vertical wall. In New York, however, the setback ratio is not the same as the street multiple. In the highest height zone, for example, each foot of street width below the setback plane will admit of 2½ feet of building height. Above the setback plane, however, each foot of open space will permit 5 feet of building height. In this respect, the setbacks tend to put a premium upon the construction of high buildings. When the center of the street is considered, the setback plane does preserve a uniform angle of light; but when the lower stories on the opposite side of the street are considered, which is the consideration of real importance, each increase in height diminishes the angle of light. Viewed thus, the setbacks, of course, stultify themselves. To achieve their object, the setbacks should clearly be proportioned in the same ratio to the open spaces in front of them as the height below the setback plane is to the street width.

The buildings erected under the ordinance are as high in the downtown section of Manhattan as the buildings erected there before the ordinance was passed. The height regulations imposed by the zoning ordinance have not sounded the death knell of skyscraper construction. There is, however, a distinction between the old skyscrapers and those erected under the law, for the newer buildings in receding from the street admit more light and air to the lower stories than the old structures. In that respect, the ordinance is undoubtedly an advance over what we had during the days of unregulated building.

FLAT HEIGHT LIMITS *vs.* MULTIPLES OF THE STREET WIDTHS. But an increasing number of people feel that the height regulations are all too lenient, and that if the entire city is to be built up with structures of the maximum height allowed by the ordinance, the result, so far as it prevents street and sidewalk congestion and the ability of rapid transit lines to care for rush hour crowds, to say nothing of land-overcrowding and home environment, will not be what it should be, and that a general tightening up of the height provisions is therefore desirable. No one believes that a series of flat height limits would be superior to using setbacks and different multiples of the street widths.

A height limit based exclusively upon a multiple of the street width, it is true, has certain objectionable features which cannot be lodged against a flat height limit. Probably the chief among these is that it does not promote a uniform type of development throughout a district. Being based upon the street width, it allows higher buildings upon the wider streets and thus actually invites the location of buildings that will not comport with the general character of the neighborhood. High apartments in a private house zone, for instance, are only a little less objectionable than stores. The fact that they happen to be located on a wide street hardly mitigates the injury, as the blight suffered by the adjoining houses is identically the same, no matter how wide or narrow the street is on which the apartments front.

Basing the height regulations upon a multiple of the street width does not, of course, obviate the necessity of establishing general classes of height zones, each governed by its own multiple of the street width. The height limit, in a particular case, therefore, will vary not only according to the width of the street but according to the zone in which the building is located. In applying the multiples of the five New York height zones to only six sets of different street widths, 50-,60-,70-,80-, 90-,and 100-foot streets, one obtains no less than 22 separate and distinct height limits. There is often a greater difference between the height limits established for the widest and narrowest streets within a given zone than there is between the narrowest and widest streets in two different zones. Indeed, there are many instances in which higher buildings are allowed on the wider streets in a zone apparently subjected to a stringent restriction than on narrower streets in a zone with a more liberal multiple.

The Program of Improvement. To summarize: A program for improving the New York zoning ordinance should provide, among other things, for:

1. The appointment by the Board of Estimate of an advisory commission of citizens to review and examine the whole zoning ordinance with the object of correcting such mistakes as experience may have demonstrated were originally committed in preparing the plan, whether such errors are contained in the detailed provisions of the ordinance or in the boundary lines of the several zones established by the zoning maps. Only by the appointment of an official commission, whose sole function it shall be to study the zoning ordinance, can we expect to obtain a serious consideration of the subject in a comprehensive and an intelligent manner.

2. The extent of the different zones should be indicated not by symbols within the street lines of the map but upon the ground itself.

3. If possible, the three different sets of height, use and area zones should be combined into a single set of zones and shown upon a single map.

4. The different kinds of zones should be reduced to the smallest number consistent with the protection required by the types of development.

5. A fourth use zone should be established for nuisances and heavy industries.

6. The provision permitting one-story buildings in their entirety and 25 per cent of the floor area in higher buildings to be used for manufacturing purposes in business zones, should be modified so that as much or as little of the floor area may be used for manufacturing purposes as the retail business, to the conduct of which the manufacturing is an incident, might require. Manufacturing not conducted as an incident to a retail business should be entirely excluded from business zones.

7. The "E" zones should be tightened up so as positively to exclude the construction of multifamily houses.

8. The number of families to the acre should be limited.

9. Building lines should be established in residence zones.

10. Residence buildings erected in the industrial zones should be required to comply with at least as high area standards as those established for the least restricted residence zone.

11. In residence zones, the provision of a rear yard should, generally speaking, be made mandatory upon every lot. In the business and factory zones, the provision of a rear yard should be left optional with the builder, the interests of light and ventilation being sufficiently secured by a limitation upon the percentage of lots buildings may occupy.

12. The height provisions of the ordinance should be revised and flat height limits substituted for multiples of the street widths.

13. Multiples of the street widths, if used to limit the height of buildings at all, should be used only as auxiliaries to flat height limits and in a manner to restrict buildings to a lower height on the narrower streets within a zone, than would be obtained by the flat height limits.

14. Whether or not flat height limits are substituted for multiples of the street widths, the height zones should be thoroughly reviewed throughout the city, especially outside of Manhattan, and lower height limits imposed.

15. Towers occupying 25 per cent of the lot areas should not be allowed throughout the city. In private house districts, this privilege may be exercised in a manner to secure apartment houses of unlimited height.

16. The setback ratio should be reduced so that the height above the commencement of the setback plane shall bear the same relation to the space in front of the building as it does below that point.

The New York zoning ordinance, being the first comprehensive, city-wide zoning ordinance adopted in the United States, cannot, of course, be considered the last word upon the subject. Like all initial things, it left much to be desired. We learn only through trial and error. Having had five years' experience, it is only natural that New York should know how to draft a better law today.

Zoning and the Architecture of High Buildings

By IRVING K. POND

ZONING of towns and cities has its roots and ramifications far back in the past; yet, as practiced today, it may be regarded as a more or less modern institution. Its relation to architecture is intimate—not, perhaps, fully perceived at first glance but becoming apparent with study and observation. The individual dwelling—the house,—and the communal dwelling—the apartment house—were well developed in essentials of plan and design before the necessity of zoning, apart from its bearing upon town planning, was recognized; in fact, it was the desirability, not to say necessity, of preserving the spiritual character of the house and the apartment house and of conserving their material values that called modern zoning into existence. The encroachment of business and trade and industry upon the home, to the spiritual and physical detriment of the latter, was the primary reason for zoning. Now zoning protects the individual house from the overpowering apartment; the home and the apartment from business; business and trade from objectionable forms of business and trade, and from industries.

The simplest form of zoning exists in the well planned dwelling house. The elements include the basement with its heating plant, fuel bins, laundry and storerooms; the main floor with reception hall, living room, dining room, serving pantry, kitchen, store closets, maids' dining room, etc., all arranged so as to function properly without interference or overlapping; the wider stairs (or boulevards) from community rooms to individual sleeping quarters on the second floor; the service stairs to the servants' living quarters which are convenient to the kitchen and labor zones. And then the apartment building, more complicated, with all the living and domestic requirements more or less upon one floor; with individuality expressed within each apartment; with serving quarters so arranged that the service of one apartment shall not interfere with the social or individual life of its own or of another apartment; with janitors, tradesmen, callers, dwellers, all accommodated after their own manner and necessity without interference or contact or conflict with others. This is the epitome, the beginning and almost the summing up of town planning and zoning.

But one house may be a menace to other houses, one apartment building to other apartment buildings, one industrial or mercantile building to others of its own class; and so zoning has to limit, in so far as possible, the interference of the individual or the group with the rights and well being of others and of the community. Zoning has to seek to accomplish through ordinance and regulation what really civilized and humane owners and builders and really conscientious, capable and well trained architects should and would have put into effect gladly and of their own initiative. Zoning, in some localities, has had to overcome or ameliorate conditions imposed by greed and avarice under the direction of stupidity and ignorance.

It seems rather astounding, does it not, that zoning commissions, forced into being by the dire exigencies of urban existence and conditions, commissions created by and composed in greater part, or quite wholly, of non-technical elements, should be called upon to direct architecture into proper channels of expression? And yet is it so astounding after all, and so out of accord with reason? Architecture worthy of the name has grown out of the life of the people—the non-technical people—and architects worthy of the name have given that life æsthetic expression and interpretation. So arose the great architectural styles of the past; so will arise any great architectural style of the future. I would not burden this paper with the slightest discussion of this generally accepted and really axiomatic proposition were it not that a new generation, well tutored in archæology and versed in academic formulæ, is entering the field, eager to apply a newly acquired knowledge which seemingly does not include a real appreciation or comprehension of certain vital truths; and, also, that so many practitioners of an older generation seemingly have forgotten the fact, if ever they had grasped it.

The architectural schools, to my seeming, are giving scant instruction in the art of life; giving little in addition to an uncanny facility in misapplying ancient formulæ to modern conditions. Schools and license and registration boards are not doing much to supply the public with interpreters of its life and its ideals in terms of art, which includes architecture. They, the schools and boards, are providing the public with a fairly efficient lot of designers of structures, but these are not necessarily architects under the real definition. Not every seed which falls upon fertile soil germinates into a beautiful flower or a succulent vegetable; weeds predominate and spread themselves naturally. The gardener works unceasingly to produce the flower which shall be his pride; that flower which, touching human accomplishment generally, is called art—as touching buildings, architecture. I have said this to indicate that architects among builders are rare—rare even among the generality of those who have assumed the honorable title of architect—and that is why zoning commissions and other agencies are needed now and again to point the way.

THE FRENCH METHOD

Architects have known of the old mediæval streets along which the houses overhung, jutting out story by story till the gables fairly touched, cutting out light and air, so that finally to save the street and teach architects their real duties the law intervened and let the life-giving light and air enter. The architects know and apply the classic-renaissance formula for projecting cornices and string courses; and they lined modern American streets with buildings of which the wide, overhanging projections grew bolder and bolder, so as to maintain "classic proportions," as buildings increased in scale and in height. Then the law intervened and said the cornice should not project more than so far over the street line. And the architect, that he might not be hampered in the application of the formula which produced his "classic proportions," set the building back from the street far enough to satisfy the law and his own perverted taste, and wasted another's property just to gratify his own personal whim. Architects, in school and out, must have learned or heard of mediæval and renaissance experiences and how the evil was rectified, and yet they seemed not to take the lesson to heart. The most flagrant types of mediæval exaggeration seemed not to have impressed them. They seemed not to remember that from gables almost touching across the streets came a reaction in the form of two-, three- or four-storied walls surmounted by pitched roofs with three, four, five, six or seven tiers of dormer windows, while in France, led by Paris, walls were limited to certain heights, and then came setbacks, vertical and sloping, with storied dormers. From these pitched roofs developed the bulging mansard, which should serve as a warning to modern American employers of the setback not to evolve a form so generally ugly and out of human scale.

All this history seems to have been forgotten by the architects of American cities till along came the zoning commission of Manhattan and brought designers to their semi-senses;—told them how to design for light and air, for wholesomeness and right living and told them almost how to design for beauty which up to that time had been a scant element in Manhattan's tall structures, whatever visitors from over seas may have said in their enthusiasm, to the contrary notwithstanding.

AMERICAN RENAISSANCE

The idea of the setback building is old. A "staged tower" built about 2450 B.C. was incorporated in a Chaldean palace, the oldest known structure in Mesopotamia. The Assyrian palace of Sargon and the platform on which it stands employ the motif. The "Hanging Gardens" of Babylon furnished a fine example of "setback" construction (so did the "Tower of Babel," by the bye) and indicate a use which may be made of the level spaces caused by the setback walls of modern buildings. The clerestory of the Egyptian temple, but notably of the mediæval cathedral, is a striking example of setback construction designed to get light into the interior, but more especially to compel externally the effect of unity and of resistance to time and the elements, which emotions are induced by the pyramidal form.

The idea of the setback in high buildings, even in its present form, is not new. Toward the end of the last century the subject was treated by Louis Sullivan in relation to the tall office building. Contemporaneously I, myself, had studied the proposition in relation to tall apartment buildings as may be seen by reference to the third of a series of papers on "The Architecture of Apartment Buildings" published in this journal (then THE BRICK-

BUILDER), in the number for December, 1898. Ever since my earliest observations of architecture, and study of means to ends, and especially since my early dealing with the refractory material and causing it to express my desires and design, I have had a keen appreciation of the potency of the pyramidal motif to insure or strengthen the effect of unity in a composition, as in the Greek temples (notably the Parthenon) and to establish the feeling and effect of permanence and stability, as in the pyramids. Early in my practice I began to introduce this motif into my design by setting back the faces of walls where they fell off in thickness as a concomitant structural factor. Later I began to emphasize the feature and stress the motif in brick walls by cutting out a half brick in plan at the corners, forming a sort of bevel which increased by the elimination of more brick as the walls arose. The same feature was introduced into stone walls by channeling or fluting, simply below, then more and more richly as the coping is approached. The effect of this method of pyramiding, and hence of stabilizing and unifying, may be observed in the City Club building in Chicago, designed by my firm, and also in the Michigan Union building at Ann Arbor, in which setbacks and channeled corners are featured in brick and stone. No buttresses nor external piers are used or needed to enhance the structural effect of the pyramiding, the decreasing bulk of the masonry as the walls rise being sufficient.

The critical observer will note in both these buildings that setbacks and modified corners are used to enforce another element of the design, which is a direct appeal to sentiment and understanding on the part of the beholder. Horizontality and verticality are introduced into the structures in such manner that each may make its own appeal to the emotions and be held in restraint by the other only when it tends to step beyond the bounds of the larger unity which is determined upon in advance and which it is sought in every way to preserve. In the latter instance there was a study of college life and environment and a knowledge of the college constituency which gave the designer a clue to his larger masses and lesser details and permitted him through the medium of form and color to make an appeal which should find response in the mind and heart of the beholder, for both mind and heart were appealed to and not in vain.

Every work of art, every building into which the designer has put vital feeling, will produce a definite psychological reaction in a sensate beholder— and just about in the same ratio in which the designer has expended himself. It goes without saying that the designer and the beholder must have had community of background and experience that the reaction may be commensurate with the action; that there must have been on the part of both sender and recipient of the message some similar knowledge of the past, some appreciation of the reaction of the race to physical and spiritual environment, of reaction to atmospheric, geographic, climatic and geologic surroundings—to social, political and religious conditions. And this community of apprehension and appreciation should extend to and embrace modern categories and conditions, and include a community of idealism. The potentialities of feeling and expression within us have been implanted by the age-long contact of our ancestry with these conditions, physical and spiritual, and it is for us to release them in unstinted creative and appreciative effort.

What has this to do with setback walls and tower office building? It has this: that some beneficent power, embodied at present in a zoning law, has given architects a chance to create beautiful and appropriate buildings, not Greek temples nor mediæval cathedrals, but something modern, born of a new spirit which is neither Greek or Gothic nor Roman or classic renaissance, but which is intensely of today. There is a chance for the expression of poise, serenity and restraint controlling emotionalism and exuberance of spirit. All are factors of the modern age and all are to be considered and all, at times, in one composition. The tower office building under zoning laws would seem to furnish an opportunity for the latter.

I have discussed the elements of this problem in a book called "The Meaning of Architecture," written from years of experience with materials and men, years of physical and spiritual reaction to circumscribing conditions. I can do no better than to refer to its pages those who subscribe to its main thesis, which is that life is a struggle in which, by overcoming obstacles, character is to be developed in all the perfection of beauty, failing which man falls short of the ideal. Architecture, in the western world at least, is a symbol of this struggle, and a demonstration of perfect final achievement interpreted in terms of structural forces. The content of self-restraint, poise and serenity is to be manifested in the Greek expression of horizontality— not the details but the fact. The content of exuberance of spirit and emotionalism is to find expression in the mediæval concept of verticality—not the details but, again, the fact. We moderns have not the restrained philosophic attitude of mind toward life as had the Greeks, nor the exaggerated emotionalism of mediævalism in the presence of any civil, secular or religious manifestation, but we have in us elements of each which are to be reckoned with.

The problem of the architect in America today is to reconcile and combine these seemingly opposed but very human elements in a composition which shall be appropriate to the time, to the location, and to the conditions. I have suggested, merely suggested, in Figures 21, 22 and 24 in the book referred to, an application under dissimilar conditions and conceived in my mind before zoning commissions had created the issue; conceived because an ideal of appropriateness and beauty seemed to lead that way. A survey of recent buildings in Manhattan erected under the zoning law indicates that idealism as well as the law is pointing the way in some cases.

It were well, in studying the effect of zoning laws upon high buildings, to mark the wide distinction between a certain already existing type of building and that which is being evolved under the impulse of recent enactments. A zoning law, like that in effect in New York, requiring setbacks under certain conditions of environment, tends toward the development of the "tower building" as against the building with a "tower accompaniment" or a tower with a "building accompaniment" of which latter there are two or three striking examples on Manhattan Island, and an extremely crude suggestion of one of these New York structures in Seattle. In Chicago and elsewhere the type leans generally toward the building with the "tower accompaniment." Differing in primary impulse from that which led to the erection of the tower building,—a lofty, unified and quite self-contained composition,—these towers accompanied by buildings or buildings accompanied by towers were not called into existence by economic or social conditions, nor made to relate themselves to their environment by such or by other conditions affecting the well being of the community, but are altogether individualistic expressions, piercing the sky in order solely to attract attention to themselves. In this and other regards the attempt would have been equally successful and the æsthetic effect heightened had the building accompaniment been subdued or eliminated altogether. This could have been done in the case of any tower with "building accompaniment" with perfect feasibility and perhaps æsthetic gain; but an attempt to eliminate either factor, building or tower, in a "tower building" would be as fatal to the structure as to the idea. Tower and building are one, and the one factor is not to be distinguished from the other.

A building is often unified by the presence of the "tower accompaniment," just as a vocal performance is unified by an instrumental accompaniment. Our designers to date, especially those with classic or pseudo-classic proclivities, have been laboring under the delusion that u-n-i-t spells unity and have made their big buildings cubical affairs without charm or interest in general outline—seeking only size and lavish display of ornament to impress. Unity is a social element—a concomitant of civilization and culture, not easily achieved, no more so than civilization itself.

The effects of the units upon unity must be carefully considered in a "tower building." The setbacks may be treated so as to give the effect of a clustered village upon a high plateau, which is fatal to unity and to character. Designers of skyscrapers, in ante-zoning days, to get away from the stupidity and monotony of the cube and to introduce the pyramidal motif, were known to crown their 20- to 30-story office structures with domestic pitched roofs, thus eliminating every vestige of unity and character. The setback would have furnished them a needed relief, had they but known it. The upper stories of the setback building must be brought into harmony,—can only be brought into harmony,—with the whole by a rational and beautiful application of the principles of horizontality and verticality, not either or each alone, but both in harmonious interaction and co-ordination. The one will emphasize the element of repose, the other the element of action. It is for the architect to study the conditions surrounding him and his special problem and give to his structures the full and perfected character they deserve.

Aronson Building
Schwartz & Gross, Architects

Garment Center Buildings
Walter M. Mason, Architect

Younison Building
Geo. & Edw. Blum, Architects

A Group of New York Buildings Designed in Accordance with the Zoning Law

Architecture and Illumination

A NOTABLE EXAMPLE IN THE WRIGLEY BUILDING, CHICAGO

THE most notable of the buildings built in Chicago as a result of the extension of the business district and the development of the lake front improvements is undoubtedly that of the Wm. Wrigley, Jr. Co. This structure, with its 34 stories, is placed where Michigan avenue, after crossing the Chicago River, makes a slight turn and the orientation of the building almost upon the axis of the avenue renders it visible at a great distance. The structure, because of its height and striking tower form, would be notable anywhere, but it gains greatly in dignity by reason of its being placed where owing to the bridge plaza upon the east, the river upon the south, and streets upon the west and north, it is effectually separated from adjoining buildings which might challenge its architectural dominance or mastery. Here, secure in comparative isolation, this vast structure of white terra cotta and of ornate design rises to a height of 400 feet.

Michigan Avenue Facade of Wrigley Building at Night

The architects of the Wrigley building have made an excellent choice of design for a structure which on account of its location will always be of striking importance. The three lower stories above the street level form a base for the building, in the main facade of which is placed the chief entrance which extends through the third floor. At the twentieth story the setbacks develop the tower, which is crowned with a cupola.

Although its appearance at any time is impressive, it is particularly so at night when fully illuminated by a system which is itself unique, and which is said to be the most complete illumination of a single building in the world. The illumination is produced by the use of powerful projectors which flood the structure with a brilliance which is accentuated by the dazzling whiteness of the building itself. The lighting increases in intensity as the building rises until the tower is all aglow. To produce this marvelous illumination requires the use of 198 projectors with 500-watt lamps and 16 projectors with 250-watt lamps, thus making the total current consumption 103,000 watts, requiring about 80 horse power. The approximate candle power cast upon the building from all these units is somewhat more than 25,000,000; the cost of installing the illumination will approximate $30,000, and the cost of operating it each night, including maintenance, lamp renewals and washing the building as often as is necessary, will be about $80. Certainly it is for the Wm. Wrigley, Jr. Co. the most striking possible form of advertising, indelibly impressing upon the minds of tens of thousands of people daily the Wrigley Chewing Gum product.

At left is a plan showing location of Wrigley Building and position of tower so that it is visible from South Michigan Avenue. Below is a group of projectors

Housing in England

THE FAILURE OF THE GOVERNMENT'S POST-WAR HOUSING ENTERPRISE

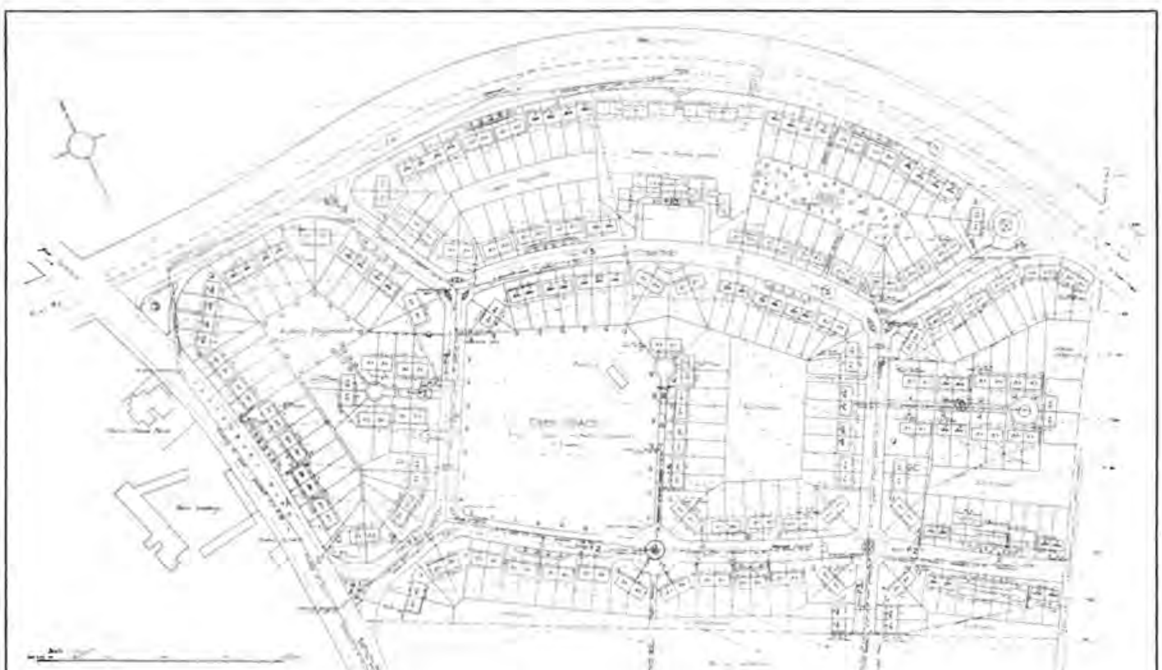
By H. J. BIRNSTINGL, A.R.I.B.A.

THE government's great housing scheme has utterly collapsed. A stupendous opportunity for social reform, for improving the housing conditions of the nation, has been wasted, owing partly to mismanagement and partly to a combination of circumstances brought about by unforeseen events. Yet now, in the midst of terrible wreckage, it is possible to see that when the debris has been removed—at enormous cost to the country—something of value will remain, and by those who are yet grappling with the great problem certain lessons are to be learned. It may therefore be of interest to trace the career of the "Government's Housing Program," which figured so conspicuously in the first post-war election in 1918, promising so much.

Already, in July, 1917, a committee was appointed by the President of the Local Government Board "to consider questions of building construction in connection with the provision of dwellings for the working classes in England and Wales and report upon methods of securing economy and dispatch in the provision of such dwellings." A very thorough investigation was made by this committee and a lengthy report was published in October, 1918. In July, 1919 the Housing and Town Planning Act was passed and most of the recommendations made by this committee, whose members included such well known architects as Sir Aston Webb and Raymond Unwin, were embodied in the Act or in the regulations arising therefrom.

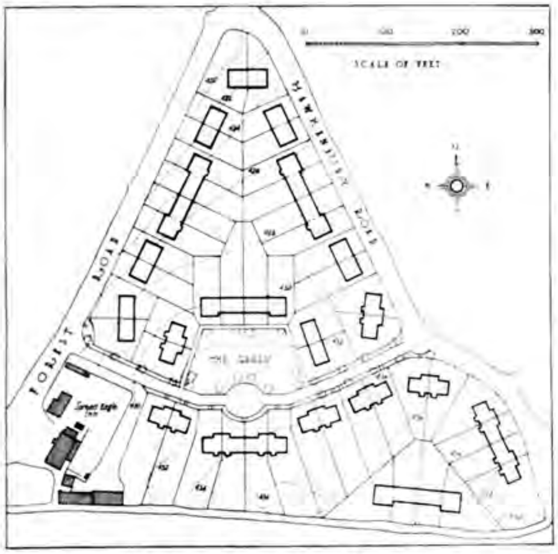
This Act made it incumbent upon the local authorities of boroughs and of urban and rural districts to undertake a detailed survey of the housing needs of their districts in connection with providing new houses, the reclaiming of slum areas, and the demolition of unfit houses, and in preparing a program for the three years terminating on July 30, 1922. Realizing the impossibility of providing houses on an economic basis, the government offered considerable financial assistance in building. However great might be the loss incurred by a local authority in providing the necessary houses, the financial liability of the authority would not exceed a greater amount than is produced by a penny rate in the pound. The remaining deficit was to be met by the national exchequer.

As the government was virtually financing the scheme, all the undertakings of the local authorities had to receive its approval. When sites were selected they were inspected by government officials; their prices had also to be approved. The



Layout for Housing Scheme at Folkestone, Showing Typical Treatment

A. E. Nichols, Engineer



Plot Plan of Royal Tunbridge Wells
Cecil Burns, Architect

layouts and house plans were then submitted for approval, and finally, before a local authority could enter into a contract for the erection of houses or the construction of roads or sewers, it was necessary that the bids and the terms of the contracts be approved. In order to carry out this work, and generally to assist the authorities in their task, 12 offices were opened by the Ministry of Health—the department responsible for housing—in different parts of England and Wales, each under the supervision of a "Housing Commissioner," who was assisted by a technical staff of inspectors, surveyors and architects. Likewise, at headquarters a staff of experts was engaged which included such men as Raymond Unwin and Michael Bunney. Most of the men comprising these staffs were young and zealous and had seen service in the war; they were, moreover, full of enthusiasm for the work and for the high ideals and standards which the Ministry of Health, under Dr. Addison, maintained.

In order further to assist the local authorities, various manuals were issued for their guidance; these dealt with plans of houses, details of roads, methods of redeeming slums and of converting large houses into flats, and army huts into temporary houses. Moreover, a fortnightly periodical called *Housing* was published by the Ministry, which contained the latest information and showed the progress that was being made in different parts of the country.

By October, 1919 the scheme was fairly launched, but there were innumerable difficulties to be overcome. Local authorities were suspicious of the government's good faith, and doubted the statement that their liabilities would be limited to a rate of a penny in the pound. The plans which they prepared were often not in conformity with the government's new standards of housing, or they were extravagant in use of road frontage or floor space, and there was a shortage of material and of labor. By dint of hard work on the part of the government officials the first of these difficulties was, for the most part, overcome. The inspectors interviewed the officials of local authorities and attended committee meetings, and the architects often entirely recast the plans which were submitted to them for approval.

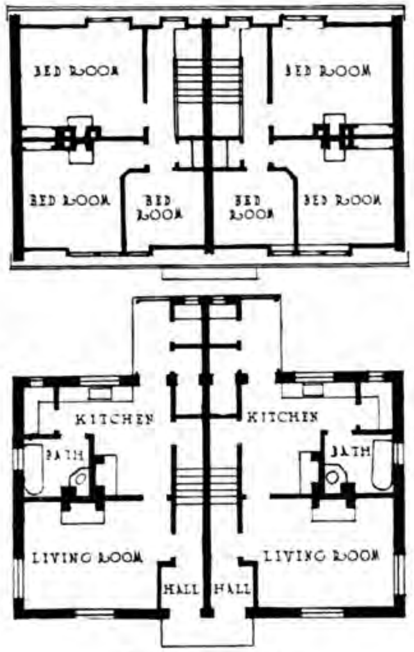
In the early spring of 1920 a veritable campaign was launched by the government to endeavor to persuade authorities to hasten the development of their schemes and avail themselves of the fine building weather of the summer and autumn. As a result of these efforts, the number of houses for which bids were approved, increased during the three months ending March 31 from 16,000 to 85,250. Meanwhile, at the end of 1919 another Act was passed by which any private individual building a dwelling house of a certain size and quality and conforming to certain not very stringent regulations could obtain a grant of money varying from £230 to £260 in accordance with the size and accommodation provided; the floor area of the house was not to be less than 700 square feet or exceed 1400 square feet. This, however, has not proved a successful method of providing houses, for although many have been built, they have often failed to provide accommodations for the class of people whom the Act was designed to

Pair of Brick Cottages at Tunbridge Wells
C. H. Strange, Architect

assist. Thus a rich man could build for himself a week-end cottage, or a lodge for his chauffeur or gardener, and claim a contribution of £260 from the taxpayers, or, to take the other extreme, a jerry builder could erect a shanty of the poorest materials, badly planned, with but the barest necessities, miserably built and of desolating ugliness, and claim state assistance to the extent of £260.

Another method by which the government sought to encourage domestic building was by offering financial assistance to building societies, or Public Utility Societies, as they are called. These schemes required the approval of the Ministry of Health, stage by stage in a manner similar to the working of a local authority's method, but the plan of giving financial assistance differed. A loan might be obtained from the Public Works Loan Commissioners for three-quarters of the cost of the approved scheme, to be repaid over a period not exceeding 50 years by equal semi-annual payments of principal and interest. The societies were furthermore entitled to a subsidy, equivalent to 50 per cent up to 1927 and thereafter 30 per cent of the annual loan charges.

Such then was the condition of affairs during 1920, and by the end of the year the number of houses for which contracts were signed by local authorities or Public Utility Societies was 140,000 and 11,000 houses were completed. Under the terms of the government grants to private persons a further 4500 houses were actually completed and certificates had been issued sanctioning the building of a further 26,500, implying a commitment on the part of the government of £6,500,000. Meanwhile, however, prices were steadily rising, and many of the contracts were let at the top of the market, prices reaching their maximum in about October or November, 1920. By this time the average price of a house containing two sitting rooms and three bedrooms, a kitchen, pantry, bathroom, coal cellar and toilet was about £950 and that of a similar house, containing only one sitting room, about £850, and the Ministry began to be alarmed at these ever growing costs.



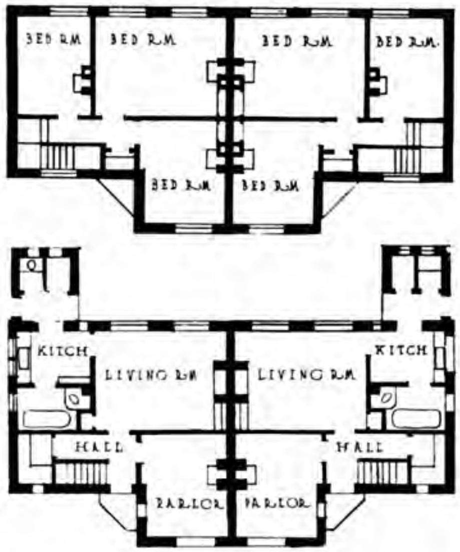
Typical Cottage Plans
Housing at Westhampnett

At the end of 1920, efforts were slackened and scarcely any new contracts were approved. This seemed a wise course, and it was presumed that when prices had fallen, by the spring of 1921, fresh efforts would be made to push forward the great work of providing houses, for the moment was ripe to achieve material results from the preceding two years of work. The enthusiasm of local authorities had at last been aroused; labor, whose earlier failure to co-operate had proved a very serious obstacle, at last seemed willing to increase its output; plans had been prepared for extensive building, and in many cases new roads to accommodate the houses had been built and quantities of materials had been acquired, in fact, the great machine for the provision of houses had at last been started. Yet this was the moment chosen by the government to drop the whole enterprise and to repudiate its pledges to the country to provide houses at any cost for the returned soldiers.

It is not possible—nor

Cottages for the Westhampnett Rural District Council
John Dovaston, Architect

desirable—to consider the justification of the coal strike which lasted from April until July this year, and disorganized the industry of the country, but there is little doubt that the cost of it so depleted the national resources that it became impossible for the government to enter into any new commitments that might add to its already overwhelming burden of expense. This, coupled with the cry—often utterly unconsidered and indiscriminate—for national economy, which, inspired by a section of the press, swept over the country in the spring and summer of this year, killed the national housing movement. The suddenness and thoroughness of the abandonment may be judged by the fact that on September 30, 9 of the 12 regional housing offices were closed, a technical staff of nearly 900 had been dismissed, effecting a saving in salaries alone of £250,000, and yet the provisions of the 1919 Act were to continue until July 30, 1922.



Typical "Parlor" Cottage Plans
Housing at Westhampnett

The course of procedure that has been adopted involves very serious financial losses to the country, for, although actually less money will be spent than if the full program had been completed, much of it will now be spent on the machinery constructed to produce houses but not on the houses themselves. This arises largely from the fact that, on the presumption that the pressing need for 500,000 houses was to be met, provision had already been made for the erection of this number. Thus, by July, 1920, 57,000 acres of land had been acquired for housing purposes, sufficient, at 10 houses to the acre, to accommodate more than the half million, yet the number of houses for which contracts are signed is only 157,500 and this number represents the maximum that will now be built. The surplus land must be re-sold and the legal and other expenses incurred in the transactions of both buying and selling represent a dead loss. Similarly, plans for 280,000 houses have been approved. These must be paid for, but half the houses are not to be built; this again represents a dead loss. Another enormous waste is incurred through the miles of new roads that have been constructed and sewered to accommodate the houses that will now probably never be built. The average cost of street work and sewers is £50 per house. These roads must either be maintained by the local authorities, thus constituting an additional burden on the taxpayers, or they must be allowed to fall into disrepair. There are the materials that have been purchased. When all the houses now contracted for have been built the government will find itself with a surplus of some 400 million bricks, to name but one item, which it will be able to dispose of only at a very serious loss, since the contracts by which the bricks were bought were extremely loosely drawn up, enabling the makers to sell bad bricks at top prices; moreover, these huge stocks are now so congesting the makers' yards that damages are being claimed for storage. Finally, the government is so anxious not to spend more money on houses, that it is actually paying builders, to whom contracts have been let, sums *not to build* houses. At Richmond a sum of £40 per house is being paid to a builder as an inducement not to complete

Pair of Cottages for Westhampnett Rural District
John Dovaston, Architect

his contract. The overhead charges of the government administration were computed some months ago at £2 10s per house. This figure will now be greatly exceeded.

These facts represent the debit side of the enterprise, but fortunately it has a credit side, which shows itself, for the most part, in a less material way. Out of a need of 500,000 houses, about 160,000 will actually have been built; a small percentage, but nevertheless these figures represent the largest contribution that any government has made towards the solution of one of the acutest post-war problems. But there are even more far-reaching results. The whole standard of working class housing has been raised. There is scarcely a parish in the country that is not now familiar with improved methods of estate development, with the necessity of avoiding overcrowding, of giving due consideration to such matters as appearance, proper ventilation, of planning houses with a view to minimizing the work required for their upkeep, and of providing baths and other conveniences. These are lessons that, once learned, will not be forgotten, and there is little doubt that, however the provision of houses is to be effected in the future, estate development will be on the new lines and not on the old, and the long rows of hideous and monotonous terraces, with their filthy back courts and their rear projections shutting out the sun and air, will be things of the past.

The question now naturally arises as to whether the mistakes that were made might have been avoided. The success of the scheme would probably have been assured, despite all obstacles, if it had not been turned into a matter of party politics. In the purchase of materials by the government the most inexcusable blunders were made. Contracts with brickmakers were so full of loopholes that the makers were able to do as they pleased and to postpone supplying the government until prices had reached their maximum; moreover, large quantities of materials were bought that were entirely unsuitable for cottage building, such as large cooking ranges at £14 each. All this could have been avoided by drawing proper contracts, by purchasing the total output of certain brickyards, and by buying only materials which would be of use for the particular class of building concerned.

Seeing the determined efforts that were being made by contractors throughout the country to keep up prices, the government should have given greater encouragement to direct labor schemes and to the Building Guilds. Many municipalities already possessed works departments of which advantage should more often have been taken; they had, moreover, the organization for purchasing materials. Under adequate supervision these staffs and organizations might have been developed for building. Where this course was adopted it usually resulted in cheaper houses.

As this article is being written the Departmental Committee appointed to inquire into the high cost of building has issued its report. It constitutes a strong defense for the attitude of labor, and emphasizes the fact that "houses in great numbers are absolutely essential in the interests of public health and humanity." Who is to provide them? The government is still in a position to fill the interim that must now occur between the time of the abandonment of the moribund public enterprises and the day of the revival of private enterprise, by allowing local authorities to sell this surplus land on specially favorable terms to bona fide constructors of working class dwellings, and by selling stores of materials in the same way. Housing activity must revive, for a vital demand will invariably be met.

Group of Eight Houses for Westhampnett Rural District Council
John Dovaston, Architect

ENGINEERING DEPARTMENT

Charles A. Whittemore, *Associate Editor*

Power, Light and Heat in Large Buildings

THE SELECTION OF ECONOMIC MACHINERY AND COSTS OF OPERATION

By JAMES A. McHOLLAN

Vice-president of The R. P. Bolton Company, Consulting Engineers

THE expense of operating boiler and engine room machinery in a large building to provide heat, light, power and elevator service is an item which may range as high as 40 per cent of the entire outlay upon the operation of the building. It is therefore a matter of real interest to the architectural profession to be fully informed on the most economical selection of such machinery that can be made, so that not only the initial investment but the operating costs after installation may be kept down to a minimum. The architect is especially interested in economies or innovations effected by those who operate their buildings as such practices have an important bearing on the commercial feasibility of new structures. A large building is primarily a new business enterprise, designed to earn a reasonable return on the capital invested, and if a reduced expenditure upon machinery and a low cost of operation can be assured in advance, some of the difficulties which discourage the investment of money in building operations, especially during periods of high construction costs, will be removed.

One of the most important economies in building operation is the general adoption of purchased electric power and electrically operated machinery in conjunction with the use of low pressure steam. In the economical new building of today, electrically operated machinery is used almost exclusively, such appliances costing less to install, occupying far less floor space and requiring less attention and expense to operate. The heating of buildings and operation of hot water apparatus are, however, unsolved insofar as the substitution of electricity for steam is concerned, and must be by steam. It is generally found that power plant machinery designed to operate in this manner can be installed for about one-third the cost of other systems and is from about 17 to 30 per cent less expensive to operate.

Illustrating the investment required for machinery in boiler and engine rooms these figures will show the reduced cost in three typical new buildings of applying the use of a supply of purchased power in conjunction with low pressure steam supply as compared with the installation of more complex systems:

TYPE OF BUILDING	VOLUME CU. FT.	PLAN I Investment required for high pressure boilers, private electric power plant, piping system and auxiliary machinery arranged to operate with high pressure steam	PLAN II Investment required for heating boilers, piping system in boiler room and electric auxiliary machinery for low pressure plant, electricity being purchased from a public source of supply
Factory	4,000,000	$117,000	$32,000
High class apartment hotel	900,000	$60,000	$15,000
Office and printing bldg.	2,750,000	$163,000	$28,000

These figures are based on prevailing prices, but the same proportional saving in initial investment can be demonstrated in a large structure of any type. These amounts include the cost of only engine and boiler room machinery and do not include the cost of elevators, heating radiators, plumbing and other building equipment, the investment for which is practically the same under both plans.

In view of these wide differences in investment it is of interest to study the comparative costs of operation of the machinery after a building is put into service. Perhaps the most interesting case which has come within the writer's experience is that of a building in which a comparatively new power plant installation, carefully designed and most efficiently operated, was abandoned by the building owners after a few years' use in order to reduce expenses in operation. The cost of converting the equipment so as to make possible the boiler and engine room machinery being operated electrically and the heating service to be supplied on a closed system, amounted to $13,000. A saving of $21,592 was effected so that the entire expense of alteration was saved by the economies secured in nine months' operation. This detailed information will be of interest for purposes of comparison with other structures, existing or proposed:

Type of building	Offices and printing
Volume	2,750,000 cu. ft.
Height	14 stories

Prior to the abandonment of the use of the high pressure steam system the costs of operation were

$90,384 per year, made up of these items:

Coal	$64,345
Labor	20,184
Oil	1,398
Ash removal	1,257
Repairs (to private electric power plant) and supplies	3,200
Total per year	$90,384

This operating expense provided these various services:

I Building service	II Methods of operation or production
Electric light and power	Supplied from the electric power plant operated by high pressure steam
House water pumping	High pressure steam pumps
Fire protection, water and air under pressure for sprinkler system	High pressure steam pumps and compressors
Building heating	Exhaust steam from electric power plant
Hot water supply	Exhaust steam from electric power plant
Industrial steam for stereotype and other purposes	High pressure steam from main boilers

Upon the installation being changed and the machinery operated with purchased electricity the arrangement of the equipment was such as is shown in the accompanying Diagram I, from which is gathered a striking illustration of the reduced number of appliances required to be maintained and used. The actual expenses of operation under this rearrangement were:

Coal	$12,000
Labor	4,150
Oil	37
Ash removal	260
Purchased electricity, 1,462,772 kw. hrs.	50,082
Purchased gas	2,263
Total per year	$68,792

Under the revised plan of operation, the building services were provided in this manner:

I Building service	II Method of operation or production
Electric light and power	Purchased from public supply company
House water pumping	Electrically operated automatic control
Fire protection, water and air under pressure for sprinkler system	Electrically operated automatic control
Building heating	Low pressure steam
Hot water supply	Gas-fired boiler with automatic control
Industrial steam for stereotype and other purposes	Gas-fired boiler with automatic feed and pressure regulation

This is only one example of an economic development such as is taking place over the entire country. The rising expenses of operation are making obsolete many installations which were at one time considered the most perfect of their class. Many buildings have already been changed to operate electrically, the general experience being that the cost of the change is saved within a maximum period of two years. The engineers of a large public utility corporation, owners of many real estate properties, whose operations extend over the entire country, have checked up the wastages chargeable to the use of complex engine room systems and are now proceeding to follow the example of other real estate operators in adopting the newer and simpler methods.

Large hotels are commonly supposed to be dependent upon the use of high pressure steam to a greater degree than any other type of large building, yet a modern hotel can be designed so that only a few minor pieces of apparatus have to be operated with high pressure steam, the largest of which, curiously enough, is the mangle of the hotel laundry. A small automatic gas-fired boiler is provided for this purpose—compact, self contained, automatic and economical in its operation—placed beside the mangle which it supplies. For all other hotel service, electricity, low pressure steam and gas provide economical and simple operation. The architect or engineer of today who plans installations to operate with high pressure steam for even the largest hotel is diverting his clients' funds to purposes for which no operating benefit, either practical or economic, can be secured. A hotel is run on a narrower margin of profit than the majority of business enterprises and every item of investment should be restricted to that which will directly earn revenue for the owner or operator or which is absolutely necessary to complete the physical structure of the building. It may be of interest to know that a well known chain system of hotels in New York, noted for its careful and scientific methods of management, has just recently reorganized the power plants in the properties in its system so that only low pressure steam and purchased electricity are used.

New buildings designed to operate with low pressure steam and purchased electricity show substantial advantages in the use of coal and power as compared with older types of similar buildings in which a larger investment has been made for machinery and in which a higher expense is required per year for the same kind of building service. To illustrate this point, the comparison is made of two large buildings, one of which is equipped to operate with high pressure steam apparatus and the other for operation with low pressure steam and purchased electricity:

	Office building, equipped with high pressure steam and electric power plant	Office building, equipped for purchased electricity and low pressure steam operation
Volume	3,200,000 cu. ft.	6,500,000 cu. ft.
Total steam used per year	78,400,000 lbs.	25,200,000 lbs.
Total electricity used per year	*700,000 kw. hrs.	950,000 kw. hrs.

*Higher consumption of electricity than is usually found in a building of this size is due to design, long interior corridors, small windows, etc.

This following tabulation shows the different methods by which the building service was provided in these two structures:

Building service	Office building, equipped with high pressure steam and electric power plant	Office building, equipped for purchased electricity and low pressure steam operation
Electric light and power	High pressure steam	Purchased electricity
House heating	Exhaust steam	Low pressure steam
Water heating	Exhaust steam	Low pressure steam
Elevator service	High pressure steam	Purchased electricity
Water pumping	High pressure steam	Purchased electricity
Auxiliary pump operation	High pressure steam	Purchased electricity

It must not be assumed, however, that in existing buildings equipped with high pressure steam installations similar economies can be obtained merely by shutting down the engines and generators of a private power plant and replacing their operation with a supply of purchased electricity. While substantial economies may result from this procedure, it is essential in every building, new or existing, where electric light and power are to be purchased, that every piece of steam-operated machinery be rearranged to operate electrically if the full measure of economy is to be realized. The entire system of steam-piping, traps, tanks, heaters, etc., must also be rearranged so as to secure the maximum economy in operation in conjunction with a purchased supply of electric power. These figures of cost show the actual experience of the owner of a factory building who merely shut down his private electric power plant and purchased electricity, but did not convert the other steam-using appliances for economic results under the changed system. The building in question was five stories high, having a volume of 800,000 cubic feet.

Under the system of high pressure steam supply and with the private power plant in operation, the annual costs were:

Fuel, 2320 tons	$18,972
Labor, 4 men	6,900
Ash removal	1,392
Repairs (average) and supplies	1,000
Electricity purchased (breakdown service)	960
Water chargeable to electric plant	250
Insurance	140
Total	$29,614

Upon shutting down the private power plant and purchasing electricity, but making no other changes on the equipment or operating methods, the annual costs of operation were:

Fuel, 2000 tons	$16,200
Labor, 3 men and 1 man for 6 mos.	6,290
Ash removal	1,200
Repairs (average) and supplies	300
Water chargeable to steam plant	180
Insurance	125
Electricity purchased, 270,000 kw. hrs.	12,760
Total	$37,055

The machinery was then rearranged so that all the steam-operated pumps and other appliances were operated electrically, except building heating, hot water apparatus and industrial steam for tenants' use. The latter service was furnished from a new auxiliary vertical steam boiler, with a separate steam piping system specially installed for the purpose. All unnecessary usages of steam were thus eliminated, and under these conditions the costs of operation were:

Fuel, 1100 tons	$8,900
Labor, 2 men and 1 man for 6 mos.	3,500
Ash removal	660
Repairs (average) and supplies	100
Insurance	75
Electricity purchased, 280,000 kw. hrs.	13,140
Total	$26,375

These figures show the effect of a correct operating system in reducing expenses of operation and at the same time explain why so much controversy has centered around the question of central station *versus* private power plant operation. The full

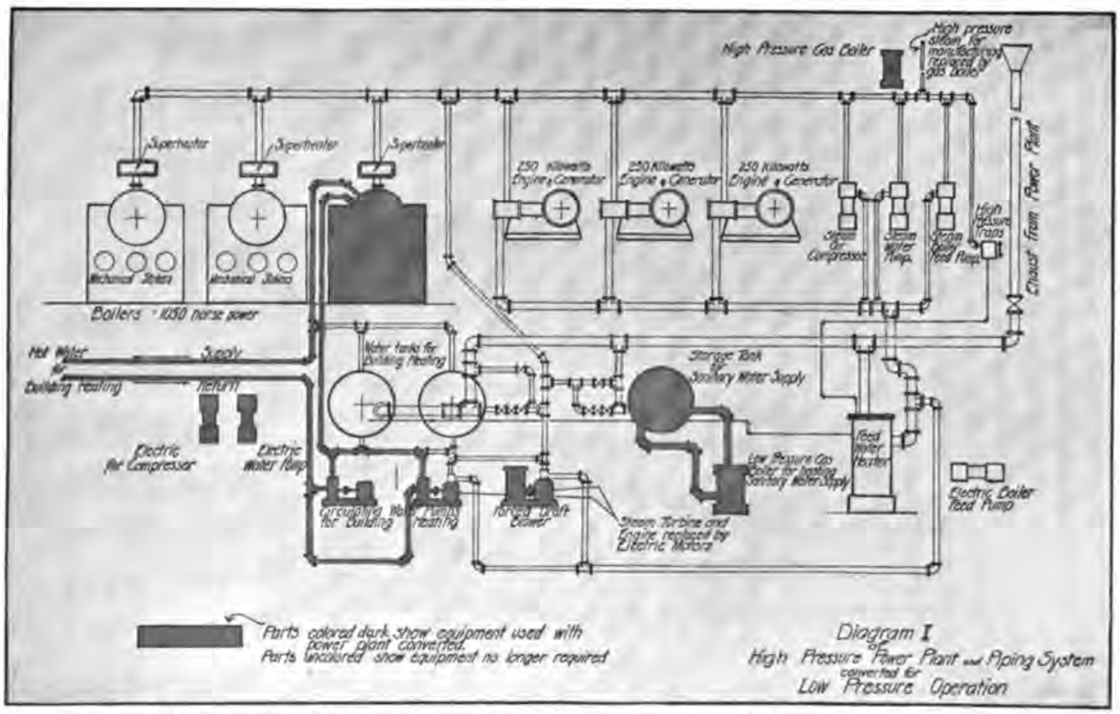


Diagram I. Comparison of Independent Power Plant with Equipment Required when Purchased Current Is Used measure of economy in operation with purchased electricity, in large buildings, can be obtained only when all power machinery is arranged to operate electrically. Steam should be used only for warming, cooking or other similar processes. If this plan is followed the result is a simple arrangement of machinery, obtained at low cost and inexpensive in operation.

Another development in the financial success of buildings, which is of interest to architects and engineers, is the sub-metering of electricity by which the tenants in office buildings, apartment houses and lofts are charged for electricity in exact ratio to the amount used. It was at one time a general practice of real estate operators to supply free electricity to tenants. This resulted in excessive use and waste of power and light. It is an axiom in building operation that a service gratuitously afforded is seldom appreciated and is frequently wasted. This condition became aggravated as electrical devices for the apartment and office increased in number, and a general policy came into effect, first in loft buildings, then in apartment houses and now being generally extended to the largest office buildings, of metering the electricity used by each tenant and charging for the amount used at the same price which would be charged if the tenant had purchased direct from the public supply company. By applying this system the owner can purchase a total supply current for the entire building at wholesale rates and re-sell to his tenants at the regular retail rates. The building thus bears only the expense of lighting public space, of power for elevators and for minor pumping service. In many buildings this system returns a profit to the owner, due to the difference between the wholesale and retail rates for electricity. In loft and manufacturing buildings the margin from this source usually meets the expense of the lighting of halls and stairways and power for elevator service. This system of sub-metering electric current is of special interest to architects in its effect on the financial success of a proposed new structure, as every reduction in the expenditure which falls on the owner makes it easier to justify an investment in building operation.

Allowances must be made for the cost of providing and installing the electric meters in the offices, stores or apartments. The complete cost with wiring loops, meter boards, cutouts, etc., for the usual building is about $40 each. Under this system the cost of power in loft buildings and of light in office and apartment buildings may be disregarded by the architect who has to consider only that used for public lighting and that required to operate elevators and water pumps.

Another development in machinery design which has an important effect in the operating expense of apartment houses is the modern unit type of refrigerating plant. In an apartment house of the highest class it is customary to furnish refrigeration service to each apartment, and until recent years the usual method was to provide a refrigerating plant in the basement, consisting of a steam engine or motor, refrigerating compressor, brine pumps, circulating water pumps and auxiliary apparatus of sufficient capacity for the requirements of the entire building. Cold brine to cool the boxes was circulated through a piping system.

The development of the so-called unit refrigerator, each machine complete in itself and placed in the apartment to be served, does away with the expensive installation of brine piping, the life of which is always limited. In many buildings such systems of piping have failed, through corrosion, in less than six years after installation and replacement has been found impracticable, due to difficulties and expense in redecorating. The cost of these self-contained unit machines is approximately $1,000 per unit, installed complete, so that in a high class apartment house with 18 apartments the investment is about $18,000, which is no more than a central plant with piping would involve. The expense of operation is of course borne by the tenant instead of by the building owner, as even in the highest class of apartment buildings it is now the general practice for the tenant to pay for all electricity used in his own service. In a building of 18 apartments the cost of operating a central refrigerating plant was about $2,500 per year, but when it was equipped with the unit refrigerators in each apartment, the owner's expenses were reduced to $540 per year.

Coal Usage in Buildings on Low Pressure

Coal usage in buildings equipped for operation with low pressure steam and purchased electricity varies in proportion to the volume. Unusual exposures or corner buildings may show somewhat higher rates of usage in fuel, but the difference due to such conditions is not so great but that the quantities given here may be safely used, as the figures are from actual records from buildings in operation:

Type of building	Volume	Coal used; net tons	Coal used; net tons per 1,000,000 cu. ft. of volume
Office	6,500,000	1796	277
Office	2,032,000	960	†480
Office	18,500,000	5199	280
Office	910,000	350	390
Printing	2,750,000	1000	320
Manufacturing	1,500,000	480	320
*Hotel	1,500,000	1200	*800
Institution	11,225,000	4293	370

†Tower building
*Also includes steam for hotel kitchen and hot water supply

Architects are now devoting greater attention to the question of expense in the operation of their buildings, and the foregoing information may therefore be of interest not only from the viewpoint of costs and quantities of heat, light and power, but also for the information on operating policies favored by those charged with the operation of large buildings. Special acknowledgment is due by the writer to A. R. Heath, Vice-president of the New York Service Company, with whom he has been associated in gathering the information here presented.

Steel Design for Buildings

PART III. THE DESIGN OF A PLATE GIRDER (CONTINUED)

By CHARLES L. SHEDD, C.E.

IN the preceding installment, owing to restricted space, only one table for allowable flange stresses was given. This was Table V, for two 6 x 6 angles with 13″ cover plates. There are given here two others, one, Table VI, for 6 x 6 angles and a 14″ cover plate and the other, Table VII, for 6 x 4 angles and a 9″ cover plate. The 14″ cover plates are a little more economical for heavy girders than narrower plates and if the top flange is unsupported laterally for some distance it is stiffer to resist buckling sidewise.

The narrower plates are especially good for double girders where the width is limited. Two girders side by side with 9-inch cover plates make a very good section to carry a plate and angle column with a 10-inch web, when the web of the column is perpendicular to the webs of the girders. The columns carrying such a pair of girders can readily be made facing the same way as the column carried, so that the webs of the girders may pass directly by the flange plates of the columns and be riveted directly to them with only a small seat angle for erection purposes. This makes a very rigid connection and one that can be easily erected. The different widths of flange plates for the girders may be used to suit various conditions which may be encountered.

As there is but one gage line in the 4-inch legs and two in the 6-inch legs, the sections are so designed that the area of the plates does not exceed the area of the angles in order that when the rivet pitch is figured between the flange angles and the webs, the rivets between the flange plates and angles will be sufficiently strong if spaced opposite those in the inside gage lines of the angles.

Table VIII corresponds to Table IV, showing the distance from the back of the angles to the center of gravity of the flanges.

When this distance is plus, the center gravity is in the angles, but when it is minus it is located in the plates. Some designers specify that no section shall be used where this distance is a negative quantity. Occasionally, when the shear is too great on a short shallow girder, ⅞-inch rivets have to be employed, when a new but similar set of design tables will have to be used.

On light work smaller angles are used and in cases of emergency, when rolled beams were hard to obtain, plate girders have been substituted for beams as small at least as 20″ Is. In designing these very shallow girders it is best to use an exact method in designing the section, that is to compute the sectional modulus of the section to be used.

To determine the rivet pitch on these shallow girders the amount of longitudinal shear per lineal inch should be obtained from the value of SQ/I, where S is the total shear on the girder, Q the statical moment of the flange about the neutral axis of the girder, and I the moment of inertia of the entire girder section.

When no flange section can be found strong enough to resist the bending moment on the girder, the strength of the flange may be increased by introducing some plates 9″ wide under the flange angles. This allows the use of an extra row of flange rivets through these plates and the web inside the rows through the flange angles. In computing the rivet pitch for such a section care should be taken to realize that this new row of rivets does not help to develop any flange stress except in these new plates. It is therefore necessary to compute the rivet pitch twice, once for the planes of shear between the web and these plates and once between these plates and the flange angles.

ALLOWABLE FLANGE STRESSES

2-6″x6″ L3	3/8″	7/16″	1/2″	9/16″	5/8″	11/16″	3/4″	13/16″	7/8″
Gross A	8.72	10.12	11.50	12.86	14.22	15.56	16.88	18.18	19.46
Net A	8.06	9.36	10.62	11.88	13.12	14.36	15.56	16.76	17.92
do 2h	7.40	8.58	9.74	10.90	12.04	13.16	14.26	15.34	16.40
Flg St No Pls	129.0	149.8	170.0	190.0	210.0	229.8	249.0	268.2	286.8
14″x 5/16	179.6	198.4	217.0	235.6	253.8	271.8	289.4	306.6	323.6
3/8	191.9	210.7	229.3	247.9	266.1	284.1	301.7	318.9	335.9
7/16	204.1	222.9	241.5	260.1	278.3	296.3	313.9	331.1	348.1
1/2	216.4	235.2	253.8	272.4	290.6	308.6	326.2	343.4	360.4
9/16	228.6	247.4	266.0	284.6	302.8	320.8	338.4	355.6	372.6
5/8	240.9	259.7	278.3	296.9	315.1	333.1	350.7	367.9	384.9
11/16	253.1	271.9	290.5	309.1	327.3	345.3	362.9	380.1	397.1
3/4	265.4	284.2	302.8	321.4	339.6	357.6	375.2	392.4	409.4
13/16	277.6	296.4	315.0	333.6	351.8	369.8	387.4	404.6	421.6
7/8	289.9	308.7	327.3	345.9	364.1	382.1	399.7	416.9	433.9
15/16	302.1	320.9	339.5	358.1	376.3	394.3	411.9	429.1	446.1
1	314.4	333.2	351.8	370.4	388.6	406.6	424.2	441.4	458.4
1 1/16	326.6	345.4	369.0	382.6	400.8	418.8	436.4	453.6	470.6
1 1/8	338.9	357.7	376.3	394.9	413.1	431.1	448.7	465.9	482.9
1 3/16	351.1	369.9	388.5	407.1	425.3	443.3	460.9	478.1	495.1
1 1/4	363.4	382.2	400.8	419.4	437.6	455.6	473.2	490.4	507.4
1 5/16	375.6	394.4	413.0	431.6	449.8	467.8	485.4	502.6	519.6
1 3/8	387.9	406.7	425.3	443.9	462.1	480.1	497.7	514.9	531.9
1 7/16	400.1	418.9	437.5	456.1	474.3	492.3	509.9	527.1	544.1
1 1/2	412.4	431.2	449.8	468.4	486.6	504.6	522.2	539.4	556.4
1 9/16	424.6	443.4	462.0	480.6	498.8	516.8	534.4	551.6	568.6
1 5/8	436.9	455.7	474.3	492.9	511.1	529.1	546.7	563.9	580.9
1 11/16	449.1	467.9	486.5	505.1	523.3	541.3	558.9	576.1	593.1
1 3/4	461.4	480.2	498.8	517.4	535.6	553.6	571.2	588.4	605.4
1 13/16	473.6	492.4	511.0	529.6	547.8	565.8	583.4	600.6	617.6
1 7/8	485.9	504.7	523.3	541.9	560.1	578.1	595.7	612.9	629.9
1 15/16	498.1	516.9	535.5	554.1	572.3	590.3	607.9	625.1	642.1
2	510.4	529.2	547.8	566.4	584.6	602.6	620.2	637.4	654.4
2 1/16	522.6	541.4	560.0	578.6	596.8	614.8	632.4	649.6	666.6
2 1/8	534.9	553.7	572.3	590.9	609.1	627.1	644.7	661.9	678.9
2 3/16	547.1	565.9	584.5	603.1	621.3	639.3	656.9	674.1	691.1
2 1/4	559.4	578.2	596.8	615.4	633.6	651.6	669.2	686.4	703.4

Table VI

It is occasionally necessary to splice the webs or flanges where the girders are very long. Where only one splice is required in the web it may be placed near the middle of the girder or, in other words, near the point of zero shear where the web is doing the least work. These web splices are made in varying forms, depending upon the taste of the designer. Two common types were shown in Fig. 10 of the article appearing in the June number of THE FORUM. The "a" type is preferred by the author as it allows a simpler and more exact analysis to be made. Two origins of stress must be considered in making this design, that is the stress from the shear on the girder and the stress from the bending. The rivets on each side of the joint in the web must be capable of resisting these stresses. The shear must be considered as being transferred from the web to the splice plates at the center of gravity of each group of rivets. This causes a moment on the group equal to the shear multiplied by half the distance between these centers of gravity, and this moment should be added to the moment on the girder resisted by the web and the rivets designed to resist the resultant of the stresses caused by this moment and the vertical shear.

The stresses caused by the moments are proportional to the distances of the rivets from the center of gravity of the group and the moments are therefore proportional to the squares of the distances. If a summation were made of the squares of the distances of each rivet from the center of gravity of the group, and the moment divided by this summation (care being taken to use inches in the summation of the squares and inch-pounds for the bending moment), the result would be the stress on an imaginary rivet one inch from the center of gravity of the group, and if this were multiplied by the distance to the rivet the most distant from the center of gravity, the result would be the stress on that rivet due to the moments. This stress would act in a direction at right angles to a line connecting the rivet with the center of gravity, and if this were shown diagrammatically it could be combined with the vertical stress found by dividing the shear by the total number of rivets in a group and the resultant would be the stress on the most strained rivet. The value of the rivet to resist this strain would be the same as that of one of the flange rivets. Tables can be made showing the sum of the squares of various groups of rivets, which will aid materially in designing a splice, but in any event two or three trials are usually necessary before the required design can be obtained.

In designing a flange splice the operation is much simpler as only the direct tension or compression has to be considered. It is not practical to have the angles or plates in the compression flange bear against each other to transfer any part of the stress. The only care necessary is to have the centers of gravity of the spliced material, of the splicing material, and of the rivets as nearly coincident as possible.

In girders used in shops to carry crane girders or in any place where the girder is liable to lateral stress, the top flange can be strengthened to resist such a stress by adding a channel placed with its web flat and its flanges turned down. Such a channel may be replaced by a wider plate than the ordinary flange plates, having additional angles at its outer edge with their vertical legs turned down to make a section similar to a channel with its web flat. The maximum stress in such a girder is at the outer edge of this channel shape and is the sum of the stresses caused by the bending in the two directions. The mistake is often made of using the resultant of these two stresses instead of the sum.

ALLOWABLE FLANGE STRESSES

2-6×4 Ls	3/8"	7/16"	1/2"	9/16"	5/8"	11/16"	3/4"	13/16"	7/8"
Gross A	7.22	8.36	9.50	10.62	11.72	12.80	13.88	14.94	15.96
Net A	6.56	7.60	8.62	9.64	10.62	11.60	12.56	13.52	14.42
do 2h	5.90	6.82	7.74	8.66	9.54	10.40	11.26	12.10	12.90
Flg St. No Pls	105.0	121.6	138.0	154.2	170.0	185.6	201.0	216.4	230.8
9×5/16"	130.6	145.4	160.0	174.8	188.8	202.6	216.4	229.8	242.6
3/8"	137.9	152.7	167.3	182.1	196.1	209.9	223.7	237.1	249.9
7/16	145.1	159.9	174.5	189.3	203.3	217.1	230.9	244.3	257.1
1/2	152.4	167.2	181.8	196.6	210.6	224.4	238.2	251.6	264.4
9/16	159.6	174.4	189.0	203.8	217.8	231.6	245.4	258.8	271.6
5/8	166.9	181.7	196.3	211.1	225.1	238.9	252.7	266.1	278.9
11/16	174.1	188.9	203.5	218.3	232.3	246.1	259.9	273.3	286.1
3/4	181.4	196.2	210.8	225.6	239.6	253.4	267.2	280.6	293.4
13/16	188.6	203.4	218.0	232.8	246.8	260.6	274.4	287.8	300.6
7/8		210.7	225.3	240.1	254.1	267.9	281.7	295.1	307.9
15/16		217.9	232.5	247.3	261.3	275.1	288.9	302.3	315.1
1			239.8	254.6	268.6	282.4	296.2	309.6	322.4
1 1/16			247.0	261.8	275.8	289.6	303.4	316.8	329.6
1 1/8				269.1	283.1	296.9	310.7	324.1	336.9
1 3/16				276.3	290.3	304.1	317.9	331.3	344.1
1 1/4					297.6	311.4	325.2	338.6	351.4
1 5/16					304.8	318.6	332.4	345.8	358.6
1 3/8						325.9	339.7	353.1	365.9
1 7/16						333.1	346.9	360.3	373.1
1 1/2							354.2	367.6	380.4
1 9/16								374.8	387.6
1 5/8								382.1	394.9
1 11/16									402.1
1 3/4									409.4

Table VII

BACK OF Ls TO C G FLANGE (INCHES)

		t of Pls	0	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/8"	1 1/4"	1 3/8"	1 1/2"	1 5/8"	1 3/4"	1 7/8"	2"	2 1/8"	2 1/4"
6"×6" Ls	14" Pls	5/16"	1.64	.95	.80	.66	.54	.43	.32	.22	.13	.04							
		3/8	1.66	1.02	.88	.74	.62	.51	.40	.31	.21	.12	.03						
		1/2	1.68	1.09	.95	.82	.70	.59	.48	.39	.29	.20	.11	.03	-.06	-.14	-.22		
		9/16	1.71	1.15	1.02	.89	.77	.66	.55	.46	.36	.27	.18	.10	.01	-.07	-.15	-.24	
		5/8	1.73	1.21	1.08	.95	.83	.73	.63	.53	.43	.34	.25	.17	.08	.00	-.08	-.16	-.24
		11/16	1.75	1.26	1.19	1.01	.89	.79	.69	.59	.49	.40	.32	.23	.14	.06	-.01	-.09	-.16
		3/4	1.78	1.31	1.18	1.07	.95	.85	.75	.65	.55	.46	.38	.29	.20	.12	.05	-.02	-.09
		13/16	1.80	1.35	1.23	1.12	1.00	.90	.80	.71	.61	.52	.44	.35	.26	.18	.11	.03	-.04
		7/8	1.82	1.39	1.27	1.16	1.05	.95	.85	.76	.66	.57	.49	.40	.32	.24	.16	.08	.00
6"×4" Ls	9" Pls	3/8	1.94	1.27	1.11	.96	.82												
		7/16	1.96	1.35	1.20	1.05	.93	.80											
		1/2	1.99	1.43	1.29	1.15	1.02	.90	.78										
		9/16	2.01	1.49	1.36	1.22	1.09	.98	.87	.77									
		5/8	2.03	1.54	1.42	1.29	1.17	1.05	.95	.84	.73								
		11/16	2.06	1.59	1.47	1.35	1.23	1.11	1.01	.91	.81	.71							
		3/4	2.08	1.64	1.53	1.41	1.29	1.17	1.07	.98	.88	.78	.68						
		13/16	2.10	1.68	1.57	1.46	1.35	1.23	1.12	1.03	.93	.84	.76	.66					
		7/8	2.12	1.72	1.62	1.51	1.40	1.29	1.19	1.08	.99	.90	.81	.72	.63				

Table VIII

BUSINESS & FINANCE

C. Stanley Taylor, *Associate Editor*

Straight Talks with Architects

II. HOW MANY ARCHITECTS WILL BE IN BUSINESS TEN YEARS FROM NOW?

THIS morning we sat in the office of an architect who, for many years, has been a constructive force in his profession. He has long realized the importance of architectural practice as an element in the economic structure of the United States. He also realizes the weaknesses which exist in the profession today and which threaten to undermine its strength and to result in an adverse effect on the business of every member of the profession, regardless of the volume of his practice or its character.

There are some unpleasant facts facing the architectural profession today, and our friend voiced this sentiment when he said in no uncertain terms, "There is only one thing you can do to make architects realize the gravity of the present situation — use scareheads! You cannot make them too strong, because conditions warrant every possible effort to stir architects into a state of mind where they will give consideration to the future welfare of the profession, which today is menaced far beyond their realization."

We have fully realized this situation for many months —in fact since long before the close of the war. We have been at a loss, however, to know how these conditions might best be brought before the architects of the country in a sufficiently strong but inoffensive manner. We have discussed these questions with architects of every type—with conservatives, who have warned us that we are treading on dangerous ground, and with radicals, who have a tendency to agree with any departure from the well worn path of precedent. The test of the matter, however, and a fact which has clarified our course in attempting to "shed light in the dark corners," is the unfailing approval which has met our views in discussing these matters with architects who have made *business successes* of their organizations.

JUDGING by the expressions of public opinion regarding architectural service, which have from time to time reached this office, it is evident that there exists today a paradoxical condition. The public condemns the average architect as inefficient from a business viewpoint. The general impression exists that the employment of an architect is in many instances almost a luxury. On the other hand, as is universally understood, the public entrusts the architectural profession with the expenditure of vast sums of money for construction.

Unfortunately, the public does not understand the complexity and volume of the work involved in carrying out an architectural commission. In days of old, when the architect functioned principally in the field, his service was obvious—he was a master craftsman, directing the work of the representatives of the several guilds or crafts which were involved in the construction of an artistically designed building. Today, he is the master builder, but much of his service is carried on behind the closed doors of his drafting room, and of all he produces, the average layman can understand only the perspective and sketch floor plans. In the public consideration of a finished building, the architect usually receives credit only for its finished appearance. Approval is rarely bestowed upon him for convenience of arrangement, together with the equipment for the comfort and safety of tenants. In fact, the average person does not realize that architectural service goes far beyond the development of the æsthetic phase of building design.

There is no great profession which receives so little publicity as that of architecture. Newspapers and periodicals dwell on the progress which is made in the medical profession—the exploits and achievements of lawyers constitute first page news. How rarely does one read of the work of an architect in the public press! It is true that monumental buildings receive a certain amount of favorable comment, but it is a rare instance when the name of the architect is mentioned or any credit given to architecture as a professional activity.

There are two kinds of criticism which are useless. The first of these is criticism which is of a destructive nature; the second is criticism of a general nature which offers no solution. In this article we must, therefore, attempt to make our criticism constructive and specific. In the course of articles which are to follow, together with presentation of correspondence regarding the subject, we hope to offer practical solutions. Here, therefore, is a list of the points which we believe express present weaknesses, individual and collective, in the architectural profession today:

1. Lack of full co-operation within the profession to meet business problems which confront the profession as a unit.

2. Failure on the part of individual architects to keep thoroughly abreast of developments affecting their professional and business interests.
3. Unbusinesslike and improperly developed methods of charging for architectural services.
4. Lack of proper business training.
5. Lack of thorough knowledge of practical construction, or field experience.
6. Weakness in cost estimating, particularly in preliminary stages.
7. Unsound business getting methods.
8. Failure to assume a rightful position in community and political activities.
9. Inefficient business administration within the individual organization.

We may now consider these points individually and in some detail:

1. Lack of full co-operation within the profession to meet business problems which confront the profession as a unit

In order that there be no misunderstanding of our position in this matter, may we at once call attention to the fact that this article is not an adverse criticism of the American Institute of Architects? In fact, it may be said that the Institute has functioned perhaps as efficiently as an organization may function when its membership in numbers probably represents only 20 per cent of the practicing architects in this country. The present writing therefore is directed more to the great unorganized mass of architects who, as individuals, are struggling against problems which can only be solved by a strong collective effort.

If we investigate other professions, we find strong organizations functioning in research, publicity and as media for the exchange of advanced knowledge. We find these organizations establishing standard practice wherever possible and representing their members on political and business questions having a direct bearing on their collective business interests.

One of the duties of such an organization among architects is to keep the profession before the public eye in the proper light. It must take proper interest in civic and national problems; it must be the spokesman of its members in the establishment of national or local regulations affecting the profession; it should be actively co-operating with the federal government in the solution of housing and unemployment. It should be strongly represented at every point where standardization of building materials, methods and practice may be under consideration. Such an organization should take the lead in constructive efforts to educate those within its own ranks in proper business practice and professional procedure. Every architect in this country should belong to an organization of this type. At this point we may mention the state societies of architects, some of which are beginning to function strongly on behalf of their members. Of particular interest in this consideration is the work which has been done by the Illinois Society of Architects. We have not the space here to review its work, but we assume that many architects are familiar with it and we know that these activities have been not only beneficial to the direct membership of this organization, but that they provide the proof of what can be done when architects get together seriously to meet their collective problems with definite action.

Why should we hear from east and west, from north and south, complaints of the encroachment of building contractors on the architectural field? Surely, any competition which gives service to the public is worthy competition, and if it be such that it disturbs the architect and makes him feel that others are encroaching on his legitimate field, this can be true only because he is not rendering proper service as demanded by the building public. We may close our consideration of this matter by calling attention to the obvious fact that no professional, industrial, commercial or labor group has ever received proper consideration, public or politic, until organized, co-operative effort has been put forth.

2. Failure on the part of individual architects to keep abreast of developments affecting their professional and business interests

We may preface this discussion with a question. "Why is it that architects collectively *read* less than any other professional group?" Consider for a moment the doctor, the lawyer, the dentist or the engineer. Where we find them, we find readers, particularly of the publications which convey to them the knowledge of progress within their respective professions; news which describes new methods; facts regarding the economic phases of their own businesses, and any other data which may be of help to them, either in getting business or rendering better service to their clients.

It is a fact that the architect keeps fairly well abreast of developments along the line of design because he is a close student of pictures. He is far behind the times, however, in matters of business and of developments within the building construction industry. In fact, the broad statement may be made that in no profession are there so many individuals who stop studying almost at the time when they begin their professional practice! Fortunately, in the average architectural organization, young blood is constantly being introduced. It is this fact alone which keeps many offices at least only four or five years behind the times. In analyzing this matter, we find a new application of the biblical statement that "To him who hath shall be given." We find that the more successful an architectural organization may be, the more closely it has studied every contribution tending toward the advancement of knowledge along lines contributory to the building industry and to modern architectural design. As a matter of fact, the less business an architect has, the more carefully should he study modern business trends and modern developments in his profession, in order that he may be in a better position to get business and to hold his clients and receive their recommendation for the work which he does.

We may pause here for a moment to quote further comments made by our friend whose statements form the introduction to this article. "You will realize," he said, "that the average architect hates to admit lack of knowledge on any subject, particularly in relation to building construction. In some cases, he thinks he knows it all, and in other cases he wants the client to think so. It is a fact, however, that building construction has become so complex in its nature, that no one man can know as much as should be known in order to carry out all details of designing a large building. In the profession of medicine, all doctors have reached a stage where they admit that the knowledge of specialists should be employed in difficult cases. On the other hand, there are very few architects who will not undertake the design of any kind of a building if they have the opportunity. They hesitate to call in consultants who are specialists in certain phases relative to construction or equipment. They do not realize that in most cases the owner welcomes such advice.

" The result may be seen in every part of the land, in the form of buildings which are inefficient machines to carry out the purposes for which they were conceived. This should not be the case, and every building which represents an element of failure in performance of its main purpose, contributes its quota of disfavor towards the architectural profession in the eyes of the public.

"Is it the fault of the leaders in the profession who will not contribute the knowledge they have gained for the benefit of beginners? Perhaps so—but more certainly it is the fault of the individual architect who assumes more than he can perform and who does not keep abreast of developments and resources which may tend to safeguard the interests of a client!"

3. Unbusinesslike and improperly developed methods of charging for architectural services

This is a subject which we deem of particular importance and which will be considered in detail in the November or December issue of THE ARCHITECTURAL FORUM. It is sufficient now to say that many architects are struggling for a successful solution of this question of charging clients for services. It is true that a certain standard series of minimum charges, based on percentages, has been recommended by the American Institute of Architects. It is not true, however, that these standard charges are always adhered to by architects generally. In fact, we doubt very much if there is any office which has not deviated from the standards set forth in some instances. There has gone abroad through the architectural profession a definite misconception of what we believe to be the position of the A. I. A. in regard to this question. Membership in the Institute is not contingent upon agreeing to the charges of this schedule. We have heard many of the younger architects declare that they would not join the Institute because of this condition. What the Institute has set forth, in its own words, is:

> "Even as a schedule of charges the document is not of a very precise nature. It indicates that the basic percentage under ordinary circumstances is six, but that there are many cases in which it is greater. The percentage necessarily varies under different circumstances, since the architect's fee, like that of any professional man, must depend upon his skill, experience and standing, upon the character and location of the work to be done, as well as upon the kind and cost of the services to be rendered. Therefore, to base the architect's fee upon an unvarying percentage of the cost of the work is neither reasonable nor equitable; but since that method has long been and is still largely in use, the Institute names a certain rate lower than which in ordinary cases competent and complete services are not to be expected."

It is but logical to say that the fee of the architect must depend, even as a doctor's fee depends, upon his established practice, his skill and his experience. There are architects who do no residential work for less than 10 per cent and they get 10 per cent without question, because of the record which they have established. To go to the other end of the scale, we may cite the case of an architect who does work for speculative builders at low cost to them and at high profit to him. Here is an instance. A speculative builder comes to him for the plans and building permit necessary to construct a two-family house. He draws the plans on paper and gets the building permit. He writes no specifications and provides no details. It takes approximately 30 hours of draftsman's time to do this work. On the ordinary schedule of charges, the owner will pay for the plans and specifications and other architectural service between $600 and $800. He pays in this case $150. Out of this, the gross profit to the architect is over $100.

The question thus resolves itself most logically into the evolution of a method of payment by which the architect is reimbursed for the time of his organization, and this time paid for by the owner is used as he may see fit. Here there is introduced the opportunity for differentiating between the skill and experience of one architect as opposed to another. The architect, under a system of this kind, could estimate the value which the market establishes for his services and could contract definitely on this basis without proceeding along unethical or unprofessional lines. Today, if you want the doctor on the corner, you pay him $3 a visit, but if you want a famous specialist you will pay as much as he sees fit to charge. The same condition is true of the legal profession. Why not, then, of the architectural profession?

4. Lack of proper business training

Here is a subject on which volumes could be written. At this time, however, we will take occasion to make only a few comments. To outline another paradox—in the education of an architect as it is carried out today, there seems to be no room for business training. Our architectural schools, even including the so-called "practical" courses which are presented through such organizations as the Y. M. C. A., do not equip a man to conduct the *business of architecture*—what he learns about business procedure is learned in the "school of hard knocks." A few architects, fortunately, are gifted with what in many instances is slightingly termed "the commercial instinct." But when we realize the vast changes which have taken place in the requirements of building construction, it becomes evident that this "commercial instinct," introduced into an architectural organization, is to be admired.

Naturally, the need for business knowledge varies with the type of practice in the individual office. We may make the direct statement, however, that in almost every instance where a client becomes dissatisfied with the service of an architect, *it is not on the grounds of design*, but is due to failure in some one of the business phases which enter into relations between the architect and his client.

5. *Lack of thorough knowledge of practical construction*

When in the evolution of architectural practice the principal activities retired from the field to the office, the momentum of the change was too great and carried the architect too far from direct contact with actual construction conditions. It is a well known fact that a practical building contractor will take the plans of many architects and make changes which will result in economy, due to the saving of labor and material. We have watched with interest the educational value of field work which has been undertaken by certain younger architects employed by building construction organizations. These men have been called upon not only to design buildings but to carry out construction superintendence or to work as assistants to the superintendents of construction. In this manner they have had a much more intimate contact with actual field conditions than is ordinarily received in the course of architectural supervision. It is an undeniable fact that this experience has made their services as architects of much more value to those who have employed them. They have much more practical methods of cutting corners; they have learned to visualize their work more definitely in terms of quantities of material and hours of labor. They have learned the value of standardization and the important relationship between dimensions and available stock sizes of material. They have actually been very close to work in three dimensions, which to a great extent had before been carried out in their own minds on the flat surface of drawing boards. There is a vast difference between designing a building and supervising its construction, and designing a building and actually building it. This difference is reflected in future planning in many practical ways. We believe that a young architect or a graduate from an architectural school can have no better experience than to work for one or two years for a building construction company. Changed outlook and added knowledge thus afforded will find direct expression through all the rest of the years in which this man may be engaged in planning buildings.

Naturally, it is impossible for the average architect to spend much time in the field, but he has another opportunity to meet this situation, which in most instances does not receive his consideration. If he himself has not a thorough practical knowledge of actual field work, it would be well to call into conference those who have. These may be building contractors or they may be engineers, specializing in some important phase of mechanical or structural design.

Restrictions of time and space forbid an extended consideration of the additional points set forth in the introductory paragraphs of this article. To a certain extent these are self-explanatory. In preceding issues we have discussed the question of preliminary cost estimates and the dissatisfaction which has arisen on the part of owners where building costs have greatly exceeded the architects' original estimates. We have seen numerous sound projects taken out of the market because of the disappointment of the owner in finding the contractors' figures greatly in excess of the architect's estimates and his own limit of investment.

In regard to business getting methods there exists today a great need for constructive work on the part of the average architect. We are no longer in a period when an architect can afford to wait patiently for such work as chance and social contact may bring into his office. Back of this failure to get work on a sound selling basis there is, of course, the factor of inadequate business experience. It is difficult, indeed, for an architect to visualize real estate improvement in the form of building if he has no knowledge of real estate methods or building finance. Similarly, it is difficult for him to enter the field of commercial and industrial building if he has not the faculty of viewing building problems from the viewpoint of the tenant to whom the building is the most important machine in connection with the conduct of his business.

These are but indications of the great fundamental problem which faces the architectural profession today. We are undoubtedly at a parting of the ways in this reconstruction period when architecture as a profession is threatened with the loss of individuality. There is a definite danger that it will be assimilated by new types of building organization, many of which are in evidence today, wherein architectural practice is but a department of a complete service to the owner. On the other hand, by careful, co-ordinated effort, which will come only through individual realization of the situation, it is quite possible that the architect will become in fact the master builder and that his organization will, as never before, be the service organization to which the prospective building investor turns, not only for the best in design but for complete appreciation of his business problems.

Plate Description

HECKSCHER BUILDING, NEW YORK. PLATES 47–49. This structure, at the southwest corner of Fifth avenue and 57th street and fronting also on 56th street, besides being the largest building yet erected in this immediate locality, is interesting as being designed in the style of the French renaissance, a type rarely selected for a tall business structure, and also as having been planned in conformity with the New York zoning regulations. The lower stories of the building are intended for high class wholesale and retail business while the floors in the tower, being of smaller area, are arranged as offices, the main entrance to the different floors being from Fifth avenue.

An arcade, one story in height, extends through the building from 56th to 57th street, the space upon its sides being arranged as small retail shops suitable for businesses which require but small areas. This is a comparatively unusual application of the arcade idea and is especially successful in making a more intensive use of ground floor space in a building covering a large and extremely valuable area. The arcade has been given an architectural appearance in keeping with the building, with trim of black and gold marble, bronze show window details and painted ceiling.

The designing of the Heckscher Building in accordance with the provisions of the zoning law was simplified by reason of the fact that 57th street, being of unusual width, permitted the same cornice line as Fifth avenue; the southern portion of the structure, however, facing 56th street, was necessarily planned in accordance with the street's narrower width. The exterior of the building is of Indiana limestone up to the main cornice, the walls above, with their various setbacks, being of grayish tan brick made in a special size, 4 x 4 x 11½, while the terra cotta which is used as ornament is the color of limestone. A striking detail of the exterior is the use of metal panels at the floor levels between the windows of different stories. These panels are of copper wrought in high relief and toned to a light, bright green by the use of acids. The panels create strong vertical lines which have the effect of accentuating the height of the building.

FISK BUILDING, NEW YORK. PLATES 50, 51. This structure fronts upon 57th street and the ends face Broadway and Eighth avenue so that the building was planned to embody the setbacks required by the zoning regulations governing these three thoroughfares. Being in the heart of New York's automobile district, it was necessary that the salesrooms upon the ground floor possess ample show window space which has been secured to an unusual degree by covering the structural steel with cast iron about these window areas. Above this main floor the second and third stories are faced with stone to form a base for the remaining 23 floors of brick with their setbacks and parapets. Above the 21st floor, where the uppermost setback occurs, the facade of the tower is designed with a row of pilasters which tend to unify the design and to broaden the apparent width of the facade.

THE LIGGETT BUILDING, NEW YORK. PLATES 52, 53. This structure represents a typical modern New York office building occupying a valuable plot, which necessitates the obtaining of the utmost in rentable area. The building occupies the northeast corner of Madison avenue and 42d street, with an extension, 40 feet in width, facing 43d street.

Complying with the provision of the New York zoning ordinance, the building is planned with setbacks above the height permitted facing avenues or streets of the widths here involved. Up to the sixteenth floor the exterior walls are of red brick in four shades, laid in Flemish bond, with sills of limestone and a cornice at the level of the seventeenth floor. At this point, where the first setback occurs, small towers are placed at the corners. This setback is of two stories and the walls are of the same material, with cornice and trim of limestone. Above this is the main portion of the tower which includes four stories, which are given similar treatment, and above the tower is a penthouse for tanks and elevator machinery, so planned as to form the crown of the entire structure.

The treatment of the two lower floors is such as to permit show windows as large as possible for space devoted entirely to retail stores. Use has been made of pilasters and spandrels of cast iron which cover the girders and columns. At the top of the second story front is placed an ornamental cresting of cast iron and the base of this show window area is of black fossil marble, the entire composition giving the building the effect of being securely anchored to the ground behind and below this show window space and independent of it—a far more successful arrangement than would have followed the apparent resting of the building upon inadequate stone piers.

THE SHEDD MAUSOLEUM, LOWELL, MASS. PLATE 56. The design of this family tomb is based upon the Greek stèle. The walls are battered on each elevation and together with the roof slabs are of white granite from New Hampshire. Doors, vases, slab rings and ventilator are of greenish bronze. The interior of the mausoleum is of pink marble and contains six niches, three on each side of the axis, which are lined with black slate.

WHITMAN MONUMENT, MT. AUBURN CEMETERY, CAMBRIDGE. PLATE 57. With the exception of the base course, which is of pink granite from North Carolina, this monument is constructed entirely of pink marble. It rests upon a foundation of solid concrete, 6 x 8 in plan and 5 feet deep. The marble has been given a treatment with the pneumatic tool which produces a surface that keeps clean automatically.

EDITORIAL COMMENT

CONSTRUCTION AND UNEMPLOYMENT

THIS month sees the formation of a capable group, called together by President Harding to consider the unemployment that exists generally throughout the country. Unemployment is the natural outcome of the disjointed business conditions we have been struggling with for several months, but distressing as the situation is, it is not without a redeeming feature if we will recognize the opportunity it offers for finding some means of stabilization in future. In prosperous times there is little incentive to take count of cost; wasteful practices creep in unnoticed and steadily cause losses that are not recognized as such until the cumulative mass appears in a period of depression.

This is a situation particularly true of the building industry. It has been realized dimly for some time but the real seriousness of the waste in construction was emphasized for the first time in the report of the Engineering Council's Committee on Elimination of Waste in the Building Industry. The wastes principally stressed in this report are those due to seasonal employment and they occur in the industry in normal times as well as in periods of depression. How much greater their effect will be this year is easy to estimate when it is recalled that the present construction season, rapidly approaching the customary shut-down, will add to the number of unemployed many hundreds of building mechanics and laborers.

This probable addition to the number of the unemployed is a matter deserving of immediate and serious attention. There is no logical reason for the abandonment of construction during the winter months in most sections of the United States. It is merely the result of custom dating from the days when our appliances and methods for handling construction were of the simplest order. Winter building under those conditions meant delay and increased costs, but with proper organization and equipment, construction can be carried on now practically as well in one season as another.

Much of the distress that will result from a suspension of work can be eliminated by carrying out a program of public works, both highway and building construction. Officials, zealous in their efforts to procure the most for the expenditure of public funds, may argue that such construction can be had at a lower price later on. This may or may not be so; it is nothing but common sense, however, to figure that any extra expense is well incurred if it provides employment to people who would otherwise be suffering and depending on bread lines for their maintenance. Another important consideration bears on our efforts to complete the readjustment of prices. Material prices can only be reduced as operations in manufacturing are continuous and a normal rate of production maintained. The stopping of building will make necessary partial or complete closing of quarries and manufacturing plants serving the industry, which will increase their costs and further delay readjustment.

There are many hundreds of competent workmen ready to give a fair day's work for fair wages, and due to the special conditions now existing there need be no fear of the excess labor cost and general inefficiency that characterized immediate post-war days. The construction industry can give employment to many thousands and create a demand for materials that will be an important factor in holding and steadying business conditions.

Both private and public work should be undertaken now wherever feasible — the former because of certain definite advantages in the way of prices and service that can be had now, and the latter in a sense of duty to the general welfare. Architects should make a careful survey of their local conditions, find out the favorable conditions and exert their efforts in influencing clients and their local government authorities to build in all cases that show justification.

There is nothing of a charitable or paternalistic nature in strongly advocating public construction at this time. Improved roads and new public buildings are needed in every community. In many cases funds are available through the sale of bonds or the issue of bonds already authorized; it requires only the go ahead signal from public officials. This work can be produced at as low a cost now as later, when competition with private work will tend to hold prices up. The communities will have the use of facilities they need, and, what is of more immediate import, labor released from private work will be absorbed, insuring continued earnings which will stimulate general retail business.

The general subject of seasonal employment should be given consideration in every locality. The engineering report just referred to asserts that the average wasted or lost time in Philadelphia runs as high as 44 per cent among iron workers, 37 per cent among cement finishers, 36 per cent among steamfitters, 40 per cent among roofers, and 29 per cent among painters and paper hangers. A recent investigation in Boston by the Congress of the Construction Industry reveals similar percentages. The greater portion of this loss is due to seasonal employment, and if architects and others would influence more uniform employment, the resulting savings would soon appear in the cost of finished buildings.

DECORATION *and* FURNITURE

A DEPARTMENT

DEVOTED TO THE VARIED PROFESSIONAL & DESIGN INTERESTS WITH SPECIAL REFERENCE TO AVAILABLE MATERIALS

It will be the purpose in this Department to illustrate, as far as practicable, modern interiors furnished with articles obtainable in the markets, and the Editors will be pleased to advise interested readers the sources from which such material may be obtained

CEILING IN A ROMAN PALAZZO OF THE EARLY SIXTEENTH CENTURY

The timbers which divide the ceiling area into squares are carved and colored to emphasize the principal lines. The soffits are polychromed in slightly softer colors. Such a ceiling could be effectively worked out in wood of a light color, with color and gilding

Interiors Adapted from the Italian

PART II. CEILINGS AND WALLS

By WALTER F. WHEELER

HARDLY any detail connected with an interior of any kind is more important than the ceiling which, together with the walls, forms the room. The similarity of the word itself to *ciel*, the French for sky, has frequently been pointed out, but whatever its derivation, the analogy is not difficult to trace.

In the treatment of Italian interiors the ceiling assumes an importance not always so great in interiors of other types, for its form immediately indicates the character of the room, since while the walls are often of plaster of the most rigidly severe type the ceiling may be wrought out with a more or less intricate pattern. True, the ceiling itself may be of plaster as well as the walls, but often it will be found to be of timber and of some one of a number of well known forms. Where a ceiling is of plaster it may vary from the usual flat type and be given a vaulted appearance, such as is suggested in Plate 46 of the September FORUM. It must be borne in mind that the very essence of success in dealing with interiors in the Italian style lies in the use of good proportions and that the use of this form of ceiling treatment tends to reduce the vertical dimensions of a room and to emphasize its horizontal proportions, which is often to be desired.

The timber ceiling is often used to give the effect of contrast which always follows the use of two wholly different materials—contrast not only of color, but also of texture and general character. The ceiling of timber may be severely simple, the joists being merely exposed, or else it may be given a "coffered" form and divided into quite a number of units which may be treated in a manner as severe or as elaborate as may be desirable. In either instance the spaces between the timbers may be plastered or covered with wood, and the timbers themselves may be merely somewhat smoothed off and left to tone down with time, or very slightly oiled, or else treated in polychromed designs. Where the joists are to be left exposed considerable dignity is added to the appearance by placing heavy supporting timbers beneath the joists and running at right angles to them. The dignity of this treatment is increased when the ends of these beams, where they join the walls, are supported by corbels or brackets such as are shown in a number of these illustrations.

This treatment gives a rich and somewhat formal dignity but in some instances, particularly when a large room is square or so nearly so that neither dimension is notably the larger, the preferred treatment may take the form already suggested by which the entire ceiling area is divided by beams placed at right angles which of course divide the area into smaller squares; these smaller squares may be treated in several ways, depending upon the character of the room, the purposes which it is to serve, and the amount which the client is willing to expend upon it. In its simplest form the spaces between the beams may be merely plastered; in a more elaborate treatment these spaces may themselves be divided by smaller timbers, placed somewhat higher and with decoration of some kind upon the spaces between, while other forms of enrichment, involving carving of wood, modeling of plaster and rich painting and gilding of all the surfaces, would of course place the ceiling in the class of those highly intricate and ornate compositions which characterized the work of the renaissance builders at the height of its splendor. A treatment of this kind is shown on page 114 of the September number. There are instances where a wooden ceiling is desired but where none of the forms of treatment thus far described seems desirable. Another variation is the type where below the joists a false ceiling is built, arranged in small, shallow panels which may be square, octagonal or given other geometrical forms. The timbers as well as the spaces between may be painted with flat decoration or carved in low relief. The majority of these ceilings are probably carried out in dark tones, but equally effective results may be had with lighter colors. A recent example of such treatment is of wood bleached to a light tan, the relief ornament picked out in gold with a few soft colors discernible on close examination, the general effect being that of a dull gold which agrees well with the architectural design.

It must not be supposed that treatment of a ceiling by any one of the methods here described entirely precludes the use of a frieze just beneath

Fireplace in Washington Mews, New York
Eric Gugler, Architect
Cement columns uphold cornice of unfinished walnut; plaster on walls and between joists

the ceiling, even when the ends of the heavy beams are supported by brackets or corbels. A frieze was often used in such cases, but it of course increased considerably the richness of the treatment and for that reason might not always be desirable. Another treatment, in many cases successful, consists in having a series of heavy mouldings placed on the walls just below the ceiling timbers in the nature of a cornice. This relieves the severity of the abrupt transition from vertical to horizontal surfaces,—but here again restraint and careful judgment must be used, for such is the subtlety of this style that sometimes an abrupt transition may be exactly what the architect requires for the proper interpretation of his design.

Hall in Villa Caronia, Florence
Vaulted plaster ceiling; polychromed doorway; walnut furniture

When a ceiling is built of open timbers in any of the forms which have been mentioned here, opportunity is afforded for the use of decoration in polychrome which may be either simple or ornate as circumstances demand. In designing such ornament for ceiling timbers it has been found that the result is improved by the avoiding of too much minute and intricate detail, and by the use of design which is somewhat bold and vigorous; this is of course because a ceiling in a room thus treated would generally be placed at a comparatively considerable height, and design of too minute a character would not possess sufficient force to make it effective. For the same reason the colors used should be definite and decided — such colors as

Corner in a Music Room of a House near Boston. Harry B. Russell, Architect
Woodwork and open timber ceiling, stained dark brown; plaster walls of mottled ivory tones
Dimensions of room, 20 by 20 feet; ceiling height, 12 feet; fireplace opening, 4 feet 3 inches high and 4 feet 2 inches wide

"carry" well—and it would be wise to avoid all the subtle shades and indefinite colors which are admirable for some purposes but which are not sufficiently forceful or robust for use upon a lofty ceiling. The dark color of the wood itself is certain to absorb something of the brilliance of whatever colors are used, and this should be allowed for so that the finished work will be sufficiently vigorous.

Walls share with ceilings the important function of enclosing or defining a room; they might even seem to be of greater importance, since they are necessary to support the ceiling. Here again there are several forms of treatment which are quite suitable and which, since they are of varying degrees of cost, afford a broad range of selection. In many instances the walls may be of plaster which may be treated in any one of several ways. Nothing affords a more excellent foil for objects to be placed against the wall than plaster, and this is all-important when it is remembered that in the careful handling of contrasts much of the interest of the Italian style is found. Plaster forms a suitable background for tapestries, furniture, carved wood or paintings which are sufficiently strong, but it may be readily seen that a style which is itself so vigorous and forceful requires that furnishings be equally virile.

Library in a New York Apartment. Charles A. Platt, Architect
Polychromed wood ceiling; woodwork stained brown; hangings of old red brocatelle, hung from cornice

The finishing of plaster walls, unless they are to be covered with figured decoration of some kind, is an item which has much to do with the success of a finished interior. The inner walls of many of the older Italian houses were of stone or marble, which of course gives a note of architectural strength and dignity very important in interiors such as are here being discussed, and which was secured in later days by the use of plaster treated to give something of the effect of stone. To get this effect in plaster requires a treatment which shall contribute a surface in which play of texture and color gives quiet interest, variety and sobriety—a fitting background for tapestries, strong and heavy furniture, dark in color as in chestnut, the wood mostly used in Italy. Having laid up the wall, the final coat of plaster is rough troweled in areas of surface instead of being given sand or smooth finish. Over this surface which is close to that of a travertine marble, soft umbers and sienas (rotten stone in two tones is one of the best pigments) are washed on, preferably in water medium. Then a general going over with a sponge or brush stippler brings the surface to the desired variation and softness. If a wall of travertine marble is kept in mind,—with its richness of texture and the softening and staining and dusting of time,—an agreeable and fitting wall is the result, quite in the spirit of Italy.

Excellent results sometimes follow the use of dry colors mixed with the last coat of plaster, and pigments in powder form are to be had for this specific purpose. The process of marbleizing, used in Italy from the earliest times, supplies an effective and comparatively inexpensive method of treating wall surfaces, being used also on woodwork and sometimes on furniture and even on floors. Its use is quite legitimate and marbleizing is employed on even the best work where expense is not one of the chief considerations, since it does not pretend to be an exact imitation of real marble but rather a means of securing the rich effect of marble without its coldness and hard glitter. Marbleizing is particularly useful for wainscoting, as suggested in the illustration of the loggia on Plate 61 or to emphasize panels or the inner surfaces of niches, as may be seen from the illustration on page 159. The marbleizing process is quite simple in principle but of course requires considerable experience to make the result as finished as it should be. The

Main Hall, House of Charles E. Mitchell, Esq.
Walker & Gillette, Architects
Plaster walls as a foil for a Spanish portrait and a carved bench of Italian design

treatment consists of the application of one paint over another, choice being made of colors that contrast well. The paint used to produce the veining, upon a body color, is mixed thick and then "scumbled" on—thinly spread or rubbed with a hard brush. One of the most successful results of marbleizing is often had when the effect is to be that of black and gold marble, heightened in certain spots by the use of small fragments of gold leaf. There is no end to the color combinations which may be used, and this is one reason for the vogue of the marbleizing process through many centuries.

The use of painted figure decoration upon walls affords possibilities of varied effects. Perhaps the taste of even the sixteenth century wearied of too austere a handling of its walls, or else the architects may have had to provide for families not possessed of the rich tapestries or splendid portraits which are seen to such advantage against plain plaster. The plain walls, as already pointed out, were usually of rough plaster to afford desirable textures. In other cases smooth surfaces were employed and polychrome treatment was applied and this, when the design was not too intricate, afforded a rich and satisfying result without in any way detracting from architectural dignity. Several of these illustrations deal with interiors so treated and it will be realized that this development is often helpful when furnishings are hardly adequate to the architectural requirements. Recent examples of the domestic use of mural decoration in America prove what excellent results are to be had, and the attention of architects and decorators may well be turned toward it.

The thickness of walls such as are common in Italy affords considerable opportunity for splaying the openings of doors and windows, often with excellent effect. When the walls about them are of plaster, unornamented, these deeply splayed surfaces may be treated in polychrome design, the contrast affording an acceptable relief to the severity of plain walls; when the wall surfaces are themselves ornamented the splayed jambs and sills

Dining Room and Plan of Main Floor, House of Charles E. Mitchell, Esq., New York. Walker & Gillette, Architects
Vaulted ceiling, plaster walls of uneven texture and stone mantel afford an architectural setting for Italian furniture

An Illustration of the Value of Marbleizing in Contrast with Surfaces of Plain Color. Hampton Shops, Decorators

may be without ornament, which often produces a highly desirable result. Jambs and sills splayed and treated in similar fashion are useful for the tiny inches or alcoves which the Italian builders were fond of using occasionally to break the monotony of large expanses of wall surface. Sometimes these small niches in the thick walls would be fitted with doors and thus converted into tiny cupboards, the doors themselves sometimes being given polychrome ornament when such a treatment would heighten the decorative effect.

Covering the walls of a room with fabrics of different kinds may have been an outgrowth of the use of tapestries hung upon walls. Architects and decorators often find that clients demur when this form of wall covering is proposed, the idea being distasteful to many since these fabrics are generally fixed to the wall and cannot be easily removed for necessary cleaning. This objection may be entirely overcome when such fabrics are arranged as suggested in the illustration on page 157 where the wall coverings are suspended from hooks placed in the wall just beneath the cornice, from which they are readily taken down for an occasional brushing. Made as these wall coverings are, in large panels or sections, considerable use may be made of borders to create a certain contrast in the hangings themselves, although such a use of borders would only be possible, perhaps, in an instance such as that illustrated where the wall spaces are but little cut into by openings.

The use of fabrics upon walls has a particular value in that it gives a room what might be called a "furnished" appearance even when but little furniture is used. Fortunately for the architect or decorator, a few American manufacturers of fabrics, who realize that the public taste long ago abandoned false gods and turned to an appreciation of the historic periods of architecture and ornament, have reproduced with astonishing fidelity to the originals a large number of fabrics which for use in decorating and furnishing in the Italian manner are precisely what are needed. The modern makers of tapestries have learned many of the secrets of the tapestry weavers of the golden age of the art, and the output of their looms, possessing the rich softness which characterizes tapestries, is available to present-day architects and decorators.

It will be realized by the architect or decorator at all familiar with the present markets that they afford every advantage for a correct interpretation of Italian domestic interiors. An appropriate architectural setting may be obtained with very simple materials used with judgment and discrimination, and the interior thus secured may be developed at no excessive cost with modern furnishings of various kinds which are true to the period.

Walls and Ceilings Polychromed in All-over Patterns Are Often Useful Where Important Furnishings Are Wanting

Investigate the Furniture Market Now

WITH the opening of the fall season, a period during which there is a great increase of activity in furniture and decorative material show rooms, architects will find it well worth while to visit them, even if no particular purchase may be under consideration. The most interesting impression which will be gained is the fact that prices have been reduced, which should encourage many clients to buy now. A large number of new consignments of imported furniture and objects of art have been received and are on display and for sale at moderate costs. There has been a distinct tendency on the part of American manufacturers of good furniture to increase the stock output of furniture showing definite period influence. For example, there has never before been in the market so varied and interesting a collection of dining room furniture showing the influence of the Italian renaissance period.

In the field of floor coverings the reduction in cost is quite noticeable. Large shipments of oriental rugs have been received. Fine chenille carpets of Czecho-Slovakian manufacture may be had at moderate costs, comparing favorably with good grades of Scotch chenille. Rugs of Chinese manufacture and motif are to be had at prices closely approximating the cost of good grades of domestic carpets. It has been many years since the costs of furniture and of decorative materials of every kind have been so moderate and this condition will undoubtedly lead to the remodeling and refurnishing of many existing dwellings, and to the placing of interior decorating and furnishing commissions on a large scale for new houses.

Architects will find that the designs of furniture, lighting fixtures, fabrics, wall paper and other decorative materials are in many cases full of suggestion and inspiration, and while the interior architecture of special rooms may be under consideration, it will be found that time spent in the various show rooms may have a direct effect in the designing of other interiors. We have known of several recent instances where interiors have been specially designed to form the background or setting for furniture and decorations selected by clients. The artistic atmosphere of the show rooms is in itself inspiring, and nowhere else will there be found such attractive studies of color, line and proportion.

In some sales rooms a practice is made of arranging certain areas as rooms in definite period styles. The rooms are correctly carried out to the smallest detail, and ceilings, walls and floors as well as furnishings and accessories of different sorts may thus be studied in combinations which exhibit to the greatest advantage the furniture, fabrics, or whatever else is sold in the establishment arranging the display. The architect who investigates, even casually, the American markets for furniture and furnishings of various sorts will find renewed interest and fresh zest in design which will have its effect on the work of his office and on the service which his office renders to his clients.

A Walnut Credenza of Architectural Character after a Piece in the Davanzati Collection
An excellent example of craftsmanship and design qualities of modern reproductions available in stock

The
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Villas of the Veneto

IV. THE VILLA CORNARO AT PIOMBINO, NEAR CASTELFRANCO

By HAROLD DONALDSON EBERLEIN *and* ROBERT B. C. M. CARRERE

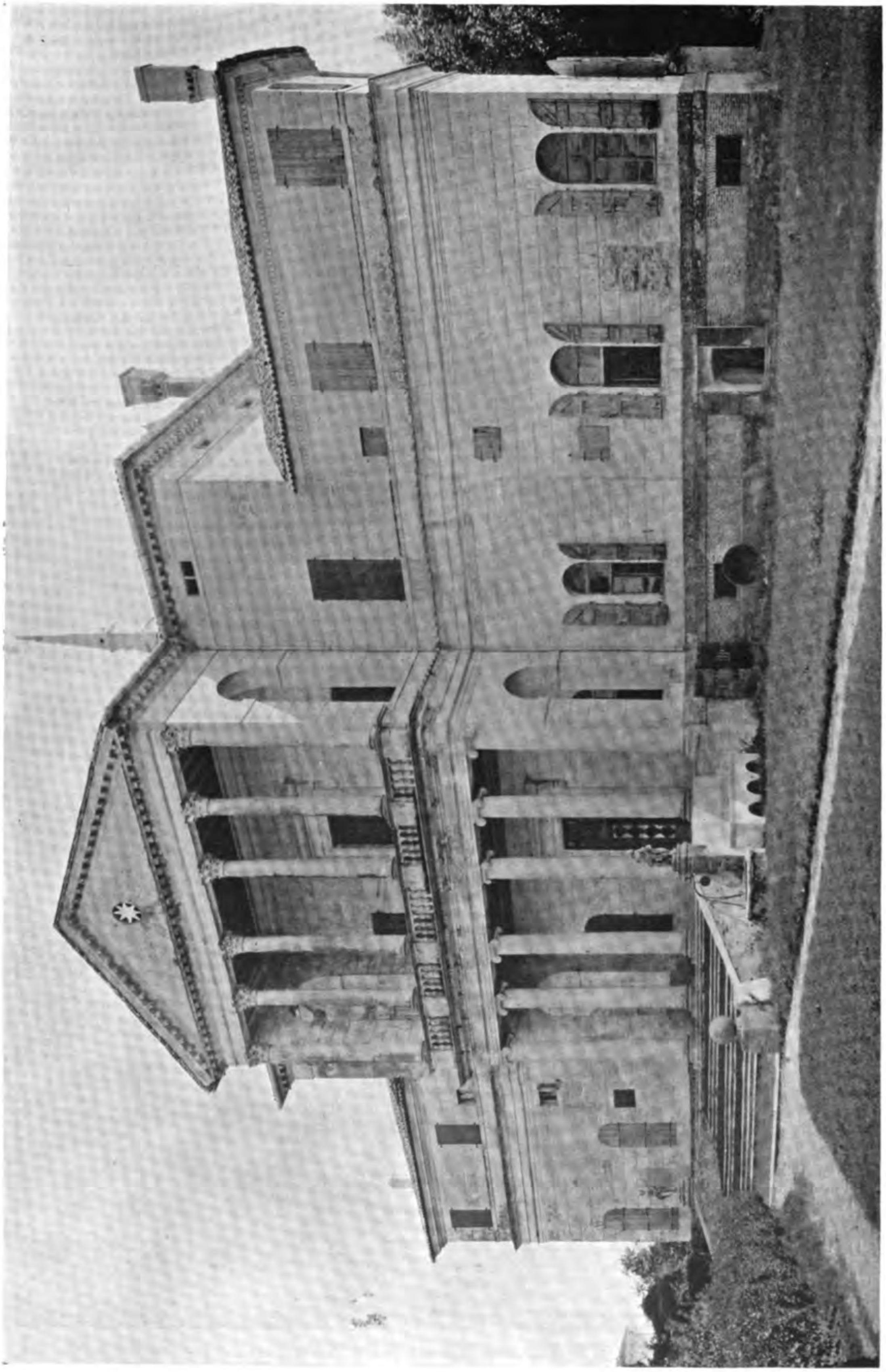
"That house only ought to be called convenient, which is suitable to the quality of him that is to dwell in it, and whose parts correspond to the whole and to each other."

HERE we have in a nutshell Palladio's philosophy of domestic architecture. It is very cogently expressed, and to discern its full force one needs but remember that in his translation Isaac Ware used "convenient" in its broader, seventeenth century sense as "fitting" or "seemly." Messer Andrea was fully sensible of the fact that the very raison d'être of a house is to shelter appropriately the life lived within its walls. He also recognized in equal measure that as the manner of life must necessarily differ for men of different stations in a complex social order, so also must the external expressions of domestic architecture differ to accord with the several estates of those who are to live in the houses.

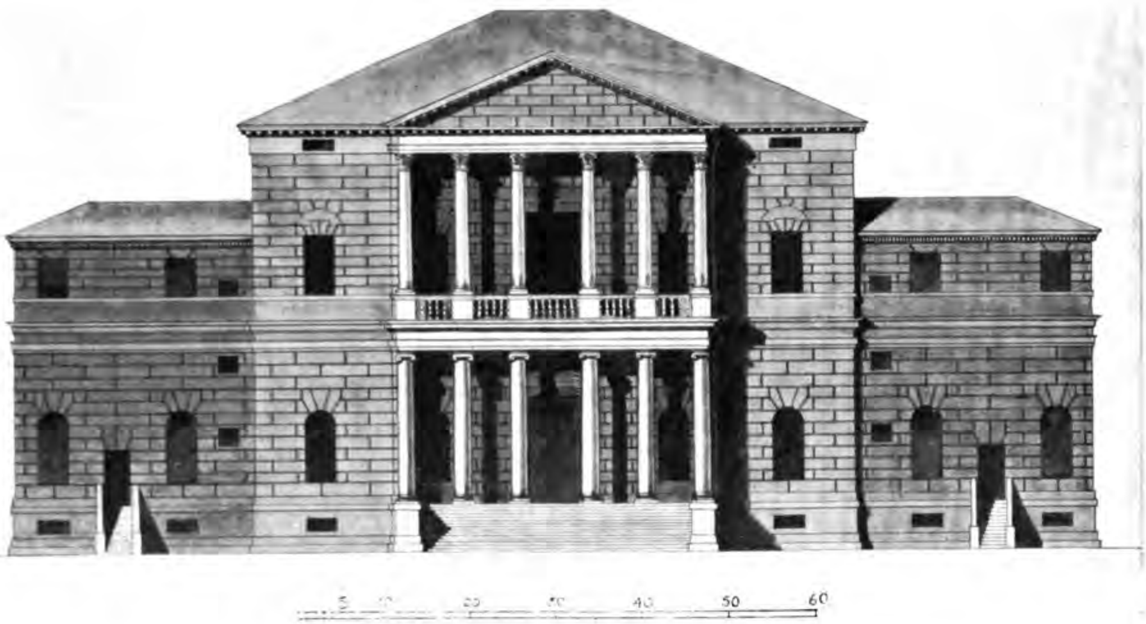
As to the particular form with which he chose to express his convictions in design, let us take his own words when he writes "the architect ought above all to observe, that (as Vitruvius says in the first and sixth books) for great men, and particularly those in a republic, the houses are required with loggia's and spacious halls adorned, that in such places those may be amused with pleasure who shall wait for the master to salute, or ask him some favour"—a thoughtful provision of enticement for these sixteenth century successors of the old Roman "client," as well as for "the virtuous friends and relations" alluded to in a previous paper.

When Palladio penned this generalization regarding proprieties of plan, he may well have had in mind this very villa at Piombino, in the Trevisan Marches. The "magnificent Signor Giorgio Cornaro," for whom the house was designed, was a person of consequence in the Venetian state—a member of a noble family that had supplied more than one doge since the thirteenth century and was destined to supply more—a family upon whose

Villa Cornaro. View of the South Front from Parked Space beyond Gates



GENERAL VIEW OF THE NORTH OR PRINCIPAL ENTRANCE FRONT
VILLA CORNARO, PIOMBINO, NEAR CASTELFRANCO, ITALY

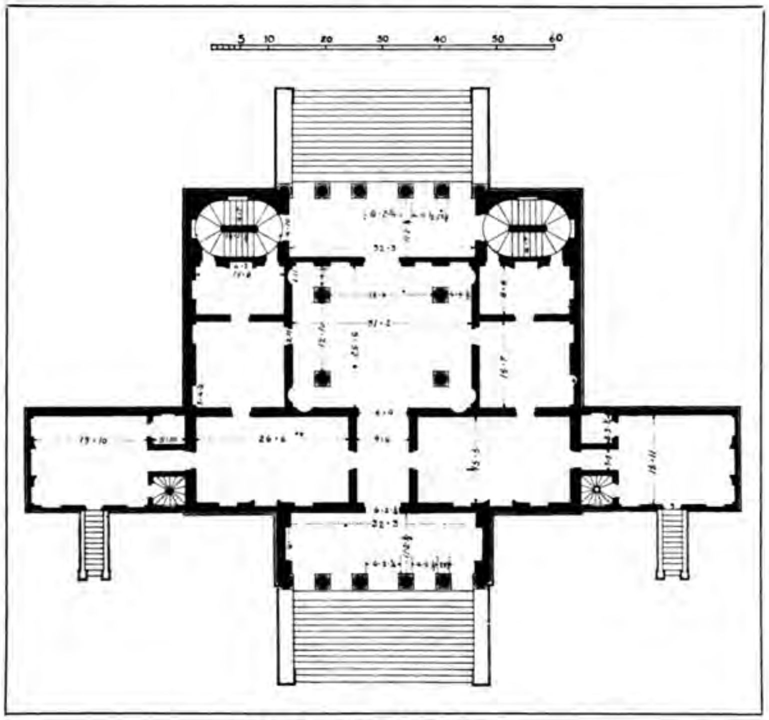


Elevation of North Front after Scamozzi's Drawings

sons the republic, according to its wont with those of ducal rank, was ever ready to impose the fulfillment of exacting public services; a man of wealth and broad interests, and a near kinsman of that ill-starred Caterina Cornaro, Queen of "Jerusalem, Armenia and Cyprus" until the paternalistic government of her native city, coveting her kingdom for its own purposes, forced her to abdicate and sent her to live in a semblance of her erstwhile royal estate at Asolo. It was fitting, therefore, that a noble of such note and connections should have a princely house, and such a house did Messer Andrea build him—about 1570, if the local tradition be correct—a house which Scamozzi properly deemed one of Palladio's most beautiful creations.

"The hall is placed in the most inward part of the house, that it may be far from the heat and cold"—the quotation is from Ware's translation of Palladio—"and the wings where the niches are seen, are in breadth the third part of its length. The columns answer directly to the last, but one, of the loggia's, and are as far distant from one another, as they are high. The large rooms are one square and three quarters long. The height of the vaults is according to the first method for the height of vaults [Bk. I, Ch. 23]. The middle sized rooms are square, one-third higher than they are broad; their vaults are *à lunetti*. Over the small rooms there are *mezzati*. The loggia's above are of the Corinthian order. The columns are one-fifth less than those underneath. The rooms are with flat ceilings, and have some *mezzati* over them. On one part is

West End of Villa Cornaro



Main Floor Plan of Villa Cornaro

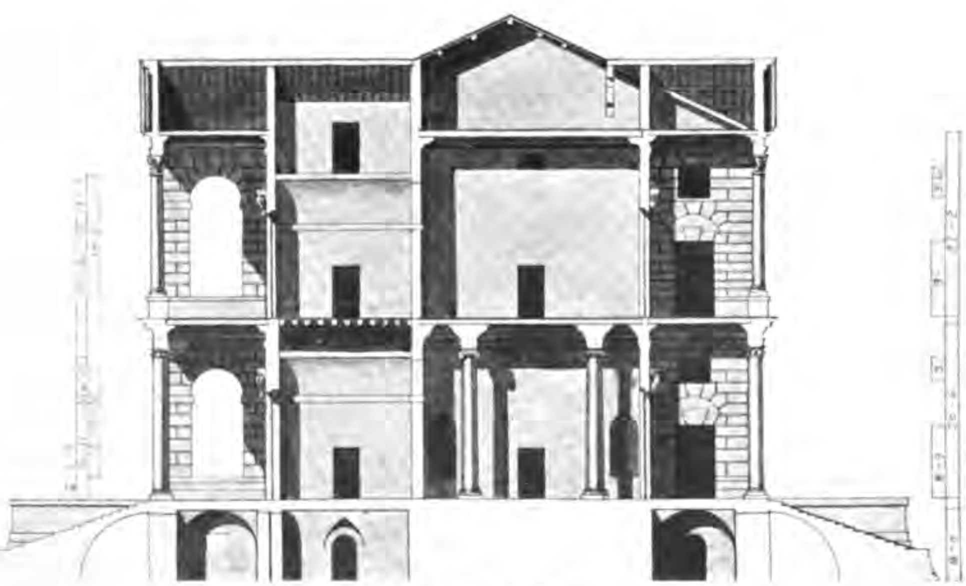
the kitchen, and places for housewifery; and on the other places for servants." Palladio's literary style is not so lucid as it might be, to begin with, and Ware's translation might have been happier, to say the least, but by comparing the description with the plan, elevation, section and the photographic reproductions one may gather an accurate idea of the fabric as it is today.

One caution it is necessary to impress upon the reader before going further. The careful student who undertakes to collate the available documents will observe that Palladio's own drawings, the drawings here reproduced, and the photographic records do not all tell exactly the same story. There are manifest discrepancies, on the one hand, between Palladio's plan, measurements and elevation and the plan, elevation and measurements here published. On the other hand, furthermore, there is not complete coincidence between the last named data and the photographic testimony.

The explanation of this three-sided divergence is this: Palladio published plan, measurements and elevation as he originally designed them.* Scamozzi (edition Vicenza, 1786), upon the basis of which the accom-

	*As Designed by Palladio	As Executed
Width of vestibule	32′	31′ 2″
Length of vestibule	27′ 3″	25′ 6″
Width of entrance passage	10′	9′ 6″
Width of great chambers	16′ 5″	15′ 5″
Length of great chambers	24′	26′ 6″
Square chambers	16′	15′ 7″
Width of cabinets	10′	8′ 8″
Distance between central columns	6′	6′ 2¼″

These measurements are given in the Vicenza foot.

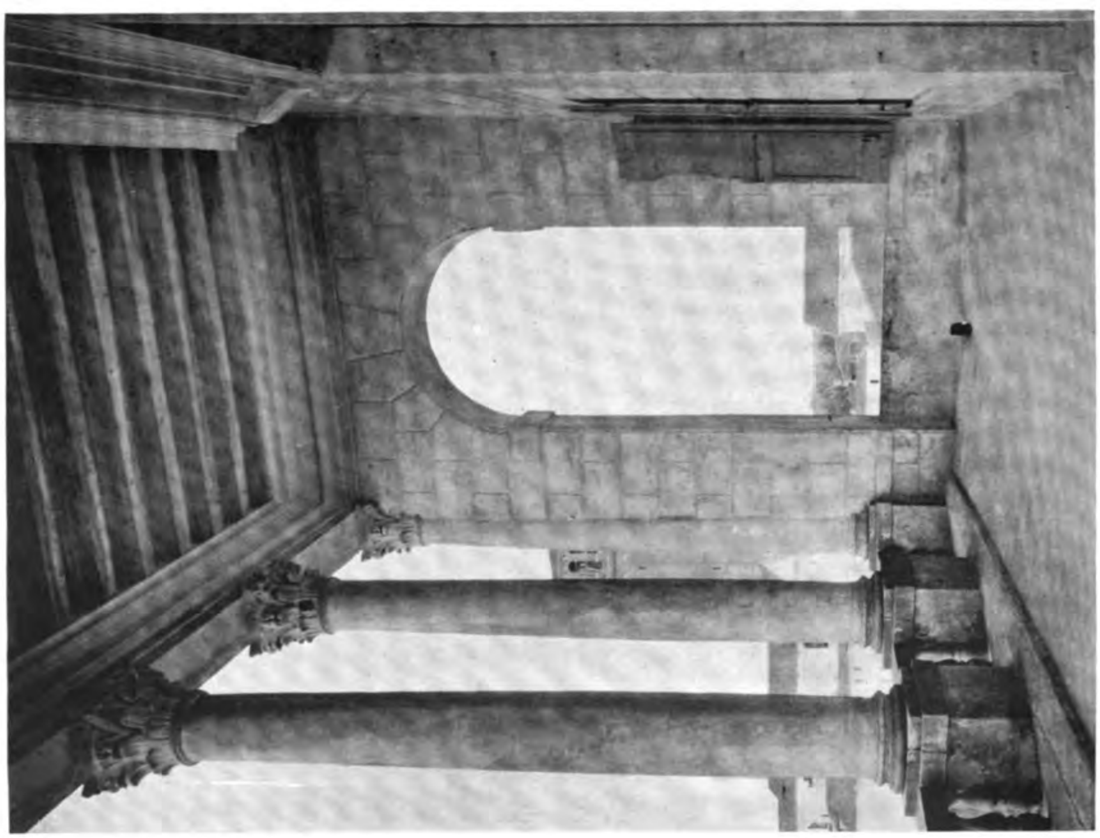


Cross Section of Villa Cornaro after Scamozzi's Drawings panying plan, measurements, elevation and section are given, with some recent additional verifications, gave the version of the villa as actually built, and was careful to note the most important variations between Palladio's measurements and his own, a table of which appears in the subjoined footnote. In the course of years, sundry changes have been made, such, for example, as removing the steps and blocking up the doors in the wings, and it is the present state of the fabric we find recorded in the illustrations. Between the two last named classes of documents no serious discrepancy occurs, with one exception. In both the Scamozzi and Palladio versions the ascents to the loggias, north and south alike, appear as runs of continuous steps. That they consist of short ramps separated by runs of three steps, that they extend much farther outward from the building than the plans and section indicate, and that the treatment of the balustrades is different from that shown in the elevation, is quite clear from the illustrations. Why Scamozzi did not correct this in his version, whether as an extramural matter he thought it not sufficiently important to change, or whether as a subsequent alteration of Palladio's design he deemed it improper to indicate, it is impossible to say. At any rate, it seemed advisable to let the record stand as shown in the drawings.

As is the case with so many of Palladio's country houses, the Villa Cornaro is built of brick and coated over with an excellent quality of stucco, finished with a *marmorino* surface which has well withstood the effects of time and taken on much the appearance of light limestone, the effect being considerably heightened by the rustication. The shafts of the columns are also of brick, specially shaped, and coated with *marmorino* finished stucco, while the bases are stone and the capitals terra cotta painted or stucco washed. Both Ionic and Corinthian capitals are more refined in detail in the south than in the north loggias. The balustrades of the loggias and the steps are of white Istrian stone, and the ramps, between the runs of triple steps, on the broad ascents to both north and south loggias, are cobbled, and now thickly grown with grass.

The ground floor loggias are paved with large bi-colored elongated hexagons, each composed of two bricks, one straw colored, the other orange, with the corners clipped to form the hexagon. The same paving is found in some of the rooms, while the others are floored with the large bricks commonly used for that purpose in old Italian houses, or else with terrazzo. In the large enclosed and oval shaped south staircases, which communicate directly with the ground floor and main floor loggias by open doorways without doors, the steps are made of brick set on edge. So far as any paint is left upon the shutters, it seems once to have been green. The roof is of the usual reddish tiles. Inside, the ceiling of the great hall is beamed and bears the original *cinquecento* arabesque decorations in an agreeable combination of white, yellow and dark blue. As the section shows, there is a second great hall on the main floor, directly above

Villa Cornaro. Loggias and Ramp of South Front



INTERIOR, SECOND FLOOR OF NORTH PORTICO

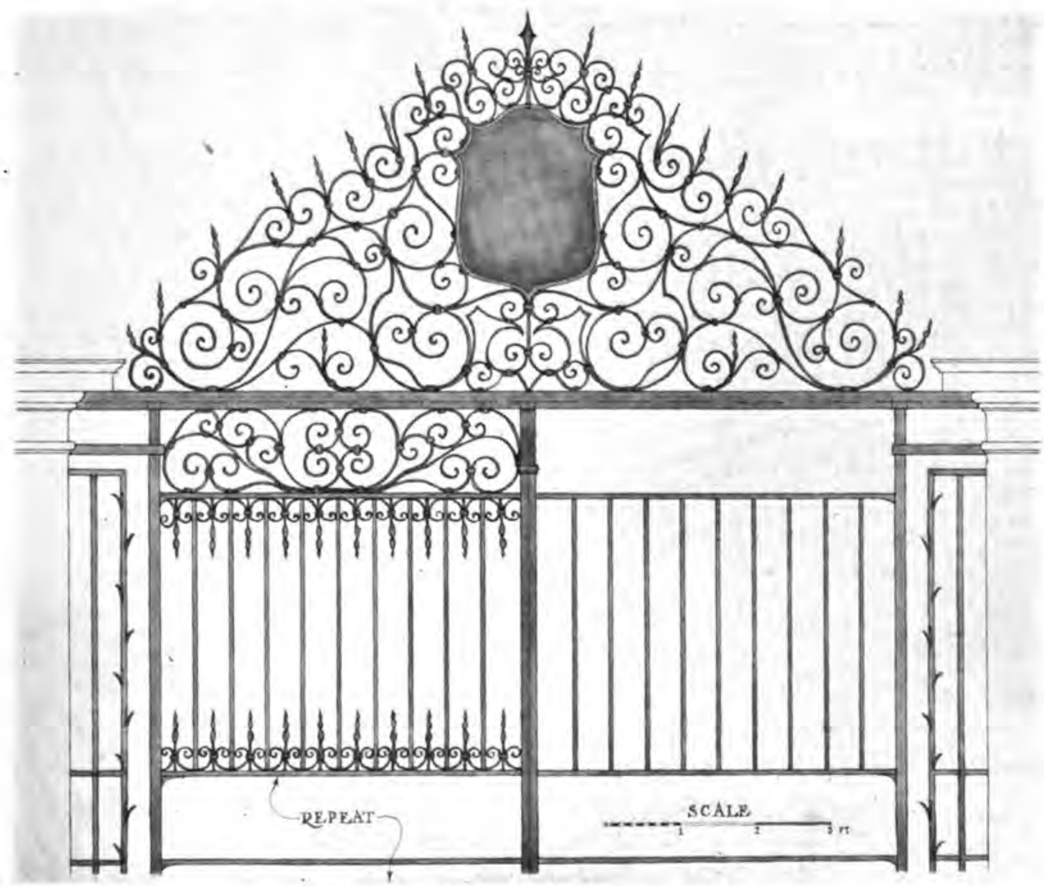
GREAT HALL LOOKING TOWARD NORTH DOORWAY

VILLA CORNARO, PIOMBINO, NEAR CASTELFRANCO, ITALY that on the ground floor, and of the same dimensions. Here also the ceiling is beamed and painted in the same manner as that in the lower hall, only a little more elaborately and with a greater variety of color.

In the seventeenth century the baroque decorators adorned the doorways in the lower hall with highly wrought plasterwork, very good of its kind and admirably executed. They also added stucco embellishments for the chimney-pieces in some of the rooms on the main floor, and likewise contrived ornate plaster frames in several of the ground floor rooms to enclose a series of well conceived but very indifferently executed frescoes of biblical subjects. To the seventeenth century also belong the gates opening on the street, an achievement in wrought iron of such beauty that it somewhat inclines us to forgive the contemporary frescoes just alluded to.

Mr. Fletcher's classification of Palladio's country houses, according to five types of plan, is probably familiar to the reader:—(1) block type, without wings; (2) central block with quadrangle; (3) central block with straight wings; (4) central block with quadrant wings; and (5) central block with returned wings. The Villa Cornaro belongs to

Entrance Gates, North Front



Villa Cornaro. Detail of Ironwork of Entrance Gates on North Front
An addition made in XVII Century to original work

the third type, but in disposing the layout Palladio departed from an arrangement to which he appears to have been partial and which, indeed, he expressly mentions as an important detail to be observed in the planning of villas—that "the covertures for the things belonging to a villa, must be made suitable to the estate and numbers of animals; and in such manner joined to the master's habitation, that he may be able to go to every place under cover, that neither the rains, nor the scorching sun of the summer, may be a nuisance to him, when he goes to look after his affairs." The stables and other accessory buildings are set separately at a little distance from the house, and lie along the road, with an arcaded portico opening upon the grounds. A thoroughly practical and worthy piece of composition, thus, the north side, but not nearly so imposing and stately as the arrangement to the south of the house.

Here a broad *tapis vert*, bounded east and west by lofty avenues of plane trees, extends a goodly distance to the park gates, set just at the far side of the bridge, which spans a little stream and what were once fish ponds, but are now overgrown with reeds and become breeding places for the "molesting gnats and other small animals" that Palladio cautions his clients against, "which are generated by the putrefaction of still fenny waters." Beyond the gates there opens out another and greater rectangular lawn enclosed by trees and hedges, behind which run clear rivulets. Again, beyond these bounds there stretch the fields of the estate. Thus, as one stands in either of the south loggias, the eye commands an extensive and agreeable prospect. In this immediate region, flat and possessed of no striking natural beauty in itself, the villa and its grounds are so contrived that they make a spot of genuine delight to the eye.

The more one studies Palladio's country houses at first hand—and the Villa Cornaro is an admirable example to cite in support of this observation—the more is one filled with admiration for the ingenuity of the master who could use the same limited number of motifs and stock "properties" over and over again, and yet dispose them in ever new combinations, without repeating himself or incurring the risk of having one of his compositions mistaken for another.

Plaster Doorway in Great Hall

Plaster Decorations Framing Frescoes

Embellishments on Ground Floor, Made in Baroque Period of XVII Century

Ramp Design in Public Garages

By HAROLD F. BLANCHARD, AUTOMOTIVE ENGINEER

THIS is the second of a series of articles to be presented in THE FORUM *by members of the Consultation Committee on their respective subjects. Others of equal value and interest are in preparation.* — THE EDITOR.

THE popularity of the ramp as a means of inter-floor transportation has increased very rapidly in the last three or four years. There was a time when elevators were used almost exclusively for multi-storage garages, but it has been gradually realized that there is much to recommend the ramp for the transportation of self-propelled vehicles. The ramp obviously is much older than the elevator; in fact, it antedates the stairway. It is nothing more or less than an artificial hill, and consequently was man's first means of moving from one level to another. Then came the staircase which, however, was mainly suited for the inter-floor movement of human beings. As a means for moving goods its use was largely limited to what a man, or perhaps several men, could carry. Hence, the hoist was introduced and from that the elevator was developed. The freight elevator is a logical device for the movement of goods of all sorts, but the introduction of automotive vehicles, themselves possessing the power to climb or descend from floor to floor if a roadway was offered, changed the problem. This partly explains the growth of the use of the ramp.

The chief objection to the ramp is the fact that it often takes up considerable space. Just how much space it occupies depends on circumstances, including the size of the plot and how well the building is laid out. It also depends on the type of ramp used. At least one type of ramp, from a space-economy standpoint, compares very favorably with the single elevator. Even the ordinary ramp, although it often requires a great deal more space than a single elevator, has frequently been used because of the advantages it offers. It is cheaper to install and involves no upkeep cost. There are no moving parts and there is nothing to get out of order. It is part of the building itself; its capacity is almost unlimited. Cars may be run up or down in quick succession whereas the elevator has a very definite capacity limit.

Owners of automobiles invariably prefer the ramp because it provides quick and easy inter-floor transportation. There are no serious delays as with an elevator. The ramp is easily, instantly available. It makes every floor a straight floor. The objection to upper stories is almost completely removed. Owners and drivers of motor trucks are equally enthusiastic. In the storage of motor trucks it is almost a rule that all the trucks in the garage will go out within a period of half an hour or so in the morning and come in during a similar period at night. Because of this fact there must be means of handling a large capacity one-way traffic. The elevator is at its best when it is handling simultaneously two-way traffic, carrying a car up and bringing one down. The ramp is at its best when handling traffic in one direction, therefore the ramp is particularly desirable in a truck garage since it permits the emptying of a building in a few minutes in the morning and the filling of the building with equal ease at night.

In first approaching the question as to whether to use ramps or elevators it is necessary to consider whether one or more elevators will be necessary. Ordinarily one elevator will handle the work in a garage of 125-car capacity. In other words, if the building houses 500 cars, four elevators would be required. This figure, of course, must vary with different buildings and different requirements, but it is, nevertheless, a good average figure. One elevator would be sufficient for a garage having 150

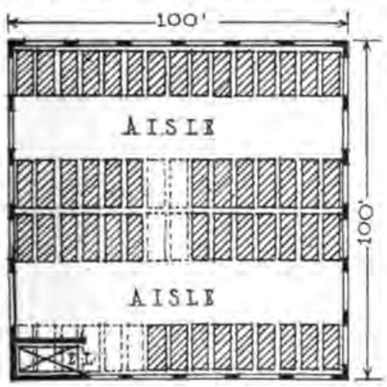


Fig. 1. Elevator Garage
Capacity 50 cars. Space for 6 cars occupied by elevator and approach

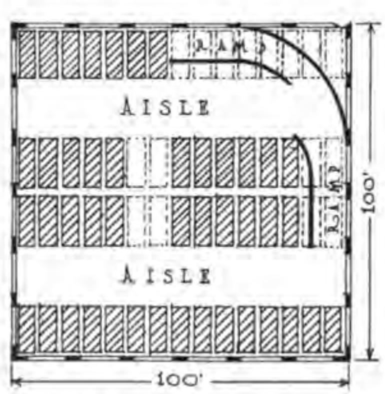


Fig. 2. Ramp Garage
Capacity 44 cars. Space for 12 cars occupied by ramp. Floor layouts vary

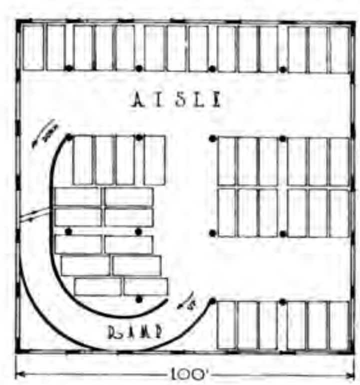


Fig. 3. Garage with Improved Ramp
Capacity 46 cars. Space for 10 cars occupied by ramp. Floor layouts identical

cars on three floors. Also a single-track ramp would be satisfactory for this building. Such a building would probably be 100 x 100. The elevator would be located in one corner and it would probably occupy a space which could be devoted to six cars. This figure includes the necessary approach to the elevator and it assumes an average elevator location; see Fig. 1.

A ramp design for the same building would probably vary from floor to floor but, on the average, it would occupy space which might be devoted to twelve cars. In other words, the ramp takes up six more car spaces than a single elevator. Notwithstanding this fact, the ramp is usually preferred because of the reduction in first cost, the absence of cost of upkeep, and the ideal service which it usually offers.

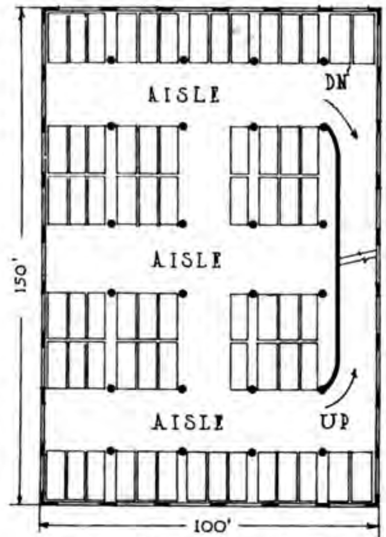
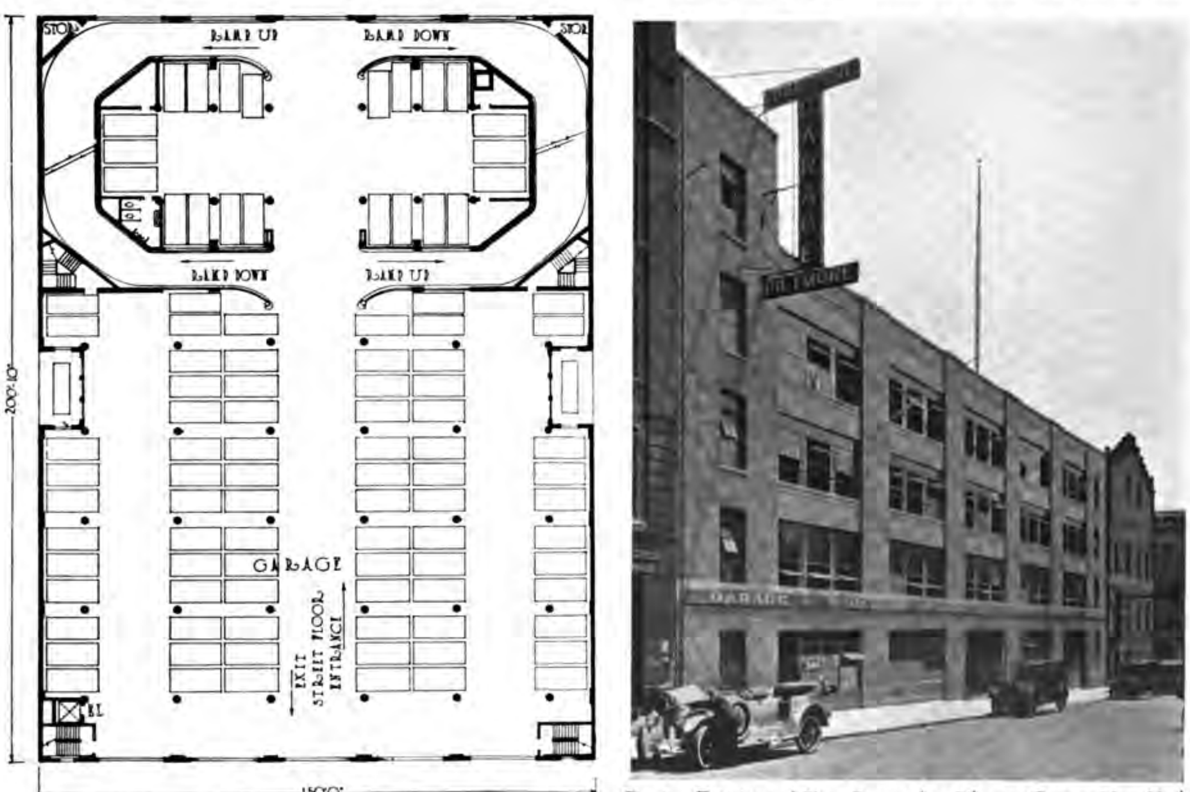


Fig. 4. Plan with Straight Ramp
This type is more economical in space than curved ramp but requires a floor depth of 150 feet

If a single elevator breaks down, the garage is out of business until it is repaired and for this reason a second elevator is often installed, adding to the expense. Advocates of the elevator often object that the ramp is not satisfactory because a broken down car cannot be taken up it. This is not true, however, because any good touring car is powerful enough to tow another machine up a 15 or 20 per cent ramp grade.

The ramp is often considered preferable to an elevator, even in a service station, because there are no parts to get out of order, no upkeep expense, and its capacity for transporting cars is much greater than the elevator's capacity. Furthermore, it is easier to tow a disabled car up the ramp directly into the repair shop than it is to disconnect the tow car at the elevator, raise the disabled car to the designated floor, and then remove it from the elevator. This is particularly true when one end of the car is so badly smashed that it must be lifted by the tow car.

The ramp has an advantage in the eyes of the average garage operator which cannot be calculated in dollars and cents. It is a sales talking point, the importance of which cannot be overestimated. However, if it is desired to make a comparison between a ramp and an elevator on a strictly economic basis, it is easily done, although the exact figures must vary according to the elevator considered, the height of the



Floor Capacity 99 Cars

Fig. 5. Exterior and Plan, Commodore-Biltmore Garage, New York
Warren & Wetmore, Architect

building, and so on. Nevertheless, for an average case it may be assumed that the elevator costs $5,000, that repairs and depreciation per year will total $500, and that the cost of electric current will be $750. The interest on the investment at 6 per cent will be $300, making a total annual expense of $1,550. To this must be added the salaries of the elevator operators, if necessary. The usable space that the elevator occupies in a building should also be added to the expense. In other words, if the elevator takes up space sufficient for six cars per floor the rent that might be obtained from these spaces should be figured in. On the other hand, the cost of the ramp is entirely represented by the cost of the usable space it occupies. It is not fair to figure, in the case of the ramp, any addition for construction because the ramp will cost no more than equivalent floor space secured by ordinary building construction.

View of Ramp along Rear Wall, Commodore-Biltmore Garage
Warren & Wetmore, Architects

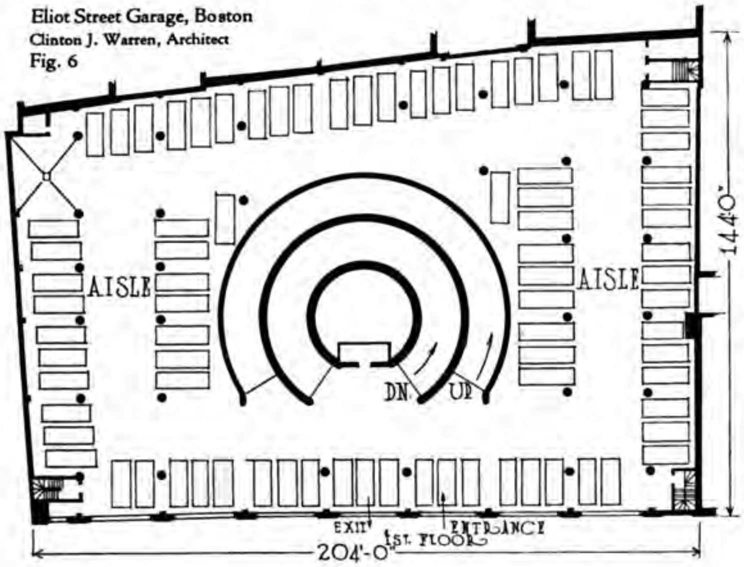
Many interesting facts have been developed regarding ramps within the past few years and from an examination of buildings already erected it may be said that few ramps have been laid out so as to fit their buildings as economically as possible. Here is a subject that demands the closest study, because the revenue to be obtained from the building depends upon how many cars can be stored in it. The design of the garage, by the way, is different from that of most other buildings because automobiles are large, bulky objects which can only be moved forward or backward. The conditions, therefore, under which a garage operates are very different from those found in an office or a factory. The ramp or elevator location and column spacing mean everything in a garage, whereas they mean comparatively little in a factory or an office building.

Many hold the view that a ramp is only suited to a large building, but it may be said positively that there are few buildings which are so small that they may not include a ramp properly designed. Perhaps the quickest way to get at the question of efficient ramp design is to consider the faults of some typical layouts that have been developed.

Fig. 2 shows the usual design for a building 100 x 100. This layout is for the second floor. The ramp rises along the right side of the building, from the first floor front, and swings in under the rear aisle. A continuation of this ramp goes on up to the third floor and perhaps from there to the fourth. It will be noted that the entrance to each floor is at a different point because of the type of ramp used; also, on the second floor the ramp takes off a slice of one side and one end of the building. This naturally has a serious effect on car storage. It subtracts space from all floors, but unfortunately the space subtracted is different on every floor. In other words, a ramp of this design raises havoc with the layout. The layout on every floor must be different, and yet the columns of all floors must have the same location. The objection, therefore, to this design, and to many ramp designs, is the fact that the floor pattern is different on every floor. Therefore, the desirability of so locating the ramp that it gives a uniform floor layout is a matter of prime importance. In the building in question, the easiest way of achieving this result would be as shown in Fig. 3. In fact it might be said, as a rule, that wherever a uniform floor pattern is desired it may be obtained by locating the ramp system as a flight of stairs and using the aisles to travel from one ramp to the next. The objection to both plans, Figs. 2 and 3, is that the curving of the ramp takes up a great deal of useful space. Therefore, it must be concluded that the straighter the ramp the less space it will occupy. It is difficult to make a straight ramp of ordinary design fit in a building 100 x 100. It is quite feasible, however, to place a straight ramp in a building 100 x 150, as shown in Fig. 4.

Fig. 5 shows the floor plan of the Commodore-Biltmore Garage in New York. This garage is of interest because it is one of the first to have a uniform floor pattern, and the layout shown is typical of all floors as far as the ramp is concerned. One ramp is for up traffic and the other for down. A car entering the garage swings to the right, up a ramp to the second floor, where it crosses the center aisle and reaches the third floor by way of a ramp on the left hand side of the building. Crossing the center aisle again it reaches the fourth floor up a ramp on the right hand side. The down ramps are alternately placed between these up ramps; there-

Eliot Street Garage, Boston
Clinton J. Warren, Architect
Fig. 6



as far as turns are concerned, the occasional large cars being placed on the ground floor. This ramp gives easy access to the upper floors and there is little interference between up and down traffic streams. The ramp is open to the objection, however, that by its very nature it must be made long—too long. In other words, the grade must be made much less than it need be. There is also considerable waste space at the turns. The grade is about 8 per cent where it may be twice this figure. A close study of the layout will show that it would be impossible to use this ramp design on the plot shown, and yet alter the dimensions so that a steeper grade might be employed to give more car storage.

The steeper the ramp grade is, the shorter the ramp becomes, and therefore the less space it occupies. Consequently, it is desirable to make the ramp as steep as possible and yet not too steep to be fully satisfactory. For a passenger car garage there is no reason why the grade should be less than 15 per cent and 20 per cent is not entirely objectionable, although 20 per cent is about the limit. A 20 per cent grade, by the way, is as steep an incline as the average car in good condition can ascend on second gear.

fore, a car coming down from the fourth floor would take a ramp on the left hand side to the third floor, and then on the right hand side to the second floor, thence on the left hand side to the ground floor.

This ramp design is excellent from an operating standpoint, excepting that the turns happen to be a trifle too sharp, the result being that large cars are likely to scrape their fenders. There are few garage locations where this would happen. In this section of New York, however, large cars are the rule rather than the exception. In many parts of the country this ramp design would be more than ample

Start of Ramp in LaSalle Garage Showing Fire Door
Holabird & Roche, Architects

Another garage design that has attracted a great deal of interest is the Eliot Street Garage in Boston, Fig. 6. Two concentric ramps are placed in the center of the building—one ramp for up traffic and another for down traffic. The circular space inside the inner ramp is not utilized. Traffic on both ramps is in the same direction, which feat is accomplished by sloping the inner and outer ramps in opposite directions instead of in the same direction, as might be expected. The ramp system is ideal from an operating standpoint. There is no conflict in traffic stream. When a car enters the building it can move directly on to the up ramp to the upper floors, or on the down ramp to the basement. Both these openings are facing the driver. Likewise, in going down, the car proceeds straight out of the building or, in coming up from the basement, it goes straight out. It will be seen, therefore, that no matter what the path of the car, it does not cross the path of any other car. This is an advantage when traffic is heavy, although it is an advantage which is often overestimated as to its importance. A car in moving up or down through the building moves a certain distance on the main aisle once each revolution. It will be noted that the paths of up and down cars are entirely separate. There is no conflict of motion.

The disadvantage of this design is due to the enormous amount of space that the ramp takes up. The outside ramp is approximately 90 feet in diameter, which is to be expected inasmuch as the inside ramp has a circle of about 60 feet. The

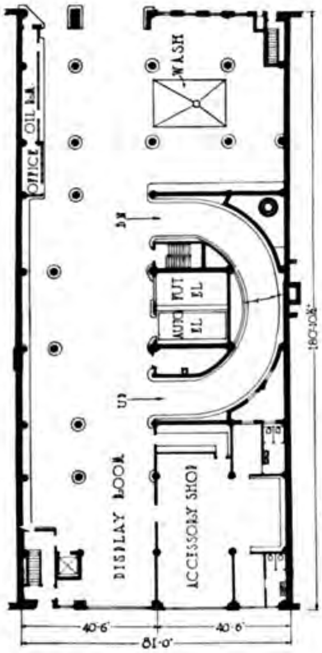


Fig. 7. First Floor Plan, LaSalle Garage, Chicago

Exterior of LaSalle Garage, Washington Street, Chicago
Holabird & Roche, Architects

ramps are broader than necessary. This plan illustrates one of the defects of the concentric arrangement of up and down ramps. In a large city garage it is hardly feasible to make the turning circle of less than 60 feet, and this, of course, applies to the inside ramp; yet if this is done the diameter of the outside ramp cannot be less than 80 feet, assuming that the ramps are 10 feet in width. Obviously, a circle 80 feet in diameter is a large space to devote to inter-floor transportation.

The LaSalle Street Garage in Chicago, Fig. 7, contains a noteworthy feature in that a ramp is used for traffic in one direction and an elevator for traffic the other way. In the morning, when the heavy traffic is *up*, the elevator is used for light *down* traffic, and at night, when *down* traffic is high the elevator is used for light *up* traffic. This garage is used largely by men who drive to business; if it were in a residential section the traffic streams would be in just the reverse directions. This elevator and ramp combination has much to recommend it, but it is a mistake to think that it suits all buildings. In small and medium sized garages a single ramp without an elevator is enough. The same ramp will serve quite satisfactorily for up and down traffic. On the other hand, very large garages will require separate ramps for the two traffic streams. The ramp and elevator combination, however, is deal for all large garages where traffic is heavy in only one direction. Traffic in the other direction, being small, can be handled by a single elevator. The ramp design in this garage is rather wasteful of space, occupying area useful for storing cars.

Where a building is long and narrow, say of 50 or 60 feet frontage and 150 or 200 feet in depth, an ordinary ramp may be placed as shown in Fig. 8. The ramp starts at one side of the building, swings around to the end and then up the other side and,

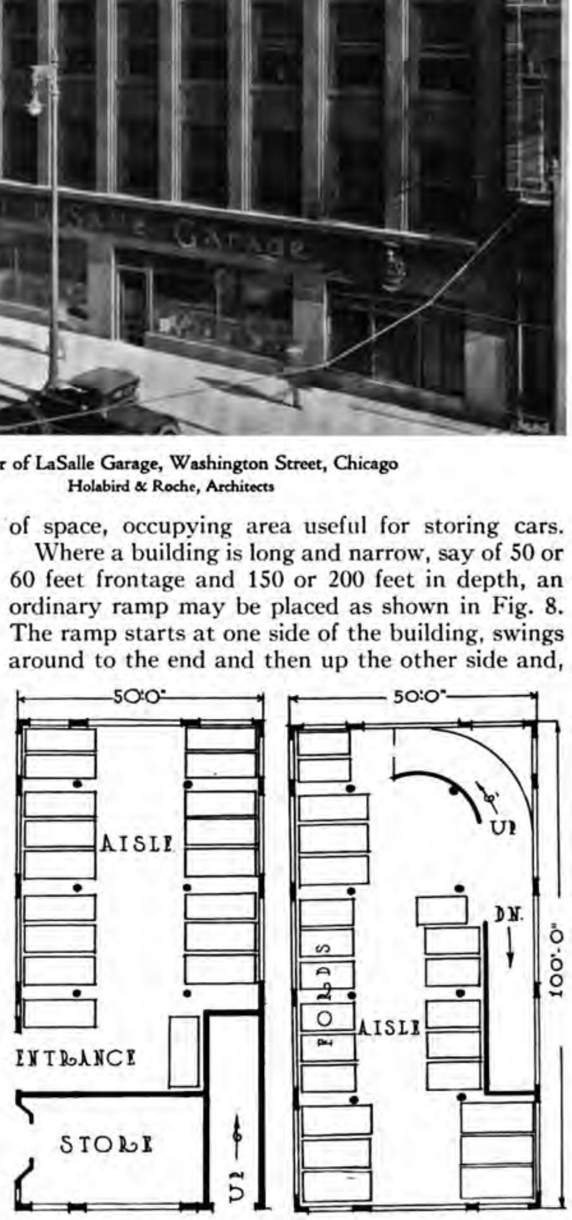


Fig. 8. First and Second Floor Plans Showing Efficient Design of Ramp in Narrow Building

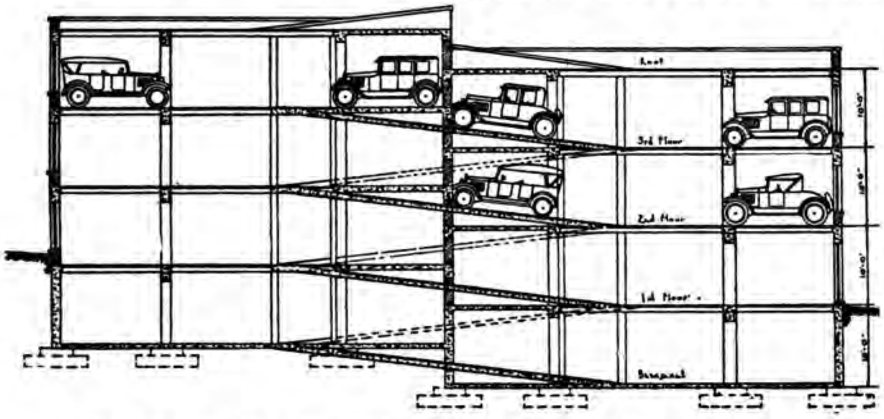


Fig. 9. Section through Garage Showing Patent Ramp Design with Staggered Floors

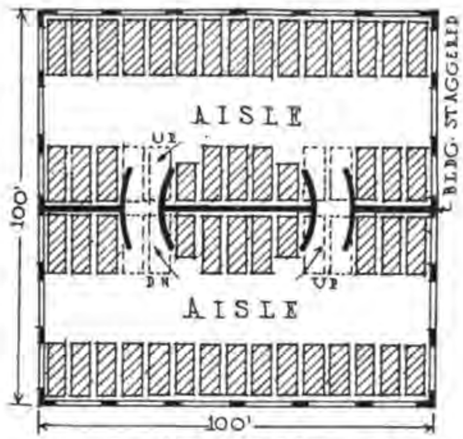


Fig. 10. Typical Floor Plan of Garage with Patent Ramp Design and Staggered Floors. Capacity per Floor 52 Cars

if the building is high enough, may circle around the front. At first glance this seems to be an inefficient design, but it works out well in buildings that are 60 or 70 feet wide. In fact it works out better in buildings of this width than it does in some larger buildings.

Where possible, it is advisable to make the turning circle 60 feet in diameter, but if the building is narrower there is no serious objection to using a smaller circle; in other words, if a building is 50 feet in width, obviously the circle cannot be any more than this diameter. The majority of cars made today will turn in a 50-foot circle, and in many towns practically all cars to be stored in the garage will turn within this circle. The few cars turning in a larger circle may be placed on the first floor. There are really very few automobiles built today which require more than a 50-foot circle, and there is only one machine now being manufactured that requires more than 60 feet and that is the Locomobile. It is poor economics, however, to design a building for Locomobiles, when it is considered that their number is so small that many garages in the country will never be called upon to house a car of this make.

The width of the ramp curb should be from 9 to 12 inches; the outside curb had best be made 12 inches and the inside 9 inches, and it is advisable to make the inside curb 9 or 10 inches high. The distance between curbs should be 8 or 9 feet, making the total width of the ramp 10 or 11 feet.

In truck garages the ramp circle need not be over 80 feet and many truck garages are designed with a 60-foot ramp curve. There are some trucks that require more than 80 feet to turn in, and many require more than 60 feet, but it is assumed that these trucks will be stored on the ground floor. It should be obvious that the larger the circle the more space the ramp must take up, and this holds true whether the ramp is a complete circle or is built as straight as possible. Therefore, every effort should be made to keep the circle as small as possible and still satisfy requirements.

Within the past two or three years patents have been issued on several special ramp designs, among which may be mentioned a design in which the whole floor of the garage slopes. Originally this design was helical in form but eventually it was modified to fit a square building. It is much more economical of space than the ordinary ramp design, but it possesses the disadvantage of having a sloping floor and special steelwork and forms must be used throughout.

Fig. 9 shows a patented design in which the building is divided into two parts, the floors in the two sections being staggered. In most cases the floors of one section come halfway between the floors of the other section, although where equal length ramps are used the floor spacing may be changed.

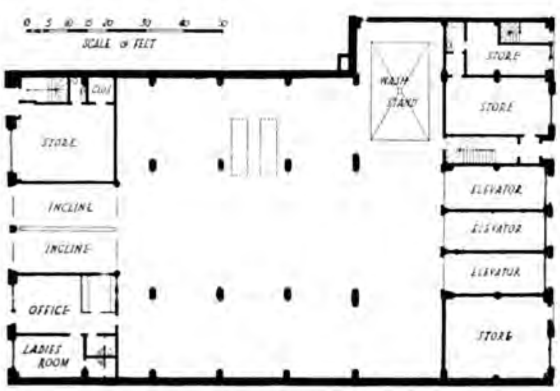
The floors in the two sections are connected by inclined passages or ramps, each ramp rising one-half story at a time. The path of a car going up through the building from the street would, therefore, be from the first floor in the first section up a ramp to the first floor in the second section one-half story above, and from thence up a ramp to the second floor in the first section and so on. The ramps in this system are half the usual length and, therefore, the system is particularly suited to small buildings; in fact there are few buildings so small but that this ramp system can be used satisfactorily. Cutting the length of the ramp in half makes it almost as easy to locate the ramp in this system as it is to locate an elevator in the building. In other words, the building may be laid out first and the ramp located afterwards, whereas with the ordinary ramp it is almost necessary to fit the ramps in first and then decide how the cars are to be arranged.

One of the most important features of this ramp is that it rarely takes up more space than a single elevator, or rather a building equipped with this system has as much or more storage space than it would have with one elevator. The two are compared in Figs. 2 and 10. It will be noted that the economy of this system lies in the fact that the space used for a connecting passageway in Fig. 1 becomes a ramp in Fig. 10; therefore this space does double duty. It also permits the use of the same layout pattern on all floors. Another advantage is that the ramps may be open. It is not necessary to box them in as is usually done with a long ramp. The open sides make it easier for a driver to see. It is necessary to wall in the ordinary ramp in order to obtain fire protection, a rolling door going on one end of the tunnel. With the arrangement shown in Fig. 10 a dividing fire wall is part of the building design and the fire doors are located in line with this wall; therefore, it is not necessary to wall in the ramps. The dividing wall greatly reduces the insurance, and this as well as other features helps reduce the slight additional cost because of this construction.

The most usual mistakes in designing ramps deserve special attention. In the first place, it is quite frequent to find a double-track ramp where a single-track ramp would do. There are few garages that are large enough to require separate tracks for up and down traffic. In the ordinary garage, housing 200 or 300 cars, a single-track ramp is ample.

Ramps of ample size are sometimes designed with right-angle corners which are extremely difficult to negotiate. If a right-angle turn is used it is advisable to curve the curb to guide the car, and if this is not done, at least the turn should be ample enough so that there will be no difficulty about scraping fenders on the walls of the garage. On the other hand, many ramps are designed with turns that are so ample that much valuable space is wasted. A tiled line in the floor and leading up the center of the ramp is an excellent guide for motorists.

It is sometimes said that ramps are dangerous. However, it is questionable as to whether any ramp is as much of a menace as an elevator with its open shaft. It is true that a car may get out of control on a ramp, but as a matter of practical experience brakes have to be in extremely bad shape to be so ineffective as to permit a car to run away on a 15 or 20 per cent grade. Those who doubt this statement should make a practical test of the matter. Looking at the question from another angle, no car has any business on the highways if its brakes are not sufficiently powerful to hold it on a 20 per cent grade. In the hilly sections of the country 20 per cent grades are frequently encountered and there is never any complaint among motorists in ascending or descending inclines of this degree of steepness, nor will they complain when a hill of this degree is found in a garage.



THIS garage contains space for about 444 cars, or about 82 to a typical upper floor with none in the distributing aisles. Each floor is provided with apparatus for washing two cars at one time, and the elevators extend to the roof.

PORTLAND STREET GARAGE, BOSTON, MASS.
ANDREWS, RANTOUL & JONES, ARCHITECTS

General Business Conditions and Building

THERE is particular reason at this time for architects' keeping in close touch with general business conditions. Changes are taking place rapidly, but they are not occurring simultaneously in all industries nor to the same extent in all sections of the country, and inasmuch as the development of building depends to so large a degree upon the general attitude of business men and in recognizing opportunities for securing favorable conditions in materials and labor, it is definitely to the advantage of the architect to know the relative conditions of different industries and general price movements so that he may apply his energies where they will be most productive.

For many months the building industry has made probably the least favorable showing. It is, therefore, a distinct encouragement to note that building conditions in the fall months have shown a very appreciable improvement. An index of present activity is had from the total represented by contracts awarded in the 27 Northeastern states, as reported by the F. W. Dodge Company. This total is $246,186,000, the largest monthly total in the current year, and a record for September in any year. This shows a gain of 11½ per cent over the total for August, which itself was 14½ per cent greater than the average value of contracts let in the month of September during the last ten years.

Although price reductions have been important, a contributing factor of perhaps equal importance to this gain is the renewed confidence brought about by general economic improvement. Forced liquidation of stocks is completed as attested by the index numbers of wholesale commodity prices. Bradstreet's index records the first upward turn in more than a year on July 1 and a further slight increase has been shown in each subsequent month.

The activity noted in building this fall has been reflected, to a greater or less extent, in raw materials and in industrial lines, but it is not generally agreed that the present activity necessarily is the beginning of continued improved conditions. There is an element of seasonal demand, which must be recognized as contributing considerable reason for the present favorable conditions. Steady business in practically all lines is dependent upon the stabilization of prices, and there is as yet no assurance that present prices are stabilized, but the average tendency of prices, not only in the United States but in foreign countries as well, toward a slight rise or continuance on a level, would indicate that further changes in the price situation would be brought about comparatively slowly.

In connection with materials used in building, reports that reach us indicate smaller stocks on hand than is usual at this time of year and likewise a comparatively brisk demand, which conditions, of course, are favorable to maintaining prices on a firm basis. Thus the shipments of Portland cement during the third quarter of this year established a record, approximately 33,970,000 barrels being distributed in that time. Production likewise in this quarter established a record, yet the stocks on hand for the month of September showed 135,000 barrels less than the average September stocks for the last five years. A large portion of this cement is going into the construction of concrete roads, it being estimated that possibly 20 per cent of the output is used in this work. The remainder, however, is largely used in the building trades and provides an indication of the very large amount of building that has been put under way.

In the brick industry the same conditions may be observed, the relation between orders on hand and stocks showing steady improvement in the demand for brick, and this has resulted in not necessarily an increase in the price of brick but an equalization of prices. In the report of the common brick industry for the month of September the composite price is quoted at $13.80 as compared with $13.87 for August, but the variation between the highest and the lowest prices has been greatly reduced from that of previous months. In the steel industry the increase in the tonnage of unfilled orders of the Steel Corporation, as reported September 30, is the first monthly increase since July, 1920, and offers further evidence of definitely better business conditions. Money is becoming cheaper, and this should continue owing to the very excellent condition of the banking situation. In the bond market interest rates are decidedly lower than earlier in the year, and money for their purchase is plentiful. This condition is favorable to easier funds for building construction because the margin of return between short and long term securities is gradually lessening. Indication of the country's financial strength is seen in the report of the Guaranty Trust Company for October 31, which reports that in the first nine months of 1921 some $756,000,000 in new state and municipal bonds was placed on the market, which is well above the previous record of $520,000,000 for the same period in 1919, and that during the month of October an additional offering of $60,000,000 in federal farm loan bonds was well received.

All of these factors are bringing nearer a realization of the general activity which is needed in building in order to make up the deficiencies in construction which the recent Unemployment Conference found was estimated in value at from 10 to 20 billions. They mean that building which has long been contemplated will begin to take definite form, and architects, as their particular responsibility, should exert every effort to follow the trend of prices in materials and labor, the available stocks and their location in view of transportation costs, so that they will be in a position to provide their clients with every advantage of lowest cost.

A Western School of Music

SMITH MEMORIAL HALL AT UNIVERSITY OF ILLINOIS

By WILLIAM MACY STANTON

FIFTY years are but a day in the history of the pyramids of Egypt or the Parthenon at Athens or even in that of certain of the old universities of Europe, but in the past 50 years there has grown up in the corn belt of the Middle West a great university. Set down in the vast, fertile prairie, 128 miles from Chicago, is the University of Illinois,—53 years ago an infant university, established by an act of the state legislature,—today a great modern university of 8,000 students, whose homes are located in every state in the union and in almost all foreign countries. Its scholastic standing is long established and recognized throughout the educational world; its athletic teams have been victorious in meets and contests everywhere. The growth of the university may be said to typify the development of the part of the country where it is located.

Illinois, one of the richest states in the union, supports the university by generous appropriations, so the tuition is a very nominal sum, well within the reach of every aspiring boy or girl. The land is acquired, buildings are erected, and equipment purchased out of state funds. It is therefore unusual to find at such an institution a personal gift such as the Smith Memorial Building. Having been in use only one school year, this building stands as one of the newest on the campus.

Captain Thomas J. Smith, a former member of the Board of Trustees of the University, gave toward the funds for the erection of this building which was to be known as the Smith Memorial Music School, and to be dedicated to the memory of his wife, Tina Weedon Smith. She had loved music and had devoted her life to the uplift of musical education and desired that this education be available to all classes of people.

The Smith Memorial Building is located on the campus at the southeast corner of the present quadrangle, close to the university auditorium. The architecture of the auditorium dictated the style, and in a certain sense the feeling of the whole building, as the cornice heights are the same in both buildings. Brick, the logical building material for this clay country, was used, with Indiana limestone trim. The brick surfaces are relieved in places by polychrome tile and marble inserts. The Italian renaissance style was used wherever it did not conflict too seriously with the lines and materials of the auditorium. One request of Captain Smith was a Memorial Room in which portraits of himself and his wife would be permanently hung, and this room is located on the second floor in front of the recital hall, with its windows facing into the portico.

In this modern, well equipped Memorial Building is housed the School of Music of the University of Illinois. Completely separated from all the great musical centers of the country and hundreds of miles from New York, this school of music has grown up and now flourishes in a modern temple dedicated to its study.

View of Smith Memorial Hall from the University Campus
James M. White, Architect, G. F. Wright, Associate Architect

Soundproofing a Building

STUDY OF RESULTS AT SMITH MEMORIAL HALL, UNIVERSITY OF ILLINOIS

JAMES M. WHITE, *Supervising Architect of the University.* G. E. WRIGHT, *Associate Architect*

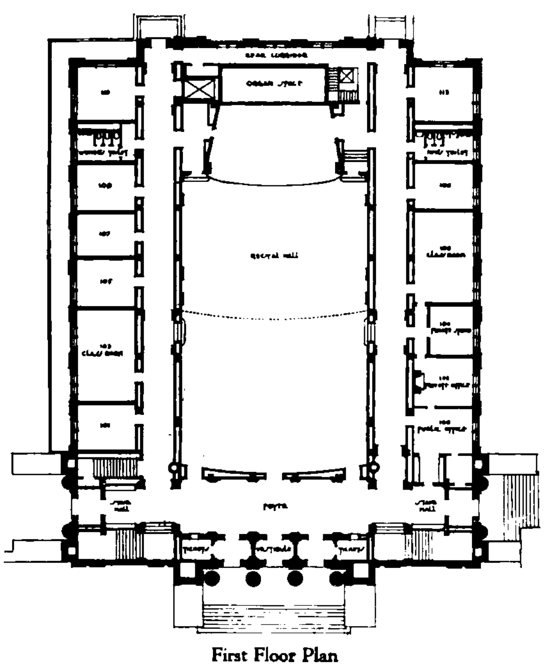
By F. R. WATSON, *Professor of Experimental Physics, University of Illinois*

THE Smith Memorial Music Building was built to accommodate the School of Music at the University of Illinois. It is a reinforced concrete structure, containing two stories with an attic space and basement. The total floor area is 65,641 square feet, and the volume 1,146,812 cubic feet. For the purposes of instruction in music, a number of special features were needed, such as practice rooms for students, studios for instructors, and a concert hall for recitals. In view of the varied nature of the music and the likelihood of discord, it was especially desired that the different rooms be separated by soundproofing. It was also of importance that the concert hall be designed acoustically so that music could be rendered under the most favorable conditions.

In view of these demands, and also because of a personal interest in the matter, a collaborative investigation of the problem was conducted by the architects and the writer. An effort was made to soundproof the building throughout. This involved the insulation of 45 small practice rooms in the attic, 21 studios and classrooms on the first and second floors, and the large concert hall. An effort was also made to reduce noises due to fans, motors and elevators. The various systems of steam pipes, electric conduits and ventilation ducts were installed in special ways to minimize the possibility of their transmitting sound. The building has been in use for several months, so that a statement may now be made concerning the outcome of the venture. While the essential objects sought for appear to have been attained with a fair degree of success, this account is written to set forth the features of the construction and to discuss their effects, advantageous or otherwise, in controlling sound.

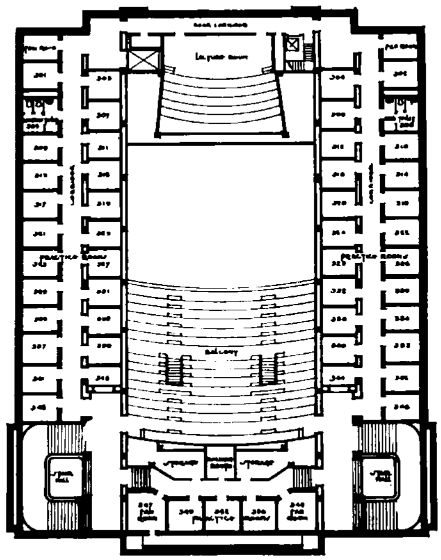
Before describing the acoustic details, it appears desirable to give some account of the action of sound in a building and thus make apparent the reasons for adopting the various methods of construction.

ACTION OF SOUND WAVES IN A BUILDING. Sound consists of a series of pressure pulses that travel through the air or in the solid structure of a building. Two types of sound should be considered. The first type includes sounds that are generated in the air by a violin, the human voice, etc., which travel through the air to the boundaries of the room. Such sounds are reflected to a marked degree by continuous walls of some rigidity. Where an air passage is presented, however, such as a ventilation pipe or an open window or door, the sound waves pass readily on through until they meet some solid obstruction. If the air passages from a room are suitably guarded, the sound may be confined to the room and absorbed by rugs, furniture and walls. The second type of sound originates in the vibrations from a piano, cello or other instrument that comes into intimate contact with the building structure. These vibrations proceed readily through the continuity of structure to all parts of a building, setting up air vibrations (sound) whenever a wall or other construction member responds markedly to the traveling vibrations. To stop these waves, it is necessary to interpose in their path a substance or construction having a decided change in elasticity or density. An air space in masonry construction would be a very efficient obstacle, provided the air space were continuous and not bridged over by any solid structure. Since this is practically impossible in buildings with any degree of rigidity, recourse must be had to special devices such as soundproof partitions and floating floors that interpose layers of hair felt or other air-filled material. If the vibrations can be made to pass from solid structure into the air, they may be absorbed largely by felt or similar material. With these considerations in mind, the efficiency of the various constructions is more readily understood.



First Floor Plan

DETAILS OF CONSTRUCTION. The framework of the Smith Memorial Music Building is constructed of reinforced concrete with combination tile and concrete joist floor construction, thus giving a massive, rigid structure not easily affected by vibrations. The soundproofing of rooms involved an application of the principles set forth in the previous paragraphs but in conformity with the restrictions imposed by practical building requirements. Each room was treated as a unit and was insulated at the floor, ceiling and walls, except outside walls.



Attic Plan

PARTITIONS. The partitions between rooms are constructed of two 3-inch gypsum block members separated by a 2-inch air space that contains a layer of sound-absorbing material. The method of construction was interesting. First, one 3-inch member was built up complete. Wood strips were nailed to this and the layer of patent sound-absorber was tacked to the wood strips so as to leave no open joints. Then the second member was built, attention being paid in the construction to prevent contact between the gypsum blocks or the mortar at the joints with the sound-absorber on the first member. Both of these 3-inch members rest on machinery cork, thus breaking the intimate plaster contact with the floor construction. They are insulated from the floor above by hair felt. At the outside walls the partitions project into a 4-inch chase insulated by hair felt, thus guarding against possible crack openings. Contact between the partitions and columns, beams, etc., is avoided by the interposition of hair felt. This arrangement places the patent sound-absorber or hair felt as an obstacle to transmission of sound, particularly if cracks or openings develop in the partitions.

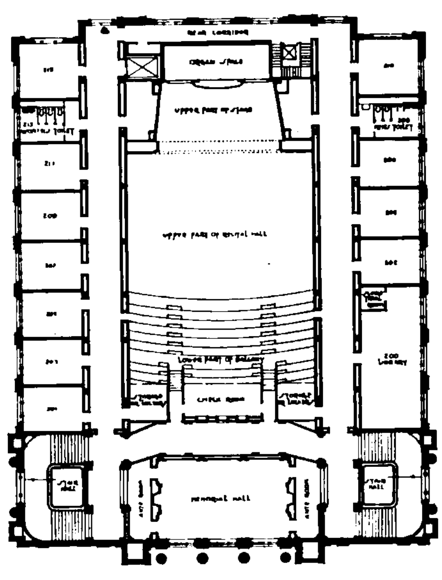
FLOOR CONSTRUCTION. The structural floors are composed of reinforced concrete 12 inches thick with 10-inch hollow tile inserted to reduce the weight. Wooden planks were set in place so as to make a structural break under each room partition. This arrangement assists in making each room an insulated unit.

From the structural floor up, the details of construction are: a 1-inch layer of dry sand, 2 inches of cinder concrete fill with cement topping, a layer of uncoated builder's felt, and finally linoleum. The sand serves to break the continuity of the structure between the finished floor and the structural floor.

CEILINGS. Suspended ceilings of metal lath and plaster are installed in the practice rooms on the third floor. While these ceilings are thin, compared with the walls, it is assumed that any sound transmitted through them will be absorbed to a considerable extent in the attic space and will have to pass through a second ceiling before reaching the interior of another room. Double windows in the ceilings allow light to enter from skylights. The ceilings of the studios on the lower floors consist of two coats of plaster on the underside of the structural floor. These will be covered with sound-absorbing material, where it is found desirable, to reduce the reverberation in the room.

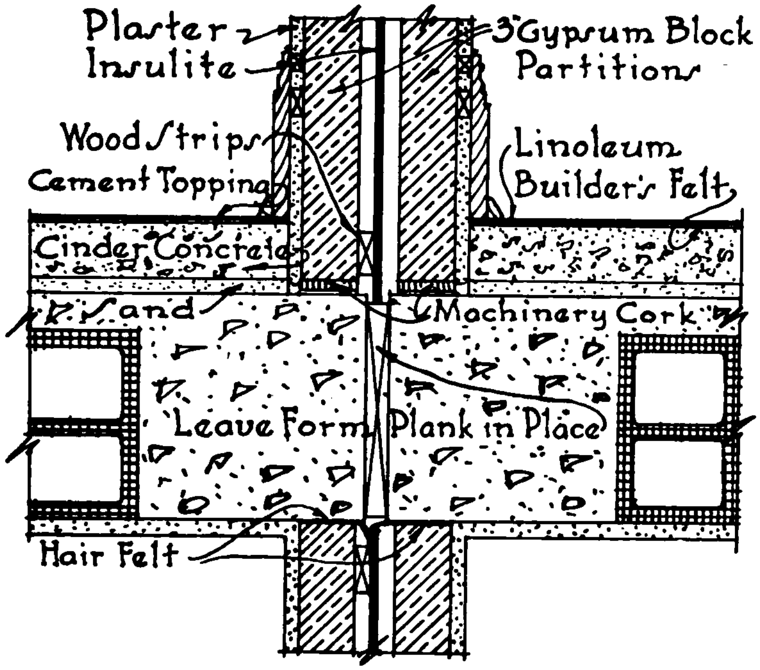
DOORS, TRANSOMS AND WINDOWS. All studios and practice rooms are equipped with a special soundproof door of heavy double construction with a 1-inch thickness of hair felt in the center. It makes a tight closure all around against felt stops and, by means of a lever door handle, presses a felt stop down so as to close the threshold crack.

An accompanying diagram shows the construction of the frames for the soundproof doors and transoms. The woodwork is backed with heavy felt to avoid direct openings through which sound might pass behind the finished jambs from the room to the corridor outside. All transoms are fixed and are set in rabbets 1 inch deep, being pushed tightly against a heavy, tubular wool felt. This felt is held in place with removable wedge-shaped strips so that it may be replaced with new felt when desired. The transoms are double-glazed, with the glass panes set in felt. The double windows in the ceilings of practice rooms are insulated in much the same manner.



Second Floor Plan

PIPES FOR LIGHTING AND HEATING. A special study was made of the placing of pipes to avoid possibility of easy transfer of sound. Electrical wire conduits are carried in vertical shafts in outside or corridor walls,



Detail Showing Floor and Partition Construction

of sound. Elevator doors are arranged to shut tightly. Ventilating fans are of slow velocity type to decrease noise, and are installed in special rooms.

Summary of Construction Details. It was the intention to insulate each room as far as possible to make it a separate unit. Since the greatest chance for leakage of sound appeared to be through the walls separating adjacent rooms, all such walls, floors and ceilings were left continuous without any breaks in the surface. Where it was necessary to have openings, these were placed in other walls. Ventilators and doors were located in the partitions facing the corridors. Electrical conduit and steam pipes were housed in outside or corridor walls. Windows were placed in doors or outside walls. This arrangement minimized the likelihood of sound transference directly from one room to another. Furthermore, any sound leaking through the openings for doors, windows, etc., would have to pass along a corridor and penetrate a second barrier to reach the interior of another room.

with wall plug outlets in each room. This obviates making outlets in the ceilings and floors, according to usual practice, and reduces the leakage of sound. Steam pipes for heating are housed in chases in the brick walls, the chases being filled with sponge felt to prevent transmission of sound vertically. The steam radiators are bracketed from the outside walls and do not touch the floor, thus lessening the chance that floor vibrations from pianos will enter the metal heating system. Attic rooms are heated by warm air and therefore are not connected with the steam heating system.

The Ventilation System. There are four separate ventilation systems that furnish washed, fresh air to the various rooms in the building. It is therefore unnecessary to open windows for fresh air, and the escape of sound through these open vents is made impossible. Having four systems lessens the chance of transmission of sound between different parts of the building. One system supplies the studios and classrooms on the first and second floors. A separate supply duct leads from the main duct to each room. A second system ventilates the concert hall. The practice rooms in the attic are arranged in two groups, each group being supplied with air from a separate system, which serves also for heating. Individual outlet ducts convey used air from each room to the upper attic space, where it leaves the building.

Corridors and Halls. The floors of the passageways in the building are covered with cork or linoleum to deaden the sound of footsteps. Swinging doors are installed in several places to minimize transfer of sound through the halls. The two elevator shafts are situated apart from music rooms and housed inside tile walls to avoid easy transfer

The Concert Hall. The concert hall is situated in the center of the building and is insulated from studios by surrounding corridors on the first and second floors. Practice rooms on the third floor are contiguous to two walls. Further insulation is provided by double walls consisting of two 4-inch hollow tile members separated by a 17-inch air space. These side walls are continuous to the roof, thus leaving no openings, except for tight closing doors, through which sound may pass.

A special study was made of the acoustical design of this hall. Since it was designed solely for music, the time of reverberation should be greater than for speaking. Accordingly, only a moderate amount of sound-absorbing material was prescribed, in accordance with Sabine's formula, and a considerable percentage of this absorption was secured by using upholstered seats. Ventilation grilles break the expanse of the ceiling surface. Two large panels in the side walls are to be covered with felt and a decorative tapestry cover.

The acoustic properties of this room are in accord with the expectations. Music of moderate intensity, such as chamber music or vocal solos, is rendered in a pleasing way. Musicians say that it is easy to sing in the room. The tones flow easily and with little effort. Heavy orchestras would be heard at a disadvantage, because the intensity would be too great. Speaking is also done at a disadvantage, because of the rather long period of reverberation. With a considerable audience present, the conditions for speaking are improved, while the music is still heard advantageously. Director Erb, of the School of Music, reports that the hall is "perfect" for music. Arthur Beresford, whose experience as a baritone has given him a wide acquaintance with music halls, says that the "recital hall is the best in the country."

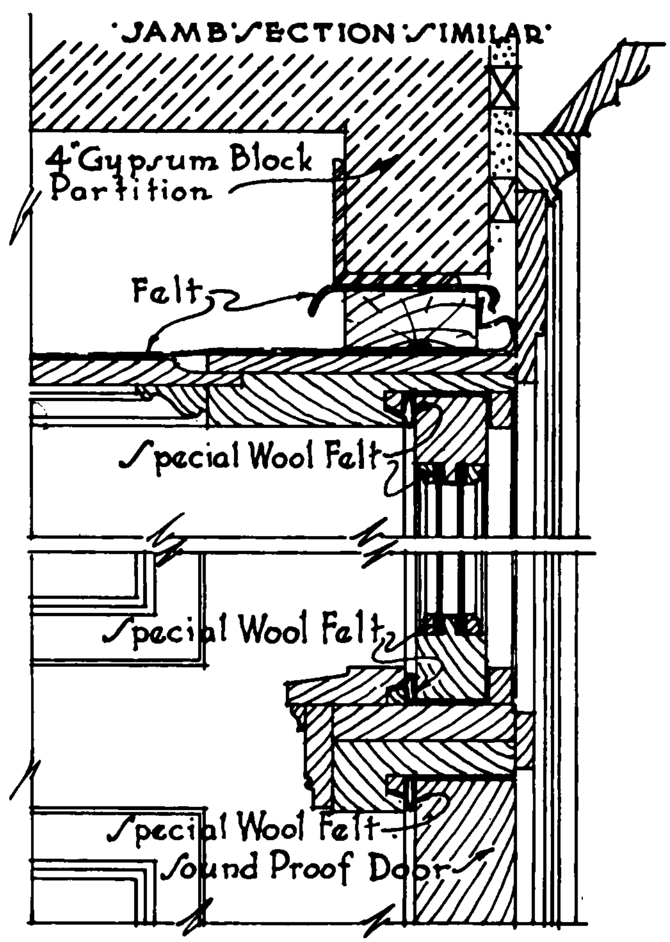
EXPERIMENTAL INVESTIGATIONS. Tests have been made of the efficiency of the soundproofing. One observer, inside a practice room with the door shut and speaking in a loud voice, can scarcely be heard by a second observer outside in the corridor. Music, however, penetrates the walls more easily, although it is greatly diminished in the transmission. Students in practice rooms say that they notice sounds from other rooms only when they stop practicing. The partitions are thus not absolutely soundproof but, for practical purposes, it appears that they need not be. The walls could have been made more effective but the construction would have been elaborate and costly and not in accordance with ordinary building requirements.

One of the severest tests given the partitions is by a small practice pipe organ in a studio on the first floor. When this organ is played, sound is transmitted to adjacent rooms. The double partition vibrates under the vigorous action of the sound waves. An observer in an adjacent room, by placing his ear or fingers against the partition, can hear or feel the varying pulses in different degrees, depending on the pitch of the tone and its intensity. He can also feel the vibrations in the floor. This transmitted sound, however, becomes of minor importance when a piano is played in the room.

Another test of the efficiency of the partitions was discovered accidentally. During an investigation, a sound of undue intensity could be heard in the halls of the building and in some of the studios. The sound was located readily in an unsuspected room on the third floor over the organ loft. Since this room was designed for lectures, it was not soundproofed as for music rooms. A piano placed temporarily in this room for practice purposes gave rise to sounds that quite easily penetrated the partitions and thus gave direct evidence of the desirability of double partitions. Sound also passed through the ventilators from this room to studios. Considerable sound could be heard in the hallways. This was to be expected, as already explained, by leakage of sound through doors, ventilator frames and other breaks which were purposely placed in the corridor partitions rather than in walls separating rooms. This confusion of sounds in the halls is not particularly objectionable, but it would probably be better if carpets were used or else sound-absorbing materials placed on corridor ceilings.

The concert hall is insulated by double walls and surrounded by corridors, except for practice rooms on the third floor. This arrangement appears to be effective. But little sound is transmitted from other parts of the building. The writer sat near the wall adjacent to the practice rooms and could detect faint sounds, but these appeared unimportant compared with music generated in the concert hall itself. Piano music in the third floor lecture room had easy access through ceiling ventilators and was objectionable.

The ventilation ducts allow a transfer of sound between different rooms in greater amount than the partitions. The use of separate ducts for each room minimizes the trouble, but greater insulation is to be desired. Ventilator stops with layers of sound padding have been tried with some effect, but further modifications are contemplated to reduce this leakage. One marked case of the transfer of sound by ventilation ducts was discovered between the lecture room on the third floor and a studio on the first floor. An inspection of the ventilating system revealed the reason. The outlets to the lecture room were of rather large area and left the main duct opposite the outlet to the studio. As a result, sound originating in either room traveled to the main duct, crossed it and entered the opposite duct where it proceeded readily to the other room. Except for this lecture room, the individual pipes lead-



Section through Door Head and Transom Bar
Note double glass in transom and special closing door on tubular felt strips

ing to studios proceed from the same side of the main duct with a lessened chance for intercommunication of sound.

The soundproof doors have not been entirely satisfactory. The success of the insulation depends on closing the door tightly, and this requires a considerable pressure on the patent door handle. People using the rooms do not always observe this requirement so that an aperture is left for the escape of sound. Possibly a door with an automatic closing device would prevent this trouble. A door is analogous to a single partition. Sound transmitted through a door to the corridor must pass through another door or wall to get into a second room.

CONCLUSIONS. The installation of special forms of construction in the building appears to have a decided effect in controlling and diminishing sound, although the effects are uneven. The building is not absolutely soundproof and the experience thus far indicates that it is not essential that it should be. Each room was insulated as thoroughly as possible; motors, fans and other machinery were selected from types that produced little noise; elevators were placed in separate housings.

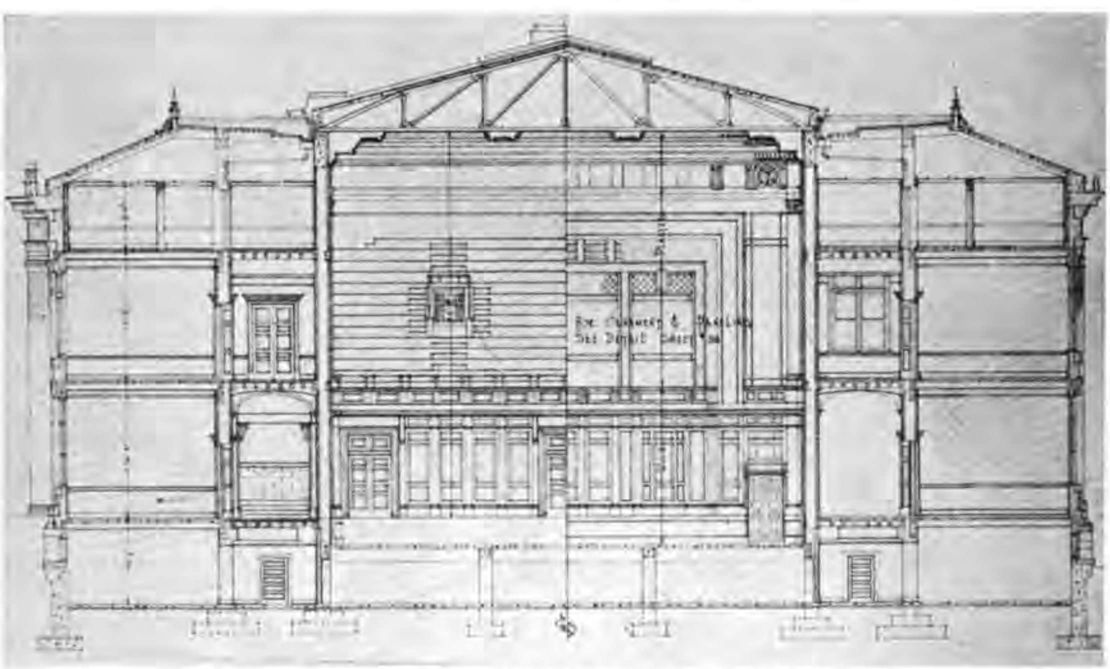
Sound travels easily through the continuity of building materials and its paths are not easily traced. With each room insulated, it is difficult for a generated sound to penetrate the insulation and a similar obstacle exists to its entrance into another room. In the meantime, while traversing the building structure, such a sound continually meets obstacles in its progress that reflect and absorb it until its energy is dissipated.

It is not easy experimentally to estimate with any great accuracy the separate effects of the various sound-insulating constructions. A person in a room can hear diminished musical sounds, but is unable to give confidently, in each case, the source of the leakage. The experiments show, directly and indirectly, the advantage of using continuous, unbroken walls, floors and ceilings between adjacent rooms. Making these walls double, with air spaces containing sound-absorbing material, adds to their efficiency.* Placing the necessary openings for doors, windows and ventilators in outside or corridor walls confines the leakage of sound largely to corridors, with a reduced possibility of transfer of sound between rooms.

Ventilation ducts, even with separate pipes to each room, do not appear to insulate sound as completely as double walls. Using separate ventilation systems for groups of rooms reduces the possibilities for transfer of sound between different parts of the building. Further investigation is desired to develop a more effective soundproof ventilation.

The concert hall, designed in accordance with the known facts of acoustics of auditoriums, possesses properties that assist in an acceptable manner in the pleasing production of music. Without commenting in further detail on the arrangement of pipes, doors, windows, etc., it may be said that the experiments in this building show some of the features necessary for effective control of sound, and that while there is much more to be learned, enough has been discovered to lend support to the belief that soundproofing in buildings may be prescribed in the not distant future with some of the certainty that now attends the acoustic design of auditoriums.

*The plaster partition members of these double walls should possess, as far as possible, the desirable qualities of mass, rigidity and freedom from vibration as described in THE ARCHITECTURAL FORUM for June, 1920



Transverse Section through Recital Hall, Half Showing Stage and Half Balcony End

ENGINEERING DEPARTMENT

Charles A. Whittemore, *Associate Editor*

Steel Design for Buildings

PART IV. DESIGN OF COLUMN BASES AND FOOTINGS

By CHARLES L. SHEDD, C.E.

IN the June number of THE FORUM we took up the general consideration of the design of column bases. Figs. 17 and 18 showed two types of bases for a plate and angle column carrying loads of about 500,000 pounds.

Let us now consider the actual design of a concrete example. Let us take a load of 668,000 pounds with a column unsupported for a length of 17′ 6″. Using the column formula of 16,000—70 l/r we find that we can use a column made up thus: four 6″ x 4″ x ¾″ Ls, one 12″ x ¾″ web plate and two 14″ x ¾″ cover plates. This column has a radius of gyration of 3.25 about its weaker axis, which gives an l/r of 64.3 which in turn, with the formula just expressed, gives an allowable stress of 11,500 pounds per square inch which is about equal to the actual stress on this column with the load used. If this column base is to bear on concrete and we use an allowable bearing of 700 pounds per square inch, we get a required area of 955 square inches which requires a base at least 31″ square. If we use a steel base, as shown in Fig. 17, let us use a base plate 32″ x 32″ to make even figures. If we allow the plate itself to transfer the load a short distance out from the face of the column we can take the part which must be taken by the stiffeners as 7/32 of 668,000 or 146,000 pounds. If we use ¾″ rivets, worth 4420 pounds each in single shear, we would require 33 rivets. As we are to use four rows of rivets we will use 36 rivets, or 9 in each row as shown in Fig. 1. As these stiffeners are short we can use 16,000 pounds per square inch on them in compression which will allow us to use 6″ x 6″ x ½″ Ls. We can use the same size for the long base angles and ½″ for the thickness of the gusset. The base plate should be ¾″ thick and the short base angles could be 4″ x 4″ x ⅜″ Ls. In the small bases

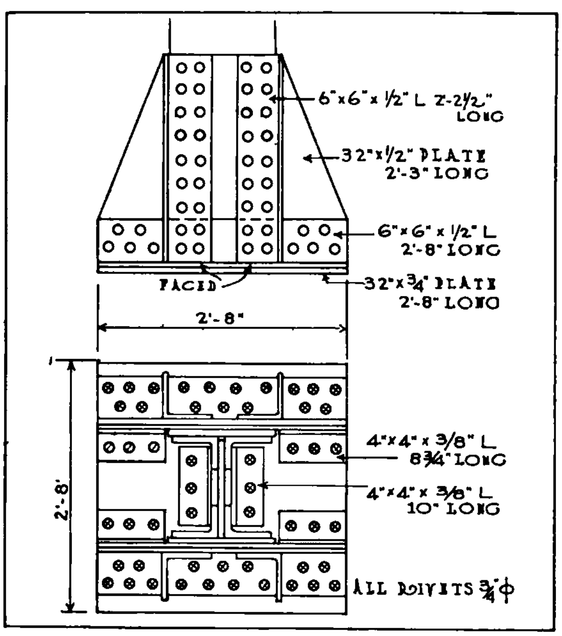


Fig. 1

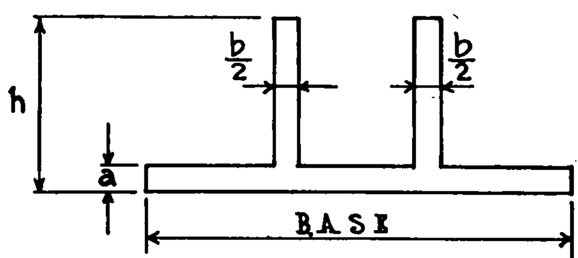


Fig. 2

shown in Figs. 14, 15 and 16 in the June FORUM the same principles apply, but probably the only thing that would be necessary to figure would be the area of the base. The number of rivets required in Fig. 16 might be a limiting factor.

If we use a cast iron base as indicated in Fig. 18 in the June number, we have a section through its center consisting of the base with two or three uprights (Fig. 2). The small projections at the top may be neglected. It is this section which resists the bending on the base. With a plate and angle column the maximum bending is at right angles to the web of the column as the distance of the center of gravity of half the column from the center of the base is less than in the other direction. To facilitate the designing of these cast iron columns a table has been prepared of the sectional moduli of various sections. Various widths of base have been used, 20″, 24″, 28″, 30″ and 36″, with various heights for each size of base; "a" is the thickness of the base and "b" is the combined thickness of the ribs. The

20″ BASES

10″ High

a	b=2″	2½″	3″	3½″
1″	126	134	140	146
1¼	139	147	155	161
1½	148	157	166	171
1¾	155	165	173	182

12″ High

a	b=2″	2½″	3″	3½″
1″	165	175	185	194
1¼	184	196	205	214
1½	200	211	222	232
1¾	212	224	236	246

14″ High

a	b=2″	2½″	3″	3½″
1″	206	221	234	247
1¼	233	246	260	272
1½	254	269	282	295
1¾	272	288	302	315

15″ High

a	b=2″	2½″	3″	3½″
1″	229	245	259	275
1¼	258	274	288	303
1½	282	299	314	328
1¾	303	320	336	351

24″ BASES

10″ High

a	b=2″	2½″	3″	3½″
1″	144	151	159	165
1¼	159	168	176	183
1½	168	180	188	196
1¾	175	186	197	206

12″ High

a	b=2″	2½″	3″	3½″
1″	190	200	210	220
1¼	212	223	234	244
1½	229	241	254	264
1¾	241	257	269	282

14″ High

a	b=2″	2½″	3″	3½″
1″	237	251	265	279
1¼	266	283	296	309
1½	291	308	323	336
1¾	312	329	343	360

15″ High

a	b=2″	2½″	3″	3½″
1″	261	278	294	309
1¼	295	312	328	343
1½	324	342	358	374
1¾	348	367	385	401

28″ BASES

12″ High

a	b=2″	2½″	3″	3½″	4″
1″	212	224	235	245	254
1¼	238	251	262	273	283
1½	256	272	285	295	306
1¾	271	287	302	314	325

14″ High

a	b=2″	2½″	3″	3½″	4″
1″	265	281	294	309	322
1¼	303	317	332	345	359
1½	327	346	362	376	390
1¾	349	370	388	402	415

15″ High

a	b=2″	2½″	3″	3½″	4″
1″	293	311	327	342	358
1¼	333	351	367	383	398
1½	364	384	402	418	433
1¾	390	414	432	449	466

18″ High

a	b=2″	2½″	3″	3½″	4″
1″	380	404	427	451	473
1¼	431	457	481	503	526
1½	478	505	528	552	575
1¾	518	547	572	596	618

30″ BASES

12″ High

a	b=2″	2½″	3″	3½″	4″
1″	224	236	247	258	267
1¼	251	264	276	287	297
1½	269	286	299	311	323
1¾	283	301	317	330	344
2	290	313	330	344	358

14″ High

a	b=2″	2½″	3″	3½″	4″
1″	280	296	311	324	337
1¼	316	334	349	363	377
1½	346	364	380	396	411
1¾	367	390	407	424	439
2	383	408	429	447	461

15″ High

a	b=2″	2½″	3″	3½″	4″
1″	309	326	344	360	374
1¼	350	370	387	404	418
1½	384	404	423	440	456
1¾	410	433	457	472	489
2	431	458	479	500	517

18″ High

a	b=2″	2½″	3″	3½″	4″
1″	399	424	447	476	493
1¼	456	482	505	528	549
1½	505	532	555	579	602
1¾	546	576	602	626	649
2	578	612	640	666	689

36″ BASES

12″ High

a	b=2½″	3″	3½″	4″	4½″	5″
1¼″	304	318	331	342	352	361
1½	327	343	357	369	380	390
1¾	344	362	378	392	404	415
2	355	375	393	409	422	434
2¼	359	383	404	421	435	448
2½	361	387	408	427	444	461

14″ High

a	b=2½″	3″	3½″	4″	4½″	5″
1¼″	383	400	416	431	445	458
1½	417	437	455	470	484	499
1¾	446	467	486	503	517	533
2	465	490	514	530	546	561
2¼	477	506	530	551	569	584
2½	488	516	544	566	585	604

15″ High

a	b=2½″	3″	3½″	4″	4½″	5″
1¼″	425	442	459	476	491	507
1½	466	486	505	522	539	553
1¾	498	521	541	561	576	594
2	523	550	573	591	611	630
2¼	542	571	596	619	639	656
2½	553	585	614	638	660	676

18″ High

a	b=2½″	3″	3½″	4″	4½″	5″
1¼″	553	578	602	626	647	669
1½	612	640	664	688	711	735
1¾	661	691	719	745	767	787
2	703	735	765	790	814	840
2¼	735	774	804	832	859	882
2½	762	801	836	868	895	921

SECTIONAL MODULI OF CAST IRON BASES

figure in the body of the table is the sectional modulus.

As 31″ is required we will use the next larger in the tables, that is 36″. The moment will be equal to half the load on the column multiplied by a quarter the width of the base, less the distance from the center of the base to the center of gravity of half the column, in this case 334,000 (9–2.38), and this divided by the allowable tension on cast iron (3,500 is used here) gives the required sectional modulus. Looking up this quantity (630) in the portion of the table for 36″ bases we find various sections which we may pick from:

h	a	b	h	a	b
15″	2½″	4″	18″	1¾″	2½″
15″	2¼″	4½″	18″	1½″	3″
15″	2″	5″	18″	1¼″	4½″

It is best to have the thickness of the cast iron directly below the column at least as thick as the column metal itself. This might necessitate thicker metal in some cases than would be required for the sectional modulus. The ideal base, of course, is the one which will fulfill all the conditions we have noted and be of least weight. One of the most important conditions to remember, as noted in the June FORUM, is to keep the thicknesses of metal as nearly equal as possible. To do this it is usually best to choose a base where "b" is about twice "a." The local bending between ribs is also an important consideration. In a column as large as the one we are designing for, this thickness of the base should not be too small and it would be safer to choose the first than the second section of these we have found possible in the table. This means that we can use a base 15″ high with the base 2½″ thick (Fig. 3). The two ribs under the flanges of the column should equal "b" or 4″, so we can make them 2″ each as the steel above is only 1½″ thick. The steel in the web of the column is 2¼″ thick, therefore we should make the middle web of the base 2¼″ thick. The two side ribs parallel to it could be made 1″ each, using the minimum thickness as the two side ribs plus the middle rib would then equal 4¼″, which is more than the required value of "b." The corner

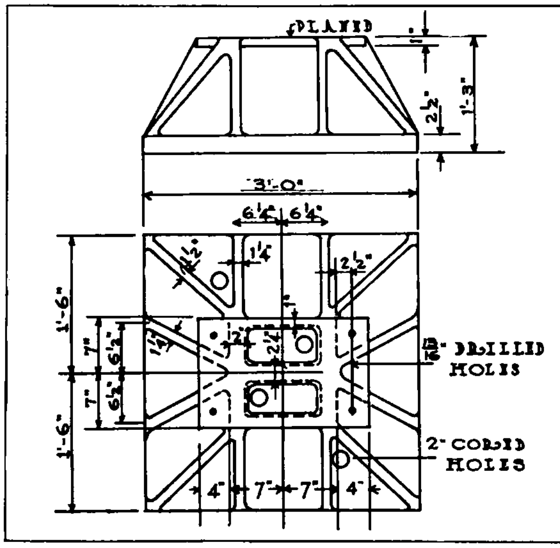


Fig. 3

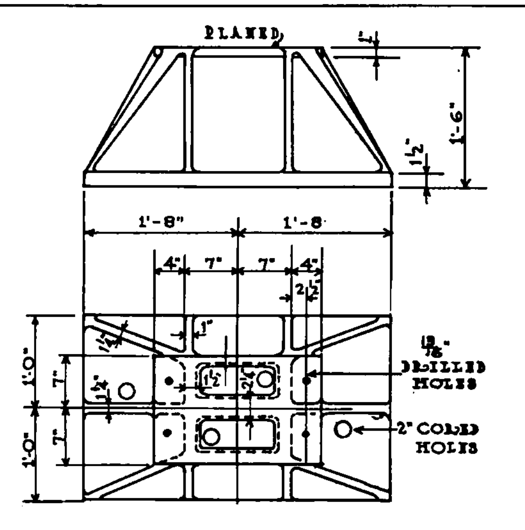


Fig. 4

ribs could be made 1½" and the other outside ribs 1¼". The top plate should be the minimum thickness, that is 1", and should project 4" beyond the ribs under the column flanges to allow the bolts connecting the base to the column to be easily placed in position. In larger bases, where cast steel is employed, 16,000 could be used as the allowable fiber stress in place of 3,500. Other sizes of bases can be readily used besides those given in the table by proportion, as will be shown.

If we multiply both the width of base and "b" by any factor we are also multiplying the sectional modulus by that same factor. If we multiply the height and "a" by a factor we are multiplying the sectional modulus by the square of that factor. For example, referring to the table we may find these values:

Base	h	a	b	I/y
20"	12"	1½"	2"	200
30"	12"	1½"	3"	299

and the values:

Base	h	a	b	I/y
36"	12"	1½"	2½"	327
36"	18"	2¼"	2½"	735

where it will be noted that 327 x 1.5 x 1.5 = 735.

From this relation we may use the tables for an endless number of base designs. For example, we may design the base which we have already designed for one just 32" square, by using the 36" table. 36/32 = 1.12. The required sectional modulus would be $\frac{334{,}000(8-2.38)}{3{,}500} = 540$. 540 x 1.12 = 600. Looking this up in the 36" table we find:

h = 18" a = 1¼" b = 3½" I/y = 602.

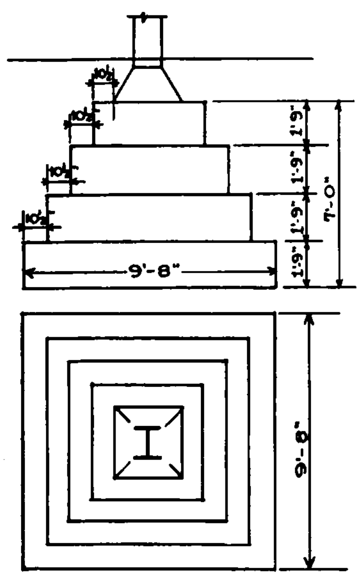


Fig. 5

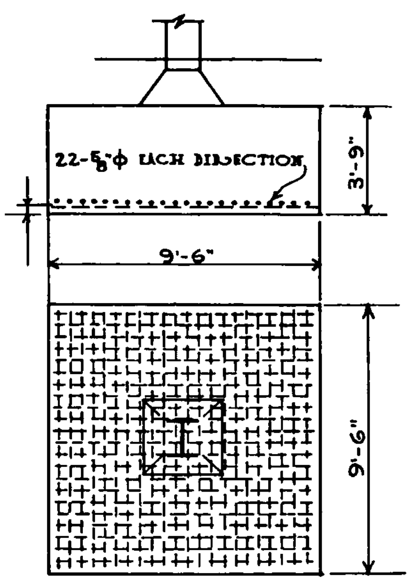


Fig. 6

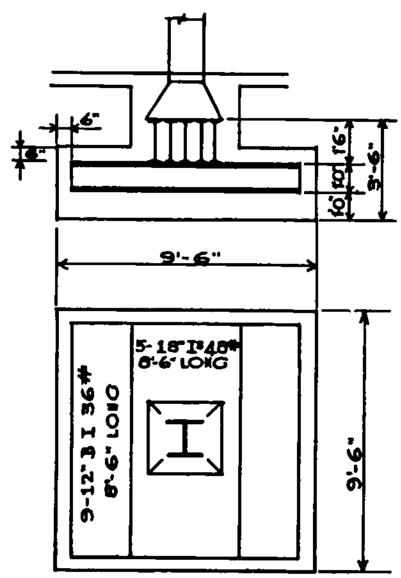


Fig. 7

3½″ divided by 1.12 would equal 3.13 and we could use a base

Base = 32″ h = 18″ a = 1¼″ b = 3¼″.

Places are at times encountered in a building where it is desirable to use an oblong base. These tables may still be used with the aid of these rules.

The column for which we have already designed three bases may be used again for an oblong base. The area required was 955 square inches. If we had to have this base 24″ wide it would have to be 40″ long (Fig. 4). If the web of the column is parallel to the long side of the base an economical base may be designed. The distance from the center of the column to the center of gravity of half of the column, measured parallel to the web, is 5.36. The moment in this direction would then be 334,000(10 − 5.36) and the required sectional modulus would be 443. For this we find for a 24″ base h = 18″ a = 1½″ b = 2½″. The moment in the opposite direction would be 334,000(6 − 2.38) and the required sectional modulus 345. For a 40″ base with h = 18″ and a = 1½″ the value of "b" could be a minimum or 2″.

Under the column base the footing may be made of concrete or a combination of concrete and steel. Such a combination may be reinforced concrete or grillage beams encased in concrete, or a combination of grillage with concrete below it, either plain or reinforced.

If the footing is plain concrete (Fig. 5) not reinforced the footing may be assumed to weigh about 10% of the column load, or in this case 66,800 pounds, which would make a total load on the soil equal to 734,800 pounds. If we had soil capable of carrying 8,000 pounds per square foot we should require a footing of 92 square feet or 9′ 8″ square. In plain concrete, steps are usually made about 2′ high and 1′ wide. With a 32″ column base this would require a footing 7′ 0″ deep.

If the column footing were made of reinforced concrete (Fig. 6) the footing could be most easily designed from tables found in Hool and Whitney's "Concrete Designers' Manual." Here we find that the reinforced footing would be 9′ 6″ square, 3′ 9″ deep with 17 square ⅝″ or 22 round ⅝″ rods in each direction.

If we used grillage (Fig. 7) we could design it readily from Table I in the July FORUM. We will use a footing 9′ 6″ square which will project 3′ 5″ each side of the base. The grillage can be made of several I beams side by side under the base extending to within 6″ of the outside of the footing, with another layer of I beams under them and at right angles to them and of the same length. The bending on each layer would be 334,000 (2.92 − 1.33) = 530,000 foot-pounds. The shear on each layer would be $668{,}000\,\frac{3.42}{9.50} = 240{,}000$ pounds.

To design these beams it is a simple matter to make a table for the investigation of each footing. First find the actual buckling per lineal inch for various depths of beam. This will be equal to the column load divided by the width of base plus half the depth of the beams. Thus:

12″ Beams	668,000/38	= 17,600
15″	39.5	= 16,900
18″	41	= 16,300
20″	42	= 15,900

We can now make a table showing the required moment, shear and buckling per beam for various numbers of beams. Thus:

			Buckling			
No.	Mom.	Shear	12″	15″	18″	20″
9	59,0	26,7	2,0	1,9	1,9	1,8
8	66,3	30,0	2,2	2,2	2,1	2,0
7	75,7	34,4	2,5	2,5	2,4	2,3
6	88,5	40,0	3,0	2,9	2,8	2,7
5	106,0	48,1	3,6	3,4	3,3	3,2
4	132,5	60,1	4,4	4,3	4,1	4,0
3	176,8	80,2	5,9	5,7	5,5	5,3

To find the most economical beam for each case we can use Table I in the July FORUM and follow down the column of moments until we find a moment of resistance large enough, then see if the shear and buckling are all right. If they are not, follow down still farther in the table and the first one found which will satisfy all three requirements is the most economical for that number of beams. Thus if we have four beams, with a moment on each of 176,800, we find that the first one is the 20″ BI 59# and that the shear is also sufficient, but the buckling is only good for 3,700 while we require for a 20″ beam 4,000. Following on still farther, the first one reached which satisfies all conditions is the 21″ I 60½#. The flange width may be another limiting factor. There should be at least an inch between flanges to allow for proper filling with concrete. In the table given here we will show the size of beam required, the combined flange width for each group allowing 1″ between each flange, and the weight per lineal foot of each group for comparison:

No.	Section	Flange	Weight
9	12″ BI 36#	64.7	324
8	15″ I 37½#	51.0	300
7	15″ BI 38#	52.2	266
6	18″ I 48#	41.0	288
5	18″ I 48#	34.0	240
4	21″ I 60½#	29.0	242
3	20″ I 80#	23.0	240

Evidently the six-beam grillage would not be best for any case. The four-beam would likewise never be chosen. With a 32″ column base we could use either the five- or the three-beam for the top course. The weight would be the same and the flange width would be satisfactory, as in the five-beam design the flanges would only project an inch on each side of the base, leaving the webs well under the base. As these beams are 2″ less in depth than the three-beam we will use these to save that much excavation. In the bottom course we have 6′ 9″ less 1 foot of concrete, as the allowable flange width which would be 102″. Thus any of the designs could be used here. If the beams are a foot apart the stress can be distributed satisfactorily to the concrete below. We will therefore use nine beams for the lower course. This makes the footing 3′ 6″ deep which is 3″ less than for reinforced concrete.

Testing Materials

By HERBERT L. SHERMAN, B.S., of Skinner, Sherman & Esselen, Inc., Chemists and Engineers

IT is in order to assure the use of only entirely satisfactory materials that architects and engineers so universally call for tests or inspections.

About 25 or 30 years ago the larger consumers of cement began to install testing laboratories. Those were hard days for the cement manufacturer. Not only was his product less uniform than today and the justified number of rejections greater, but he had to contend with tests made by entirely unqualified testers who knew little if anything about the action or use of cement. It was always "up to the manufacturer" to prove himself innocent, and often it meant great expenditure of time and money.

It was also customary, not so many years ago, for each engineer or architect to write his own specifications and they were, indeed, a varied lot. If the manufacturer did not supply a product which would pass each requirement of each consumer, he was likely to be ordered to remove the cement from the site. It was an impossible situation. However, the great bulk of cement used was not tested and it speaks well for the industry in its infancy that so many fine pieces of work are standing in such excellent condition.

Until a few years ago, testing was nearly always done on samples taken from the job. This meant that considerable storage space was necessary for a large piece of work as, even from the start, it has been unsafe to pass any conclusive opinion until seven-day tests are completed. In recent years, however, it has become more customary to test the cement at the point of shipment, a representative of the testing laboratory taking samples from each car as it is loaded.

The American Society for Testing Materials has done more than any other body to advance the cause of cement testing and, in fact, the testing and inspection of materials in general. Large committees representing both consumers and manufacturers have worked for years on the preparation of standardized specifications which shall be fair to all, and their work has been wonderful.

All the architect or engineer has to do today is to include a sentence in his specifications under "Cement" that "All Portland cement used shall meet the requirements of the American Society for Testing Materials." Every manufacturer agrees, without the necessity of a special clause, to produce a material which is satisfactory under these specifications. The requirements are thus given:

Standard Specifications and Tests for Portland Cement

Serial Designation: C9—21

Adopted, 1904: Revised 1908, 1909, 1916, 1920 (Effective Jan. 1, 1921)

These specifications were approved January 15, 1921, as "Tentative American Standard" by the American Engineering Standards Committee.

Specifications

1. Portland cement is the product obtained by finely pulverizing clinker produced by calcining to incipient fusion an intimate and properly proportioned mixture of argillaceous and calcareous materials, with no additions subsequent to calcination excepting water and calcined or uncalcined gypsum.

I. Chemical Properties

2. The following limits shall not be exceeded:

Loss on ignition, per cent	4.00
Insoluble residue, per cent	0.85
Sulphuric anhydride (SO_3) per cent	2.00
Magnesia (MgO) per cent	5.00

II. Physical Properties

3. The specific gravity of cement shall be not less than 3.10 (3.07 for white Portland cement). Should the test of cement as received fall below this requirement, a second test may be made upon an ignited sample. The specific gravity test will not be made unless specifically ordered.

4. For fineness, the residue on a standard No. 200 sieve shall not exceed 22 per cent by weight.

5. A pat of neat cement shall remain firm and hard, and show no signs of distortion, cracking, checking or disintegration in the steam test for soundness.

6. The cement shall not develop initial set in less than 45 minutes when the Vicat needle is used, or 60 minutes when the Gillmore needle is used. Final set shall be attained within 10 hours.

7. The average tensile strength in pounds per square inch of not less than three standard mortar briquettes (see Section 50) composed of one part cement and three parts standard sand, by weight, shall be equal to or higher than the following:

Age of Test, days	Storage of Briquettes	Tensile Strength lbs. per sq. ft.
7	1 day in moist air, 6 days in water	200
28	1 day in moist air, 27 days in water	300

8. The average tensile strength of standard mortar at 28 days shall be higher than the strength at 7 days.

III. Packages, Marking and Storage

9. The cement shall be delivered in suitable bags or barrels with the brand and name of the manufacturer plainly marked thereon, unless shipped in bulk. A bag shall contain 94 lbs. net. A barrel shall contain 376 lbs. net.

10. The cement shall be stored in such a manner as to permit easy access for proper inspection and identification of each shipment, and in a suitable weather-tight building which will protect the cement from dampness.

IV. Inspection

11. Every facility shall be provided the purchaser for careful sampling and inspection at either the mill or at the site of the work, as may be specified by the purchaser. At least 10 days from the time of sampling shall be allowed for the completion of the 7-day test and at least 31 days shall be allowed for the completion of the 28-day test. The cement shall be tested in accordance with the methods hereinafter prescribed. The 28-day test shall be waived only when specifically so ordered.

V. Rejection

12. The cement may be rejected if it fails to meet any of the requirements of these specifications.

13. Cement shall not be rejected on account of failure to meet the fineness requirement if, upon retest after drying at 100 C. for one hour, it meets this requirement.

14. Cement failing to meet the test for soundness in steam may be accepted if it passes a retest, using a new sample at any time within 28 days thereafter.

15. Packages varying more than 5 per cent from the specified weight may be rejected; and if the average weight of packages in any shipment, as shown by weighing 50 packages taken at random, is less than that specified, the entire shipment may be rejected.

Frequently the chemical properties are not determined on each carload, it being generally thought sufficient to make an occasional analysis for sulphuric anhydride and magnesia or to omit these tests entirely. If the physical tests are all good there is no need for adding to the expense for testing, unless the use of the cement is such that limits for certain elements are advisable.

The story to be told by each test is, in most cases, obvious. They show the rate of hardening, the strength and rate of improvement with age, the sand-carrying capacity and the general condition of concrete or mortar which may be expected with the passage of time. It is safe to say that any cement which passes these requirements is good.

While the almost universal use of cement testing is comparatively recent, the testing of concrete aggregates is far more recent. In fact, it is only within the past two or three years that these materials have been investigated to any appreciable extent. Sand is undoubtedly the worst offender among the constituents of concrete, but it still pretty generally devolves upon the cement company to prove this fact. Concrete seldom develops any defects without the contractor's making a demand on the cement manufacturer to pay for the damage. In the writer's experience, it is found that there are about ten cases of poor sand to every one of poor cement.

The most common cause for poor sand is the presence of loam. Cement will not carry loam, and even increasing the richness of the mixture will not make good concrete. It simply will not harden properly and sand of this kind should always be rejected. Unfortunately, the quality of sand cannot be told, excepting in rare instances, by its appearance, but there are tests which will tell absolutely.

It is customary to conduct tests for tensile strength in comparison with standard testing sand, using a cement of known good quality; for fineness or grading by means of sieves of definite sizes, and for the presence of organic matter. Just now there is considerable discussion regarding the substitution of a compression strength test instead of the tensile test usually used on the ground that concrete is always used under compression. We shall not attempt to participate in the discussion in this article.

As already said, loam is the most common cause for poor sands but run-of-bank gravel is a close second. Concrete must, of course, be fairly accurately proportioned to give the desired results. Gravel, as it occurs in most banks, contains considerably more sand than true gravel and as a result the concrete will contain an undue percentage of sand and a small amount of coarse aggregate. Bank gravel should always be screened before using, and the resulting sand and gravel, if of good quality, properly proportioned before mixing again.

On much small work, these conditions are not attended to. Poor concrete results, and the testing laboratory may be called on for a post-mortem instead of for a preliminary diagnosis. It becomes necessary in such cases to dissolve the cement out of the mixture as used and, by screening the separated aggregate, determine the amount of sand and stone. It is impossible to tell, with any accuracy, the quality of the original materials. Nothing can be said of the cement. This is destroyed by the analysis. Also any organic matter originally present in the sand has been consumed.

Stone or coarse aggregate can generally be passed upon without test. It is of value to ascertain the proportions of particles of various sizes or the grading, and this can be done simply by means of a few sieves, but the nature of the particles themselves can be as well studied with a hammer as by means of an extensive series of laboratory tests.

The two most important materials of construction for large buildings are, of course, concrete and steel. The use of the testing laboratory with relation to the former has been told. In the case of steel, the architect usually calls for a standard structural grade, here again using the requirements of the American Society for Testing Materials. Inspection is then entrusted to some reputable testing laboratory, which sends its representative to the steel mill, where the rolling is carefully observed; tests of specimens from each melt are witnessed to determine the tensile strength, elongation, bending, etc., and weights and dimensions are checked.

Shop inspection includes no tests, but in the realm of steel there is no service of more value. The fabricating or bridge shop receives its steel from the rolling mill and builds girders, beams, columns, etc., all ready to be put together on the building site. The inspector makes regular visits to the shop, or works continually in the larger shops. He has copies of all detail prints for each of his jobs and he goes over each member with the utmost care, checking dimensions, location and punching of holes, testing rivets, and, in short, seeing that each and every piece is exactly as ordered. As a result, a well inspected steel job will fit together in the building without need of troublesome and costly alterations.

There are of course many ways other than in testing cement and inspecting steel in which a testing laboratory works with the architect and engineer. However, these two services are the most frequently used and most regularly needed. Brick, lime, paint, putty, plaster, etc., are often examined, but not to the extent of these already mentioned, and it would needlessly prolong this paper to discuss them.

It would hardly do to close an article on this subject without mentioning briefly the inspection of treated lumber. This is generally impregnated with so-called creosote oil, but treatments with such substances as zinc chloride and sodium fluoride are on the increase for building construction. Inspection of this material comprises an examination of the untreated wood, analysis of the impregnating oil and inspection of the creosoting process, including the steaming vacuum and pressure treatments, so that the resulting lumber shall contain the right amount of the proper kind of preservative. On the quality of treatment the life of lumber depends.

The equipment required for the larger testing laboratories or inspection bureaus is extensive and many skilled men must be kept upon their pay rolls. Furthermore, the recompense for this class of work has never been commensurate with the value of the work performed. Clients' battles must be fought, as protests against rejection are not infrequent and the laboratory must be in a position to prove its contentions.

Architects and engineers are continually increasing their demands for work of this character and are more and more conscious of the value of this extra care in seeing that the owner gets what he pays for.

The Essex County Tuberculosis Hospital

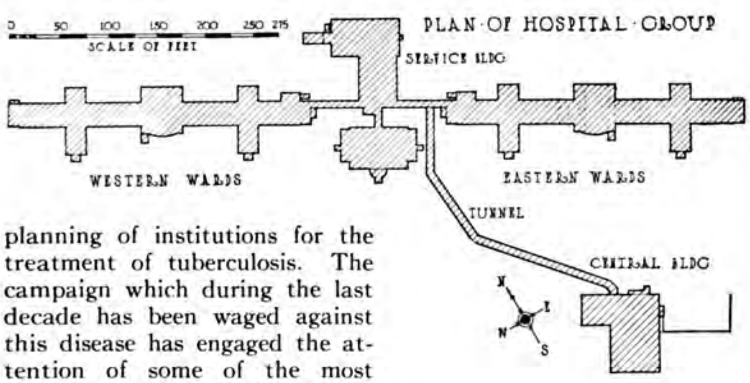
MIDDLETON, MASSACHUSETTS

JOHN H. BICKFORD COMPANY, BOSTON, ARCHITECTS *and* ENGINEERS

By REUBEN H. DOCKHAM

PROBABLY only those who specialize in the planning or equipment of hospitals, or who are connected in some way with their administration, are familiar with the rapid development which is taking place in this department of architectural work. The institution which is regarded today as the last word in planning is before long out-distanced by another, wherein are embodied still more advanced ideas of planning or details of equipment.

This progress is particularly manifested in the planning of institutions for the treatment of tuberculosis. The campaign which during the last decade has been waged against this disease has engaged the attention of some of the most eminent members of the medical profession, and assisting them have been schools of research and carefully trained specialists in many forms of allied effort ; the entire movement has been supported not only by public funds, but also by those of powerful foundations, and the whole has resulted in a great outpouring of popular interest and enthusiasm. As might be expected, therefore, a modern hospital when planned upon a considerable scale for the treatment of tuberculosis in its varied stages is apt to represent the highest type of excellence which this combined effort has put forth.



It is not long ago that buildings for the treatment of tubercular sufferers were crudely built and equipped, as it was deemed necessary only that the patient be supplied with open air accommodations and good food. These buildings were termed "shacks" because of their crudeness. All this is changed, however, and a modern tuberculosis hospital is not merely a "patients' boarding house," but a highly developed and fully equipped institution for the care and treatment of tubercular patients, and also for the carrying on of research work in this particular field.

The Essex County Tuberculosis Hospital, popularly known as Essex Sanatorium, located in the Town of Middleton, about 25 miles north of Boston, is the most recent of its type and is considered the most complete of any yet built. Situated on a hillside and overlooking a wide expanse of open country, the hospital immediately impresses the visitor with its air of entire completeness, and as being an institution in the planning of which good taste in architecture has been joined to a high degree of engineering skill.

Some distance back from the public highway, and against a background afforded by a wooded hilltop, stretches the long and finely proportioned group of buildings, consisting of a central pavilion flanked upon each side by a symmetrical wing, joined to the pavilion by a one-story glazed arcade. The pavilion has three stories and a low basement, while the wings have each two stories and a low basement. Great care has been taken to give the buildings a suitable architectural expression, rich in simplicity and proportions.

The buildings face about ten degrees west of south. The front exterior walls are treated with gray stucco of moderate roughness of texture, relieved with a trim of ivory white artificial stone. The exterior rear walls are veneered with a very light shade of vitrified brick. The backing of all exterior walls is interlocking hollow tile.

THE MAIN PAVILION

As the visitor enters the Administration Building through the main doorway under a semi-circular portico he finds himself in a broad hall which is a reception room for visitors and patients. Here are the general office and Superintendent's private office adjoining, both on the left of the spacious reception hall, while on the right are the medical offices consisting of the Superintendent of Nurses' office, examination room and throat room, all of which are equipped with the latest fixtures and devices for determining the various phases of tuberculosis.

The second and third stories of the Administration Building contain the sleeping rooms for certain members of the staff and the nurses, complete with sitting room and baths, while in the basement are located the X-ray room with as complete an equipment as money will purchase, a fully equipped pharmacy and a laboratory supplied with the most modern apparatus and devices for both pathological and research work. Here also are several small offices, and the general linen room for the whole institution, besides record vaults, toilet rooms for both men and women and a large general storeroom.

As one passes from the reception hall in the first story of this building, one may continue through the glazed corridor to the patients' dining hall, a room spacious in size, architecturally attractive and full of light and cheerfulness, the room being supplied with light and air by four very large windows on each of two sides and having semi-circular transoms that may be opened inwardly. These windows open toward both the east and west, therefore this room is supplied with sunshine both forenoon and afternoon.

Immediately in the rear of this dining hall is the service building, in which on the first floor are the nurses' dining room, servants' dining room, the serving room for the main dining hall, the main kitchen and the steward's room.

The serving room is placed so as to give rapid and convenient service to all three dining rooms and is equipped with steam tables, hot closets, a specially designed milk cabinet cooled from the refrigerating system, cup warmer, bread and pastry cabinet, ice cream cabinet, coffee urns and the customary small utensils for quick and economical service. Adjoining the serving room is the main kitchen, to one side of which and opening into the serving room is the dish washing room. The kitchen, including the dish washing room, is a marvel of compactness and convenience, and is equipped with all modern devices and machines to save labor and allow of rapid and skillful work. Especially interesting is the arrangement of the large French range and the steam cooking fixtures, all of which are grouped in the middle of the room with ample space all around, while an eight-door refrigerator is close to the chef's cooking table.

The dish washing room was especially designed for cleansing and sterilizing the dishes used by the patients, which are kept entirely separate from those used by the staff, nurses and servants. The machine in this room will wash, sterilize and dry

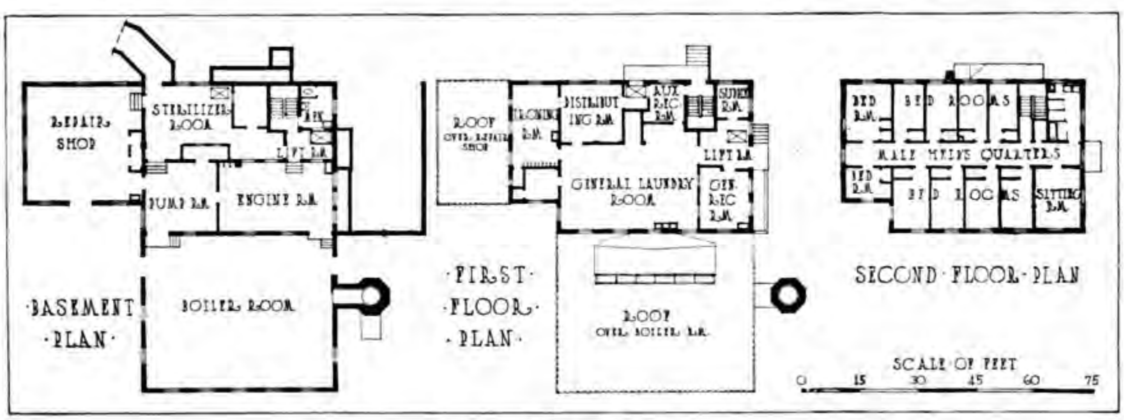
Patients' Dining Room in Rear of Administration Building

2000 pieces per hour if run to its full capacity, and all with the help of two persons. In the basement of this building is located the bakery, the equipment of which in point of convenience and completeness rivals that of the kitchen above. Here also is the cold storage plant, divided into five separate compartments to avoid a transference of natural odors, and which is of a capacity that, when filled, would defy the effects of possible strikes, embargoes on transportation lines, or the designs of profiteers. One of the most unique and important adjuncts to the cold storage plant is the garbage cooler, so arranged and connected to the ammonia circulating system that all garbage from the hospital buildings is kept at a temperature that will not breed or attract flies, nor permit ferment prior to its being taken away. Other adjuncts are the ice making tank and storage space for ice. Near this section of the basement are two storage tanks of 5000-gallon capacity for water. These tanks are supplied with necessary additional pressure to supplement that of the public water service. Town water pressure at this basement level is indicated at 31 pounds per square inch, which is too low for good service upon the upper floors of the hospital buildings. This pressure is augmented in the storage tanks by means of electrically driven pumps, automatically controlled, to give a suitable working pressure. An ingenious arrangement of valves provides for the instant segregation of the hospital water system from the town supply, always with a reserve of 5000 gallons. All drinking water, and that used for cooking purposes, both hot and cold, is thoroughly filtered.

A Typical Ward Showing Lighting, Heating and Ventilating Arrangements on Wall toward Corridor

The Hospital Wards

The two long two-story wings which extend to the right and left of the central pavilion or Administration Group just described, with which they are connected by glazed arcades, contain the quarters occupied by the patients themselves. Each of these four floors is organized and administered as a separate hospital; each has its own staff of nurses and attendants, and the result is practically four wholly separate institutions, each of which is devoted to the treatment of tuberculosis in some one of its various stages. It would be difficult to imagine anything more complete than the arrangement of these subsidiary hospitals, for each is planned with the idea of making it as comfortable as may be for the patients, and also with a view to making possible the most effectual work on the part of nurses and attendants. Through each of these minor hospitals there extends on the north side a long service corridor from which one may enter the wards and the various rooms and departments which pertain to their operation. Each of the minor hospitals has three so-called "terminal rooms," and each has its own isolation room, cut off by air locks, for contagious diseases. These rooms are so arranged that they may be entirely isolated from the rest of the hospital, and each has



Floor Plans of Service Building
Essex County Tuberculosis Hospital, Middleton, Mass.

its screened sleeping porch and communication by stairway with out of doors. Instead of having one general wash room and dressing room for patients in each of these separate hospitals, each of the larger wards has its separate wash room opening directly from it and part of each wash room is divided into tiny dressing rooms, each of which is shared by two patients, each patient having his own steel locker in which his small belongings are kept.

In hospitals for the treatment of tuberculosis arrangements are made for keeping the patients in the open air as much of the time as is possible. In this instance the wards are intended to be open to the air, in all but the most extreme winter weather, by means of casement windows, and in order that the air within the wards may be kept in constant circulation in cold weather, heating radiators are placed along the walls which divide the corridors from the wards, and *opposite* the windows in order that the warm air, rising from near the floor, may assist in keeping the air at the patients' heads in constant motion. The lateral porches, with which this hospital is provided, are a very successful solution of a problem which heretofore has meant the darkening of the wards and exclusion of the sun; here they are placed so that their *smaller* dimensions join the building and at points which are not occupied by wards, so that neither light nor air is kept from the patients.

In planning this sanatorium three other important adjuncts have been provided. In the basement of the East Ward building is an assembly room supplied with complete moving picture apparatus. This room will seat nearly 100 persons and is marvelously light and airy and attractive for a basement room. In the West Ward building, in a corresponding position to that of the assembly room, is a chapel with a seating capacity of 75 persons which is equally attractive in point of light and air as the former room. Both of these rooms are artificially ventilated and each is supplied with a small emergency room and toilet facilities for men and women.

As death is always liable to be in the midst of the occupants of an institution of this kind, a mortuary room becomes necessary, and this has been supplied in the rear of the basement of the West Ward building and at a point where the transfer and attention to a deceased patient is attended with the greatest privacy. This room is complete in every detail and includes an autopsy table, a four-section cooler and surgeon's toilet facilities. This room is also artificially ventilated and heated by indirect steam.

To make the institution still more complete, each of the four hospital floors already described has an auxiliary examination room, one of which is thoroughly equipped as an operating room and one as a violet ray room. In the East Ward building is a thoroughly equipped barber shop, and in the West Ward building is a dental room with all of the latest appliances for caring for the teeth.

Central Power and Heating Plant

An institution of this size (it readily accommodates 200 patients) requires a central power and heating plant, and this has been provided in a separate building about 300 feet from the main hospital buildings and connected with them by a service tunnel or subway through which pass the steam pipes and electric cables. This tunnel simplifies the traffic to and from the main hospital buildings and makes possible the unobstructed operation of the complete institution irrespective of weather.

The engine room contains one 60-kwt. engine generator unit, installed primarily for power purposes, but it is so connected that current for lighting may be supplied from it in case of temporary failure of the Town of Danvers municipal plant from which service is available for permanent lighting of the hospital buildings. There is ample space in the engine room for another engine generator unit. In the pump room adjoining the engine room are one steam-driven and one electrically-driven vacuum pump, and one steam-driven and one electrically-driven boiler feed pump, making the possibility of a failure of the heating plant exceedingly remote. These pumps all operate automatically and are connected to a central tank which receives the drainage from the entire heating and power systems and returns it to the boilers. In this room is also located a triplex fire pump, so connected as to deliver 120 gallons of water per minute at 100 pounds pressure to a hose attached to any one of five hydrants distributed about the hospital buildings. This pump also serves as an automatic booster of the water pressure.

The boiler room contains three 66-inch horizontal tubular boilers in brick settings, and the system of piping is such that either boiler may be run at high or low pressure, or one may be run high and another low at the same time. The plant is designed to heat with the vacuum system and during the heating period the exhaust steam from the engine and pumps may be turned directly into the low pressure heating main. By this process 60 kwts. of power are obtained as a by-product at little cost for fuel.

On the first floor of this building is the hospital laundry, a veritable model of its kind. It is supplied with the most modern machinery and each piece is driven by an individual, direct-connected electric motor, and is protected by safety devices to prevent accidents to operatives. There are sterilizing washers for the patients' clothing separate from another for the clothes of the staff and employes, and these washers are so built and installed that the soiled linen is put into the machines in special receiving rooms and is taken out clean on the opposite side of the washers in the main laundry room.

There are many other novel and useful features throughout the buildings to interest those who have to do with hospitals, and much may be learned by a study of this institution, which can truthfully be said to be the "last word" in sanatoria.

BUSINESS & FINANCE

C. Stanley Taylor, *Associate Editor*

Straight Talks with Architects

III. WILL YOU GET YOUR SHARE?

TWO months ago in this Department of THE FORUM the subject under consideration was the possibility of getting work immediately in architects' offices. Last month we discussed some of the individual and collective weaknesses which have operated to the detriment of the architect and of his profession. Some of the predictions which were made in these articles have already come true. We find today a peculiar condition in the profession, which is shown by the fact that a considerable number of architectural offices are very busy, while an even greater number have little to do. As we analyze this condition further, it soon becomes evident that the architects who are busy are of the aggressive type and those who are not busy are numbered among those who wait.

The question of selling architectural service is one which has been discussed from practically all possible angles. There are many architects who hold the opinion that a definite attempt to sell architectural service is unethical. On the other hand, it must be realized that almost every architectural commission is obtained by salesmanship in one way or another; it may not be through the employment of the principles of direct salesmanship, but through the more indirect method of developing social contacts or waiting for commissions to come into the office through the recommendation of satisfied clients.

Just a few days ago we were in the office of a well known architectural firm. We found little action there—the working force had been reduced to almost a minimum—the drafting boards were covered and an air of inactivity pervaded the entire premises. We could not help but contrast this condition with that of an office visited the day before, where millions of dollars' worth of apartment houses were being designed to meet the active demand existing in the sections of New York directly affected by the tax-exemption ordinance. The former office has for years borne a high reputation in the architectural field; the latter, where work was active, is not so well known, but is destined to be one of the great architectural firms of the next decade.

In an interview with one of the principals in the idle office, we were asked: "Why is it that with so much activity going on in this district, we are not busy?" Our answer was in some detail and may be gathered from the statements made in these paragraphs. What we were really interested in was *why* the other office was so busy and *how* the work was being obtained.

In this office, after the passing of the tax-exemption ordinance in New York, a careful study of the trend of the real estate market was made, particularly to determine what class of buildings would be erected to take advantage of this tax-exemption. It was not difficult to guess that the new housing which would be provided must consist of moderate cost individual and two-family houses and apartment houses. It was felt that in sections of the city where land values were too high for individual houses, but low enough to construct moderate cost apartment buildings on a paying basis, activity on the part of speculative builders could be anticipated. This prediction was made even more sound by the fact that there were several districts of this kind where adequate rapid transit facilities had recently been provided.

To interest prospective investors in entering upon building ventures, facts and figures must be determined, and practical types of apartment houses designed to meet public approval must be evolved. All this meant a certain amount of gambling in time and effort, but having a definite objective in view, tentative plans of two or three buildings were prepared and prices of available real estate were determined. The next step consisted of direct selling, in which the architect visited a number of logical prospective clients and showed them exactly what types of buildings could be built; what they would cost, together with the land; what return might be expected on the investment, and what margin of profit for quick resale to ultimate investors might be expected. At first it was difficult to convince, but finally the first client decided to proceed with a venture of this nature. Soon after that others came into line and before long, in the section selected by the architect, a considerable boom was on the way, and the reputation of having designed some of these buildings brought in more and more work, until the office had reached the busy stage in which we found it.

Studying the Business Phases of Each Project

Perhaps the strongest favorable impression which can be made upon the client of an architect is developed when the client realizes that his architect is possessed of sound business judgment. The impression is strengthened again if the architect seems to possess more than the usual amount of knowledge regarding the particular purpose for which the building is planned.

Not long ago there came to our attention a project which involved the design and construction of a large office building. This building was being built as an investment and paid for out of war profits. Tentative plans had been filed as prepared by a prominent firm of architects. Shortly thereafter we noted the filing of a new set of plans by a younger architect, who as yet had carried out no large project of this nature, although in the course of his previous employment he had been with firms where such experience was available to him. Being acquainted with one of the principals of the owning company, we inquired the reason why this architect had been employed rather than the prominent firm which had prepared the first set of plans. It turned out that the cost of building from the first plans filed proved to be greater than was warranted by the expected revenue under conditions that now hold, and the building project was for a time dismissed. The younger architect learned of this and promptly made a study of the tentative plans, calling into consultation an experienced building manager. Many defects which would reduce the rental income and increase the cost of maintenance were found in the first set of plans and an entirely different set of sketch plans was developed in which it was clearly indicated that the cost of maintenance and operation would be less, while the space was utilized to provide a greater income on the same expenditure of money.

Those who have money to expend in the building field today are generally hard headed business men who respond more quickly to an appeal made along business lines than through the æsthetic appeal of a well designed exterior. Realizing this fact, the younger architect did not present at the first interview an elevation or perspective, but merely based his argument on the floor plans which he had developed, saying that if they were further interested, he would be glad to show the elevations of the proposed building. Proceeding thus along businesslike methods of approach, this architect was able to bring into his office the largest commission he had ever handled. The fault with the larger organization is to be found in the fact that they did not realize the value of consulting a building manager, and had merely produced another office building, well designed it is true, but showing the same waste of space and disregard of maintenance cost that are to be found in the average hotel building and many office buildings today.

Entirely aside from the architectural and engineering problems involved in a new building project, we believe that the first idea on the part of the architect should be toward making the building a machine highly efficient in accordance with its intended purpose. This means not only a study of the plans of other buildings which in times past have been built for a similar purpose, but an actual examination on the ground of the functioning of these buildings to determine through experience of others those points which should be incorporated in planning a new building, or items of design and equipment which for one reason or another should be omitted. To illustrate this point, we may refer briefly to one instance. In this case the architect had drawn plans for an office building and had incorporated the equipment for a stationary vacuum cleaning plant. Fortunately, and largely through the insistence of the owner, his plans were gone over by a building manager. Among many recommendations was one to the effect that the portable type of vacuum cleaner would represent considerable less investment and a lower cost of operation and provide eminently satisfactory service for the particular building. The architect investigated and obtained data on several installations of each type in buildings of similar size and kind, finding that the building manager's judgment was correct and saving the owner a sizable item in original building cost.

Follow Construction Costs Closely

In the past, architects have often been charged with failure to keep closely in touch with actual conditions in the building field and failure to maintain a thorough working knowledge of costs. The result has been that in preliminary discussions of a project, and even in the preparation of sketch plans, the architect's tentative cost estimates have often proved misleading to the client. To such an extent has this been true that there are on record many instances where a client has refused to go beyond the sketch plan stage, because the cost seemed too high, when in reality a careful combing of the field might have resulted in obtaining information upon which a lower cost could be based.

Another period of disappointment to the client is the time when he has ordered working drawings and specifications to be prepared on a basis of estimates furnished him by the architect. When actual contract and sub-contract figures have been obtained, it is quite often found that these figures are much higher than the estimate given by the architect. This is a situation which in nine cases out of ten serves to discourage the client and to prevent the carrying out of the project. If it is found difficult to obtain comparative costs in order to provide a tentative estimate, it is much better to inform the client frankly that the tentative cost estimate was based only on general information and that the actual figures cannot be had until plans have been developed to a point where actual estimates on material and labor can be obtained. The average client, particularly in the case of owners of business buildings, will be found fair minded in this matter and appreciative of the architect's frankness and co-operation and his apparent willingness to serve the best interests of the client.

It is a great mistake to assume too much knowledge, and this is a common error among architects today, particularly among those who are in the early stages of developing their practices. In view of the complexity of the modern building operation no reasonable person would expect an architect to know everything. Consequently, the best practice today involves the employment of consultants who are specialists, particularly in connection with the mechanical installation problems of a building project. Difficult problems of heating, ventilating, acoustics, fireproofing and structural engineering should never be undertaken excepting under the guidance of consulting engineers or with the services of a staff member who has a thorough knowledge of the subject involved. In cases where the project is tentative in its nature, and the architect may be doing a certain amount of preliminary work, it will be found that the average consulting engineer is entirely willing to co-operate on a very reasonable basis. Similarly, in problems of actual construction, it is the part of wisdom to consult with a practical building contractor or sub-contractors in order to incorporate practical features in planning and to avoid mistakes which are commonly found in working drawings and specifications tendered to bidders.

Standardize Your System of Charges

In analyzing the methods of charging clients for services by various architects, we have been frankly surprised to find how many are working on some form of cost-plus basis. It would seem that we are now in an evolutionary period, not only regarding the scope of architectural service but also the method of charging for it. As a basic consideration, it is evident that a professional service of any kind will be paid for by the public, not on a standard charge or percentage charge, but in accordance with the experience and ability of those who render such service. This condition has been generally accepted in the legal and medical professions, among others. On the other hand, many architects have attempted to adhere to a fixed or standardized percentage of charges, based on the type of work involved. There has been too little consideration of the differential which enters into the situation because of the factors of skill and experience. Again, we have to consider the varying degrees of complexity in a building operation and the question of repetition of design in such cases as that of an industrial or other type of group housing project. Some of the methods of charging for service which have been brought to our attention are:

1. The straight percentage method, such as that suggested by the American Institute of Architects.
2. The lump-sum method, in which a price is quoted for full architectural service on a given project.
3. Various forms of cost-plus charges.
4. Salary basis.

The majority of architects work directly on a percentage basis, receiving fees which must include their operating expenses, leaving the balance for profit. The percentage charges vary considerably, depending upon the size of the project and the amount of work involved. The usual basis, however, quite closely approximates the schedule of charges as set forth by the American Institute of Architects.

The lump-sum method has been experimented with on numerous occasions but has been found generally unsuccessful, excepting in the speculative building field, where it is quite customary to maintain a standardized series of lump-sum charges, which may be so much for the plans of an individual dwelling under certain cost limitations, so much for the plans of a two-family house, and plans of apartment houses which are sometimes estimated on the basis of cost of architectural design per front foot. Naturally, there are many variations in this system of charging, and in most instances the architectural work does not include the preparation of detail drawings and specifications, as this work is done by the building contractor or speculative builder through his own organization and to a great extent through the offices of his sub-contractors.

The cost-plus system of charging seems to be gaining in favor. Briefly, this consists of arranging a contract with the owner by which he is to pay the actual costs, which are increased (usually doubled) to cover the overhead expense, and above this a percentage of the actual expenditure thus determined is allowed the architect for profit, the average being about one-third of the cost as estimated on the actual expenses-plus-overhead basis. Under this plan payments are usually made on monthly statements rendered by the architects.

A variation of this plan involves a payment of actual cost of the work plus an overhead charge by the client, and a salary to the principal or principals who may be engaged at any time on the work.

There exists today in the average architectural office a great need for a revision and standardization of charges. In many instances the prospective client's complaint that architectural service costs him too much is grounded on fact. We may take one brief example for consideration. Under the ordinary system of charging for architectural service, which involves a series of percentages, the various stages of the work are based on the cost of the building. He would find that a simple type of industrial building, involving very little detail architectural work but costing perhaps one million dollars, would develop an architectural charge equal to that of designing a one million dollar hotel. The work involved in designing the hotel might require five times the effort and expenditure on the architect's part as that involved in designing an industrial building. Naturally, it seems unfair that a standard percentage charge should apply in this case. The adoption of the cost-plus form of charging, however, would obviate all such difficulties. Any of these forms of charges involves careful bookkeeping, so that the records may be open to the client at all times.

EDITORIAL COMMENT

CONSTRUCTION THE IMMEDIATE SOLUTION OF UNEMPLOYMENT

THE president's Conference on Unemployment has adjourned after a number of meetings attended by representatives of the varied fields of social and industrial endeavor. The deliberations of the Conference have not resulted in any formula for changing conditions immediately for the better. Hardly any thinking person entertained any idea that the outcome would be otherwise; the present unemployment is the effect of economic conditions that must of necessity change slowly, just as they were originally brought about. The Conference has, however, not been without purpose; it has concentrated the popular attention on a subject of great importance to the nation, and as well as could be done with the limited organization available it has gathered data and information which the delegates have been requested to use to the best possible advantage in their local communities—and it is in the many individual communities that the problem must be solved.

An interesting phase of the Conference was the emphasis placed on the construction industry as the source from which most immediate general help can come. It is a recognition of the claims of many in the industry that construction is a "key" industry and emphasizes their objections that as such it has not been accorded its true importance in the fields of finance, government and transportation, all of which have laid upon it heavy burdens, while at the same time a determined fight was required to overcome adverse general economic conditions.

The Conference points to construction as the only immediate source of help and makes a special plea that public officials proceed with all road and public building construction for which funds can be made available. The number of men that such work can employ in a direct manner is large, but even of more importance is the work indirectly created for others because of the demand for construction products from the quarry, mill, foundry and factory. The Conference estimates that more than 2,000,000 people could be employed in construction.

The difficulties that must be overcome, as given by the Conference, are those that everyone connected with building knows—they are financing, material costs and labor costs. They present questions which cannot be answered in a national sense; they must be investigated in each community for itself. As formulated by the Conference they are:

1. Can the prospective investor finance the operation at a reasonable cost?

2. Does the cost of construction materials to the prospective investor properly represent the reduction which has been made in the wholesale prices?

3. Is labor in the particular locality working at fair rates and giving fair value in the quantity and quality of work done?

If local conditions permit a satisfactory answer to these questions, there is no reason why work should not proceed immediately. The report of the Committee on Construction Industries to the Conference makes this pertinent comment on these phases of the problem:

Financing "In every section of the country owners have declined to start new projects on account of the financing charges, both the interest rates and the commissions and premiums paid for floating loans being discouragingly high. Commissions and premiums varying between 10 and 20 per cent have been charged, in addition to from 7 to 8 per cent interest. It is doubtful whether the margins received by architects, contractors and all the producers in the basic industries involved in construction aggregate a sum equivalent to these financing charges.

"The savings deposits of the people are the natural economic source of loans for home building. The aggregate is ample for this purpose, even though a portion is protected by adequate investment in more liquid securities to meet withdrawals. There would be no difficulty in the financing of homes if the fundamental principle of the use of long term deposits for home loans and other long term uses were generally followed.

Material Costs "Manufacturers of building materials should be urged to make their readjustments promptly to a reasonable basis. They must realize that failure on their part to do so is not only limiting their own business but it is also interfering with the production and sale of other construction materials.

Labor Cost "This cannot be regulated by national action. The cost of living, rentals and working conditions differ in various communities. Where fair wage adjustments have not been made, construction is held up. Such conditions should be dealt with fairly and frankly between employers and workmen, and reasonable readjustments promptly made."

The value that the Conference placed upon the resumption of construction is seen in the recommendation that Secretary Hoover appoint a committee selected from the various elements interested in construction to be known as the Committee on Construction Development, which will be charged with the responsibility of preparing plans for co-operating with the governors and mayors in the several states and cities in carrying on community conferences to the end that local restrictions may be eliminated.

DECORATION *and* FURNITURE

A DEPARTMENT DEVOTED TO THE VARIED PROFESSIONAL & DESIGN INTERESTS WITH SPECIAL REFERENCE TO AVAILABLE MATERIALS

It will be the purpose in this Department to illustrate, as far as practicable, modern interiors furnished with articles obtainable in the markets, and the Editors will be pleased to advise interested readers the sources from which such material may be obtained

ORIGINAL XV CENTURY ITALIAN SACRISTY CUPBOARD
BOSTON MUSEUM OF FINE ARTS

THIS excellent example of Italian renaissance cabinet work formed a part of the Davanzati collection of Italian antiques. It was procured for the Museum at the Davanzati sale held in New York a few years ago, which was so largely responsible for the recent revival of American interest in Italian interiors and furniture. The illustration shows its setting in the Hall of Tapestries at the Museum.

Interiors Adapted from the Italian

PART III. FLOORS AND TRIM

By WALTER F. WHEELER

IN planning interiors in the Italian style particular importance attaches to the treatment of floors, for with interiors so simple and direct in character it is necessary that floors be in keeping with their surroundings. The floor is essentially a foundation for the room and should suggest strength and solidity; for this reason the colors used upon floors should be darker than those in walls and ceilings and every effort should be made to use materials which by their very nature add an appearance of stability.

There are instances where floors in loggias, vestibules or entrance halls may be paved with flat stones of irregular shape, if not too rough in character. An extremely good treatment for use in such cases, or even for a simple interior where expense is a consideration, would be a natural gray cement floor lined off into squares, with narrow lines of black cement paint, or else every alternate square painted black. Such squares might be from 12 to 18 inches on a side and the lines themselves from ½ inch to ¾ inch in width. Cement offers many attractive possibilities in the usual forms of terrazzo or in combination with tile or metal inserts.

Brick, in various forms, provides excellent floors for rooms arranged in the Italian style and its moderate cost supplies another argument for its wider use. The well known Roman brick which is widely used in Italy for flooring is easily to be had in America and excellent results may be had by placing two such brick side by side and then cutting off the corners of the oblong thus formed making a hexagonal shape which forms a useful paving unit. Where a large surface is to be paved the expanse may be broken by bands of brick laid in a manner different from that used for the rest of the flooring and these bands may be of contrasting colors.

The use of quarry tiles marks the step to the form of flooring to be next considered. They may be had in a large number of colors and when choice is made of an appropriate color and a fitting contrast is obtained in selection of a color for mortar, a successful result may be expected. Tiles of many kinds are offered in the market and many are well

Courtesy Doubleday, Page & Company

Italian Wall Cabinet Suitable for Modern Bookcase Design in Italian Interiors
Example of favorite lozenge shape panels with raised mouldings

Original XVIII Century Venetian Polychrome Door
Courtesy of Paul Chalfin

suited to Italian surroundings. Their selection must always be governed by a proper regard for the reserve which in interiors of this type is quite necessary and it will be generally found that a single toned, undecorated tile of pleasing geometric shape will make a satisfactory, restful floor.

Wooden floors may be of several types and among them are parquetry and matched boards in geometric patterns. Wide boards, keyed together with the keys plainly visible, are highly appropriate and use might be made of oak or some other close grained native wood, stained to a dark, soft brown. These floors are frequently laid with square edged boards and with the joints purposely left open and filled with a black mastic compound that helps to create a sense of rugged construction.

The furniture workers of America, whose success in reproducing excellent examples of Italian furniture of the late fifteenth or sixteenth century has been already pointed out, have not been more resourceful in adapting the spirit of the older age to the requirements of today than the makers of floor coverings of different kinds. Unless an architect has given the subject a thorough investigation it would be difficult to realize the extent of the variety which is offered. Among the materials which are useful in furnishing interiors of the Italian type are many kinds of "fabricated" floor coverings, such as various forms of linoleum and a number of cork products such as tiles and carpeting. These materials are to be found in plain colors, in squares of contrasting colors, and also in tile and marble patterns, and since they are to be had in units of convenient size, are easily installed and give excellent service, they are being widely used.

The Italian interior is generally dominated by the fireplace. A study of illustrations of such interiors as are included here will show that considerable variety is possible in the treatment of mantels, but that almost all successful examples are of stone or of some modern substitute for stone or marble. Mantelpieces can be easily cast in cement from the architect's individual design, but the American market offers many mantels of various substances which are of excellent design and frequently exact copies or close approximations of mantels from well known Italian palaces and which are of quite moderate cost. In selecting or designing mantels for such surroundings it must be remembered that the scale of a mantel in an early Italian interior is quite different from that in the designing of a house based on Georgian or colonial precedent. In the Italian interior, the general scale is much larger; frequently the fireplace opening is almost high

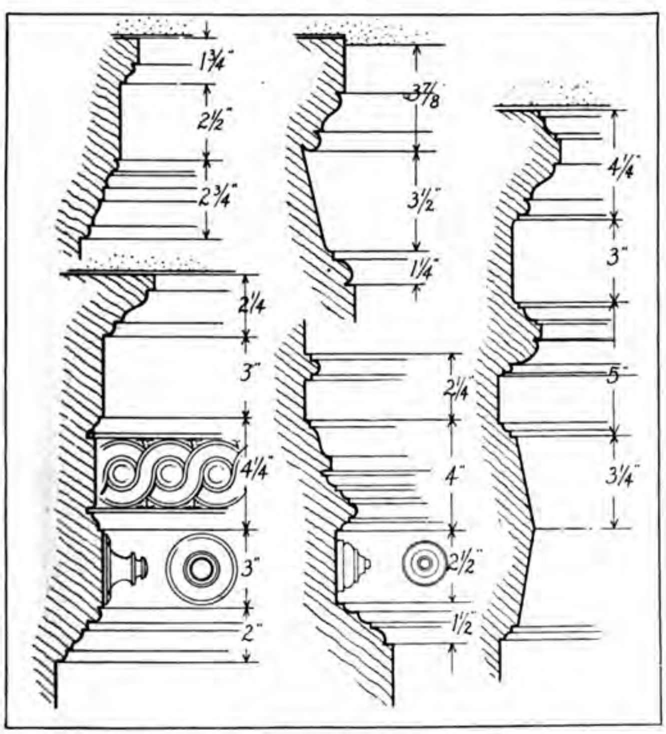
Window with Splayed, Paneled Jambs in Italian Style
Myron Hunt, Architect

enough to walk into and the effect, while lacking nothing in refinement, is far bolder and stronger and much more virile, in keeping with the more robust treatment of walls and ceilings.

There is considerable variety in the form which the Italian mantel may assume; the shelf of the mantel is not as important as with mantels of most other types, and frequently it disappears altogether. The "hooded" fireplace, which was inherited from the Gothic period, was often employed and it is much used today in interiors of this kind, for its form and general scale recommend it for rooms where lofty ceilings are the rule rather than the exception. Another favorite treatment called for the placing about the fireplace of merely a heavy bolection moulding which was generally of stone or marble. An instance of this treatment is illustrated and a section of the moulding is given on page 203.

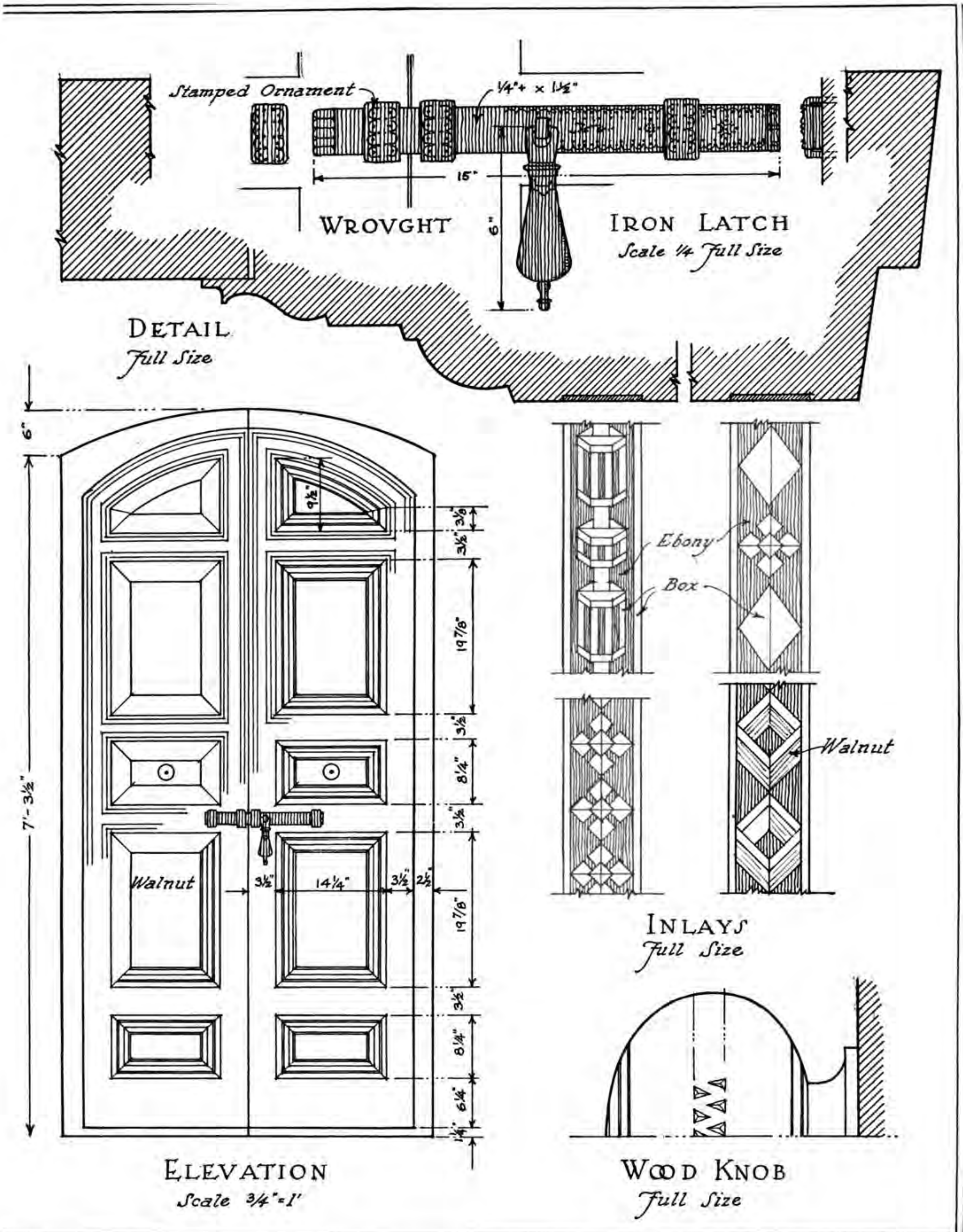
The highly developed chimney piece and over-mantel are not characteristic of this period except as the "hooded" fireplace may be so considered. The fireplace in the Italian room is nevertheless the dominating feature and this is achieved by the large opening and the vigorous moulding and carving of the stone mantel. The space above the mantel is generally left free for a tapestry, painting or sculptured ornament.

Doorway with Moulded Cement Architrave and Wood Paneled Doors in Italian Style
Bigelow & Wadsworth, Architects



Details of Mouldings from Five Italian Wood Doors
All are reproduced at the same scale

Trim is also a matter of much importance. In the discussion of ceilings in The Forum for October it was pointed out that much of the success of a ceiling in an Italian interior often consisted in the presenting of a strong and abrupt contrast to walls, but just the opposite condition obtains in regard to trim about windows and doors or the arrangement of baseboards, in planning which the effort is to make them appear to be a part of the surrounding walls. It is true that sometimes—as may be seen in a few of these illustrations—the detail about a door may be of wood and as different as possible in appearance from the walls, but in these in-



ITALIAN DETAILS 1921

INTERIOR DOORS PALAZZO DAVANZATI FLORENCE

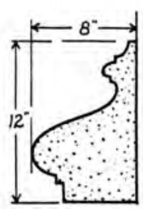
MEASVRED and DRAWN by HOWARD MOÏSE

stances the door frame is apt to be richly carved and probably polychromed and gilded, so that in effect it ceases to be a mere doorway and becomes an architectural asset of the first importance. Usually, however, the trim about doors and windows would be made extremely simple and inconspicuous—often flush with the plaster walls so that it was almost invisible, or else so concealed within the deep reveals that it was hardly noticeable, and almost always it would be painted or treated in some way to tie it into the walls, thus almost entirely concealing it. The baseboard, of course, was regarded as having only utilitarian value and was usually a mere protecting fillet a few inches high; often it was still further minimized and became a quarter-round at the angle between floor and walls.

In some instances, especially in rooms which are large and of considerable height, paneling was occasionally used to a height of five or six feet, with plaster or hangings above. Where paneling is used the panels should be in bold, vigorous scale, arranged in squares similar to English renaissance work but larger in size, often not less than two feet on a side and with a correspondingly vigorous cap. The mouldings of the panels may show some slight carving or use of carved beading and they offer as well an excellent opportunity for polychrome decoration in small areas of color.

Modern Door Designed in Accord with Italian Precedent
Richardson, Barott & Richardson, Architects

Among the important details of interior trim in the domestic architecture of Italy are doors and the wooden shutters or blinds which are often used. The older examples, made quite as much for protection as for architectural appearance, are paneled in various ways. These doors and shutters are



Above is Fireplace in Villa Caronia, Florence, with Detail of Moulding
Courtesy of E. F. Dodge

At Right are Two Mantels of Modern Manufacture, Based on Italian Originals generally of walnut or chestnut, and like wooden ceilings are often polychromed or lightly decorated with gilt. Owing to the deep reveals made necessary by the thickness of walls, such doors and shutters are often surrounded by very little actual woodwork and in some old examples are fixed directly to the stone of the surrounding jambs.

Sometimes an excellent result may be had at a cost comparatively small by placing about a door opening a wide plaster band with face moulded edge; such a band, which really constitutes a form of trim, may be marbleized or given the same treatment as the surrounding walls for the slight shadows cast by the moulded edge will give the architectural emphasis which is required. It may be noted here that important doorways should be of generous width which of course involves the use of double doors. For such doors the Italian metal workers produced exceedingly well designed hardware—long strap hinges which extended across the entire width of the doors and huge locks, which were not mortised but left fully exposed. Sometimes the doors are studded with nails having richly ornamented wrought iron heads. American makers of hardware are particularly successful in their door hardware in the Italian style. To avoid too much cutting up of the walls only doors of real importance are given any architectural emphasis, minor doorways being often entirely concealed and made "blind" doors, which are almost invisible, since absolutely no trim is used and the doors themselves are precisely like the walls about them.

Much of the trim which is discussed here involves the use of mouldings which are of great importance in interiors of any type. The mouldings most successful in Italian interiors exhibit an accentuated difference between different members—some being robust, swelling surfaces while others are of small scale and quite deeply cut. There are however no sharp arrises, care being taken to round all edges to give a soft appearance. In paneling, the stiles are generally thin and narrow, the greater prominence attaching to the panel which is achieved by the use of wide mouldings which are often raised and frequently designed in the reverse, so that the depth of moulding coming toward the panel is greater than at the outer edge. The use of mouldings in interiors can be profitably studied from the furniture of this period because of its highly architectural character and the intimate relations which it sustained to the structural interior.

The treatment of windows follows, generally, that of doors. The more important windows were often extended to the floor and made to open, in the French fashion, in two folds. Owing to the depth of the walls the reveals would ordinarily be deep enough to take the windows or even the shutters which were sometimes used, so that hangings might be undisturbed on the plane of the main walls.

The thoughtful planning of the details of floors and interior trim goes far toward making a success of an Italian domestic interior, a type which depends for final effect very largely upon careful coordination of all the different parts to make up the setting or background which is afforded for furniture and other accessories.

A Modern Piece of Furniture Faithfully Reproducing an Italian Original and Carried by Dealers
Style of North Italian Early Renaissance. Length, 57 ins., width, 23 ins., height, 38 ins.

The
ARCHITECTURAL
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Sgraffito and Its Application

By MALCOLM RICE

THE application of sgraffito on plain surfaces, as a decorative art, has to a great degree been misunderstood by both artists and artisans in America. As stucco has played such an important part as a building material and its application is so well understood, it seems only reasonable to advance from plain stucco surfaces, when occasion permits, to the introduction of sgraffito. The same precautions are taken in good sgraffito work as are taken to insure permanent stucco.

The understanding of stucco by the Romans is attested by the well preserved examples that have come down to us and it is only natural that, when the artists of the renaissance went to Rome to study the classic, they should have absorbed some knowledge of its application. As sgraffito is an outgrowth and development of stucco, with the addition of a certain proportion of lime to make it plastic while working it, this work has assumed the permanency of Roman stucco, plus the half childlike but wholly experienced spirit and temper in drawing which blossomed with the renaissance.

The translation of the word "sgraffito," derived from the Italian word for scratch work, gives us the exact character of this work. It is a decorative art, scratched or etched with great cleverness of drawing, on plaster, using a metal point or scraper. The draftsman who attempts to design sgraffito must have a thorough knowledge of the technique of pen and ink drawing, and a good working knowledge of

Detail of Sgraffito Decoration, Palazzo Spinelli, Florence, Italy

Sgraffito Decoration, Second Story, Palazzo Sertini

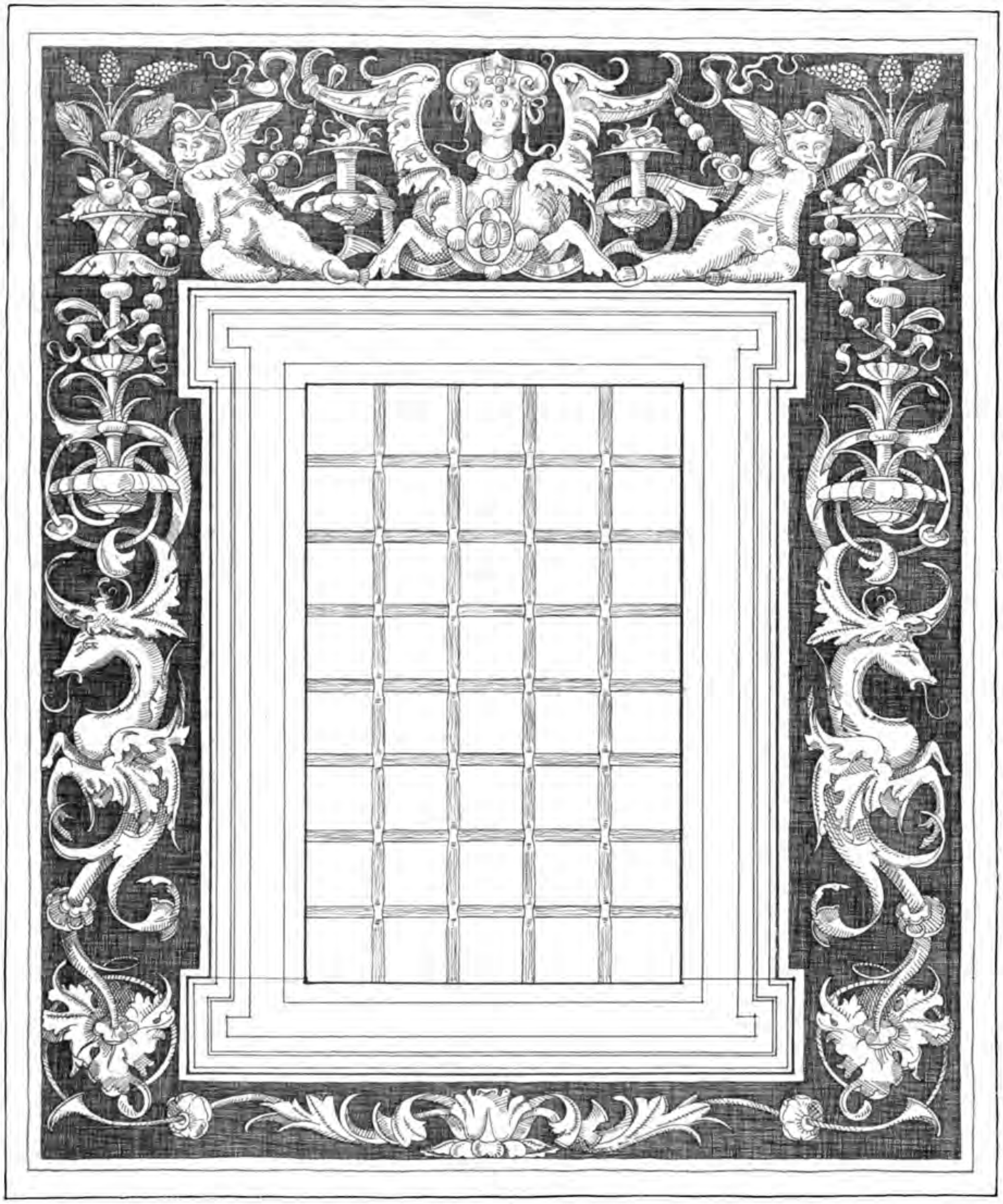
most successful in securing the relative values of light and dark. These studies should be carried to quite a finished stage before making full sized cartoons. It is noticed in the best examples, such as the Palazzo Sertini, Palazzo del Conte di Boutourlina and others, that there is a predominance of the light relief over the dark field. The subjects used in the design are unlimited, as will be observed by careful study of such examples as still remain. The artist has thrown restraint to the winds and satisfied all his sense of humor, pathos and satire in giving to this work a festive air, rendered in his most exquisite drawing. The design of sgraffito, to be successful, cannot be approached in a light or frivolous manner as the success of the work completely depends on the care, study and excellence of drawing on the full sized cartoons. In making these cartoons full size, they should be freely worked up in charcoal. Strength, simplicity, swing and directness are always the qualities striven for, the modeling being derived from lines, not blending. The final working drawings should be made on heavy detail paper and in hard, bold lines clearly showing the exact outlines.

Before applying the full-size drawings to the prepared plaster wall, the outlines of the design are perforated and sandpapered on the opposite side to prevent holes from becoming clogged when applied to the plaster. The detail is then put in place and the impression on the plaster obtained by pouncing through with a muslin bag filled with charcoal. Before the plaster, on which these cartoons are to be stenciled, is applied, the wall must be well tapped, sounded and calked. It is also well to soak the wall with water to prevent suction, but care must be taken not to get it too wet as it pre-

charcoal drawing. He must, in working up cartoons, which in all cases are full size, carefully consider a pleasing distribution of openings and solids. It is also necessary to have an appreciation of scale in the relation of subjects composing the cartoons.

In developing the cartoons it is well to make studies at the scale with which the draftsman is

Sgraffito Decoration over Main Entrance, Palazzo Sertini, Florence, Italy
Executed by A. Feltrini, 1510. Measured and drawn by Malcolm Rice



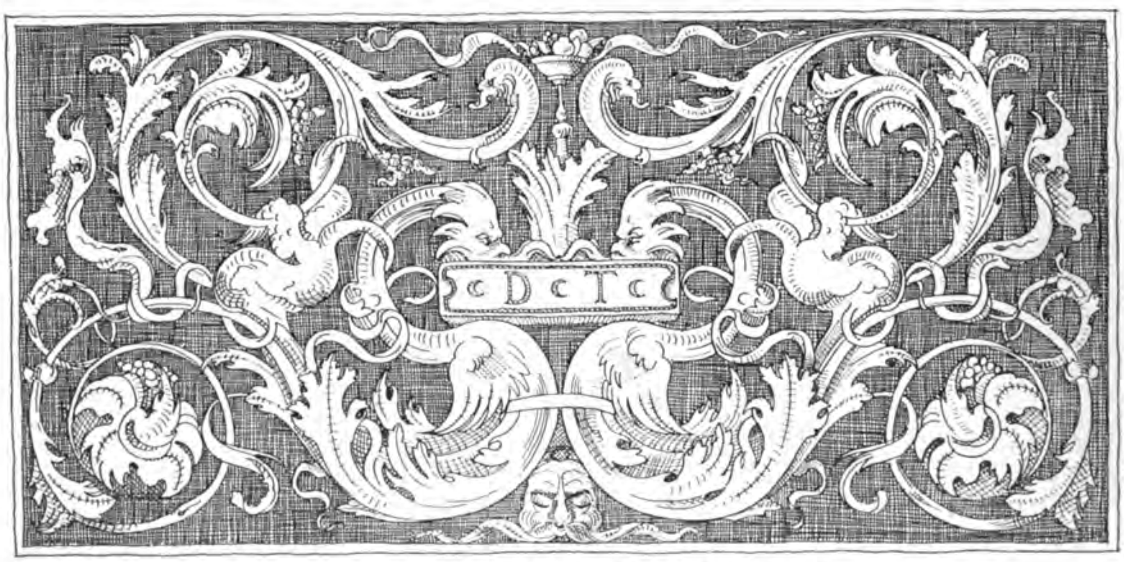
SGRAFFITO DECORATION
AROUND WINDOWS OF FIRST STORY
PALAZZO SERTINI, FLORENCE, ITALY
EXECUTED BY A. FELTRINI, 1510
MEASURED AND DRAWN BY MALCOLM RICE

Detail of Sgraffito Decoration, Palazzo Rasponi, Florence, Italy

vents the plaster from drying quickly and evenly.

In the preparation of the plaster and the proportion of sand, cement and coloring matter used, it is impossible to give a uniform specification, as the climate, atmosphere and barometric conditions control the retarding or hastening of the setting of the plaster. It is necessary to make several samples of cement plaster, varying in mixture, before commencing work. The first coat is a strong concrete mixture, applied several days before the coats used for decoration, and left with a rough surface. It is made up of a 1 : 2 mixture of high grade Portland cement and clean, sharp sand, not too quickly setting. The second coat consists of marble dust, cement and whatever color may be desired. This coat should be applied before the first has completely dried, but after it has obtained its initial set. It is from $\frac{1}{8}$ to $\frac{1}{4}$ inch in thickness and perfectly applied.

The third coat consists of lime, fine marble dust, cement and whatever color is desired. It is mixed in a liquid form and applied with a soft brush before the second coat has set, to take the decoration. The total thickness of the coats is from $\frac{3}{4}$ inch to one inch. In the use of lime to prevent plaster from setting too quickly, care must be taken in the quan-



A Study in Sgraffito by Malcolm Rice

tity used, as too much is apt to cause hair cracks to appear in the finished work. This can be to a great extent overcome by using newspapers or blotting paper, well soaked with water, applied to the plaster. It is possible to model the surface in greater relief, as in the third story windows of the Alexander Building, New York, designed by Carrere & Hastings, architects, to accentuate certain architectural features in design. Care must be taken not to begin more work than can be finished in one day's work.

Sgraffito Decoration, Third Story, Alexander Building, New York
Carrere & Hastings, Architects

Complication in color should be avoided, although it is possible to introduce as many as three or four colors. Earth pigments give the best results, colors which are always reliable being ochres, umbers, Turkey red, Indian red and lime blue. These colors may be mixed to give any shade desired. Many colors may also be gained in the use of marble dust. If black or depth of tone is desired, charcoal, burnt straw or burnt paper is used. Brick dust has been used but with small success, as it is absorbent and the color soon fades. When blue is used in the color coat, it is likely to set more quickly and in drying a film of saltpeter develops. This may be removed with a stiff brush and a damp rag. A craftsman who is an authority on sgraffito believes the essentials of this work are clean, sharp sand properly graded in size, high grade Portland cement and the best qualities of raw materials. Particular stress should be laid on the length of time elapsing between coats.

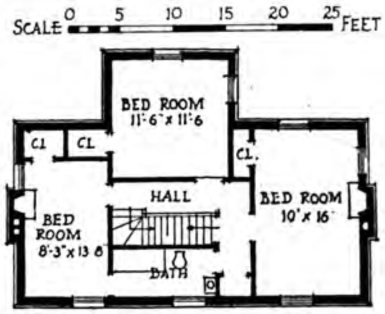
Sgraffito lends itself to broad architectural surfaces and was regarded by the late Stanford White as "the missing link in architectural design." It will adapt itself to loggias, vaulted ceilings, courts and patios. Outside of these forms, with appropriate subjects in the design, it can be made invaluable in garden and landscape work, as decoration at the end of vistas, and points of interest to be accentuated by spots of color. It is purely a decorative art and should be considered as having the same relation to exteriors that rugs, tapestries and murals sustain to interiors. Sgraffito is a direct medium of supplying the much desired and much needed color to our formal, informal and rural buildings in America.

Sgraffito Decoration on Frieze of Booth Theater, New York
Henry B. Herts, Architect

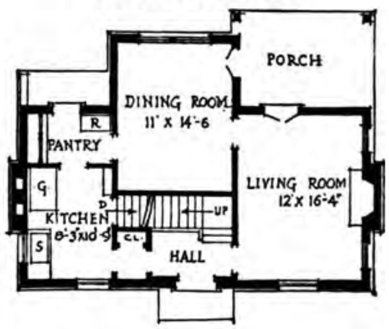
A Small Brick House, Moorehead, Minn.

OLAF WILLIAM SHELGREN, ARCHITECT

VIEW FROM STREET



SECOND FLOOR PLAN



FIRST FLOOR PLAN

MANY competitions for small house designs have been held, but illustrations of houses actually built from such designs are rarely seen. To those who have wondered what a competition house would look like in execution, we direct attention to these illustrations.

This design as presented in the sketch above was awarded first prize in the competition conducted by THE ARCHITECTURAL FORUM *in 1919 under the patronage of the American Face Brick Association. It was built in 1920 at a cost of $14,000. The design has been carefully followed in practically all essential details, but the absence of the decorative brick panel over the entrance is noticeable because it served a necessary purpose in giving emphasis to the doorway which the completed building lacks.*

VIEW FROM REAR GARDEN

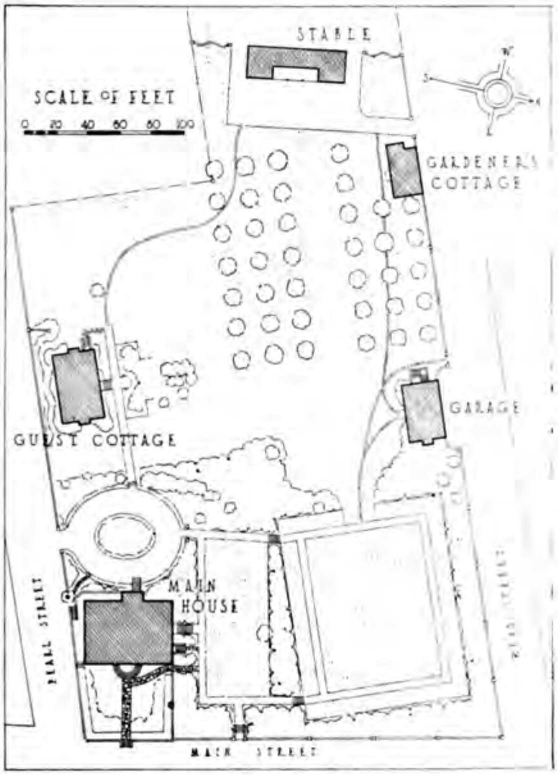
Restoration of a Southern Colonial Estate

"YORK HALL," THE RESIDENCE OF CAPTAIN GEORGE P. BLOW, YORKTOWN, VA.

GRIFFIN & WYNKOOP, ARCHITECTS

YORK HALL is one of the many old estates in Virginia in which are plainly reflected the fashions in architecture and decoration which were current in England during the eighteenth century. Its very location may have presupposed a certain degree of excellence, for Yorktown was built by order of the crown, from a plan evidently prepared in England, as a port of entry for all the British colonies in America. Captains of vessels bound for any of the ports along the American coast were obliged to clear at Yorktown before proceeding upon their way, and in what must have been an outpost of royalty the house of a prominent citizen would naturally be built with a con-

View of " York Hall " before Restoration Looking into Forecourt



Plot Plan of "York Hall"
Charles F. Gillette, Landscape Architect

siderable degree of architectural merit and finish.

This old estate, with its house built in 1740, was at the time of the revolution the home of Thomas Nelson, Jr., patriot, soldier and statesman, who was one of the signers of the Declaration of Independence and also Governor of Virginia—honors which involved the sacrifice of his entire personal fortune upon the altar of patriotism. Governor Nelson's home was used as the headquarters of Lord Cornwallis during the siege of Yorktown which was conducted by troops from all of the 13 original states and by the French under Lafayette. The scars which war left upon the Hall are not only those received during the revolution, for in the civil war Yorktown figured in McClellan's peninsular campaign against Johnson and Magruder, and later in the war the Nelson house was used as a hospital by the union army. At this period of its existence circular holes were cut in the door panels to enable the nurses to supervise the wards and traces of these may be seen in some of these illustrations. Like many other old southern homes York Hall fell into semi-ruin and decay until it was purchased and restored by Captain George P. Blow, whose home it now is. The restoration has been carried out with the utmost care to preserve the eighteenth century character of the house; parts which it was necessary to restore were studied from other parts still in place and woodwork was worked by hand to agree with that originally used.

Although it was possessed of ample grounds the original owner elected to place the Hall so that one end should be close to the side street, with a small forecourt in front of the house which formed the principal approach from the main street. The building itself is a solid, substantial pile of markedly English lines, such as were favored by prosperous citizens in Virginia, Maryland or lower Delaware, of brick with keystones at the windows and quoins at the corners cut from stone, a string course of brick surrounding the house between the lower and upper stories, and with a heavy dentiled cornice around the house and up the gable slopes. The brick used were probably brought as ballast from the kilns of England or Holland and are larger than modern brick—9 inches long, $4\frac{1}{2}$ inches wide and $2\frac{5}{8}$ inches thick, of a dull, brownish red approaching rose color, and laid in Flemish bond. The headers are of a dark, dull blue glazed brick with the red body showing through the glaze, and gray mortar is used in joints $\frac{1}{8}$ inch wide. A smaller brick of smoother texture and laid with narrower joints is used about doors and windows and for the brick pilasters at the main entrance.

In its plan the house adheres to the arrangement customary in the homes of substantial colonists of the period; a

View from Main Road Showing Old Box Hedge

Elliptical Forecourt at North Side of "York Hall"

wide hallway extends through the house, giving access to four square rooms on each floor. The hall contains the stairway, planned with two landings, which was restored from a few remaining balusters and a section of handrail, together with the mortise holes in the old treads. The importance attached to a large central hallway in the southern colonies was undoubtedly responsible for the compromise between plan and elevation. The house is not as large as the first impression of the illustration would lead one to believe; its dimensions are 56 feet across the front and 40 feet deep. This is due undoubtedly to the extremely large scale employed in the design. There is a consistency in the scale throughout and the very happy relation of parts produces a domestic effect in spite of the boldness of execution. The same vigorous handling is noted in the interior, the first floor rooms are 12 feet high and the windows, which are given vertical prominence by the use of pilasters or special paneling, are 7 feet high. The interior doors on the other hand are only 7 feet high, which tends to emphasize the largeness of scale.

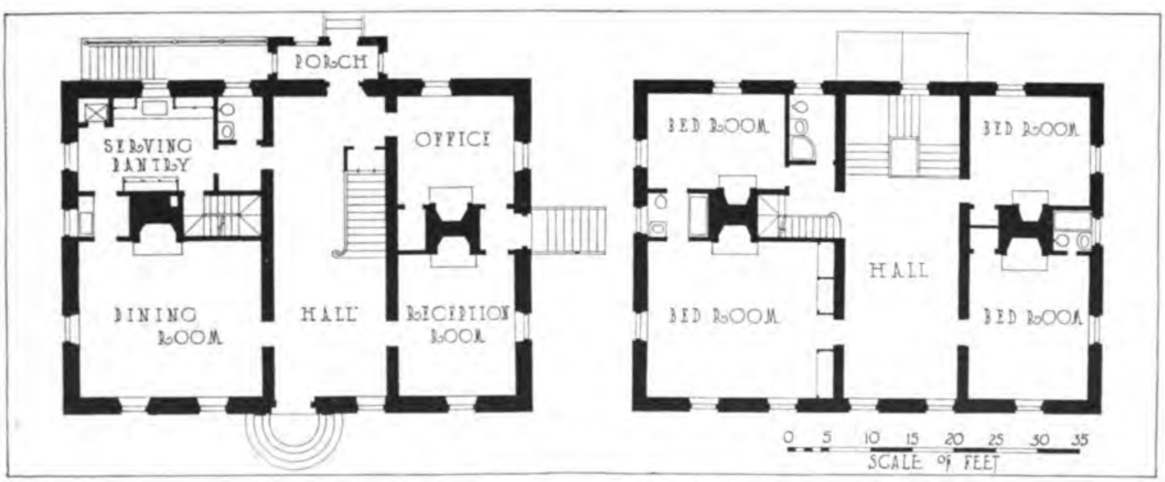
Practically all of the rooms are paneled in wood from floor to ceiling. The only exception for a principal room is the second floor hall where the paneling occurs only at the ends, the side walls being of plaster. There is a remarkable dignity about this old paneling and it can be ascribed to the pleasing proportions of the wall divisions and the extreme simplicity of the mouldings. The typical panel mould is a simple, flat quarter round made a part of the rails and stiles, and the panels themselves have their edges beveled to give them prominence. In the dining room is found the only exception; here the raised portion of the panel has a bead surrounding it and the panel mould consists of a small ovolo and bead. One detail worthy of notice is the entire absence of sharp external angles; wherever such angles occur they are finished with a bead. This is employed even on the edges of pilasters and the effect is particularly pleasing. Another individual detail is the use of a heavy moulding resembling a label mould over some of the windows and placed just below the room cornice.

The interior trim of York Hall affords an interesting study of the colonial following of the Georgian style which prevailed in America. Mouldings throughout were necessarily worked by hand and show many departures from the strictly accurate form to which we are accustomed; much of the interest of this interior woodwork lies in the slight changes at various points necessary to make

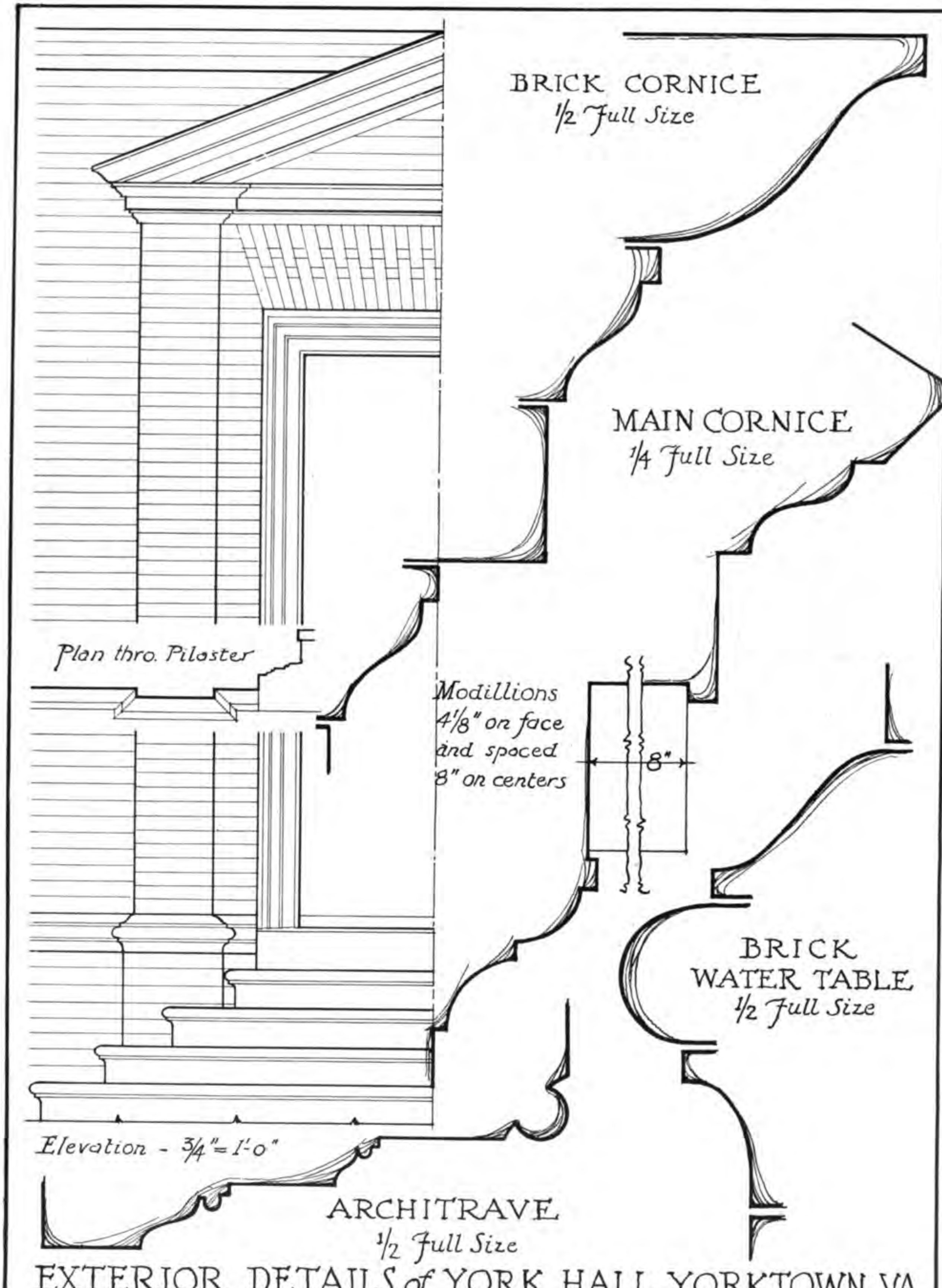
The Forecourt from the Guest Cottage
Showing the original planting now improved

Main Elevation of " York Hall " after Restoration

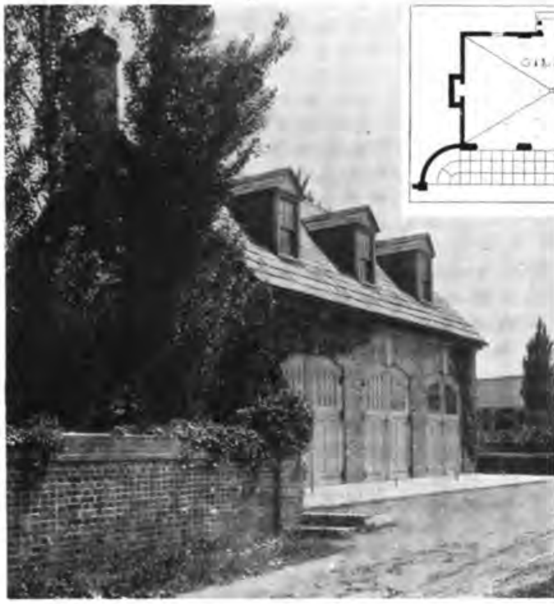
the joinery more perfect. A moulding may change in size and profile two or three times in encircling a room. Several of the paneled rooms are arranged with pilasters supporting the entablature and the curiously fashioned capitals of the pilasters in the dining room are said to have been made by slave workmen from someone's meager description of the Corinthian capitals of Christopher Wren or Inigo Jones. This old dining room is of splendid proportions and dignity; it has a width of 22 feet, a depth of 19 feet and height of 12 feet. The portrait of an old English officer above the mantel helps create an atmosphere in which one may almost feel the presence of the Red Coats, and the hangings and furni-

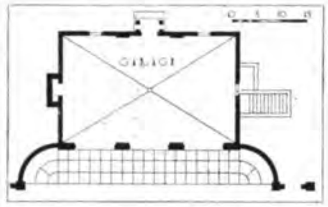


First and Second Floor Plans, " York Hall," Yorktown, Va.



EXTERIOR DETAILS of YORK HALL, YORKTOWN, VA.





Exterior and Plan of Garage

ture reflect the color and splendor of the eighteenth century. The chief thought of the original builders was given to this room as is evidenced by the greater elaboration in pilasters, cornice and mouldings.

Special reference should be made to the finish of the interior walls. Examination of the old paneling indicated a definite color scheme for each room, and curiously enough the successive coats of paint showed that the original color schemes had been adhered to in previous periods of redecorating. The wood is Virginia pine and when the paint was removed it was found to have turned to a red tone resembling that of rosewood or mahogany. All interior woodwork was removed and fumigated during the reconstruction and its present condition may be said to be as good as when originally erected.

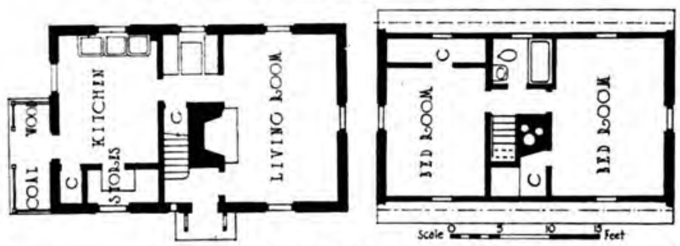
The several rooms have different color treatments; the dining room walls are in lavender and old rose, the drawing room in yellow and white, the study in black and red, and the various bedrooms are blue-gray, green and blue and brown. To give a description of these color effects is not easy; they are not obtained with pure color and the effect is

The Guest Cottage before Remodeling

View of Guest Cottage Showing Its Relation to Main House and Its Individual Garden Reconstructed from Old Growth on the Estate not so kaleidoscopic as the list just given might suggest. They are toned colors, purposely aged in appearance, and are distributed in area in accordance with structural divisions with only a slight degree of difference as may be seen from the accompanying black and white reproductions. The impression in passing from one room to another is a difference in general tone that adds interest to the interior without being strikingly apparent.

A better impression of the effect may be had from a description of the methods employed. In the study, for instance, the color scheme is black and red. The wood was first given a slightly yellowish ground with paint and over this black and Chinese red in their respective positions were wiped on and rubbed down, the red being the secondary color and applied to the bevel of panels and parts of mouldings. All surfaces were then stippled with a purple glaze and dusted. This produced a very mellow and aged effect, the wiping of color leaving the recesses of mouldings and slight imperfections in the wood darker in tone than flat or round surfaces. The appearance of the walls, however, is not in the least "painty"; the colors are put on in thin mediums and the wiping and rubbing afford an opportunity of sensing the


Approach to Guest Cottage from Main House



Floor Plans of Gardener's Cottage


Gardener's Cottage Modeled on Lines of Old Local Fishermen's Cottages

MANTEL IN SOUTHEAST BEDROOM
WALLS DECORATED IN ANTIQUED BLUE AND BROWN

CORNER OF DRAWING ROOM
WALLS DECORATED IN ANTIQUED YELLOW AND WHITE

INTERIORS IN "YORK HALL," YORKTOWN, VA.

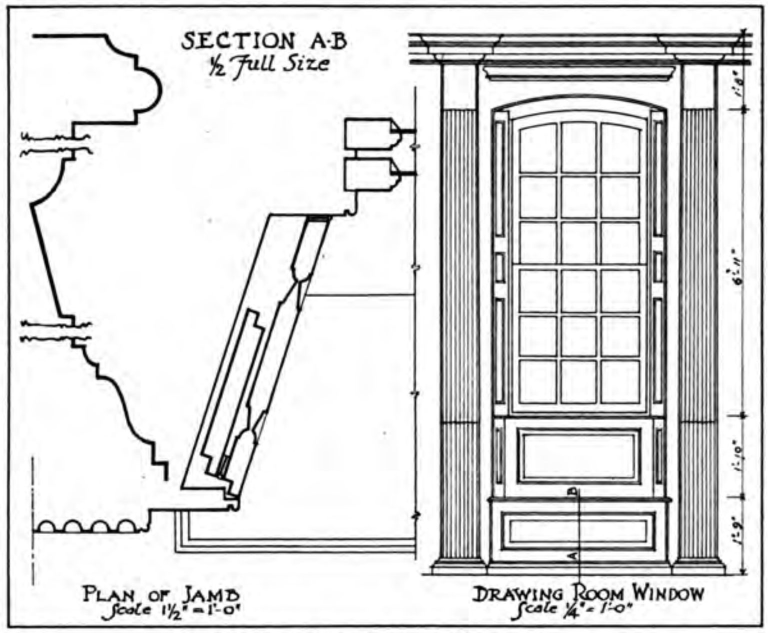
texture of the wood beneath the colored surface. The yellow ground shows through the other colors, harmonizing them with the black and gold marble mantel facing.

The grounds of York Hall include a smaller building once used as a schoolhouse and of an earlier period than the main house, recalling in its lines the early English cottage, and this has been fitted up as a guest house. Originally fronting upon the road, its entrance has been changed so that it now faces into the grounds about the Hall from which it is reached by a broad walk. The formal garden has been restored and in its arrangement and in the setting of the guest house the landscape architect has used much of the old box which was

Two Guests Rooms in "York Hall"

Living Room in Guest Cottage Decorated in Blue Green

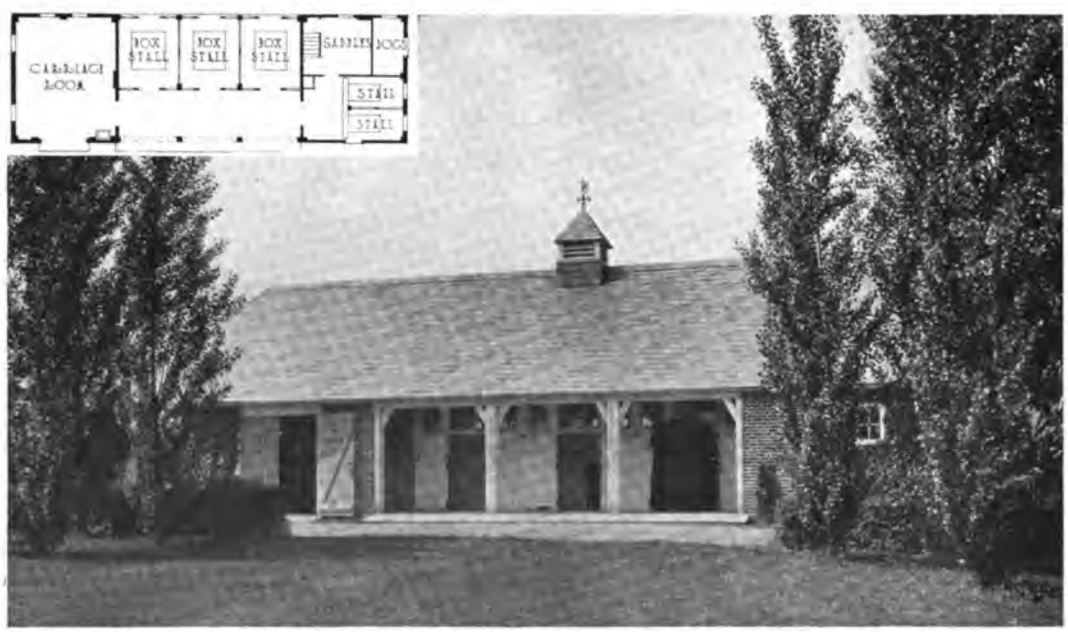

Window before Restoration



Details of Window and Trim in Drawing Room

originally upon the grounds. The space at the front of the main house, enclosed by a great box hedge, is now being developed to provide a small garden. The entrance from the street is being closed and a still pool arranged in the center of the space to reflect the old doorway, the foliage and the sky. One or two accessory or service buildings, such as garage and chauffeur's cottage which are necessary for present-day use, have been planned in the spirit of the older fishermen's cottages in the neighborhood. Owing to the presence of streets on three sides of the property these buildings have been placed so that access to them and communication with the main house is had by the streets; this avoids a driveway put through the property. An interesting economy in construction is noted in the stable where 4-in. walls of brick are used between piers carrying the framing.

Complete in its appointments and consistent in its arrangement, York Hall is an unusual example of a historic estate which is in no sense a museum but, as in the eighteenth century, an American home.



View of Stable from Entrance Court

Practical Points in Hotel Planning

By DANIEL P. RITCHEY
Specialist in Hotel Planning and Management

THIS is the third of a series of special articles written by members of the Consultation Committee of THE ARCHITECTURAL FORUM. Mr. Ritchey is the committee member on Hotel Planning and Equipment. Educated as an architect and engineer, he early became interested in the hotel field. He has acted as consultant in the designing and equipment of many hotels and as owner or manager has been in direct charge of the operation of many others in this country. He has also acted as special adviser and as an expert in legal cases involving direct knowledge of hotel operation problems. He is, therefore, particularly well fitted to discuss the subject of this article. Obviously all subjects pertaining to hotel design cannot be discussed within the limits of one article, and Mr. Ritchey will accordingly answer questions on any points not touched upon here.—THE EDITOR.

ARCHITECTS who have been called upon to solve the problem of planning modern hotels realize fully that this is one of the most complex building operations which confronts the profession today. A modern hotel presents in effect a housing problem which is complicated by the transitory nature of its tenancy, wherein the maximum of comfort, convenience and economy is demanded for the short period during which the individual tenant occupies the premises. Hotel planning, unlike any other problem of residential construction, calls for design and equipment to meet the varying demands of the traveling public. It can be built around no individual need but must meet the requirements of every one of the general class of persons who may be expected as guests. In addition to this and equally affecting design, the hotel must be a paying business machine, because it is not built as a speculative venture but as an investment, providing generous returns to stockholders.

Several general developments have taken place within recent years which directly affect the design of the average hotel; of these, prohibition is the most obvious. In years past the hotel owner depended to a great extent on the returns from the bar business to offset a large proportion of his maintenance costs. In many cases the bar returns represented the actual net profit of the business. As evidence of this condition may be noted the recent statement by Mr. Statler that the investment in the Pennsylvania Hotel would have been reduced two or three million dollars if it had been known that prohibition was to become effective. This means that there would have been a definite cutting down of space allowed to bar rooms, grills and sections of the hotel devoted to public entertainment. Naturally, the hotel owner has been forced to seek other channels of revenue to assist in meeting his overhead costs. We find, therefore, that the average hotel problem involves the question of maximum returns from room rentals, the operation of the restaurant on a paying basis, and the development of all possible additional channels of revenue, such as store rentals and returns from concessions.

The position of the main floor with respect to street grade is an important consideration from the operating standpoint, particularly today with the store problem so prominent a feature. Wherever possible the entrance should be on the street level. It is an established fact that hotel guests do not like to climb stairs, and I have noted many instances where the provision of stairs leading up to a lobby has acted detrimentally to the success of the hotel. We may note here that in many of the large hotels the main floors have been remodeled to provide unusually good store facilities, such as in the remodeling of the Hotel Astor in New York, where an unusually clever scheme has been adopted to overcome what at first might appear to be unfavorable floor levels. The additional space for these stores, which will yield a revenue of $200,000 a year, was obtained by inserting what amounts to a new floor between the old first and second floors, with a plan practically identical with the former first floor plan. The level of the former lobby was about three feet above the grade and the new floor for the stores was put in at grade level; to gain the necessary height of ten feet, about seven feet was taken out of the height of the dining rooms on each end of the building, and similarly three feet was taken out of the height of the grill room in the basement by means of a rearrangement of ventilating ducts formerly occupying this space. A new arrangement of the stairs leading to the old mezzanine floor was made so that large landings were created on the new level of the dining rooms, and additional stairs were installed to give access to these landings from two directions. Below these landings octagonal shaped store lobbies were created with a display window arranged for each of the shops. This gives each of the stores display both on the street and in the hotel lobby. To preserve the dignity of the hotel facade the show windows do not project; they are framed in heavy stone architraves and display signs are limited to recessed panels over the windows which are lighted at night.

Before entering upon the discussion of definite points in connection with hotel design and equipment, it is important that we establish two premises. The first of these is the somewhat startling fact that architects to some degree are responsible for many hotel failures; and second, that the first and most important practical point is the importance of working in co-operation with the prospective manager of the hotel during the planning period.

The outstanding features of poor planning which are noticeable in practically any hotel may involve some of these points:

1. Too much space allowed for public use, providing no direct financial return.

2. A poor arrangement of service features, particularly with respect to restaurant service, which adds greatly to cost of operation.
3. Waste of space in the design and arrangement of bedrooms and halls.
4. Too great an investment in mechanical equipment.
5. The use of poor mechanical equipment and interior finish, which results in rapid deterioration and high replacement cost.

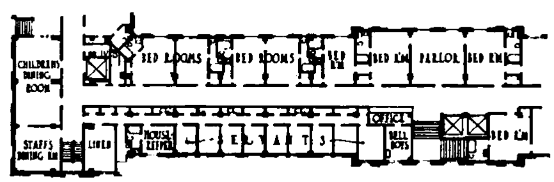
These and other features which will be discussed later represent the defects in planning which are primarily the fault of the architect. The important question, therefore, is *Why have there been so many errors made in hotel planning?* To my mind the answer is to be found in the failure of the architect to work in close touch with a practical hotel manager. I believe that the public generally expects too much from the architect; he is expected to know all the details of hotel operation and the operation of other types of buildings, and to thoroughly digest the client's business requirements which must be met in designing a building. To be familiar with all the details of the modern complex building operation would require a superman or an unusually large organization which the average architect cannot be expected to maintain, as the demand is not steady or in any way to be measured. Consequently, in my opinion, the function of the architect today is to thoroughly understand his business which is that of building design and construction and to bring into contact with his problem on its special phases those whose specialized knowledge must make for the success of the project in hand. The man upon whom the making or breaking of a hotel venture depends almost entirely is the manager. Therefore, to design a hotel without meeting the practical requirements of the manager constitutes a serious error and one which may doom the project to failure even before the books are open for registration.

Selecting the Hotel Site

In selecting the site it is important that it be as near the railroad station as possible. This has always proved to be a more successful location than a distant site, because it represents a saving on baggage transportation and taxi fare and also provides easy accessibility to departing trains when the guest is leaving. The hotel should also be located close to or in the retail and general business section of the city in order to provide convenience for guests and a practical location for traveling salesmen and business men. In any event, the hotel should be located at a point were retail stores can be incorporated in the design. It is better to pay a higher price for the land if necessary in order that this can be done. A new maxim in the hotel business is that store rentals must carry the total cost of the main floor.

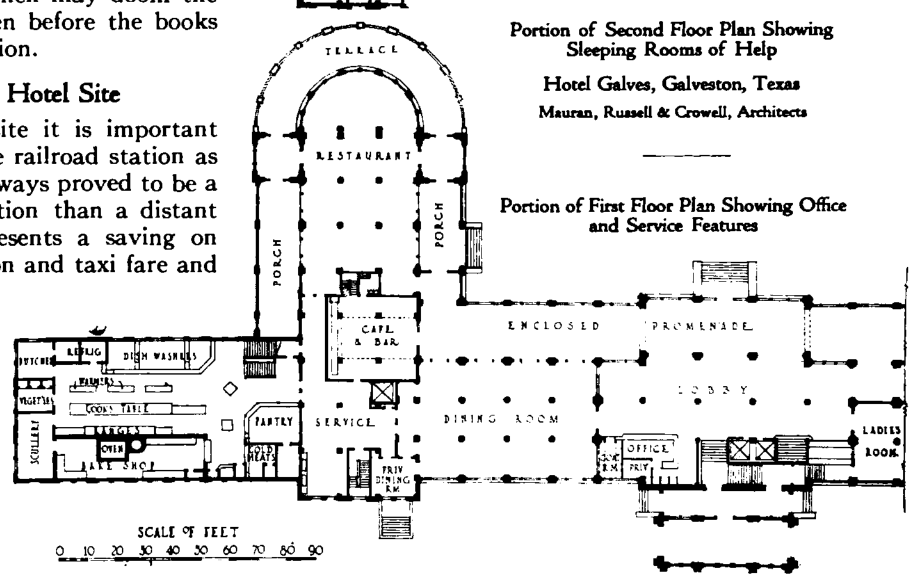
Too much stress cannot be placed upon the importance of the preliminary detailed analysis as to the purpose of the hotel and its relation to the needs, not only of the traveling public, but of the community which it serves. Since the coming of prohibition, hotel owners are not particularly anxious to have banquet work or to provide general convention or meeting space. There is not a sufficient return from this activity to invite the necessary additional investment. It is not considered wise, as a general rule, to attempt to include in a hotel space for community activities of any nature, although some elastic scheme for co-operation with an adjoining building which may be designed in connection with the hotel is desirable.

In this connection we may note the Hotel Du Pont at Wilmington. This is an unusually interesting structure in that an entire block is built up, one-half as a hotel and one-half as an office building. In designing these two structures, however, the same floor levels were established and hall lines were connected, so that either building could expand into the other, depending upon the demand. As it happens, this hotel has been quite successful, and by cutting through the party walls a considerable amount of the office space of the adjoining building has been taken for use as hotel rooms.



Portion of Second Floor Plan Showing Sleeping Rooms of Help

Hotel Galves, Galveston, Texas
Mauran, Russell & Crowell, Architects

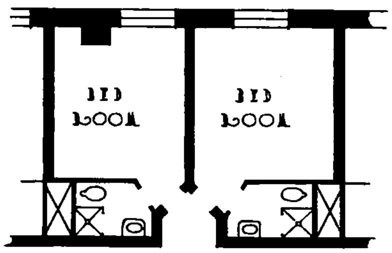


Portion of First Floor Plan Showing Office and Service Features

Laying Out the Main Floor

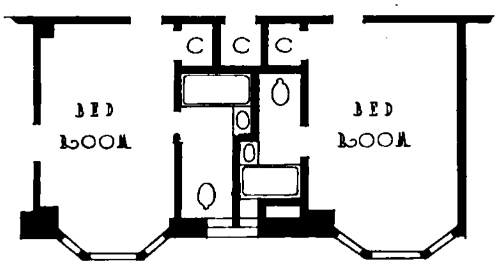
In view of facts already outlined in preceding paragraphs, it becomes evident that one of the important problems in hotel design is the layout of the main floor. The more important objectives in designing this layout are:

1. Convenient entrance for guests and easy access to registration desk.
2. Concentration of registry and room service departments.
3. Minimizing of public space.
4. Provision of maximum store and concession (income) space.
5. Practical arrangement of mezzanine and restaurant features.



Two-room Unit with Interior Bathrooms and Minimum Entry

In the average hotel there should be one main entrance which is directly in view of the registry desk. It is important also to introduce a side or private entrance at some point for women and residents of the hotel who do not wish to pass in and out through the main entrance and lobby. The elevators should be concentrated at one or two points directly in view of the room service department, so that incoming and departing guests will be easily under observation. The service entrance should be placed as far as possible from the main entrance and should be out of sight, on a side street or an alley if at all possible. This question of the service entrance is one which as a rule is not thoroughly analyzed. We may note, for example, one large hotel in New York where for some reason the service entrance was placed on the chief thoroughfare and the main entrance on the side street, probably through a misconception which did not take into consideration many features involved in the use of the service entrance, such as the delivery of unwieldy packages and the handling of deliveries of all kinds. In addition to the main lobby and the guests' service department, the balance of the main floor should consist of space given over to stores and concessions. Income may be derived from a space in the main floor of the hotel, first by the provision of stores, preferably having show windows on the street and in the lobby and from space for concessions such as cigar and news stands and space for the sale of flowers, theater tickets and similar wares. The use of any section of the main floor for a restaurant will as a rule prove a poor investment.



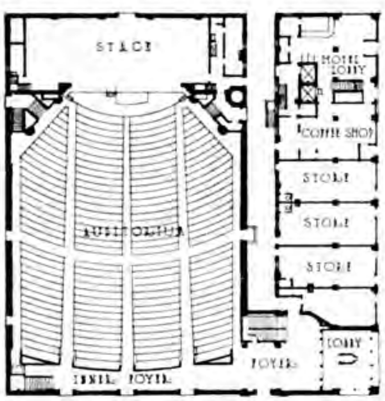
Two-room Unit with Exterior Bathrooms Reduced in Area by Interlocking Partition

The mezzanine idea has now been developed and perfected to a point where such features as lounge, writing room, grills and even kitchens can be placed on mezzanine floors. The plan can be so arranged that the front section of the mezzanine can be used for a lounge or restaurant, giving street exposure without the overhead cost of using street level frontage which should be used for stores. The arrangement of lounge, writing rooms and similar features on the mezzanine has a tendency to discourage the use of these rooms by the general public. The mezzanine thus becomes the center of general activity and avoids the confusion usual on the main lobby floor, a feature which is noticeable in many of the larger hotels and interferes considerably with incoming and outgoing guests. The placing of the kitchen and restaurant on the mezzanine floor has the advantage of providing rapid access from one to the other and avoids the necessity of elevators and stairs which must be used by waiters. This feature is particularly important today when women are being employed more extensively than ever before in restaurant and kitchen service. It is also found that by the concentration of kitchen and restaurant features, much better and quicker service can be provided for patrons and a reduction in the equipment of the kitchen results from arrangement of such quick service features.

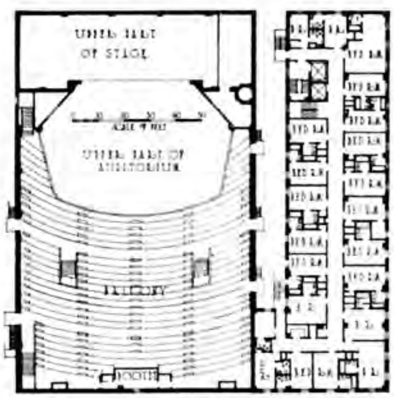
Importance of Good Interior Construction

At this point it may be well to give brief consideration to the question of the interior construction, decoration and furnishing. An architect who is somewhat of a philosopher recently said to me, "Doesn't it seem strange to you that today we build our exteriors to last a hundred years or more, when the interiors are constructed for a life of but 15 or 20 years?" This remark is particularly apropos of the average hotel. One of the greatest annoyances of the hotel manager is replacement cost, and in many instances this replacement cost comes within a short period after the hotel is constructed and is due to the use of inferior qualities of trim, decoration and everything else along the line, including mechanical equipment. The best available interior trim should be used and the best possible plastering should be secured. Poor plaster has been the bane of hotel men. Not only has it resulted in high replacement cost but in many cases the use of cheap plaster has destroyed one layer after another of wall paper through discoloration. The use of wall paper as opposed to painted surfaces, for the guest rooms, has for many years been a bone of contention among hotel men. Both methods have distinct advantages, the painted surface being sanitary and subject to practical treatment. On the other hand, a well chosen design in wall paper has a certain value

General Exterior View



First Floor Plan



Second Floor Plan

Victory Theater and Sonntag Hotel, Evansville, Ind.
J. E. O. Pridmore, Architect

in furnishing hotel rooms, the best of which are bare enough. On the matter of renewal, it has been my experience that both surface treatments require renewal at equal intervals.

The general question of furnishing and decorating is one which is more and more coming under the control of the architect. I find that in many instances special lobby furniture is designed by architects and furnishing and decoration contracts for hotels are often being handled upon a contract basis from general designs developed by the architects. I believe this is a very satisfactory arrangement as it is possible for the architect to provide a harmonious, finished result for the interiors of the main rooms of a hotel by maintaining direct control of furnishing and decoration. Naturally, there is a tendency toward simplicity, and the average hotel today represents a much higher order of taste in furnishing than ever before. While it is not true that room sizes are determined entirely by furnishing, it is true that one of the first activities in designing a hotel is to work out the practical furnishing of the average room, not only as to the pieces which will be installed and the size of these pieces, but as to their actual locations in the rooms, because this will to a certain extent determine the placing of the lighting fixtures and the arrangement of fenestration.

The Arrangement of Service Features

There is practically no limit to the detailed discussion which might be developed upon this subject. For the purpose of this article, however, it is possible only to point out a few definite features. We have already made mention of the importance of having the kitchen on the same floor level as the rooms in which restaurant service is intended. During the past few years great progress has been made in the matter of kitchen equipment; the problem of help has rendered it necessary to utilize every possible labor-saving device, and the cost of building has made it imperative to limit the space used for kitchen and service purposes. In regard to kitchen equipment, architects will naturally seek the advice of experts. There are several large organizations which specialize in this type of work and have developed kitchen layouts on a scientific basis.

It is remarkable how many miles of walking may be saved in a comparatively small but well planned kitchen today. In connection with this article there are presented two illustrations taken from the plans of the Hotel Galves at Galveston, Texas. The arrangement of the kitchen in this hotel is designed to save as much space and labor as possible where extensive service is required. A study of this plan will show various features well recommended. It will be noted that the heat of the oven and stack is centralized; that the scullery is placed in a position of convenience to give efficient service, and that the department of cold foods and hot beverages such as coffee, tea, etc., is convenient to the entrance so that the waiters may pick up anything required in this line without interfering with the order service division. It is difficult to show the entire main floor plan of this hotel at adequate scale because of its size, but the accompanying portion shows the method of providing entrances and in centralizing the guests' service features, including registration, cashier, manager's office, bellboys and a checking room which serves both as a general check room and for the dining room. It will be noted that guests approaching the elevators or entrances are within sight of the desk. The service section of this building is concentrated in one corner, with the kitchen service room and the main dining room close together. On the next floor and directly above this section will be found the children's dining room, officers' dining room and sleeping quarters for employes. A row of bedrooms for servants will be noted as entirely hidden by a wall along the corridors against which the lockers have been installed. The passageway to these bedrooms leads past the housekeeper's office so that a check can be easily kept. The location of the servants' quarters at this point was made to form a screen to the service entrance directly below, and no guest room overlooks this entrance at a point low enough for it to be annoying.

Naturally, the service features should occupy the least valuable space in the hotel and should be screened as far as possible. All disagreeable features of service should be grouped at one remote point. One important hotel in New York has its coal chute directly in front of the main entrance so that incoming coal and outgoing ashes are almost always in sight of arriving guests and also interfere with traffic at that point. Many other instances might be given of bad results caused by lack of study.

The Practical Layout of a Room Floor

The average practical size of a hotel room is 10 x 14 and the width of corridors 7 feet, although 6 feet is acceptable. The problem is to obtain the maximum of light and ventilation and to utilize every square foot. This immediately involves the question of the location of baths, as it is assumed that each room will have a bath. On the location of baths hotel men differ considerably. My own experience leads me to view the outside bath favorably. In the typical layout with inside baths it is necessary to give up a certain amount of space to a small entrance hall in each room. This space has no practical value as it is never used except to pass in or out of the room. It represents a considerable portion of the total floor space, however, and bears its quota of overhead cost in cleaning and maintenance, and as a rule it must be lighted. The inside bath requires constant lighting while in use, and as a matter of fact lights are usually left turned on and burn most of the day, so that there is not only a consumption of electric current but the heat generated in this way which is not negligible. Guests invariably prefer the outside bathroom in which daylight is available and ventilation seems better. Two room plans are shown herewith which indicate economical layouts, one with outside bath and the other with inside bath. The outside scheme is worked out by an interlocking design which minimizes the space occupied and permits a square room and better placing of furniture. This arrangement allows ample closet space in each room, which is highly important. Many hotels have been built with little or no closet space and this has always proven an objectionable feature and one on which many complaints are made by guests.

Mechanical Equipment

The mechanical equipment of a hotel building is of the utmost importance and in most cases entails employment of engineering service to make certain that layouts are correct and that the equipment selected is dependable. As said already elevators should be placed within the sight of the desk. The location of elevator and stair shafts should be carefully studied in order that the noise of this service shall interfere with the quiet of as few rooms as possible. In one exclusive hotel in New York there were seven elevators installed, located in seven different points throughout the building. Each of these elevators passes a room on each side at each floor and each trip of each elevator disturbs to a greater or less extent the occupants of these rooms. To make this condition worse, the elevator installation is of the type in which cables pass over to shafts on the other side of the building and the noise of the cables in these shafts disturbs another quota of rooms. This installation has been very detrimental to the business of the hotel, as guests insist on avoiding occupancy of these rooms wherever possible or complain strenuously because of the noise. To a lesser extent this condition is to be found in many hotels, and it is a feature which is worthy of careful study on the part of the architect.

The plumbing installation is the most particular part of hotel design. Attempts to conserve expenditure by the use of inferior plumbing have resulted in high replacement costs in many hotels. Pipes buried in walls form a constant menace, rusting out within 15 or 20 years. It is a common experience and a great problem for many hotel men. All plumbing should be accessible in shafts and in some locations it is not particularly objectionable to have exposed plumbing on the ceiling as the parts can be nickeled and are made easily accessible. It is therefore apparent that the first investment in the best available plumbing installation is wise and will be repaid many times as the building grows older.

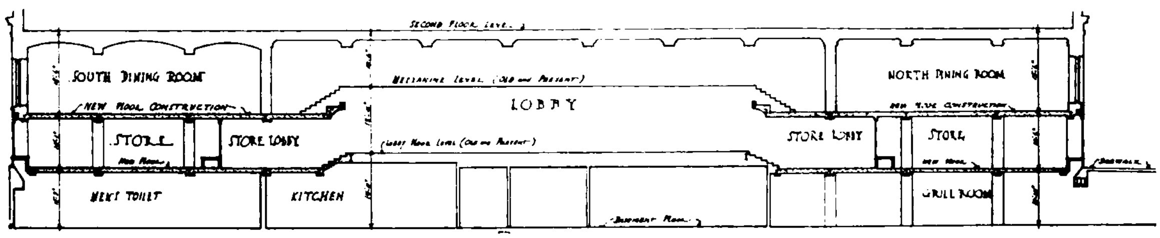
Unfortunately, in many instances engineers called in to give special advice on mechanical installation are inclined to overdo and to provide too many precautions. For instance, I believe that a reserve installation for heating or hot water which is provided against breakdown service is unnecessary, although it is often specified. In the average city the replacement of parts is simple because of the development of standardization. The excess machinery provided in a reserve installation not only adds to the original cost but adds materially to the cost of upkeep. It is also noted that at times the operating engineer who has any tendency toward neglect will depend upon the reserve system and he will allow trifles to develop into large repairs because there is no danger of delay or interruption of service. There is also a tendecy to utilize both systems in alternating times so that there is practically a double cost of maintenance. These facts apply to the power and lighting plants, and the hot water heating system and refrigeration systems.

The question of the isolated plant as opposed to central power station service is one which must be determined in accordance with local conditions and usually is decided by the cost of power.

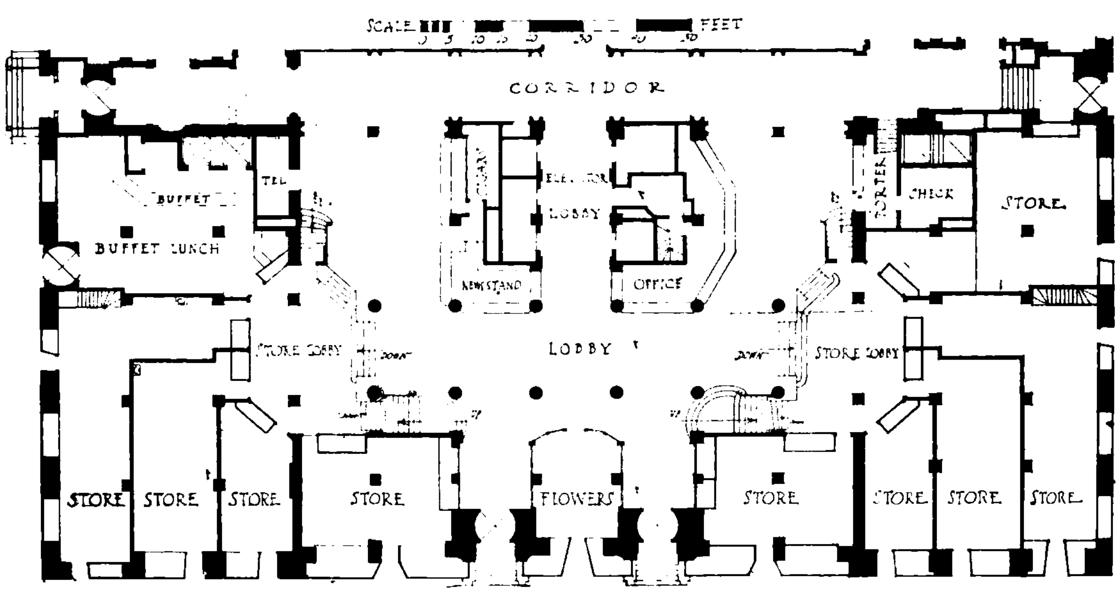
In writing this article, I have been constantly confronted by the temptation to go into detail much farther than either time or editorial space would allow. Naturally, there are many questions in which many architects are interested which have not been touched upon, but an attempt has been made to indicate some of the evident practical points which from time to time I have found were overlooked in hotels which I have analyzed.

The results of several such analyses, even before the advent of prohibition, indicate faulty planning as an important element in hotel failures, and a serious handicap in others. While architects may not with full justice be charged with all planning defects, because oftentimes the owners are lax in presenting the requirements of management and operation, the result, nevertheless, is linked up with the architect's reputation, and he should exercise a professional interest to ensure that he is furnished with all necessary data that will affect the plan.

In general and as a concluding thought it may be said that aside from æsthetic features, hotel design today is essentially a matter of common sense study of the requirements of the business. Not long ago a great railroad engineer said that engineering is 90 per cent common sense and that a man who possessed common sense is 90 per cent an engineer. This statement applies equally well to the question of hotel design. Architects who undertake hotel projects must realize the complexity and the responsibility involved, and they must be ready to undertake a comprehensive survey of the many available materials, devices and items of equipment which are offered in this field today.



Longitudinal Section Showing New Arrangement of Floor Levels



First Floor Plan and Section Showing Addition of Stores, Hotel Astor, New York

Peabody, Wilson & Brown, Architects for Alterations

Systems for Building Heating and Domestic Hot Water Supply

By JAMES A. McHOLLAN, *Vice-president,*
The R. P. Bolton Company, Consulting Engineers

INFORMATION is presented in this article upon matters of interest to architects in the selection and installation of systems for heating and for domestic hot water supply in modern structures. Investment and operating costs are also considered with special attention to the progress which is being made in the use of gas for providing power for these services.

Installation Costs of Heating Systems

It is always of interest to review current costs of installing heating equipment and this schedule, obtained from actual contracts recently awarded, may be of interest in preliminary estimates of the cost of proposed work:

Type of building	Total radiation installed	Number of radiators	Cost of complete system, boilers, piping, valves, covering, etc., per sq. ft. of radiation installed	Type of system
Apartment	9,100	342	$2.48	Vacuum
Residence	2,500	45	2.48	Hot water
Apartment	7,000	250	2.10	One-pipe steam
Institution	4,879	173	2.04	One-pipe steam

SELECTION OF STEAM HEATING SYSTEMS—The two-pipe vacuum or vapor heating system costs about 10% more than a two-pipe and about 20% more than a one-pipe gravity steam system. The improved operation obtained with the vacuum apparatus justifies the extra investment and an architect need not hesitate in adopting this type, notwithstanding the higher first cost. It is more economical in operation; circulation of steam is obtained in less time with lower steam pressure, and the heating results are invariably more positive and satisfactory. If the funds available for the construction of a building preclude the extra investment for the vacuum system, the one-pipe gravity return is the type to install. The two-pipe gravity system should not be considered. It is almost as expensive as the two-pipe vacuum or vapor systems and is no better in operation than the cheaper one-pipe arrangement. The piping layout for a vacuum plant may not differ from that for steam, but devices for eliminating the air in the system are the addition that allows the proper passage of vapor at lowest pressures.

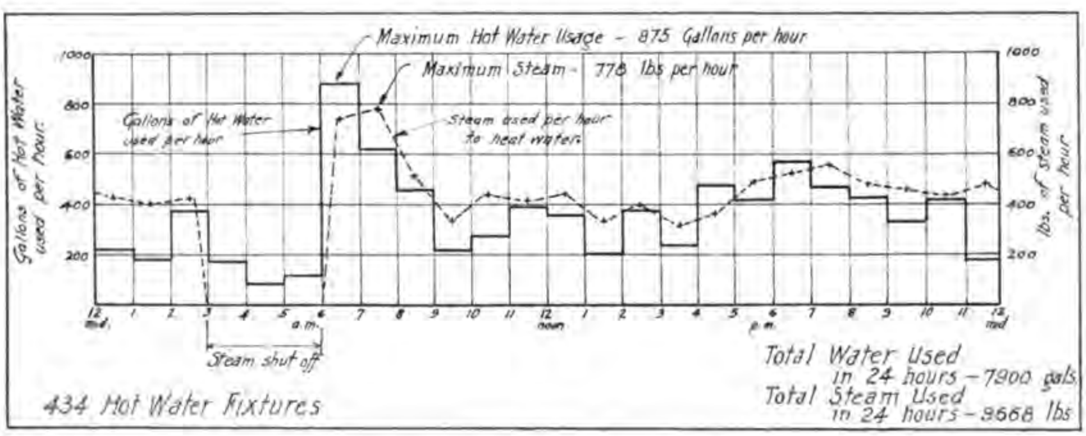


Diagram I

Graph Showing Twenty-four Hours' Operation of Hot Water Supply System for Domestic Service in a Twenty-five-story Office Building

Hot Water Systems—These systems usually cost about 20% more than a vacuum or vapor system, but it is now becoming known that the fuel used in operation is much less than for steam heated radiators. Experiments conducted in a number of buildings equipped with hot water radiators show a saving of about 25% in fuel as compared with buildings of equal size having steam heated radiators. Figures showing the amount of gas used in several steam and hot water installations will be presented later which show a decided saving in fuel in favor of the hot water systems. With regard to the advantages claimed for hot water heated radiators, of flexibility of temperature control, even temperature in moderate weather and the more agreeable heating effect obtained with temperatures of less than 200° in the radiators, the writer's opinion is that a well designed vapor system will provide equally satisfactory service. The greater fuel economy obtained, however, is a matter of great interest. The larger manufacturers of heating boilers are conducting tests in this direction and the engineering departments of several gas-supply companies, whose interest lies in increasing the use of gas for heating and demonstrating lower costs for heating by gas as compared with coal, have already confirmed this saving of 25% in fuel by the use of gas.

Chimneys—The size of chimney in a new building is a question which arises when preliminary sketches are made. If shown too large or too small, an error in size is apt to invite criticism. Here is a rule which is not difficult to apply and it may aid architects in arriving at approximate chimney sizes. The exact diameter should of course be checked by a heating engineer before final plans are prepared:

(a) Multiply volume of building in cu. ft. by .005
(b) Multiply area of exposed wall in sq. ft. by .07
(c) Multiply area of glass in sq. ft. by .3

(a) + (b) + (c) = "x"

	Chimney Height					
"x"	50 ft. Diam. in. or square	60 ft. Diam. in. or square	75 ft. Diam. in. or square	100 ft. Diam. in. or square	125 ft. Diam. in. or square	150 ft. Diam. in. or square
6,000	25"	23"	22"	21"		
8,000	27"	26"	25"	24"		
10,000	29"	28"	27"	26"		
15,000	36"	35"	33"	31"		
20,000		42"	39"	36"		
25,000			42"	39"	39"	
30,000			45"	42"	42"	39"
40,000				48"	48"	42"
50,000				54"	54"	48"
60,000				60"	54"	54"
70,000				66"	60"	60"

Coal Storage Spaces in Large Buildings—A question of importance is the size of bunkers which should be allowed for the storage of coal. The writer appreciates the difficulties of an architect in apportioning basement and sub-basement spaces in the plans of a new structure, but coal is an essential commodity in operation and day-to-day delivery in retail quantities not only increases the cost of the coal but uncertainty as to its arrival causes undue anxiety in severe weather. Fifteen days' storage for winter rate of consumption is the minimum which should be allowed. Thirty days' is better, and if any unused spaces are available in the basement, a connecting doorway or passageway should be constructed so that such space may be used as a reserve bunker if desired. This tabulation shows the maximum coal consumption in cold weather for large buildings, with the storage space recommended.

Type of building	Maximum amount of coal used per day in coldest weather per 1,000,000 cu. ft. of volume	Coal storage space for 15 days' reserve supply per 1,000,000 cu. ft. of volume
Office	4 tons	4,500 cu. ft.
Manufacturing	5 tons	5,200 cu. ft.
Apartment	6 tons	6,700 cu. ft.
Hotel	7 tons	7,800 cu. ft.

Building Heating by Gas-fired Boilers—It is of great interest to consider the progress which has been made in the use of gas for operating heating boilers. For residences, office buildings, factories and public buildings of moderate size, the use of gas under properly designed boilers may effect substantial economy over coal when the expenses of attendant labor and ash-removal with the coal-fired boiler are considered.

One of the best known and largest manufacturers of heating apparatus has just placed on the market a gas-fired boiler which is designed to operate at an efficiency under working conditions of practically 90%. This unit is automatically operated, the burning of gas being regulated by the steam pressure or the water temperature, depending on the type of system in use. A secondary, or master, control of gas supply is provided by means of a thermostat placed at a selected point in the building, by which the gas supply can be turned on at a predetermined hour in the morning and turned off in the afternoon or evening. When steam is not being taken from the boiler, a pilot light is burned which consumes not more than 4 cu. ft. of gas per hour. With gas at $1.25 per 1,000 cu. ft. the operating expense of the pilot light is ½ cent per hour when the boiler is not in active operation.

It will be understood of course that in referring to heating by gas no reference is intended to individual radiators heated by gas since these are seldom used in any permanent building. The chief use of gas is in the operation of heating systems by means of boilers, properly designed to use gas as a fuel and employing the same type of radiators, piping control and valves now in common use with steam and hot water heating apparatus.

Cost of Heating by Gas — These figures show the quantities of gas used per heating season for various buildings. The cost of operation by gas may easily be computed for any installation from the price charged by the gas supply companies according to locality:

Type of building*	Sq. ft. of radiation installed	Type of system	Total gas used cu. ft.	Cu. ft. of gas per sq. ft. of radiation
Residence	985	Steam	840,205	853
Loft building	1,268	Steam	868,900	685
Loft building	1,264	Steam	766,000	606
Residence	777	Hot water	312,000	403
Residence	840	Hot water	342,720	408

* Buildings located in New York

Hot Water Supply for Domestic Service—The apparatus used for heating water for domestic service in buildings consists of heating and storage tanks, boilers and the necessary supply, return and circulating systems of piping. Before presenting figures showing how to estimate for the use of hot water in new buildings, the writer wishes to draw attention to the defects in operation which result from corrosion and incrustation of hot water piping. The physical life of this part of hot water installations is seldom more than seven years, and in many buildings it has been necessary to commence the replacement of piping within this period. As most of these pipes are concealed, the replacement is always an expensive and difficult undertaking. Such a weak point in building construction deserves serious attention.

The corroding processes are caused by free dissolved oxygen in the system which enters with the make up water as it is drawn from the street water mains or other outside sources of supply. If this oxygen is eliminated the corroding processes are arrested and the same length of physical life may then be expected as in other materials used in construction of a building. Devices are now manufactured which effectively remove the oxygen by de-activating or de-aerating the water and these should be included in specifications and plans of new hot water supply systems. Everyone who has been concerned in the operation of buildings will realize the importance of thus arresting corrosion and in this way guarding against failure of the hot water piping within a few years of installation.

Usages of Hot Water—In deciding the sizes of heating and storage tanks, the factor which must be taken into account is the maximum hourly usage of hot water. These figures may be used in estimating the maximum rate of hot water usage in several classes of buildings:

Type of building	Maximum hot water used per hour per hot water fixture
Apartment	3.0 gallons
Hotel	6.0 "
Office	2.0 "
Manufacturing	4.0 "

With the total number of hot water fixtures known, the maximum amount of water which has to be heated in one hour can be determined. The foregoing rates of hot water usage should be used with judgment and unless one is experienced in this work it is well to tabulate the different kinds of hot water fixtures in the building being figured, the number of rooms and occupants, the location of the building, the character of occupancy and the class of service, and have the estimate checked by one or other of the manufacturers of hot water storage tanks.

Efficiency of Hot Water Supply Systems—Diagram I shows a test of a hot water supply system in a large office building. During the test period of 24 hours, there were delivered to the system 65,100 lbs. in the form of "make up" or cold water. This amount was supplied under automatic regulation and represents the consumption of hot water in the building. The steam condensed in the heating coils of the storage tanks for the same period amounted to 9,668 lbs., which included the heat expended in circulation and insulation losses.

The steam required to heat the make up water was approximately 6,320 lbs., leaving a balance of 3,348 lbs. chargeable to the standing losses of the apparatus. Substituting these figures in percentage ratios, the efficiency of the equipment appears to be about 65%. This may be accepted as representative of the typical conditions existing in such buildings, as the installation under consideration is of a workmanlike character and was operated during the observations under excellent fireroom conditions. In view of the lowered efficiency due to circulation and insulation losses, it is important that the highest grades of pipe covering and tank insulation be provided in such systems.

Gas for Hot Water Supply—A test of the cost of gas heating in a 14-story office and printing building showed that 1½ cu. ft. of gas were used per gallon of water heated. This building is equipped with 284 fixtures and the usage of hot water per day is 12,000 gallons.

Operating efficiencies as high as 80% have been obtained in hot water supply systems equipped with gas-fired units in buildings even of large size. Gas is rapidly replacing the use of coal-fired boilers for this service even in the largest buildings. A practical combination where coal-fired boilers are used for building heating is to have these boilers also supply steam for hot water supply during the heating season and in summer to operate the hot water service by means of a gas-fired boiler. This is always productive of economy as the heating boilers can be shut down in summer; no labor is employed and no ashes accumulate for removal.

Note. In the January issue of The Forum Mr. McHollan will continue the discussion of hot water and its usage and also the determining factors in selecting an efficient system.
— *The Editor.*

Steel Design for Buildings

PART V. THE GENERAL ARRANGEMENT AND DESIGN OF A BUILDING

By CHARLES L. SHEDD, C.E.

IN designing the steel frame for a building, the engineer is first called upon to consult with the architect as to the arrangement of the columns. It is best that these should be spaced as regularly as possible and rather less than 20 feet, center to center. The architectural design of the lower floors often limits this arrangement and it is best to have as many columns as possible continuous from the foundation to the roof. When columns are cut off at one of the lower levels the load must be transferred by girders to other columns which can extend through the lower stories, and this sort of construction is expensive, besides making the building as a whole less rigid and more subject to vibration from the wind or other causes.

It is not necessary that the columns line up with each other in both directions, but if they can be so

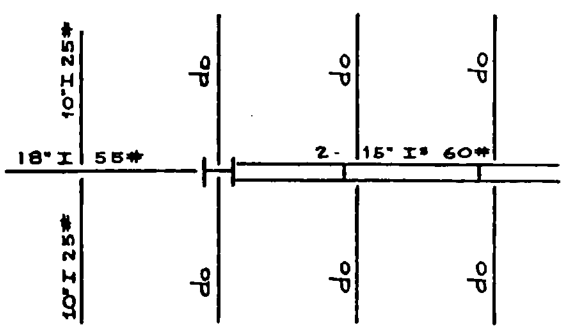


Fig. 1

arranged without inconvenience much better results may be obtained. It is however highly desirable that they line up in at least one direction. When they line up only in one direction the girder beams should extend between the columns along these lines and the floor beams or other floor construction, such as a combination floor, extend crosswise in the opposite direction. It is not necessary that there be a cross beam on each column center in the opposite direction although this adds to the rigidity of the building. Usually floor beams spaced 5′ or 6′ on centers will be near enough to any column to brace it sidewise, any lateral stress being carried to the floor beam by the resistance to bending sidewise exerted by the girder beams. When a combination or other long span construction requiring no floor beams is used, small ties or bracing beams should be placed in the opposite direction to the girder beams on the column centers. A 6″ beam is about the smallest desirable size for this purpose. Very little if any stiffness is added to the column by the angles which tie the building together for erection purposes because they in themselves offer slight resistance to bending. The connections to the column also are less likely to be stiff enough to resist the bending which they may be called upon to withstand.

When the columns are spaced opposite each other in each direction and floor beams are used it is best to make a design for a typical bay with the girder beams in one direction and another for those in the opposite direction, and compare the weights of the steel required to obtain the most economical design. This weight can be best obtained as so many pounds per square foot. Divide the weight of the floor beams per lineal foot by their spacing on centers and treat the girder beams in the same way, adding these two amounts together to get the total weight per square foot. This of course does not consider connections or tie rods but these may be disregarded in the comparison without changing the result obtained.

Having determined on the arrangement of the beams it next becomes important to determine which way the columns shall be turned. Plate and angle or H column sections are used to illustrate this in Fig. 1, but the analysis would be the same if plate and channel columns were used. The column is weakest about the axis parallel to the web and if this were the only consideration we would place the columns with their webs parallel to the floor beams in the opposite direction from that shown in the illustration, as the girder beams are deeper than the floor beams as a rule and would brace the column better. This difference in depth is, however, small in relation to the story height and other and more important considerations actually determine which way the columns should be turned. These considerations are the design of the detail where the beams connect to the columns and facility in erecting the structure. Where double beams, as for example the two 15″ Is 60# shown in Fig. 1, frame into the column forming the girder beam it is usually much easier to connect them to the column properly if they frame into the flange side of the column than otherwise. The girder beams, too, are heavier than the floor beams and in swinging them into place it is much easier to have them frame into the flange sides of the columns leaving the lighter floor beams to be framed into the web. It sometimes happens, when the columns are small such as 8″ webs, that the flange of a large girder beam, especially the Bethlehem shapes, could not be framed into the web of the column without notching the flanges; such a method means of course added expense and in addition allows less space to work in during erection.

With the exterior column another problem is encountered. Besides turning the column one way or the other, we have to locate the spandrel beams both horizontally and vertically. The column is placed back from the face of the wall some little distance to allow sufficient covering for fire- and weather-proofing and the beams must be located as far out as practical to carry the wall itself properly. Both the beams and the columns, then, must be located horizontally independent of each other and their resultant positions bear little or no definite relation the one to the other. Vertically, the spandrel beams are dependent for their location on the limitations of the proper design of the connections to the columns. On the side of the building parallel to the floor beams the spandrel could be dropped to come just above the windows if it were not for the connections to the column. If the beams were dropped to this position a channel would have to be placed just inside the wall at the floor level to carry the floor load. These channels would then come quite near to the spandrels in elevation and would interfere with each other in making the connections as well as reducing the rigidity and strength. The top of the spandrels would come at about the same level as the bottoms of the channels carrying the floors. On the side of the building parallel to the girder beams the floor beams would come in above the spandrels making awkward beam to beam connections. In any case, more material would be used especially where the floor beams were parallel to the spandrels. It is always a safe rule to assume that when a load is to be carried it is economical to carry it by as few beams as possible. It is therefore desirable that the spandrels be placed as nearly flush on bottom with the floor beams as practicable after considering in conjunction with the steel the detail of any stone cornices or other structural feature. With the increased use of artificial stone it is much easier than formerly with natural stone to so shape the pieces as to adapt them to the requirements of the steel. Angles can be placed on the outside of the spandrels to fit in the joints of the stone and by balancing the masonry to allow little or no work for the rods which are used to tie the stones in place. An I beam and channel, where the channel is placed on the outside with its flanges turned in toward the I beam, forms a convenient design for most spandrel sections. By turning the channel in this way it is possible to place separators between the webs which will cause them to share the duty of carrying the loads from the walls and floor. By placing the spandrels at the same level as the floor beams a little masonry is left over the windows below which must be carried in some other way. This can be done by a few loose lintel angles extending over and resting about 6″ on the masonry on either side of the window.

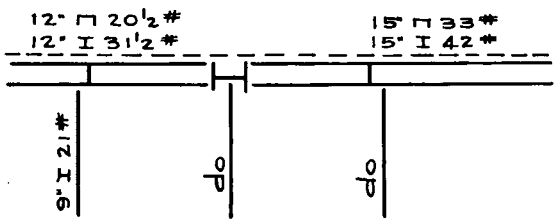


Fig. 2

In Fig. 2 is shown an exterior column with spandrels and floor beams. The column is turned with the web parallel to the wall to allow the framing of the spandrel beams to the flanges of the column. In this way they may be carried by a shelf angle with stiffener angles under it riveted to a gusset plate on the face of the column. The spandrels may be carried conveniently regardless of the eccentricity provided the column is designed for the eccentric loading and a floor beam is framed into the column to tie it back into the building. Here we have an instance where the top and bottom angles used for connecting the beam to the column are much superior to a web connection on the beam. These seat angles on the floor beam make a stiff connection, usually limited in strength by the rivets, provided thick enough angles are used to resist the stress tending to straighten the angle between the rivets in the two legs. It is of course impossible to frame both sets of spandrels into the flanges of the column at the corners of the building. These columns should be turned so that the larger beams may frame into the flange unless it is found that one set of beams is located in such a way as to make it possible to frame them more conveniently into the web than the other set of spandrels.

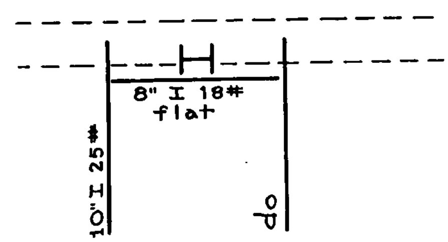


Fig. 3

At the first floor or basement (where there is a sub-basement) it is often customary to allow the beams to rest directly on the wall in order to economize on the size of the column even though the column extend down to the footing below the lowest floor. If this is the case, the column is not supported laterally in either direction by steel. Masonry cannot be calculated to brace the column in this way due to the difference in the moduli of elasticity. In order to brace the column economically at these levels the designer may place a small beam flat between two floor beams as shown in Fig. 3, connecting it by clip angles to the column. This arrangement braces the column efficiently in both directions. The 8″ beam may be placed with the web coincident with the center of the web of the floor beam allowing a standard web connection to be used on either side, and not necessitating the coping of either beam.

The so-called flat roof of an office building or similar structure usually has a slope of from ½″ to ¾″ per foot which makes the grades of the roof vary considerably from the high points to the lowest. If the roof beams were framed level this would necessitate a large fill where the high points of the roof occur. This fill, besides costing in itself an appreciable amount, adds to the dead load to be carried by the steel work and therefore to its cost. It is the best practice to slope the beams in such a way as to reduce the fill to the minimum. When a beam crosses a valley a line directly over the beam on the roof will slope at one end while at the other

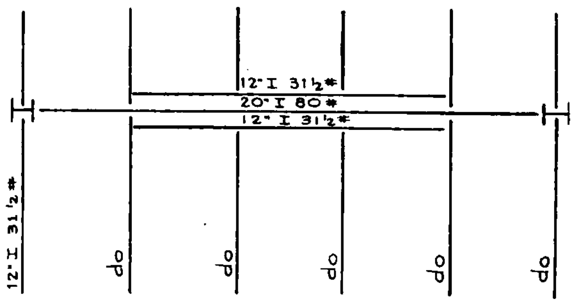


Fig. 4

end of the beam the roof will be level directly over it. The manner in which the beam should slope is determined by that part of the roof which is over the greater part of the beam. If the beam is principally under the slope we should slope the beam, but if under the level part the beam should be level. In a bay where the high point is on two sides and the low point at the opposite corner, if the valley extends diagonally across the bay, the beams on the high side would be level and after passing the center of the bay the beams would all be sloping.

Penthouses around elevator shafts often extend a considerable distance above the roof and when this is done it is frequently advisable to extend the entire column nearest the elevator up far enough to carry the sheave beams. As the elevators are frequently along one of the outer walls of the building and as the greatest part of the elevator load is carried to the rear of the elevator shaft, this brings the larger part of the elevator load directly on the columns.

Girder beams are frequently limited in depth so that two beams are required. When the load is greater on one side than on the other one beam will get more than half of the load unless some means is provided to equalize the load. Separators are used for this purpose, but the ordinary cast iron separator is not capable of transferring any great amount of the load. Riveted separators are expensive, and they too have their limitations. The author has used a scheme illustrated in Fig. 4 to carry the load without the use of any separators at all. If the span of the floor beams on each side of the girder were the same, the two beams could be used as a girder beam and separators would be only necessary to transfer any small inequality which might exist in the actual live load. However, if the spans of the floor beams on either side of the girder beams were unequal there would be a great advantage in this plan.

Let us investigate a specific case to find the relative amount of steel used. For the sake of simplicity let us assume the lengths of the floor beams are alike, using 20′ 0″. We will space them 5′ 0″ on centers and use a total load of 170# per square foot. If a double girder beam were used it would have consisted of two 20″ Is 65# and the floor beams would all be 12″ Is 31½#. If we use the arrangement shown in Fig. 4 the girder beam would be a 20″ I 80# with two 12″ Is 31½# for headers and the floor beams would remain unchanged. It is best to keep the header beams far enough away from the girder beam so that standard connections may be used. This would have to be about 11″. The farther these are kept apart the greater the chance that the floor beams into which the headers frame may have to be increased. Assuming that the weight of the floor beams remains unchanged, which is neglecting the fact that two on each side are shorter than before and two slightly longer, we can compare the weight of the double girder beams against the weight of the single girder beam and headers.

The two girder beams would have weighed 3,250, neglecting the cut-off at the columns, while the single girder beam with headers would weigh but 2,937, which gives an actual saving in the plan shown in Fig. 4 besides getting a better design for the distribution of the loads in a more certain manner. If the building law allowed a large reduction in the live load on girder beams carrying a large area of floor or if the size of the floor beams had been barely large enough, this difference might have been less or the comparison might even have been reversed.

Sometimes there is a portion of a building where it is desired that the floor shall be as thin as possible. A plan which can be used to keep this thin is indicated in Fig. 5. It is best, however, on account of deflection to limit the depth of the beams to not less than 1/24 of their span.

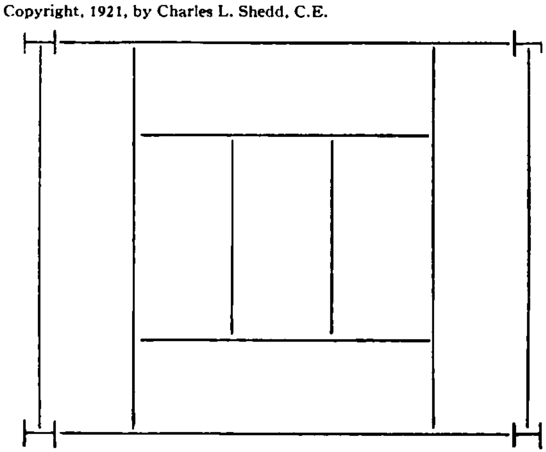


Fig. 5

BUSINESS & FINANCE

C. Stanley Taylor, *Associate Editor*

Straight Talks to Architects

IV. MANUFACTURERS' LITERATURE—DO YOU FILE IT IN THE WASTE BASKET?

"WASTE in Advertising" was the subject at a meeting of the American Institute of Architects held in Indianapolis on November 10. Representatives of a number of large manufacturers in the building field were present at this meeting. The discussion centered around the question of manufacturers' literature, which constitutes the bulk of mail received daily in every architectural office in the country. Interesting addresses were made representing the viewpoints of both architect and manufacturer.

For the last two years, and particularly during the year 1921, the staff of THE ARCHITECTURAL FORUM has been giving serious consideration to the possibility of closer co-operation on the part of architects and manufacturers. Three of the important subjects under consideration have been, first, the question of waste in advertising literature sent out by manufacturers; second, the failure of many architects to make the most of the service represented by the information conveyed in such circulars and catalogs, and third, the question of the practical value and ethics of using specific engineering service made available to architects by manufacturers, particularly in the line of mechanical equipment for buildings of every type.

We are all familiar with the amount of printed matter which is received constantly in the architect's mail. It arrives in every form known to the advertising and printing crafts. The sizes of circulars and catalogs vary from postal cards to attractively printed and illustrated catalogs, which in some instances cost from $6 to $8 each. It would take all the time of two or three high salaried men to read and assimilate the information coming through this channel into a large architectural office. It is therefore apparent that in the average architect's office much of this material is wasted. It cannot all be filed because of the attendant overhead expense, and consequently much of this sometimes expensive material finds its way directly into the waste basket.

Upon the other hand, this literature is of great value to the architect and is of direct sales importance to the manufacturer. It is evident that under the present situation injustice is being done to both parties and that there is a mutual loss and a mutual "waste in advertising" which carry their quota of direct financial loss to the manufacturer and are in turn translated into selling costs which are ultimately paid by the investor in building construction. To illustrate the architect's viewpoint, we may quote excerpts from a recent letter received from one of the leading architects in the United States, relative to the article under the heading "Straight Talks to Architects" which appeared in the Business and Finance Section of THE FORUM in the October issue.

"I have a feeling that, in order that the Editor's criticism should be just, he should devote a chapter to waste in advertising, unbusinesslike and impossible methods of indexing, and other suggestions which I could point out at greater length. For example, this firm had in one day six letters from a national advertiser, all duly stamped and addressed, several to each member of the firm as individuals, and several to the firm itself. Multiply this example, if typical, by the number of architects in the country, and realize that the cost of this inexcusable duplication is added to the cost of material and see the result.

"I believe that your journal will be entirely in accord in this matter, but you must realize that construction is probably the most complicated industry extant. Everything which you can do to standardize and prepare the data for architects will be of inestimable value to them and to the public, but at the present time I defy anybody, including your Editor if he had absolutely nothing else to do, to keep track of the situation as it actually exists."

It is quite evident that architect and manufacturer should give serious consideration to this question of sales literature and catalog descriptions of materials and equipment for buildings. The average architect is not making practical use of much of this material, which is of direct value to him. The average manufacturer is wasting money and sales effort in the presentation of extraneous matter in his literature, through the use of poor mailing lists which contain a large amount of duplication and which for other reasons may not be dependable, through presenting his information in a manner which is not of practical value to the architect and through the use of impractical sizes of catalogs and often by the preparation of printed matter which is unnecessarily expensive and cumbersome.

The recent meeting called by the American Institute of Architects, having as its purpose the discussion of this subject directly with the manufacturers, is an important step in the right direction. Of course nothing of a definite nature could be accomplished at one meeting, but it did serve to develop valuable points of contact between the architect and the manufacturer and resulted in the appointment of several committees to give consideration to various phases of this subject. Most of the officers of the Institute were present, together with representatives of about 60 leading manufacturers and representatives of various architectural publications. The meeting was opened by the President of the Institute, Henry H. Kendall of Boston, who explained the situation concisely, expressing the hope that grounds for co-operation might be established for the mutual benefit of both the architects and the manufacturers. A number of interesting addresses were made by members of the Institute and by advertising and sales managers of various well known manufacturing organizations.

We may note, however, several unusually important points brought out by a few of the speakers. O. C. Harn, Advertising Manager of the National Lead Company, who has had unusually extensive experience in this field and whose opinion is recognized as that of high authority, refuted to a certain extent the statement that architects want nothing excepting practical information which might be contained in facts and figures. It is his well founded opinion that a strong element of sales appeal is of importance in order that the architect should give his consideration to the particular line of material or equipment concerned and may make a preliminary selection of the manufacturing organizations which he wishes to consider. He then reaches the stage of comparison on practical points, such as structural integrity, utility value and prices.

Robert D. Kohn, of the American Institute of Architects, said that the manufacturer certainly has information which is of great importance to the architect and that the architect should not treat the sales effort of the manufacturer as constituting a nuisance to him. Mr. Kohn frankly said that he does not know how this problem is to be solved. He feels that too many superlative claims are made in advertising, but he is also under the impression that the architect is foolish when in writing his specifications he calls for the "best," when in many instances materials or equipment which may not be the best are sufficiently good for the purpose and represent a direct saving to the owner.

In other addresses by manufacturers, it was suggested that the average architect today does not know what he wants in the way of information from manufacturers, which is a statement based on fact because the average architect has given little consideration to this question. One result of this meeting was the formation of four active committees to give serious consideration to the several points involved, and to call further meetings until certain standards may have been established which should result in eliminating a considerable amount of waste of money and time, both by the architectural profession and by the manufacturers.

There are times when the architect is greatly in need of service and information from the manufacturers. It can be readily understood that this is not a stable condition as it depends entirely upon the amount and character of work in the architect's office. It would seem, therefore, that the development of proper indexing and filing systems would be a partial solution to this problem. It must be realized, however, that if fair consideration is to be given to all literature which the architect receives, these files would soon become too cumbersome and the expense of maintaining them too great for the average architect.

The subject of indexing and filing in the architect's office is one which will receive serious consideration in a future issue of THE FORUM, when we will present methods used by various architects. In this connection we may note the existence of a paradoxical situation. The further we go from the large cities in this country, the greater value we find attached by architects to manufacturers' literature. This is largely due to the fact that in the larger cities the architect can find within easy distance of his office sales representatives of almost every important line of manufacture in the building industry. Through direct advertising, and to a certain extent through direct mailing, he has a certain impression of those manufacturing concerns which are active in different lines, and when he undertakes the design of a particular building, he is in a position to get information quickly. This is not the case in smaller cities and towns.

The average architect who practices in smaller communities is not usually in a position to maintain an expensive filing system. We have noted that inquiries received through the Service Section of THE ARCHITECTURAL FORUM for manufacturers' literature have been in inverse proportion to the allocation of sales offices. We have been told also that the architect who is not located in close contact with sales outlets gives more study to manufacturers' literature, although he may not preserve it to any great extent.

We believe that the architect would be directly benefited if manufacturers would cut down the volume of direct mailing matter and eliminate lengthy discussion of generalities. We do not believe in limiting direct mail advertising to mere presentation in cold type of facts and figures. While a time may come when the architect must be interested in this subject, he is also interested in examples of successful use or installation and he is impressed by institutional advertising of the right character which will definitely spell to him service and dependability. We believe also that there should be certain standard limits of size, and undoubtedly these will be worked out by one of the committees already referred to. The manufacturer should seek to make his literature at once informative and of practical value.

The average architect does not like to experiment, for many have had sad experiences because of selection of materials or devices which were put forward by new organizations which have not been able to stand behind their products.

Building Activity in 1922

THE question which is uppermost in the minds of architects today relates to the activity which may be expected in their offices in the year 1922. In the early summer, when building activity was not up to normal expectation, THE FORUM predicted that with the coming of fall there would be a noticeable improvement from the architect's viewpoint. Building reports of August, September, October and November show a material increase and our investigations among architects indicate that many offices are becoming active and that the prospect is brighter in almost all instances. It has been our opinion that this stirring in the fall of 1921 would be the beginning of a period of sound activity in the building field, which will probably not assume "boom" proportions but which will represent for several years to come a greater than normal expenditure in the building field, particularly in classes of construction which present subnormal totals over the past few years.

During the year 1921 the cost of construction has lessened materially, due to decreased prices of materials and labor and to greatly increased production on the part of labor. Reasonable progress is being made towards stabilized conditions, and building investors, to a great extent, are working only for normal stability of the market as expressed in the graphic presentation of the building cost situation published in the September issue of THE FORUM in the Business and Finance Department.

In order to gauge the volume of construction activity which has been waiting only this approach towards stabilized conditions, THE FORUM has recently made an intensive survey of work being planned in architects' offices, which clients might reasonably be expected to build as material and labor costs reach stabilized levels. Reports have been received from over one thousand architects' offices giving classification of work, together with estimated value of the new buildings. On the next page there will be found a complete tabulation showing the number of reports received in each state and a classification of the work, together with total volume of anticipated expenditure in each class. This table has been arranged so that percentages might be determined showing the relative volume in dollars of each class of construction in the particular section of the country under consideration. As these reports were received from all types of architects and from offices both large and small, it is fair to assume that one thousand such reports will serve to present fair averages for the entire volume of work which will be controlled by architects over the next year or two. In determining percentages in this manner, therefore, it is safe to assume that these percentages will closely approximate the result which will be shown by actual construction reports, filed as the various plans are completed and contracts let. We have, therefore, for consideration this interesting table showing classified percentages which indicate the relative expenditure in each important class of building construction for each section of the country. By studying this tabulation, the architect will be able to determine with a fair degree of accuracy the *relative demand* on the part of the buying public in the building field.

When the results of this investigation are combined with reports on various important factors affecting the construction market, it would seem that without a doubt 1922 is to be a much busier year for architects than 1921, and that in fact it will be the first of a series of good years for the profession. It would seem that labor costs are well under way toward stabilization on a lower cost basis, and it is reported that in many sections of the country men are coming back into the building trades which were sadly depleted by war industries and by previous lack of employment. Financing for building construction will be easier for 1922 than it has been for the last five years. The investors, both permanent and speculative, are again turning their attention to the building field. It may be noted that in New York, where the construction of apartment houses has been most active, there seems to be no difficulty in selling them.

All architects are familiar with cycles in their business, through which they pass from lean to fat years. When we predicted some months ago that the pendulum had reached the lowest point of its swing in the fall and would start the other way toward better business for architects, it is evident that we were correct. We predict again, therefore, that 1922 is to see gathering momentum as this pendulum swings up and out in a long arc, indicating better business for the architect.

PERCENTAGE ALLOCATION OF PUBLIC DEMAND FOR NEW BUILDINGS

(See also table on next page)

	Dwellings	*Apt. houses*	*Hotels*	*Schools*	*Churches*	*Hospitals*	*Public bldgs.*	*Office bldgs.*	*Industrial*	*Public garages*
Northeastern states...	8.3%	9.4%	5.7%	23.8%	3.3%	17.6%	7.9%	12 %	8.9%	3.1%
North Atlantic states..	10.4	12.5	11.3	15 5	14.5	6.7	7.8	12.8	6.9	1.6
Southeastern states....	10 8	20.4	16	12.5	4.7	4.6	10.1	17.6	2	1.3
Southwestern states...	13.2	11	12.2	14.7	12.6	8.5	8.7	6.1	7.3	5.7
Middle states........	7.2	11.8	11.4	15	12	6.1	12.1	14.1	7.9	2.4
Western states.......	8.1	13.4	12.2	23.6	5.8	10.1	9.1	9.1	5.8	2.8
Average percentage of national demand for architectural service in 1922............	9.6	13.8	11.4	17.5	8.8	8.9	9.3	11.8	6.4	2.8

PROSPECTIVE WORK IN THE OFFICES OF ONE THOUSAND ARCHITECTS

Compiled from Reports Furnished by ARCHITECTURAL FORUM Subscribers
Figures in Dollars of Estimated Value (Thousands Omitted)

	Number of reports	Dwellings	Apt. houses	Hotels	Schools	Churches	Hospitals	Public buildings	Office	Industrial	Public garages	Total construction
Northeastern States												
Maine	4	202	600	475	850	104						
New Hampshire	3	164	40		410	50	556	47	12	200	240	
Vermont	2	75	100	50	50			605	180	25		
Massachusetts	50	2,973	3,402	3,000	9,595	773	10,112	2,135	6,363	3,199	1,310	
Rhode Island	7	639	1,005		1,760	730	130	285		182	256	
Connecticut	26	1,122	656	12	2,090	375	100	1,830	911	1,875	122	
Total (in thousands)	92	$5,175	5,803	3,537	14,755	2,032	10,898	4,902	7,466	5,481	1,928	$61,977
Percentage		8.3%	9.4%	5.7%	23.8%	3.3%	17.6%	7.9%	12%	8.9%	3.1%	
North Atlantic States												
New York	148	16,955	16,257	15,620	24,530	6,790	11,315	10,348	20,630	7,963	1,550	
New Jersey	39	3,860	2,514	1,835	7,555	5,715	390	3,375	515	2,575	768	
Pennsylvania	69	7,165	8,413	14,655	10,315	18,015	7,150	3,695	12,627	8,566	1,775	
Delaware												
Maryland	11	414	1,012		980	512	175	3,675	400	540	309	
Dist. of Columbia	9	1,169	7,237		725	10,145		1,025	2,155		100	
Total (in thousands)	276	$29,563	35,433	32,110	44,105	41,177	19,030	22,118	36,327	19,644	4,502	$284,009
Percentage		10.4%	12.5%	11.3%	15.5%	14.5%	6.7%	7.8%	12.8%	6.9%	1.6%	
Southeastern States												
Virginia	10	1,222	810		2,345	281	430	1,800	3,635	340	125	
No. Carolina	9	496	670	1,065	130	710	285	25			215	
So. Carolina	5	532	50		120	15	75	75	55	48	50	
Georgia	7	205	210	450	129	535	150	775	750	100		
Florida	12	716	4,250	4,250	16	418	6	47	693	96		
Total (in thousands)	43	$3,171	5,990	4,700	3,675	1,379	1,371	2,982	5,158	584	390	$29,400
Percentage		10.8%	20.4%	16%	12.5%	4.7%	4.6%	10.1%	17.6%	2%	1.3%	
Southwestern States												
Kentucky	9	780	650		280	290	12	450	60		18	
West Virginia	13	1,540	1,151	1,270	195	590	280	160	1,105	700	510	
Tennessee	7	454	373	60	478	420	460	100	150	325	115	
Alabama	5	400	150		575	485	75	190	400	40	50	
Mississippi	1	31	52		75	15					95	
Louisiana	8	508	143	650	90	130	80	300	152	70	38	
Texas	27	1,755	1,623	1,965	3,865	3,365	1,770	2,402	584	1,864	305	
Oklahoma	10	755	910	1,600	1,230	640	1,110	525	340	330	1,620	
Arkansas	3	102	165	275	230	100	250	17	100	200		
Total (in thousands)	83	$6,325	5,217	5,820	7,018	6,035	4,037	4,144	2,891	3,529	2,751	$47,767
Percentage		13.2%	11%	12.2%	14.7%	12.6%	8.5%	8.7%	6.1%	7.3%	5.7%	
Middle States												
Ohio	57	4,797	6,388	7,825	6,030	4,866	6,250	4,715	5,277	3,368	1,268	
Indiana	38	2,015	2,801	3,300	5,835	1,897	2,140	3,065	1,960	1,260	429	
Illinois	48	2,596	9,673	15,150	7,020	6,587	2,000	11,004	22,385	10,571	1,647	
Michigan	32	3,366	2,185	1,800	3,060	5,335	1,390	2,782	5,020	2,071	1,581	
Wisconsin	23	2,394	2,687	500	4,760	1,720	590	1,918	1,260	650	633	
Minnesota	44	1,990	2,901	2,615	8,226	2,599	1,750	1,445	4,335	3,068	539	
Iowa	21	1,033	3,315	1,090	4,781	11,105	890	3,455	3,185	670	120	
Missouri	34	2,841	6,090	2,810	1,785	1,615	3,286	3,549	1,380	2,863	468	
North Dakota	5	444	100	115	1,070	570	135	505	30	236	390	
South Dakota	3	179	50	65	551	15	175	190	15		60	
Nebraska	14	877	1,630	1,060	3,330	1,775	765	2,770	170	650	390	
Kansas	15	651	425	475	2,080	730	195	3,825	485	82	255	
Total (in thousands)	334	$23,183	38,245	36,805	48,528	38,814	19,566	39,223	45,502	25,489	7,780	$323,135
Percentage		7.2%	11.8%	11.4%	15%	12%	6.1%	12.1%	14.1%	7.9%	2.4%	
Western States												
Montana	7	86	460	1,395	2,295	55	505	240	200	130	100	
Wyoming	3	143	80	30	850	300	20	475	165		100	
Colorado	13	417	960	2,250	1,720	535	640	485	600	395	170	
New Mexico	3	260	25	144			125	65	75		30	
Arizona	2				750	100	150	1,050	400			
Utah	7	345	715	750	1,125	810	350	914		135	109	
Nevada	2	128	190	500		25	30		225	50		
Idaho	4	132	130	675	720	130		150	80	50		
Washington	25	1,487	2,666	1,455	6,795	1,135	1,921	1,892	3,800	667	290	
Oregon	12	465	185	665	305	540	635	2,020	395	1,175	230	
California	49	3,614	6,296	2,763	6,042	1,438	4,410	701	2,040	2,444	1,423	
Total (in thousands)	127	$7,077	11,707	10,627	20,602	5,068	8,786	7,992	7,980	5,046	2,452	$87,337
Percentage		8.1%	13.4%	12.2%	23.6%	5.8%	10.1%	9.1%	9.1%	5.8%	2.8%	

Plate Description

Office of Post & Flagg, New York. Plates 85–87. The tendency of banks and financial houses of various kinds to erect buildings for their exclusive occupancy explains the planning of this structure in New York's financial district for a stock and bond brokerage firm. The building, six stories in height, is designed in the style of the English renaissance. Upon the two lower stories as a base the third, fourth and fifth are grouped and arranged with pilasters which carry the cornice, above which is the sixth story. Over the granite base the facade is of marble, with wrought iron guards at the windows of the third story.

The plans of the interior suggest the care and thought with which the architects, George B. Post & Sons, have planned the building. Provision has been made for every department of a complicated business and in addition to public and private rooms for the use of clients there are private offices and conference room for the members of the firm and the necessary telephone and telegraph facilities, bookkeeping and filing departments, storage vaults, etc., while the upper floor is planned as a rest room for employes.

Marble and stone have been extensively used for the entrance hall where the floor is an inlay of pink, black and light yellow marbles and the facing of the wall is of stone laid in slab courses with shallow rustication; the ceiling is of ornamental plaster. The interiors are in the renaissance style indicated by the facade and the walls, in general, are of old ivory mottled in slightly darker tones to produce a parchment effect. In the working parts of the building upon the upper floors a uniform treatment has been adopted with French gray the prevailing color.

House of Montgomery L. Hart, Pelham Manor, N. Y. Plate 88. In this suburban house Julius Gregory, the architect, has secured an unusual result by using matched siding instead of the familiar shingles or clapboards for the exterior walls. Although but of moderate size the house gains dignity from the symmetrical appearance given by the garage at the left which is balanced by the veranda at the opposite end of the house. The arrangement of the main doorway with its platform of brick and its delicate balustrade of wrought iron gives to the entrance the emphasis which its proper treatment demands. The exterior also gains considerably from the absence of dormer windows of any kind.

The floor plans show an arrangement which is convenient and economical of space and sufficiently dignified to accord with the exterior of the house. The use of French windows which open from the living room and dining room into the sun porch makes this an integral part of the house and increases materially the size of the lower floor. The garage is reached through a door under the stairway and its being connected with the house makes its heating and lighting both simple and economical. The exterior of the house is white and the blinds are painted light green.

House of Walter Haefeli, Pelham Manor, N. Y. Plate 89. In designing this house the architect, Julius Gregory, has used brown stained shingles with trim painted white and light green blinds for the exterior, the entire composition being given an added character by the prominently placed chimney of rough stone. The house, while small, is planned to possess a decided dignity of appearance which is emphasized by the added width given by the sun porch at the right.

The interior is arranged to provide a reasonable number of rooms of fair size instead of many rooms small and badly cut up. The principal bedroom is provided with a bathroom of its own with another bath for the two additional bedrooms. In these two houses planned in Mr. Gregory's office the interior finish is white wood, treated with enamel; floors are of comb grained pine and fireplaces are brick. Both houses were built during 1918–19 and their cost was around 25 cents per cubic foot.

Office of Post & Flagg, New York
George B. Post & Sons, Architects
An interesting comparison of scale in which the smaller building holds its position because of sharp detail. Note also the relation of horizontal lines with those of adjoining building

EDITORIAL COMMENT

STRENGTH OF ENGINEERING SOCIETIES

WE recently had the pleasure of attending a meeting of the Boston Society of Civil Engineers. In the course of routine business a long list of new members of the Junior Section of the Society was read. It may be recalled that the activities of this section, which was instituted little more than a year ago, were commented on editorially in a recent issue. Its growth is proof enough of the benefit to the young man.

At the same meeting it was explained that a student engineering society at Northeastern College in Boston was desirous of affiliating with some society of practicing engineers, and that after they had considered the respective advantages of different local engineering societies they selected the Society of Civil Engineers with which to seek affiliation. The result is a new branch of the Boston Society of Civil Engineers, known as the Northeastern College Section. In commenting upon their connection with the Society the chairman made an incidental remark which to us is significant of the successful organization that engineers are able to maintain. He said, "We are glad to see these young men undertaking their engineering society *work* so early." We want to call particular attention to that word *work*, because we feel that in that brief expression is the kernel of the success of engineering organizations.

The engineer looks upon his professional society as the medium through which he is enabled to serve and co-operate with his fellow engineer, and likewise the public. Interest in professional society activities is to him a duty; it is *work* which requires performance just as much as the duties of his individual practice. It is through his society that he largely keeps abreast of improvements in his profession and its relations with the public. He has a highly developed sense of professional responsibility; he looks upon his investigations and accumulation of engineering knowledge not as personal property but as the property of the engineering profession, to be held in trust, shared with his contemporaries, and passed on to the next generation. His constant aim is the improvement and dissemination of engineering knowledge and this is exemplified in his attitude toward his professional societies. The most competent engineer is always ready to acquire knowledge; he is just as ready to impart it, and the engineering society is the common meeting ground of seekers and givers.

How many architects look upon participation in their professional society activities as work? How many architects recognize the value of professional co-operation and back up their belief by membership in architectural societies? The number in each case is pitifully small. Perhaps that provides the answer to many of the problems that beset the architectural profession.

Much dissatisfaction is expressed with the public attitude toward architects. There are repeated suggestions that the public should be educated to an appreciation of architecture and the duties involved in its practice. Frankly, is it so much the public that needs education as it is the architect? The public is ordinarily fair in the bestowal of its recognition and appreciation. Is it not more practical to consider first if the architect is fulfilling his obligations to the degree that will justify public recognition?

Today public service is more needed than ever before. There are problems of immense importance directly affecting the public welfare, the arts, industry and general human relations. The professional man, because of his unprejudiced training and his peculiarly altruistic position in the economic affairs of the world, has special qualifications that give to his advice and opinions unusual value, and they should be placed at the public service. The public will gladly receive this service, and will willingly pay for it and accord it full recognition. The power to give service must, however, first be made a definite reality; the work of individuals must be co-ordinated and directed into productive channels. This can only be accomplished through co-operative effort and today the most effective and practical medium for the co-ordination of professional effort is the professional society.

Architects have in the American Institute of Architects and its local chapters an organized society with potential power to serve the profession and the public adequately, yet its membership constitutes hardly more than 20 per cent of the practicing architects in the country. What is the 80 per cent doing toward the promotion of professional interests? Even though the 20 per cent in the Institute ranks were individuals of the greatest influence, can this minority be expected to carry all the burdens of the profession? Does this state of organization indicate a very extensive belief that interest in professional activities is *work*, a duty calling for serious performance? Where lies the fault? Is it in the character of the organization existing? We do not think so. The fault lies with the individual architect; he is quick to recognize the difficulties that he labors under, but he does not so readily recognize the simple, fundamental principles which if rightly applied will remove the difficulties. Let him take pattern after the engineers, recognize that co-operation with his fellow architects and participation in society activities are *work* of the first importance, and the results will soon be apparent.

DECORATION *and* FURNITURE

A DEPARTMENT DEVOTED TO THE VARIED PROFESSIONAL & DESIGN INTERESTS WITH SPECIAL REFERENCE TO AVAILABLE MATERIALS

It will be the purpose in this Department to illustrate, as far as practicable, modern interiors furnished with articles obtainable in the markets, and the Editors will be pleased to advise interested readers the sources from which such material may be obtained

Modern Reproductions of Italian Renaissance Furniture

Reproductions of Sixteenth Century Italian Arm Chairs

Italian Fabric in Gold and Color on Gray Ground
Repeats 12 ins. in width

Sixteenth Century Italian Center Table
Height, 29 ins.
Diameter, 24 ins.

Early Sixteenth Century Walnut Table
Height, 24 ins.
Diameter, 20 ins.

Below, a Modern Walnut Table Reproduced from Sixteenth Century Italian Example
Length, 6 ft. 6 ins.; width, 33 ins.; height, 31 ins.

Interiors Adapted from the Italian

PART IV. FURNITURE AND ITS ARRANGEMENT (CONCLUDED)

By WALTER F. WHEELER

THE Italian style is essentially formal, and while it holds forth great possibilities for domestic use it should not be employed in rooms where it is necessary that a very intimate appearance should prevail, neither should it be attempted in a room too small to permit of a fairly well balanced, though not necessarily a symmetrical, arrangement of furnishings. The pieces of furniture used in such an interior are not many but to be true to type they must be of bold and vigorous scale, which naturally involves corresponding size, and size requires space for the assertion of the dignity and importance of the pieces used.

The success of a room arranged in this style demands careful and thoughtful placing of furniture. Most pieces of this type in addition to being of generally robust scale are rectilinear in form and of marked architectural character, and for this reason are seen to the greatest advantage when placed against walls. An Italian interior is apt to be dominated by the fireplace. It should therefore be placed where it will be instantly recognized as the center of architectural interest as one enters the room; the mantel should be seen as a whole and not partially hidden by groups of furniture placed between it and the entrance. Italian appreciation of the full importance of this fact may be the reason that in most of their interiors the center of the room is invariably left open, the furnishings being distributed against the different walls. This arrangement, however, is contrary to American custom so it becomes necessary to adopt some plan which, without entirely destroying the method of Italian arrangement, will render the interior livable and comfortable for American use.

Take, for example, a living room of generous size and of oblong shape, the chimney-piece occupying the middle of one of the longer walls with the entrance to the room upon the opposite side. The creating of the center of interest in front of the fireplace, which is the usual custom in America, would at once destroy the unity of the room by grouping between the chimney-piece and the door the various pieces of furniture necessary, which would cut off the view of the fireplace and mantel as one enters the room. A much better arrangement would be had by arranging two centers of interest, one at each side of the fireplace, facing each other. Each center may be built up by using a davenport of low and suitably broad type, with tables of small sizes and chairs of various kinds at each end, or else each of the centers may be arranged about a long table of suitable form, the davenports or tables in these instances being placed at right angles to the fireplace. Thus, as one enters the room, the chimney-piece will be readily observed, the centers of interest being to the right and left.

It might be, however, that in such a room the entrance would be at one of the ends, in which case the grouping of furniture could be at the middle of the room and in front of the fireplace, since as one enters the room the axes of the open spaces would be parallel with the axis of the doorway, and the group of furniture would not interfere at all with the full view of the chimney-piece. Such a group might include a davenport directly be-

Italian Damask Made in Various Color Combinations
Repeats 20 ins. in width

American Reproduction of Gothic Tapestry
"Ten Stories of Boccaccio," 7 ft. wide, 8 ft. high

Mohair Velvet Reproducing Italian Design. Diagonals of Diamonds, $3\frac{1}{4}$ by $4\frac{3}{4}$ ins.

fore the fireplace with small, low tables at either end and a long Italian table behind it. Small benches and incidental chairs or tables might be added to the grouping for convenience, but care should be taken that too intimate a fireplace setting is not the result; such a setting would be more in keeping with an interior of some other type—the Georgian, for example, in which the furniture is smaller.

Florentine Table of a Type Popular at End of Fifteenth Century. Suitable for Use in Modern Dining Room or Library. Height, 2 ft. 7 ins.; length, 8 ft. 5 ins.; width, 3 ft. 3 ins.

At least one wall of such a room should be comparatively free from windows or doors so that a formal grouping of wall furniture may be had, and such a grouping would be most effective if opposite the chimneypiece. The group would be best made about some important piece of furniture such as a long table or a *credenza*, several illustrations of which have been shown in these pages, the table or *credenza* being flanked by upholstered or carved wood chairs, while above and occupying an important area of the wall surface there might be hung a tapestry or painting of appropriate dignity. To add to the formality of such a setting there might be added to the grouping a pair of tall Italian torcheres. The other sides of the room would generally be arranged so that they would be less important in appearance than those just described.

A Reproduction of Fifteenth Century Italian Monastic Table 6 ft. in length; 2 ft. wide

Italian Walnut Table Height, 30; diam., 28 ins.

Modern comfort requires the use of rugs or carpets upon floors of wood, marble or other material, and it will generally be found that with the arrangement of furniture determined the question of rugs can be decided so that the rugs will unify or draw together the different parts of the room or the various groupings of furniture. Oriental rugs or chenille rugs in plain colors may be used with equally good results. Color in hangings and upholstery fabrics is of course highly important and should be full and vigorous in tone to accord with plaster walls and the deep toned wood of furniture and architectural features. The Italians used full reds, blues, browns and greens which in materials such as velvets and brocades created a superbly rich effect. The tops of *credenze* and cabinets were high lights, rendered so by bright majolica

Rough Plaster Walls Afford Background for Grouping of Metal Torcheres and Candlesticks and Venetian Metal Console. Hampton Shops, Decorators

Reproduction of Early Sixteenth Century Veronese Cassone. Made of Wood or Composition Gilded and Polychromed
Length, 5 ft. 4 ins.; width, 21 ins.; height, 27 ins.

jars, silver vessels and gold and polychromed candelabra. One color should be selected to dominate, but it should never be used exclusively. A room will be more livable and interesting with the introduction of the complementary and other colors proportioned in tone and area to provide harmony. Window hangings in an Italian interior are in keeping with the rich simplicity which obtains in regard to other details. Two sets of curtains are generally used, one of light material against the glass, and heavier draperies on the plane of the wall, falling in long, straight lines from poles or cornices and drawn back and forth by cords. For sash curtains there is a vast variety of fabrics such as the reproductions of Italian filet lace in small, figured squares which are best hung against the glass with no fullness, or the more solid materials of silk and wool mixture, valuable for their simplicity and qualities for tempering the light, while for heavier draperies there are not lacking rich velvets and figured fabrics of different kinds, carefully reproduced from renaissance originals. The positions of windows and their relations to important furniture groupings will largely determine their decorative treatment. Renaissance fabrics as a rule are large scaled in pattern; there must, therefore, be sufficient undecorated area in nearby wall spaces to make them effective, and unless favorably located the windows should be subordinate in color value to the main wall grouping of furniture.

Objects hung upon the walls should be confined to pieces of importance and sufficiently vigorous scale. Tapestries, perhaps, claim first place but of almost equal value are large paintings, either simply framed in characteristic Italian mouldings or with richly carved and gilded frames. Sculptured plaques or bas-reliefs of Della Robbia character are also useful, either in color or in soft terra cotta tones, but small scaled pictures and other intimate objects must be absolutely eliminated if the Italian feeling is to be maintained.

Lighting fixtures in an interior of any kind do much to make or mar the effect of the completed work. The use of torcheres has already been suggested; in many cases they are made of bronze, wrought iron or other metals, but frequently they are of wood, gilded and poly-

Italian Table Showing Spanish Influence
Length, 60 ins.; height, 32 ins.; width, 23 ins.

Italian Sixteenth Century Table
Height, 31 ins.; diameter, 39 ins.

Music Room in Residence of William Ellery, Esq., Brookline, Mass.
Wooden ceiling decorated in color by Robert S. Chase

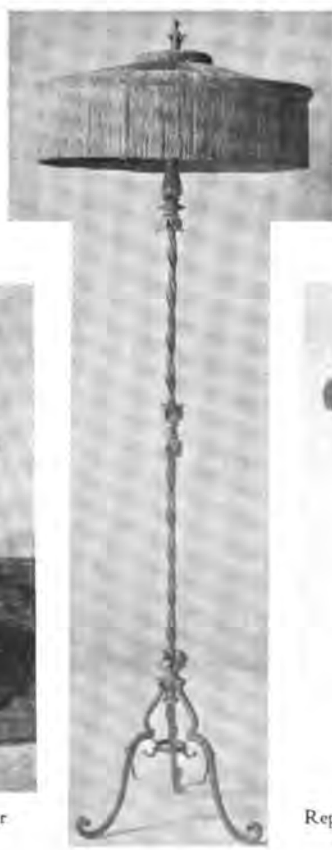
Upper Part, Modern Venetian Wrought Iron Torchere
Height, 93 ins.; spread, 14 ins.

Reproductions of Old Italian Majolica Oil or Water Jars
Heights vary from 2 to 3 ft.

Upper Part of a Modern Italian Candelabrum
Height, 80 ins.; spread, 18 ins.

chromed, and sometimes portable lights are contrived from carved wooden figures which are gilded and colored. Lights fixed to the walls are used with excellent results and suitable fittings in metal or composition are not difficult to obtain. Fixtures hung from the ceilings are often used and are frequently reproductions of old Italian candelabra. These hanging fixtures, however, should be used only in rooms of generous size, for it must be remembered that in Italian interiors, as with interiors of any kind, fixtures hung from the ceiling have a tendency to make a room seem smaller.

The furnishing of an Italian room need not be a slavish piece of restoration. The three periods of design, early, middle or high, and late renaissance, are well marked but it is not necessary to confine the selection of furniture in a room to any one period. A general sense of uniformity only need be preserved, and this the architect is perhaps better able to appreciate than any other. The late renaissance type will perhaps find less appeal in the average American house than the earlier or middle periods, but the high note of a room might well be struck with such a piece, as for instance, a center table with carved ends or a *credenza* or cabinet filling the important wall space. Similarly, a piece of eighteenth century Italian bordering on the baroque or a brilliantly painted and decorated secretary or cupboard in green, yellow or red after Venetian models might be introduced for relief to the severity of the principal furniture. There is likewise no reason for confining all of the furniture of a room strictly to Italian models. A study of renaissance forms in all countries will show an underlying basis of marked similarity. Thus Spanish renaissance furniture is closely allied to the Italian of the same period; many pieces of the Jacobean and other periods of English furniture fit in admirably with the Italian. It would be well, however, to bear in mind the fact that a mixture of styles should be made



A Reading Lamp of Bronze or Wrought Iron in the Italian Style
Height, 69 ins.; shade, 22 in. diameter

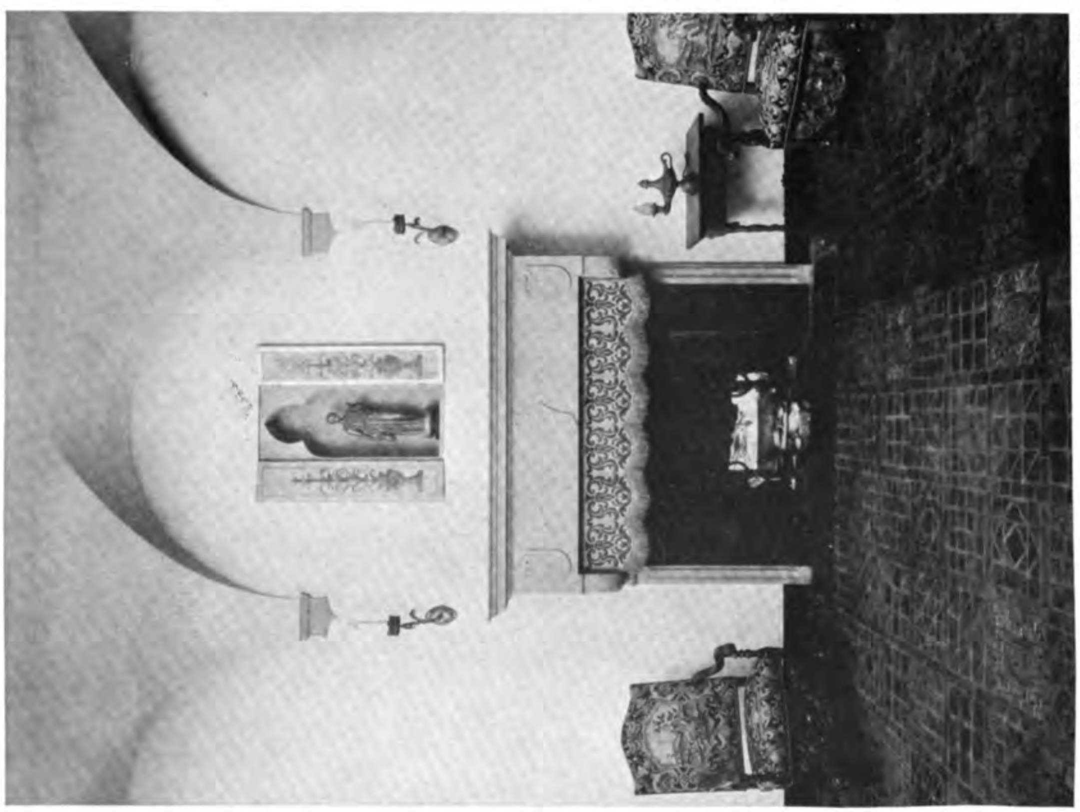
Reproduction of Venetian Walnut Arm Chair
Stuffed seat and back

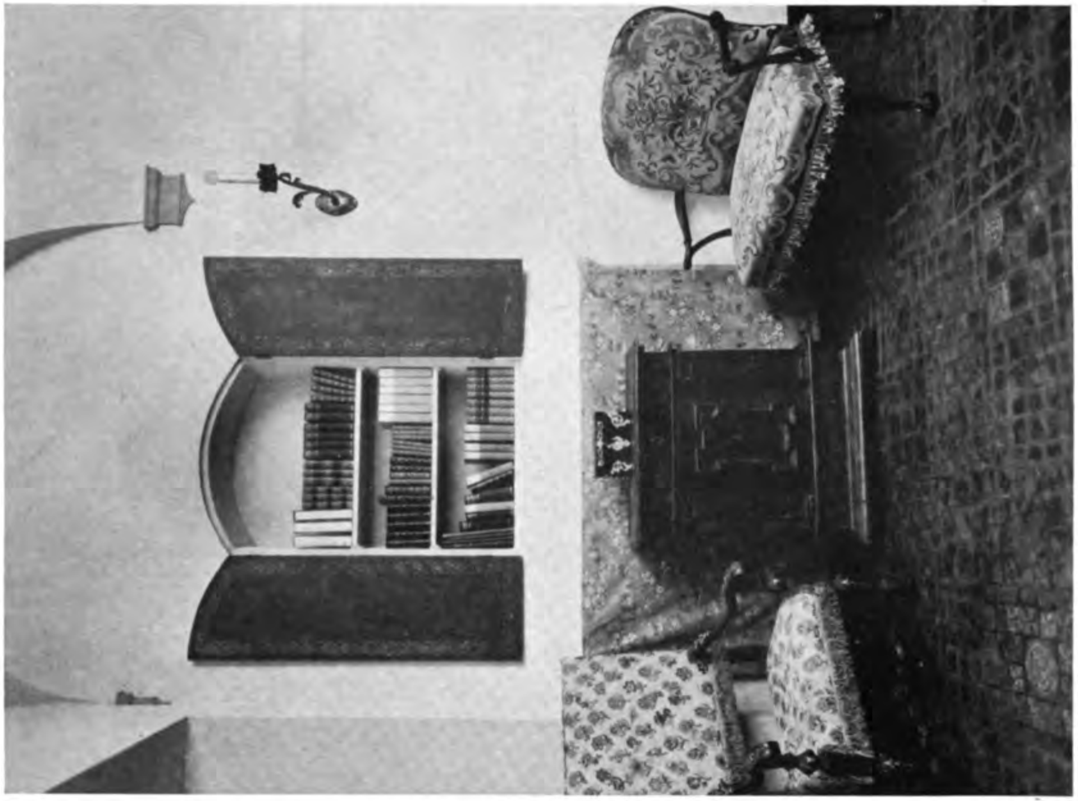
Reproduction of a "Dante" or "Savonarola" Chair
Davanzati palace collection, fifteenth century

INTERIOR IN HOUSE OF HOWARD F. WHITNEY, ESQ., LONG ISLAND, N. Y.

HOWARD MAJOR, ARCHITECT

Walls of brownish buff plaster; ceiling, polychrome walnut. Door of walnut; architrave of wood and color of wall. All furniture Italian originals, the chair at left being eighteenth century, based on Louis XV style. Hangings of green antique velvet with red introduced in upholstery. Ceiling height, 12 feet.





MUSIC ROOM, HOUSE OF CARL DREYFUS, ESQ., BOSTON

EDWIN SHERRILL DODGE, ARCHITECT

Walls and vaulted ceiling of rough, pale gray plaster; floor of red brick and tile in small units; mantel, a cement reproduction of an Italian original. The niche in the wall has walnut doors having polychromed borders. Ceiling height, 12 feet 10 inches.

with considerable care if a consistent result would be secured. The different periods of the renaissance in Italy involved a certain definite sequence of styles, so intimately related that a chair of say the earliest might easily be found in a home of the later renaissance, but one piece of French furniture carelessly selected in a setting strictly Italian might mean a discord. Care should [illegible] that any mixture of styles [illegible] intentional and not appear to be due to a mistake.

Modern Italian Wreath of Terra Cotta
Diameter about 30 ins.

The furnishing of a dining room presents what is perhaps the simplest problem in any modern domestic arrangement, because the room is planned for one definite, specific purpose and because in furnishing of any type the pieces for dining room use are unmistakable and well defined. When furnishing in the Italian style the problem is unusually simple for the necessary objects are tables, sideboard and chairs and all these pieces were used during renaissance times and excellent models are available for the guidance of modern architects.

Walnut is generally used for Italian furniture; it possesses a rich and varied grain and assumes with time an especially beautiful patina. Much of the splendor of the older furniture was due to the use which the Italian wood workers made of inlay or "intarsia," which consisted of inlaying the rich surface of walnut with ivory, bone, mother of pearl and various metals, besides ebony and countless other woods which were sometimes stained or treated with chemicals to heighten the richness of the effect. Intarsia was used upon wall paneling, doors and inner shutters, and very largely upon furniture. Certain workers of the period found—just as some modern architects and decorators have discovered—that much of the beauty of this form of inlaying may be had by polychrome decoration. Success depends upon the choice of an appropriate pattern, and in working it out in suitable colors. Intarsia—or its painted simulation—is useful for giving to flat, plain surfaces a high degree of interest. It may be used upon the edges of a table or *credenza* top, or for emphasizing the structural lines of other pieces of furniture, for panels or for use in bands break a monotonous surface up into smaller panels which may themselves be developed in pleasing designs worked out in the same way.

In these articles on Italian domestic interiors nothing has been said regarding the use of

Reproduction in Marble of Antique Italian Tripod

Modern Wrought Iron Door at Mt. Kisco, New York
Benjamin Wistar Morris, Architect

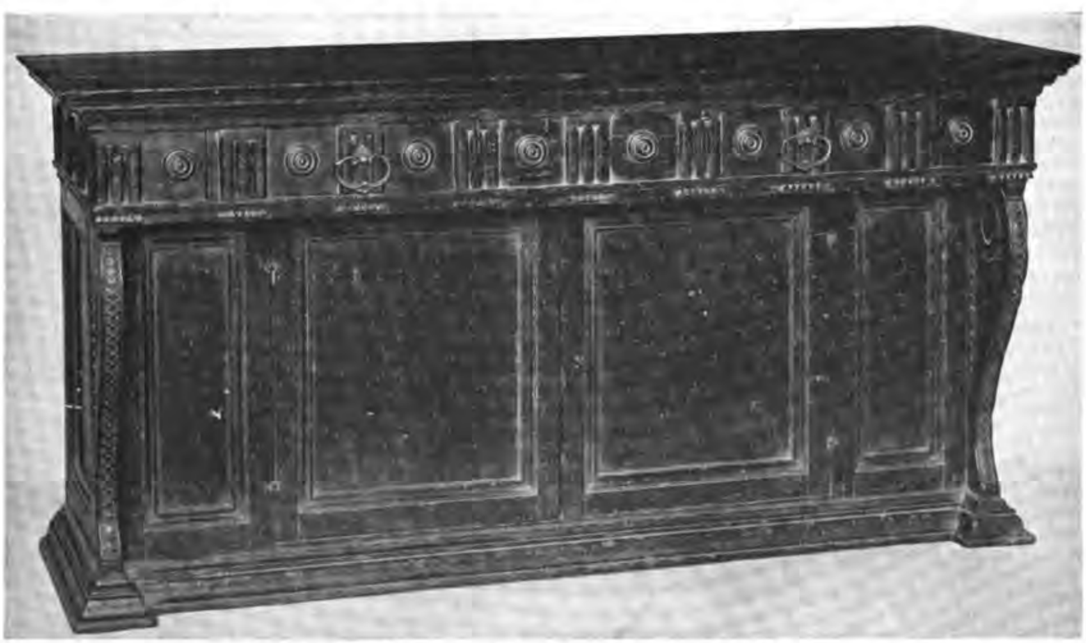
Lighting Fixture Based on Italian Candelabrum
Length, 42 ins.; spread, 20 ins.

Hall on Second Floor, Davanzati Palace, Florence
Illustrating prominent setting of Italian wall furniture

form and finish are made by the most reliable of modern methods which enable them to withstand the high, dry temperature of the heated American house. The same care has been used by the makers of tapestries and fabrics in general, workers in iron and other metals, terra cotta in various forms, and so through all the list of crafts the work of which enters into the making of the modern home.

The unity and architectural coherence which characterized the early renaissance domestic interior were due in a large measure to the fact that both the structure itself and its furnishings and fittings were planned or supervised by a single individual—the architect. Many of the architects of the period actually maintained workshops of their own for the production of furnishings of different kinds for their clients; while other architects, without actually possessing workrooms of their own, surrounded themselves with trained workers in all the many crafts who were skilled in interpreting or developing suggestions or plans supplied by the master. Thus every architect had about him a highly accomplished companyall working in close co-operation. The result was a degree of architectural and decorative harmony scarcely approached in later times.

antiques, partly because the present cost of really good examples places them beyond the reach of any but the very opulent, and partly because the development in America of furniture making and similar crafts has reached a point where authoritative and entirely reliable reproductions are available, which as a rule are more satisfactory for actual use than antiques. In the matter of furniture, for example, certain manufacturers are carefully reproducing the most valuable of renaissance pieces, in many instances from great museums or private collections, and their reproductions while leaving nothing to be desired upon the score of beauty of



Reproduction of Florentine Credenza from Davanzati Palace Collection
Made of walnut; first half of sixteenth century. Length, 61 ins.; height, 32 ins.; depth, 23 ins.