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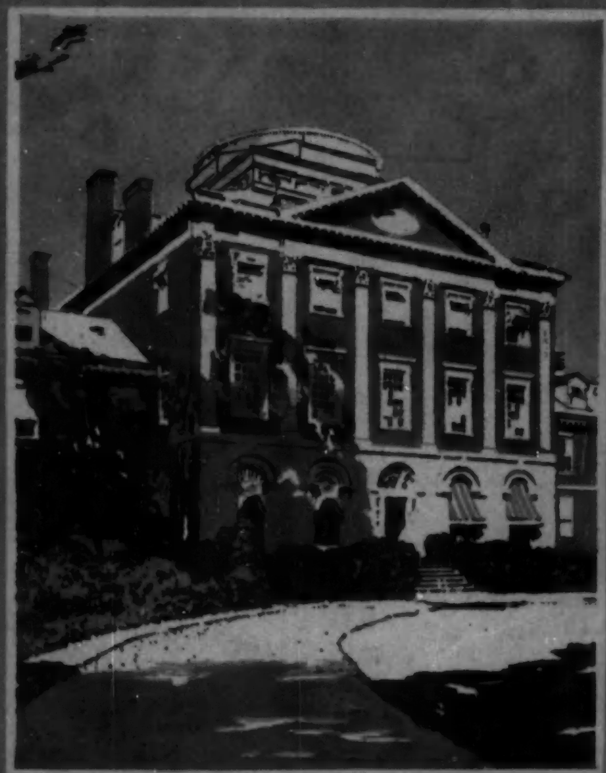

SEPTEMBER 1924

OFFICE BUILDING REFERENCE NUMBER

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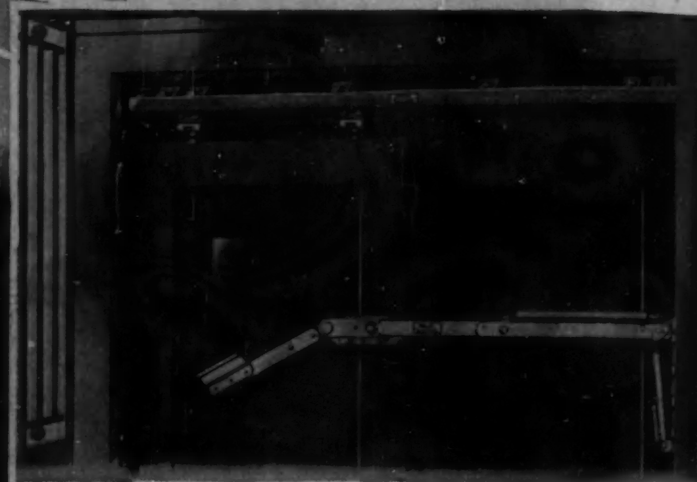

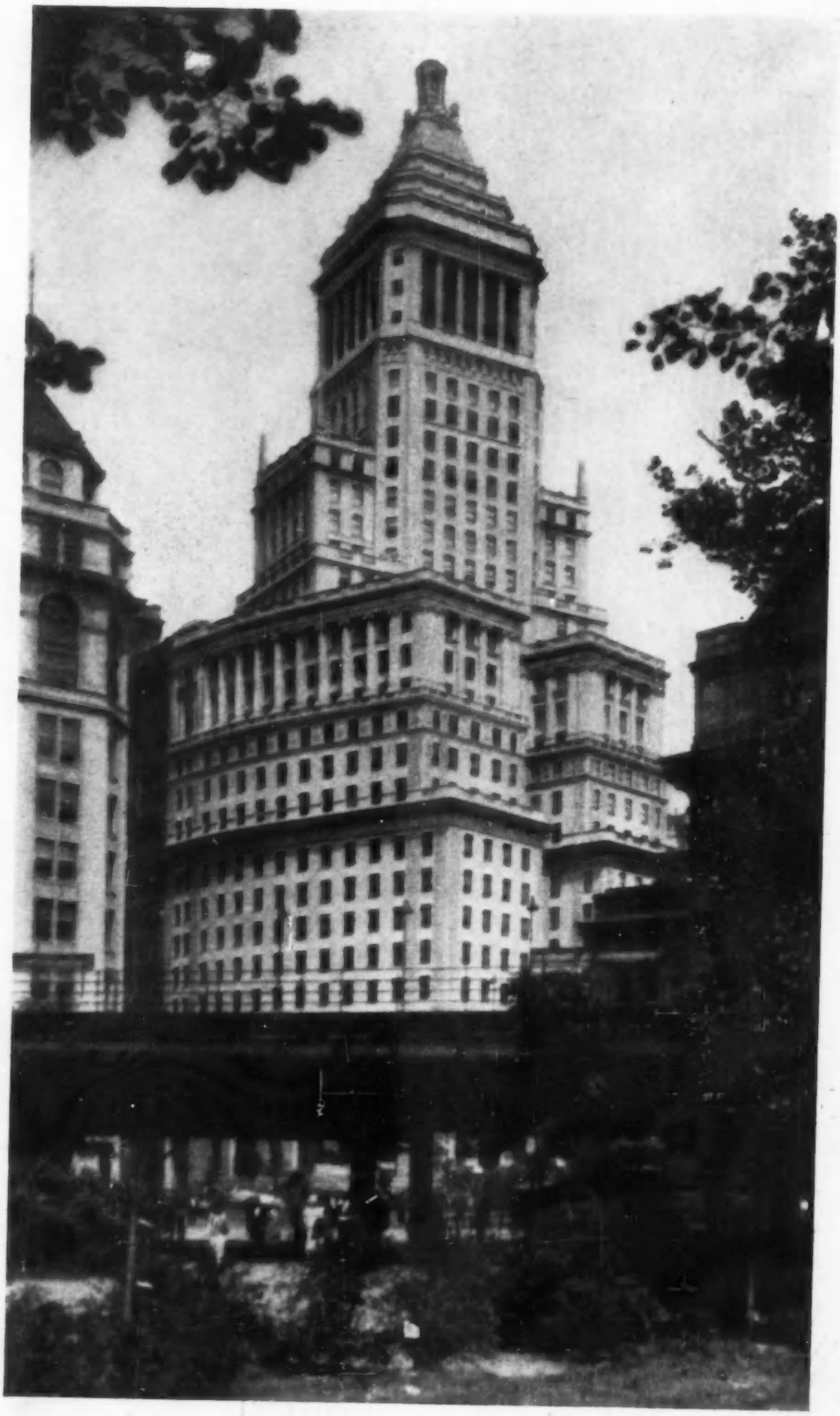

STANDARD OIL BUILDING, NEW YORK

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The Planning of Office Buildings

By HARVEY WILEY CORBETT
Of Helmle & Corbett, Architects, New York

THE modern office building is a complicated piece of machinery, designed to accomplish a certain definite purpose, to work in a particular way, to house a special group of people which has been created by the separation of home and business. It might be likened to an automobile, whose purpose is a little more evident to the casual observer. As a matter of fact, the office building is a more involved piece of machinery than the automobile. It requires even more imagination, ingenuity, and mechanical, electrical and engineering skill to create a good office building than an automobile which will run well under all circumstances and not discourage its owner with excessive gas and repair bills. The variety and types of office buildings cover quite as wide a range as do motor cars, and it often becomes the duty, sometimes the painful duty, of the architect to advise a prospective client with a Rolls-Royce ambition and a Ford pocket-book to compromise on a Buick grade of office building.

One sometimes thinks of office buildings as a specialty, and of some architects as specialists in this field, but when one stops to consider the factors which bear on the problem, such as irregularities of site, variation in zoning laws, trends of business communities, probable future changes in characters of neighborhoods, orientation, natural light, and financing, all outside or external factors, and then the varying types of office units, proportions of rentable and utility space, unit bay construction, fenestration, corridor widths, toilet facilities, entrance vestibules, elevator distribution, stairways, fire escapes, smoke towers, mechanical equipment, which are all internal factors, it is apparent that an architect who could master all these would be a "specialist" in any other field of building as well.

What then is the first step and how shall it be taken? Like crossing a modern city street, shall one jump into the traffic stream at the first opening and trust to luck and an all-seeing Providence that one reaches the other side in safety, or shall one quietly wait for the policeman's whistle and move with the changed direction of traffic? That, of course, will depend on whether one is catching a train or just out for a stroll. If one is a "promoting" architect one will jump in, take an option on a piece of property, make a sketch plan and a perspective showing crowded streets, and then hunt up a client. If one is a "designing" architect (and most architects have designs on something or somebody), one will at least wait for the client's whistle, and then come running with a design for a particular site which the aforesaid client owns or thinks he would like to own.

In any case, there will be observed the usual proceeding. The first step is to get a site, with or without a client; and the second step is to make a scheme for that site. But let this be said: one question may came up, often does come up to the architect who is working in this office building field, and that is, "Will it pay to build in a certain locality, and how large a lot must be secured to make building economically sound"? Such a question often precedes the securing of a site, and to answer it the architect must have certain general information which will enable him to give a first approximation, something which will show the financial feasibility of a building idea, before any site is selected, any option money paid, or any plans drawn. To do this one must discover some general relation between the square foot of rentable area, or as the British say "carpet area," and the cost of producing or creating that particular square foot of carpet area complete and ready to let.

In first approximations, cost of building is figured in terms of cubic contents. This means, first, that one must have a general idea of how many cubic feet of building are required to provide one square foot of rentable floor space. A calculation made on a large number of well planned office buildings shows that 16 cubic feet are required to make 1 square foot of rentable floor space possible. And this seems right, because if it be expressed in another way, each square foot of "carpet area" will require for itself some 11½ or 12 cubic feet (height from floor to floor above) of building cube. To this must be added that proportion of extra cubic contents which provides for walls, partitions, hallways, toilets, elevators, basement and cellar spaces, penthouses, roof tanks, etc.

Next one looks at a neighborhood where a building is contemplated, and decides from its general present character and possible future growth, the type and grade of office building that will go best in such a locality. It is possible to determine from buildings recently completed the probable cost per cubic foot of such a structure. A survey of the general character of the neighborhood will give the probable average rent per square foot of carpet area one may reasonably expect to get. This formula will show how it may be readily worked out:

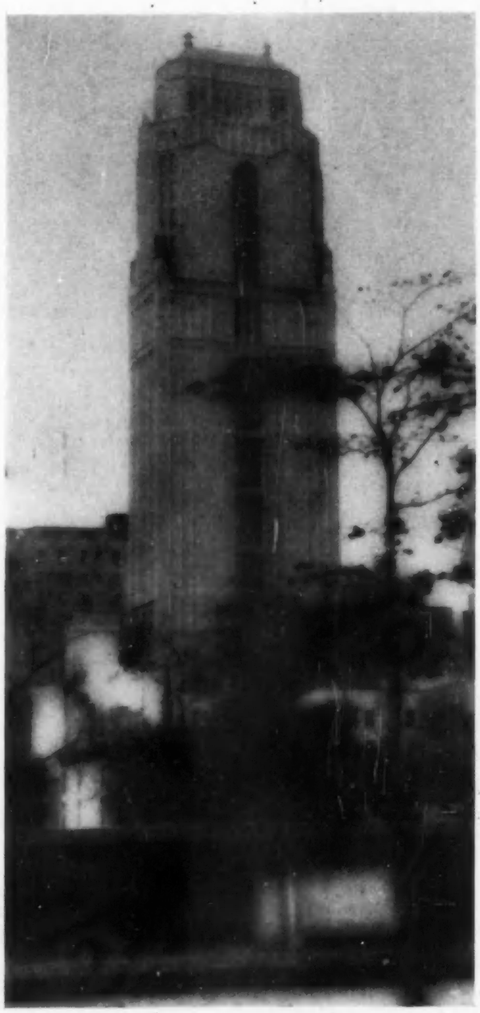
$$\left.\frac{\text{Rent of 1 square foot.}}{\text{Cost of 16 cubic feet.}}\right\}\text{Gross return on building investment.}$$

Take, for example, a certain type of office building which can be built today in New York for 70 cents per cubic foot. The same building properly located can be rented for $3 per square foot of carpet area.

$$\frac{\$3}{.70 \times 16} = \frac{\$3}{\$11.20} = 26.7\% \text{ gross.}$$

One knows at once whether this will bear further investigation; whether this gross return is enough to cover interest on property cost, building cost, taxes, sinking fund, depreciation, upkeep, maintenance, operating charges, etc. If it were 15 per cent, nobody would touch it; if it were 40 per cent, one couldn't keep capital off with a club! In fact, such a simple calculation as this will give a preliminary idea of how large a lot to try to get, how much to pay per square foot for the property, and how many stories to build.

But to return to the plan problem. Let it be supposed that a site is ready and that a plan is wanted; how shall it be started? The usual procedure in most plan studies is to start with the ground floor and build up. But in planning office buildings, one must reverse this process and start from the top and build *down*. That is to say, one develops a typical upper floor plan first, because there are a large number of typical upper floors to one ground floor. The major income is from these typical floors, and if some sacrifice in plan arrangement is to be made, it might better be made once on the ground floor than to be repeated 20 or 30 times on typical floors. In the same way, and for the same reason, the typical floor must be planned on the basis of the typical office unit. So one first plans this unit, then one strings several of these along both sides of a corridor, then places the necessary line of vertical circulation (elevators) at a central point off this corridor, making sure that no unfortunate tenant has to walk over 100 feet from his office door to an elevator; then are added some utility spaces in the form of toilets, cleaners' closets, vent shafts, flues, etc., and the plan is made. Of course it must still be warped, bent and twisted until it fits the lot, has assured natural light in all offices, will work to a possible steel frame, and made to conform in a few other ways which will be mentioned later in discussing this subject.



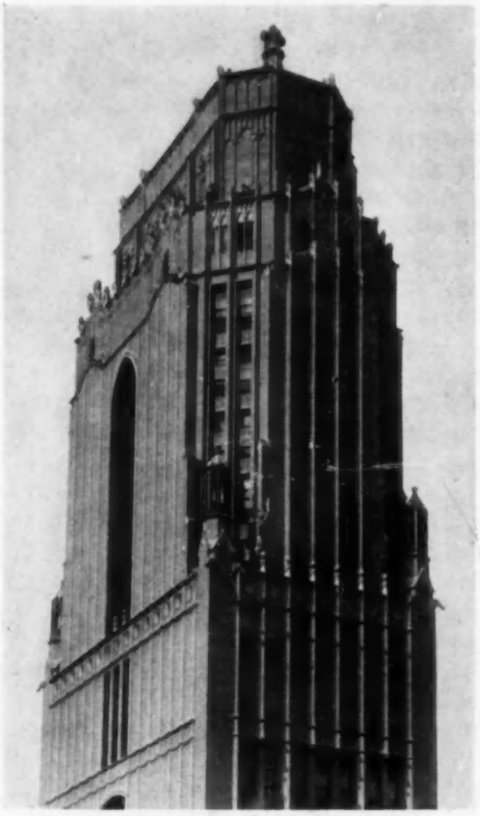
The Bush Terminal Building, New York
Helmle & Corbett, Architects

View Taken from Bryant Park Shortly After Completion

What is the ideal office unit? Fortunately, authorities differ; otherwise the poor architect would only occasionally be able to plan the "one perfect office building," whereas now every one planned, is the *one* perfect office building. But authorities do agree on one thing, which is that it is better business to construct less building, and have shallow offices, well lighted, than to have more building with deep offices poorly lighted. In other words, it is better to have less space (less capital investment) permanently rented at a high figure than too much space partially rented at a low figure.

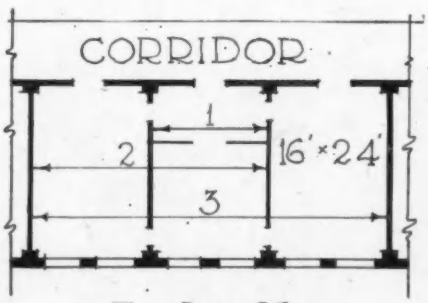
The depth of a well lighted office (by depth is meant distance from windows to corridor) is never over twice the clear ceiling height, and 20 feet is better than 25. C. T. Coley, Equitable Building Manager, says 24 by 16. The width of the office unit will vary with the distance between steel columns. Economical engineering consideration puts a limit on this of not less than 15 feet or more than 22. The structural steel engineer wants as many columns as he can get,—he wants them all evenly spaced and no offsets. The designer wants the columns where the architectural effect both of exterior and interior will have the best appearance and proportion,—and the owner doesn't want any columns anywhere. The architect, as usual, must maintain the proper balance among all these and really space his columns where, by the use of standard shapes and regular distances, he will get the freest unbroken floor spaces in the offices and yet secure economical steel construction. A great deal of good money is buried out of sight behind concrete and plaster in unnecessarily complicated steelwork, designed to meet some fanciful idea of the architect which seldom if ever justifies in its architectural impressiveness the practical sacrifices in space and money.

Corridors which are important, as a means of access to the offices, can give or destroy the *tone* of a building. One might suppose there was a practical width for a corridor running between offices and that it need never be wider than this. Probably a 4-foot corridor *would* serve all practical purposes, yet one would wish to be the last to suggest such a standard because corridor *appearance* is quite as important as corridor *width*, and the appearance is, first of all, a matter of proportion. A short corridor may be narrow, but a long corridor must be wide, and all corridors should increase in width as they near the elevators. A little extra space in corridors is money well spent and counts more than elaborate and expensive use of marble wainscoting and mosaic floors in corridors which are not designed wide enough.

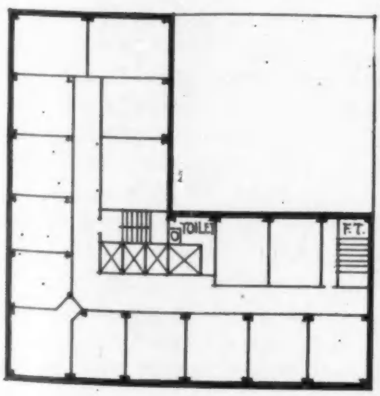


Detail of Bush Terminal, New York
Helmle & Corbett, Architects

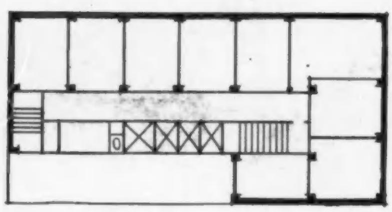
The diagram plans show a typical office unit with possible internal divisions, or the possible combining of several units in a single large office. The plot plan diagrams show possible dispositions on some standard lots as they occur in New York. It will be noted that "dark" spots in plans, such as always occur where wings join a main building, are used as far as possible for the necessary utilities, and this brings up the question of location of toilets, elevator facilities, stairways and smoke towers. All of these except the smoke towers may be inside in "dark" spots. Toilets can be artificially ventilated and lighted, but it seems better to place them on small back courts which would only give questionable office space at best, and to retain for the toilets some degree of natural light and full natural ventilation. The British building laws require outside toilets always; that is, they must always have outside windows, no matter how much artificial ventilation may be provided. They also provide separate toilets and wash rooms for executives, rather than attempting individual office lavatories. This seems to be a good idea if the grade of building warrants it. The British generally group all the toilets on the roof, as some of the older and lower class buildings do here, but modern practice in America is to provide ample facilities of this nature on every floor, and it is nearly always possible to find a



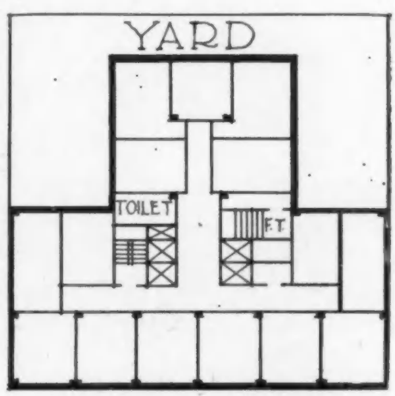
Three-Room Office



Corner Lot, 100x100



Corner Lot, 50x100



Interior Lot, 100x100

space in every plan where they can be placed without sacrifice of rentable area. Wash basins, of course, should be in every office. Plumbing lines can be run on inside columns near the corridor sides.

Stairways in American office buildings are merely fire escapes, they are so seldom used. Occasionally tenants will use them from floor to floor, and because the laws require them to be entirely enclosed with fire-resisting walls and doors, they can never be a conspicuous or even a visible feature; in fact, a man who couldn't read English couldn't find them. British practice, which limits the heights of buildings to nine or at the most ten stories, provides one conspicuous open stairway and then has one or more enclosed sets of stairs as in American cities. The tenants will actually use this open stairway, even when ample elevator service is provided. Such is the influence of habit.

The location of stairs in America is only a matter of utilizing dark spaces in the plan not suitable for any other purpose, and putting the stairs in them. If two stairways beside a smoke tower are required, then they must be well separated. But one would not think of stairs in an office building as an essential part of the vertical circulation. They are necessary, but they do not figure in the plan scheme as the elevators do. Elevators are the real means of vertical circulation, and their location in the plan is as vital as the location of the spinal cord in the backbone.

Elevators are an essentially American development; their use here is almost universal and would be sometimes regarded as necessary even in a two-story building. They are often the key to the plan scheme, and they also limit the area over which a building unit may be developed. By this is meant that elevators should be grouped together because the efficiency of the service is greatly enhanced. Even a small building must have at least two (to meet the emergency of a breakdown), and if more are needed, because of greater floor area or greater number of stories, they should be so placed that a tenant waiting for a car may be able to step easily to the first one that flashes a signal. A battery of six elevators, three facing three, is the ideal arrangement. Eight, four facing four, are possible. More than this are the equivalent of separate lines, because the passenger can at best reach only one of eight; the rest would pass before he could get to them.

As the problem increases in area, the number of elevators increases, and since, as was said before, the maximum distance any tenant should be expected to walk from elevator to office door is 100 feet, the amount of ground a building may cover (if fed by one system of vertical circulation) is pretty definitely limited. If more than one system is installed, it must be separated far enough to effectively serve a new area, and the plan problem simply repeats, *i.e.*, two buildings side by side, but with connecting corridors.

As buildings increase in height, but do not exceed a ground area which one group of elevators can serve, they may still require more than a battery of six or even eight. Thus the problem becomes two buildings, one placed on top of the other, with the vertical circulation of the top building running through the lower as an "express" service. As 100 feet each way from the elevator line is the limit one may go horizontally, it might be said that 15 stories is the limit of a single battery vertically. Zoning restrictions in New York limit very high buildings to towers which cannot exceed 25 per cent of the total lot area, so probably this theory will not be applicable to structures of over 30 stories in the future. A word about freight elevators in office buildings. They are necessary but not so important as in loft buildings, and should be located near the passenger cars, and finished well enough so that during rush hours, morning, noon, and evening, they can sometimes be pressed into service for accommodation of passengers.

The plan problem has been discussed from the angle of the various elements which compose it; let it now be examined in its broader aspects. The over-all width of a building wing, composed of two rows of offices flanking a central corridor, should be between 50 and 60 feet, and when such a wing is not too long and abuts the main building where the elevators

Bush Terminal, London, from Aldwych
Helmle & Corbett, Architects

Strand Facade of Bush Terminal, London
Helmle & Corbett, Architects

are, no utility should be placed at the far end which necessitates maintaining a full-length corridor. Such wings should be planned so they can be let in large units, getting rent for what is usually corridor space.

The question of the division of floor space into offices leads to the consideration of window spacing and height. The usual bay between steel columns is from 15 to 20 feet, in which bay experience and serviceability seem to dictate the use of two windows rather than three. One window to a bay gives too much wall space and too little light, while three windows give too little wall space and too much light. An even field of equally spaced windows is more elastic for interior division into offices. The *amount* of natural light is not as important as the quality of light. No one could do business in a hot-house. The average client has the mistaken idea that the larger and more numerous the windows are, the more desirable the building is, forgetting the annual cost of heating the window glass, of which the tenant closes off from 50 to 75 per cent with shades. High light is always better than low. Windows located with regard to exterior architectural effect, rather than to interior comfort and convenience, sometimes extend nearly to the floor, above which is left a dark void of wall space and ceiling. Many windows of average size are preferable to a few large openings, on the same principle that several well distributed ceiling lights in a room give better light than one powerful center light. Too much glass surface causes economic waste and physical discomfort. From both standpoints it is undesirable.

No general principle can be laid down for the planning of ground floors. Conditions vary so widely according to the local problem that the architect must use his planning ingenuity to make the most of the fixed conditions which come down to him from the floors above. Steel points are fixed (one or more may be carried on girders because of some special need of free space); elevators and their doors are fixed; stairs and smoketower stairs must reach a lobby and the street; all else is space through which an entrance hall to the elevators must be provided. The more direct this is the better. At the entrance, again, the tone of a building can be established. An ample entrance, well proportioned but not too large, leading directly to the elevators, will do more to make the building seem important (and make the tenants feel important) than any other interior arrangement.

In regard to the planning of basement floors, much depends upon the height and size of the building. A building of approximately 15 stories on a side street is likely to have only a basement and sub-basement, in which case the boilers, motors and other mechanical equipment are usually located on the basement floor. But in buildings centrally located and of many stories in height, as many as five floors are often built below the sidewalk level. In any case where the location or size of a building warrants it, the plan of the basement or first floor below the sidewalk level could provide for a barber shop, restaurant, bootblack stand, billiard room or bowling alley. In fact the space might be rented for any purpose or use not requiring natural light. In such cases the boilers and mechanical equipment are located on the sub-basement floors.

Now a last word about the exterior of the building. The title of this article is "The Planning of Office Buildings," and someone else is to discuss facades; but one cannot imagine planning anything without *thinking* of the possibilities of the facade. A good plan should give a good elevation; but it never does, except in the hands of a good architect, who, one may be sure, has been thinking about elevations (not just one elevation, but possibilities in elevations) during all the planning operation. American office buildings are unique in world architecture, because of their mass, proportion and silhouette and not because of their detail. Fine as this detail often is, it alone would never make a poorly proportioned mass distinctive. Mass and proportion and silhouette are matters of *plan*. Good detail is like the cultured manners of a gentleman,—a very splendid addition to a handsome man. Some men are handsome without manners, and are then interesting only at a distance. Many of our office buildings are the same,—interesting at a distance, which is perhaps better than not being interesting at all. The perfect building is the combination of mass, proportion, silhouette and detail.

The Office Building Problem in New York

By ELY JACQUES KAHN
Of Buchman & Kahn, Architects, New York

THE design of the modern high office building is unfortunately only in a very limited sense a purely æsthetic consideration. Before the construction of a building can actually be started, various necessary and important economic and technical problems have to be worked out so that the owners will be satisfied that property costs are fair, that the stability of the locality will maintain the basic land value and, further, that the complete analysis of building and land costs, with the carrying charges, architect's fees and other incidental costs, makes the financial aspect of the undertaking interesting to the investment companies and real estate operators. So it is safe to assume, if a building or permanent loan is to be obtained, that the practical requirements have been thoroughly studied and determined upon before lending companies agree to underwrite the operation's financing.

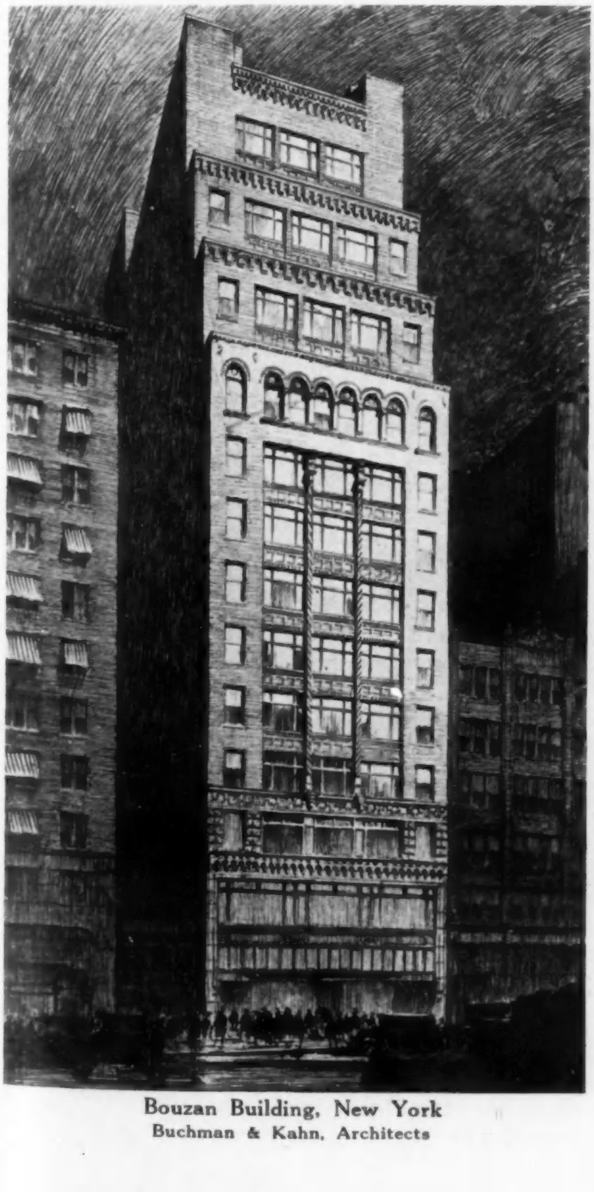
The site will determine the character of the structure. If it is to be an office or a loft building, quite different requirements will have to be met. If the neighborhood is likely to change within a reasonable period so that one type rather than the other will rent better, the building must be so flexibly planned and constructed as to facilitate such transformation. The height can be determined by computation of rents as against cost. A taller building requires more elevators, possibly express service, and as the height increases and setbacks required by the zoning law develop, the margin of safety between available areas and possible rents quickly marks a safety point which it is dangerous to ignore. It is obvious that for particular reasons, such as advertising value for instance, excess height is sometimes possible without consideration of cost or return on investment. In connection with the matter of height, it is interesting to note that a good deal of consideration has been given to the development of such sections of New York as that between Seventh and Eighth Avenues from 34th to 42nd Streets, where a number of fairly tall loft buildings are in close proximity to each other. The streets are narrow in proportion to their use, producing a freight congestion which grows more serious as the number of tall buildings increases. This feature of the problem is not covered by the zoning law, which interests itself mainly in the matter of light, open areas, safety exits, materials, construction and the like. The individual owner is little interested in what happens in a few years, so long as his building possesses the maximum of serviceability as well as accessibility.

No. 24 West 40th Street, New York
Buchman & Kahn, Architects

The loft building intended either for manufacturing or showroom purpose will have less expensive equipment in certain respects, especially as to finish of public spaces, though other requirements such as sprinkler system, possibly package and refuse chutes, add to the general costs. In the planning of the loft building, after column centers have been determined, particularly as to steel economy, the owner may discover that the number of columns is considerable. Then the delicate point arises as to how far one can go in reducing this number without too greatly increasing spans and cost in order to improve the rental desirability derived from unobstructed floor areas. Where the setback floors occur, it is necessary for the designer to take care where the columns are placed, so that all possible available floor space may be left for locating machines or showrooms or whatever else the building is planned for. The position of stairs, toilets, fire towers, etc., will have a bearing on the question of the subdivision of floors, though the positions of these main services together with the elevators and public corridors, if any, will be determined by the area of the plan. For an area approximating 20,000 square feet per floor, a central group of passenger elevators, backed by freight elevators, permits a reasonable distribution of floor space, while for smaller areas, particularly on inside lots, the service facilities will obviously find their places on the side.

Ceiling height can be determined after the block requirements of the zoning maximum are established by the particular facts concerning the use of the building. These heights from floor to floor will vary from 12 feet, 6 inches to 10 feet, 3 inches, which is a minimum for a building of average floor area. If the area is small, lower ceiling heights are more desirable on the theory that the perspective of large spaces with relatively low ceilings is disturbing. Due consideration is given to the location of sprinkler pipes and to the fact that merchandise must be kept at required distances from the sprinkler head levels. The court area prescribed by law is often not sufficient to properly ventilate the floor area, so an additional sacrifice of floor space may be of considerable value in improving what might otherwise prove to be dead space.

The distinction between the loft and office building has been emphasized because the rapid change of the character of districts in New York necessitates precaution and foresight if the investment value of the property is to be fully protected. The 25 per cent manufacturing clause in the building code makes it possible for almost any modern structure to be used to its fullest capacity, due to the fact that after computation of stock room, show room and incidental use of floor area, few loft buildings need more than 25 per cent for actual manufacturing purposes. The plan requirements to make this use possible are matters of secondary importance, as they refer particularly to stair exits, sprinkler sys-



Bouzan Building, New York
Buchman & Kahn, Architects

Garment Building, New York
Buchman & Kahn, Architects

The Arsenal Building, New York
Buchman & Kahn, Architects

tems, positions of fire towers and freight elevators.

The window problem presents special difficulties. The steel window, which does not need a large box to be built in the wall as the steel frame rises, has a definite advantage over the earlier prototype in wood. Without entering into the subject of the details of the windows themselves, it is pertinent to consider the spacing of the windows and the relation of the openings to the wall, not only as a matter of design, but primarily in relation to the arrangement of partitions that will permit a flexible subdivision into offices. There can be little discussion as to the value of maximum glass areas, though, to be sure, in proportion to the amount of glass area, the heating requirements are relatively greater or less. The happy medium can be reached only by a careful consideration of these facts and an agreeable arrangement of the fenestration as a matter of design. In the lower stories, show window requirements force upon the designer a definite struggle between the classic tradition of supporting piers and the present-day demand for a maximum amount of glass-encased display space. It is trite to assume that the modern designer thinks any longer that it is necessary to make his tall building look as though it were carried on masonry. As long as commerce persists, articles will be displayed and large windows will be required. Whether second or even third story show windows are advisable depends largely on the particular neighborhood and the character of the building. The material clothing the steel of the lower stories is of importance from a practical standpoint because experience has proved that it is wise to provide a hard substance such as polished granite to protect the piers to a height of at least 5 feet from the passing public. The narrow piers are frequently covered with a material of dark color, such as granite, marble or iron, so as to frankly make a dark base for the entire structure, assuming that the show windows themselves are dark in appearance as against masonry of light brick or terra cotta above.

It is interesting to record a growing desire among owners of commercial buildings to encourage the special study of equipment details in order to break away from the ready-made stock designs, using instead specially designed equipment possessing originality and beauty of detail. In the case of such essentially necessary objects as elevator doors, mail boxes, bulletin boards, elevator cars and the like, it is remarkable to what an extent today the designer is permitted to go in order to produce an interesting and ornamental solution. The carping critic may suggest that such expenditure is only good as advertising, but it seems to be proved that once the major details of the structure are fairly well developed, the architect is allowed a great deal of liberty in the minor details, if he himself has the imaginative ability to visualize the beauty and charm to be derived from specially designed details.

The matter of the facade is in itself a question of clothing. Given the steel skeleton and assuming that the architect has followed the designing of the skeleton quite as carefully as any other part of the structure, it falls within his province to allow his fancy to roam within the bounds prescribed by the particular piece of work. Sometimes the site may be located near buildings so conspicuously bad or good, as the case may be, that recognition of them must be taken in the character of his design. Unfortunately, the question of style, which is still one of our specters, has precipitated the spirited struggle now ensuing between the purists, who may have more books than imagination, and the other brave souls who are fighting for a logical architectural expression.

It is a fact that in these large buildings lie amazing possibilities of design. The difficulties are obvious,—the large number of windows, the rigid limitation of materials both from the standpoint of legal restriction and practical consideration of cost, the continuity of similar masses, all are characteristic of the present-day steel frame construction. But hope lies in frankness and honesty of expression.

Exterior Architecture of Office Buildings

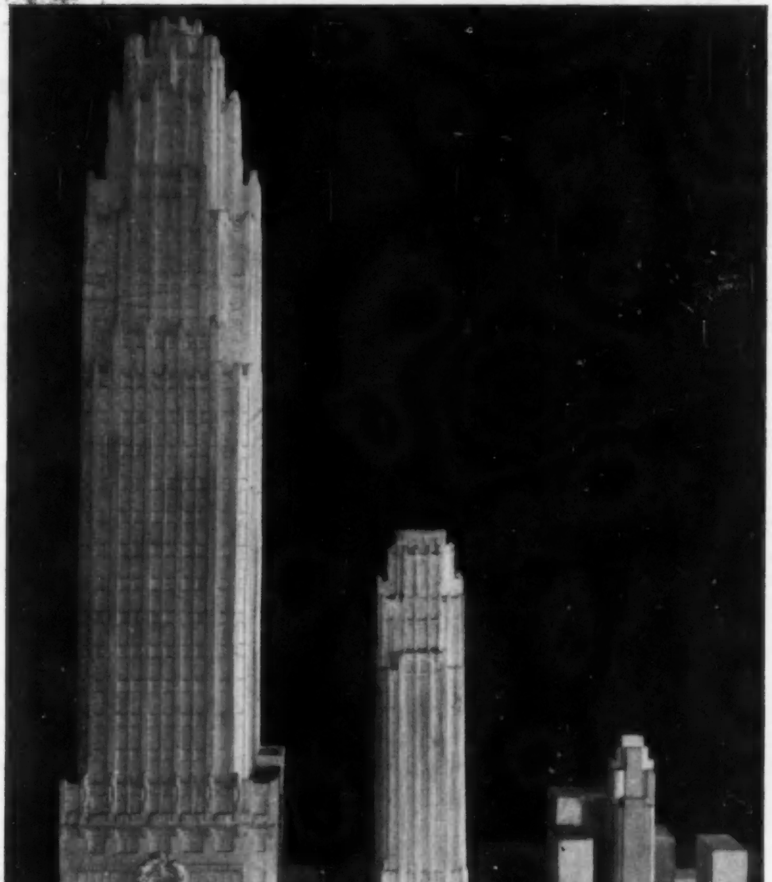
By RAYMOND M. HOOD, *Architect, New York*

WHEN asked to write an article on the exterior architecture of office buildings, I was at loss as to what to say, for the other articles in this same issue about window spacing, office arrangement, height of floors, and so forth, seem to cover all of the essential elements of exterior design. There remains only one thing further to say, and that is, take the exterior of your building, divide it into the proper number of stories, make an arrangement of windows that is dictated by the renting and lighting conditions, and then proceed to make the resulting mass attractive, by one means or another. This is the only way to go about it.

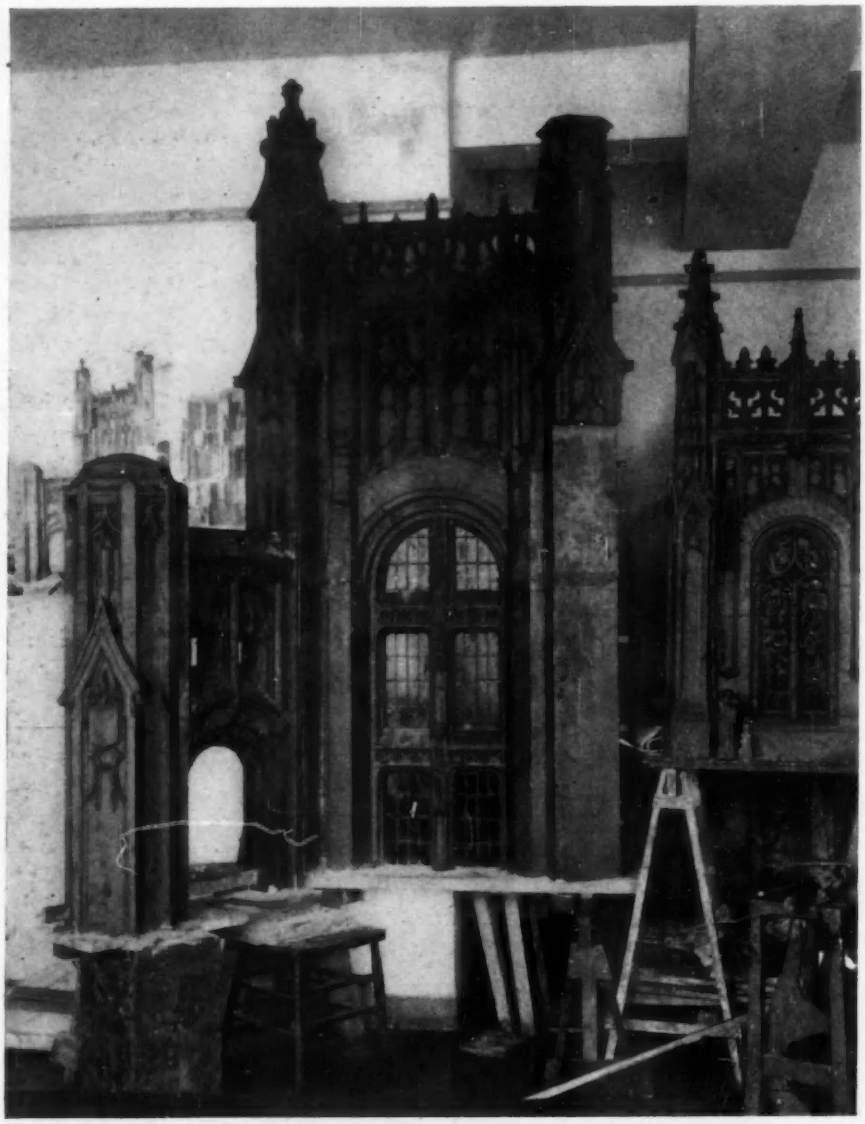
My experience, which in reality consists of designing only two skyscrapers, does not justify my expressing an opinion as to whether a building should be treated vertically, horizontally or in cubist fashion. On the contrary, it has convinced me that on these matters I should not have a definite opinion. To use these two buildings as examples, they are both in the "vertical" style or what is called "Gothic," simply because I happened to make them so. If at the time of designing them I had been under the spell of Italian campaniles or Chinese pagodas, I suppose the resulting compositions would have been "horizontal." I can see no reason in the world why there should not be as many horizontal or vertical lines in a building as a man wants, providing the horizontal lines do not waste floor height unnecessarily or the vertical lines sacrifice the window spacing unreasonably. The skyscraper problem is new; we have practically no traditions and, after all, serious architectural study is a new thing in this country; so it is fortunate that up to the present no one has formulated too strict a set of rules for our guidance. Another hundred years may, of course, change this; but if there is any one thing that gives reason to hope that a strong architecture will develop in this country, it is that we are all as free as the wind in trying out every idea that comes into our heads. Nothing but harm can result if at this stage in our development the free exercise of study and imagination should stop, and the standardizing and formulating of our meager knowledge and experience should now take its place.

It might be proper to say something precise about the different styles, but I am as much in the air about style as I am about everything else. At a dinner of architects at the University Club, Mr. Saarinen, after listening to one of our perennial discussions about style, the use of precedent, and plagiarism, in a delightful speech said that he could not understand why we discussed it so much, nor why a divergence in ideas should worry us. He spoke of the birds of the forest where each sings his own songs with a result which is not a discord but a harmony of beautiful melody.

After all, are any of our skyscrapers as slavish copies of any style as our critics like to think? Are the few ornamental details that may happen to be Henri II or Lucius the Great an essential part of the skyscraper problem? An office building is no more a slavish copy of the Chateau of Blois merely



Models Showing Development of American Radiator Co. Building
Raymond M. Hood, Architect



Models in Clay of Chicago *Tribune* Tower Details
John M. Howells and Raymond M. Hood, Associated Architects

ments of the exterior design of office buildings. In fact, viewed from any angle, I feel that while there is a great deal for the architects who are building skyscrapers to do, there is very little for them to say. Nobody has as yet produced a building so beautiful that we can all peacefully settle down, write the rules of the game, and copy it through all eternity.

The laws controlling the exterior architecture of skyscrapers can go no further, I believe, than this: that the exterior should be big enough to cover the inside of the building, and thick enough to keep out the weather; or, to borrow a remark of another architect, the facade must be useful. The remark about the size of the exterior is not completely idiotic. Anyone who looks out over New York or any other American city, at the forest of roof tanks, elevater penthouses and bulkheads that jut up against the sky, or who keeps a weather eye out for fire escapes and other excrescences, must come to the conclusion that the practice of putting an undersized exterior on a building has become altogether too common. Every now and then, if you slip around and take a look at a building with a pretentious front, from another street, you may find the rear exposed in a rather indecent fashion. I will not discuss my contention about the weatherproof qualities of the exterior.

Fortunately, however, pretentious, false tops have gone out of vogue for office buildings, as well as the fashion of putting an ornamental front on one or two sides of a building, according as it is located in a block or in a corner. The zoning law in New York has done a great deal to revolutionize and improve the design of the exteriors of tall buildings. As the setback of the upper stories exposes more wall surface to the up-gazing public, architects have been compelled to devote more time and study to the treatment of these pavilions or towers as the case may be. The tendency of today is to treat the entire building as though it were a detached, free-standing structure, introducing a new spirit of truth and consistency in external structural expression, which is now evidenced in every successful building.

because a little Francis I ornament is applied to it than an elephant with a yard of lace thrown over his back is a copy of a French manikin in a Paquin dress! Regardless of the amount of superficial ornament that may be copied, a first century Roman would at least be puzzled if he were placed in front of the Pennsylvania Hotel and told that it was a "Roman" building. Style and surface ornament are only the hooks on which critics hang their wares, and in reality, are they not a very minor and unessential part of the problem? I will admit that I have one aversion, which is rattling the bones of a five-story Italian palace and stretching them out to do duty for a 35-story office building. That aversion, however, is personal, and has no more value than the pet aversion of anybody else.

The Editor has suggested that I am supposed to have some particular theories about color. My convictions and theories on this phase of the subject are about as strong as my convictions on the other ele-

EDITOR'S NOTE

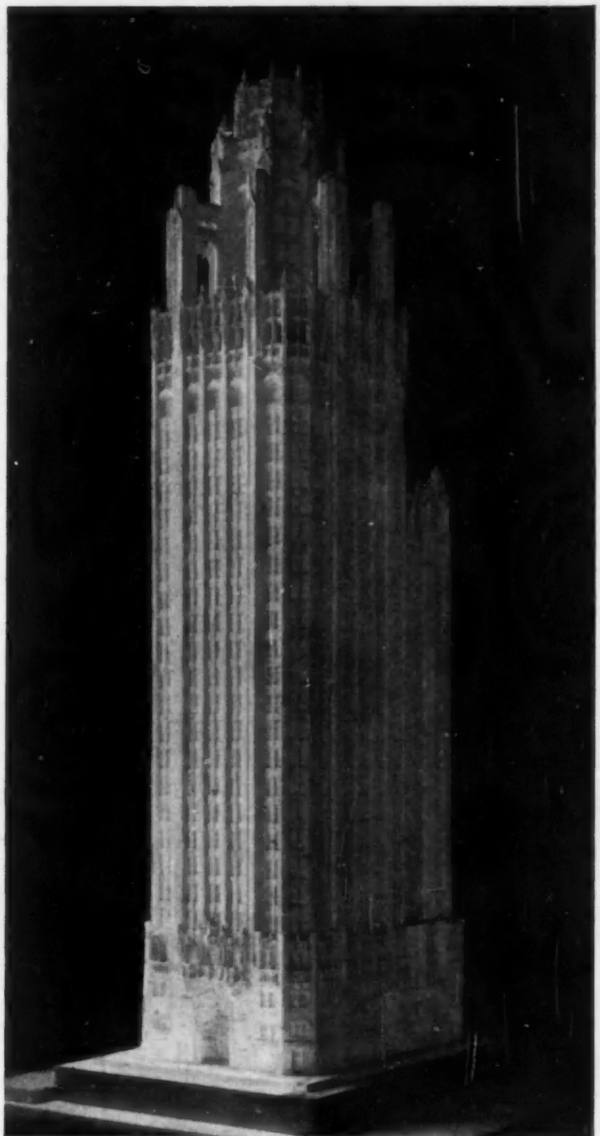
IN the brevity of his remarks on the Architecture of Office Buildings, Mr. Hood has apparently been influenced by his belief "that while there is a great deal for the architects who are building skyscrapers to do, there is very little for them to say." It is due to this modesty that the Editor feels justified in adding a brief note on the manner in which Mr. Hood studies the problem of office building architecture. He studies his problem in the round rather than in the flat; in three dimensions rather than in two. In other words, given the number of stories and the floor area required to produce an adequate return on the investment and the amount of open space required by law, small scale plaster models of the building are made. From the first model, which shows only the mass of the building and its relation to surrounding structures, the owners can obtain an adequate idea of the amount of light and air obtainable on all four sides of the building. This is particularly important in the case of structures located in a block rather than on a corner, such as the new American Radiator Co. Building, where an unusually successful plan has been evolved by treating the building as a free-standing square tower with all of the elevators, stairways, halls and toilets grouped at the center of one side of the building, leaving the other three sides open to the light and air. By this plan the entire rentable floor area is adequately lighted, and the semi-dark center, found in many office buildings, is completely eliminated.

From the small scale model, showing the mass of the building with blank wall surfaces, setbacks and projections, a larger scale model is evolved which carries the design into the field of exterior architectural expression. The general lines of the building are worked out in greater detail, and the windows and the floor levels are indicated, as well as the general decorative treatment. Finally a third model at a still larger scale is made, on which is shown quite accurately the architectural ornamentation. No line drawings or even colored perspectives can give the owners quite as definite a mental and visual impression of what the completed building will look like as does a carefully and accurately made scale model.

Mr. Hood carries this elimination of drawn elevations and details still further. Skilled modelers are employed who take from the scale model the suggested architectural detail and develop it at a large scale in modeling clay, from which the play of light and shade, relative projections and contours may be carefully studied. When these studied models are satisfactory to the architect, three-quarter and full-sized details are prepared from them by the draftsmen. In this way vigor and vitality are given to the detail, rarely attained by the old method of tracing paper study. It is said that Michaelangelo, in all his architectural work, first modeled the details from which his builders and stonecutters directly executed the work.

Illustrations of the models of Mr. Hood's two skyscrapers show that he has a deep appreciation of the importance of strongly marked vertical lines, emphasizing and indicating the steel frame which the exterior architecture protects and encloses. The termination of these vertical lines or piers in ornamental buttresses and finials is appropriately and successfully handled. In each design the lower stories form a projecting screen, back of which rises the towering bulk of the building. This treatment permits the introduction of large show windows on the sidewalk level, without detracting from the apparent structural strength of the base of the building. The use of two windows to a bay, rather than one or three, has been proved to be more practical for later interior arrangement as well as to be more effective in the exterior dividing of the facade. Attention should also be called to the pleasing treatment of the corners of the *Tribune* Tower and the American Radiator Co. Buildings, where quarter-hexagons fill up the angles formed by the center bays of each facade.

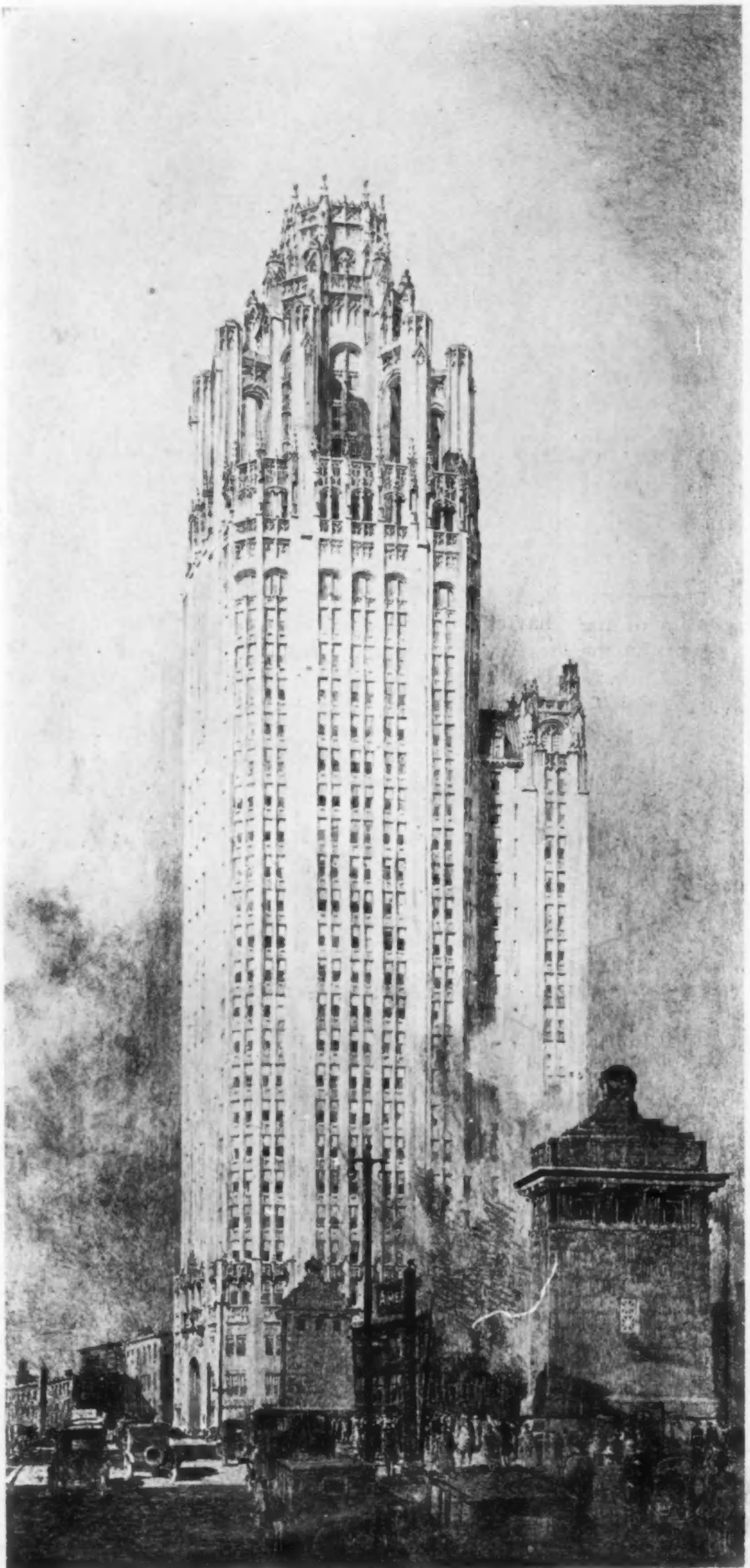
Although Mr. Hood may modestly refrain from expressing any definite opinion on the architecture of office structures, his work speaks for itself, showing as it does a grasp and understanding of the practical as well as architectural requirements of office building design and exterior structural expression.



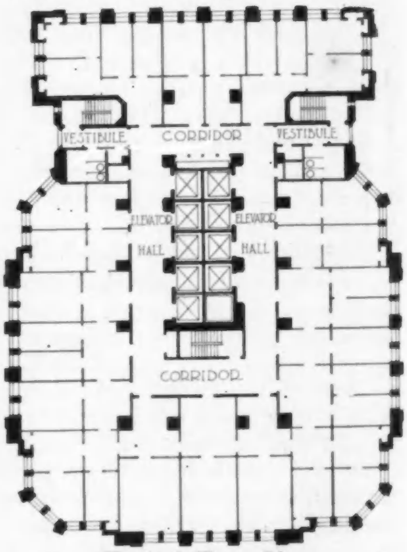
Model of The Chicago *Tribune* Tower, Chicago
John M. Howells and Raymond M. Hood, Associated Architects

The *Tribune* Tower Building, Chicago

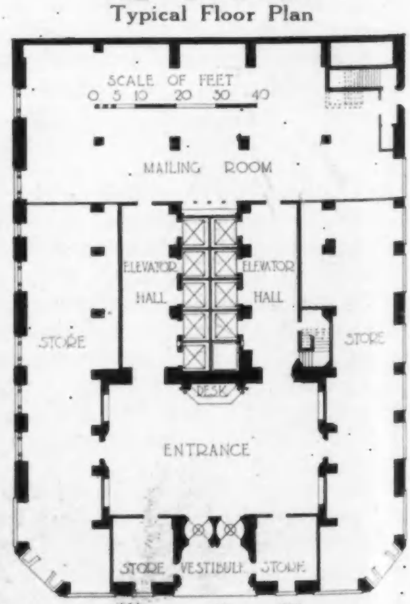
JOHN M. HOWELLS, RAYMOND M. HOOD, Associated Architects



AWARDED, after one of the most extensive competitions ever held, to John Mead Howells and Raymond M. Hood, Associated Architects of New York, the Tribune Tower Building is now in course of construction. Granite and limestone are being used to cover the steel frame construction. The floors are formed by concrete slabs. Steam water tube boilers will supply the heat. Electricity for power and lighting will be supplied by a service company. The electric elevators will be finished in steel, enamel painted. The windows will be metal frame and sash.



Typical Floor Plan



Entrance Floor Plan

Some Recent Office Buildings in San Francisco

By WILLIAM C. HAYS, *Architect, San Francisco*

AMONG those critics called "fearless" may not some be merely brazen? Are there others merely cruel? Have some the courage of half-knowledge, and others only that of mean souls? On the whole, it is an unwise critic who does not at least try to envisage for himself some mental picture of the contemporary drift before daring to enter upon an estimate of specific things. A little light, first, on what the world is thinking and doing!

Where, with the least difficulty in research, can the most authentic and the most recently collected data be found on the subject of this paper? Before me, the ink scarcely dried on the many plate pages, is the Book of the Chicago *Tribune* Tower Competition. A most alluring prize was the award which would—and did—spur the spirit of emulation among many of the virile designers of our time. "To erect the most beautiful and distinctive office building in the world" (to quote the program) is an inspiring opportunity for any and all of us. Here in this book, then, is our far-reaching symposium.

Just what bearing the designs submitted in the *Tribune* competition have upon the problem of the office building in general, it is hard to say. By the very wording of the title there is indicated a certain *parti,* because of the definite designation as a "Tower." Perhaps herein is the explanation of the type of architecture which is so prevalent in the competition, because, setting aside differences of stylistic treatment, and reaching down into more fundamental matters than the possible division into Classic, Gothic, "Modern" and like categories, there is evident among these projects a conviction for the dominance of vertical lines. Yet this is hardly to be taken as indicating that the controversy of the last 30 years or so is over, and that the expression of the steel frame, as such, is finally accepted as the American ideal in the architecture of the tall office building popular today.

To be sure, a few of the designs are insistently heavy masonry in indication, with their look of self-bearing walls pierced by countless small office windows. Here is evidence that there are still strong contenders who hold conservatively to this type, and some of these drawings are masterly works showing, by the composition of their various parts, ingenious devices to rise above insurmountable difficulties, relied upon in vain. These, based upon Classic or Renaissance models, show the weakness inherent in the relation of crowning tower to lower structure, when they are compared with the drawings in which the vertical lines are dominant. One of them, for example, resolves itself into a glorified Roman temple, reminiscent of the *Maison Carre* at Nimes, with a pinched stylobate, the whole lifted hundreds of feet in the air over a pedestal which is, in itself, beautifully complete. Still another has a crowning element which consists of the New York Stock Exchange and, since that seemed insufficient to its author, upon its back is carried the Masonic Temple of Washington, both at diminutive scale. Dividing such compositions at their main cornices, there remain two satisfying structures, neither, however, having integral relation to the other.

Another type of composition, occurring frequently, showed the influence of the New York "Setback Law." From our European confreres came schemes of many-storied steep gables,—these of a type which, though alien, give much food for thought; and one of the American designs showing this *parti* is among the best in the book.

Responding to the suggestion in the title of the program, however, are the great majority of studies, more or less successful, including the winner of that most enticing "Fifty Thousand Dollar Prize," and going down through the class of the "also rans." It is this concurrence which might reasonably be taken as indicating in a general way the trend which is winning out in the tall American office building today. Those qualities which distinguish such designs as a group are: first, the essential unity which has come from harmony between the

Entrance to the Standard Oil Building
George W. Kelham, Architect

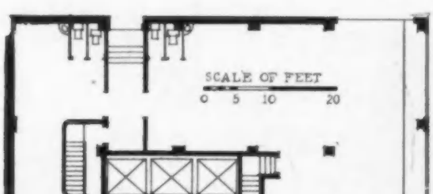
Alexander Building, San Francisco

soaring lines of encased steel columns and the vertical massing of the building as a whole; second, the omission of large cornices and the suppression of other projecting horizontal elements; third, the potentialities in nice choice of line for subdivisions in height, whether by slight belt courses or by specially developed architectural forms; fourth, common to all,—whether good or bad in detail,—the mobility of skyline, not solely attributable to the tower nature of the problem.

We must not be carried away and attach too much importance to this fourth deduction, else we find ourselves in controversy with the organized Business Building Managers who will point out that the top floors of the Woolworth Building are a losing gamble, and that from the commercial point of view only flat roofs, with upper stories of relatively large renting areas, will be tolerated. This argument is unanswerable, for the office building is built to house offices and to earn money. Let us pause here a moment. The *Tribune* Tower is different. It is not, *per se,* intended to be a money-maker. Like the Woolworth Building, it is a money-spender, for it is the main advertising project of a great daily newspaper, which has taken this novel way to use at least part of its publicity budget.

And now, to come to San Francisco! If, in the light of this analysis of what may be taken as the authoritative symposium on the subject of office buildings, we have nothing conspicuously novel among the newer high buildings in San Francisco and its vicinity, there are, nevertheless, several works which are to be regarded as distinct accomplishments if compared with actual structures elsewhere; even though most of our buildings have been of such nature that the architects have been motivated at least in part by "earning capacity"—justifiably so in every instance.

In any description of the recent works there is no question as to the according of first place, all considerations of architectural merit aside. From its size, and from the fact that its architect was unhampered by commercial limitations,—if, in fact, not encouraged to spend liberally,—the Standard Oil Company's



Plan of Ground Floor

P'an of Typical Office Floor

Lewis P. Hobart, Architect

Left, the Matson Navigation Co. Building; Bliss & Faville, Architects. Right, the Pacific Gas & Electric Building; Bakewell & Brown, Architects

new building deserves notice. Just as the king of small-denomination-trading encouraged Cass Gilbert in the monumental design of the Woolworth Building, so it seems to be the policy of the master factors in the great economic necessities (such as oil) to "urge on" the rarely lucky architects designing their structures. Plans of the group of architects collaborating at the present time in the construction of the New York building of the Standard Oil Company are an instance of this tendency; and in the San Francisco commission Mr. Kelham is said to have had similar latitude. In the light of the liberty given him, much is to be said for the restraint which Mr. Kelham has exercised. The building is rich, if not opulent, and yet it is marked with simple dignity, as if one would say "I might do more, but why?"

Since the best material for exterior walls in California is granite, of which the supply is seemingly inexhaustible, it is natural to expect that the Standard Oil Company's building should be carried out in this material. Actually, the walls of the upper stories are not of granite, but of a clever terra cotta imitation, and it is, perhaps, a safe assumption that considerations of time, delivery and setting had more weight with the owners than the question of cost, when it came to this substitution; for in respect to labor in the local stonecutting and setting industry there are serious limitations.

Some adverse criticism has been heard regarding lack of color, and on overcast days the monotone of this building may be uninspiring, if not depressing. To answer this criticism it need only be pointed out that the architectural character is derived from anterior sources in which rigor or austerity is the outstanding quality. For one's subconscious mental reaction to this building is "Florence in the time of the *Palazzo Vecchio*, the *Bargello* and *Or San Michele*." In these examples, color is the last quality thought of; the originals are forbidding to the last degree.

The Standard Oil Building has also been criticized because of the superposed stories above the bracketed cornice-balcony; scarcely valid, this, because rarely among derivatives from Italian models has there been produced so complete a unity between upper stories and shaft. This unity is brought about by the introduction of a story above the balcony and below the colonnade, which is exactly the same as the stories in the tall shaft below, even to the subdivision of the windows. A technician's trick, if you will, but certainly masterly. And to show this essential unity more vividly, one need only to glance at the many other buildings in which glorified penthouses rise above complete and finished buildings, in the form of loggias, arcades and "what nots," all of which tempt one to flick them off with the thumb and forefinger.

Some years ago, in a paper on the subject of "Burnt Clay's Share in the Reconstruction of San Francisco,"* the present writer had occasion to pay tribute to the Newhall Building, recently completed by Lewis P. Hobart, who was then a newcomer in

**The Brickbuilder*, October, November, December, 1910.

San Francisco. To the same architect is now due credit for the Alexander Building. The site is small in area,—only 60 by 68 feet,—but the building is large in its significance. There can be no question that full consideration has been here given to the legitimate aims of the office building architect,—increase of rent and decrease of first cost and upkeep, which problems have been cleverly solved. Compared with some of the other and larger buildings, the offices here are not only well lighted but also well arranged to suit the majority of tenants. Modifications are possible at small cost. The type of fenestration is such as to insure flexibility, so that yet with this great lightness of effect the building has a solidity in structural sense rarely, if ever, seen in the more "heavyfooted" type of pseudo masonry wall construction of the Renaissance derivatives. Furthermore, of the buildings described this seems to be the most completely logical, in that all projecting cornices are eliminated, thus guaranteeing full penetration of light into the street, after the neighboring corners are built up to full height.

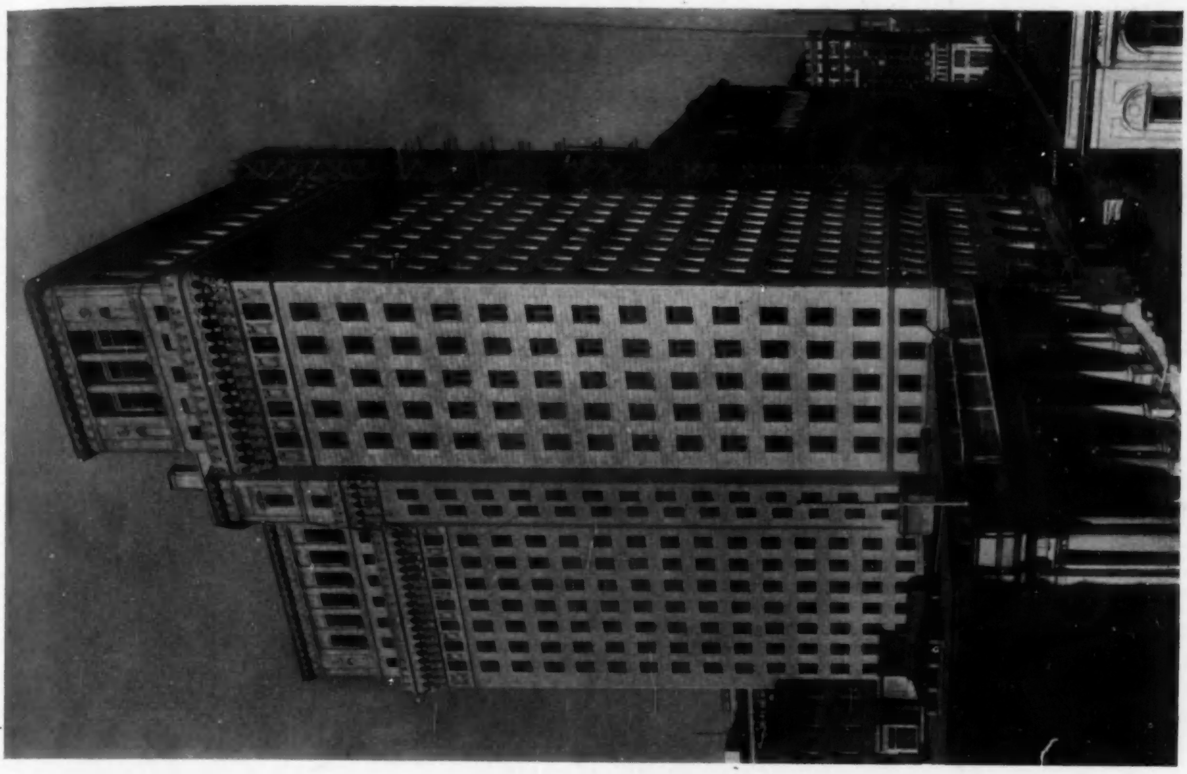
In the folly of pride, a small-town California paper not long ago paid tribute to the city's newest bank building in these intemperate terms of praise: "This will probably never be counted as one of those buildings which are eyesores in the community." I would be more modest and prophesy for the Alexander Building only that it is destined to be a lasting monument to the discrimination, sound sense and good taste of its author and its owners.

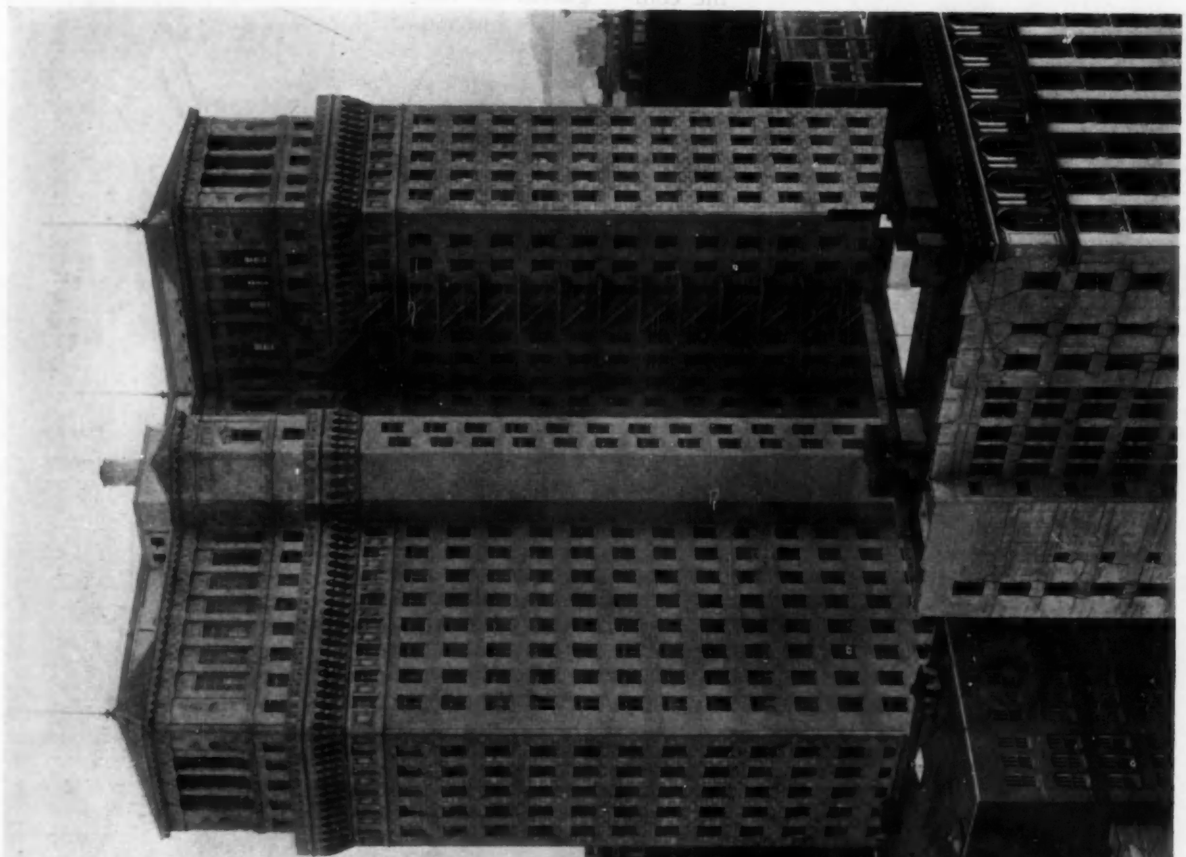
There is shown among the illustrations a "stunt photograph," showing Bakewell & Brown's Pacific Gas & Electric Building, standing up solidly in its place adjoining Bliss & Faville's Matson Navigation Co. Building. When the photograph was made the land for the former building was not even cleared of the shacks which stood there. Even at the time of this writing, the pouring of concrete in the basement walls is scarcely finished. The picture, as shown, is of the plaster model, a photograph of which has been combined with one of the site, care being taken in making the point of view, the direction of lighting, and the scale of the two pictures exactly coincide.

This Pacific Gas & Electric Building and the Matson Navigation Co. Building together occupy an entire block. The latter building was under construction when the plans for the former were begun. As soon as the scheme for a plan was settled, the next thought of the architects was to ascertain the dominant levels from the adjoining structure so that they would be carried through. Nor should it go unnoticed that here is one of those rare instances when an architect is so considerate of the public as to make the horizontal lines of his building harmonize with those of its neighbors.

But three buildings are described at length in this brief paper. Many others are well worth mention and illustration, did space permit. The Matson Navigation Co. Building, by Bliss & Faville (referred to here in just a word), the Balfour Building, the Federal Reserve Bank and other works of Mr. Kelham; the tower addition to the Oakland Bank, by Reed & Corlett; these and others are the record of an active period of large construction, the average standard of which will not suffer by comparison with undertakings of similar importance East or West.

California Commercial Union Building, Alexander Building, and Standard Oil Building, San Francisco





REAR AND STREET VIEWS OF THE STANDARD OIL BUILDING, SAN FRANCISCO

GEORGE W. KELHAM, ARCHITECT

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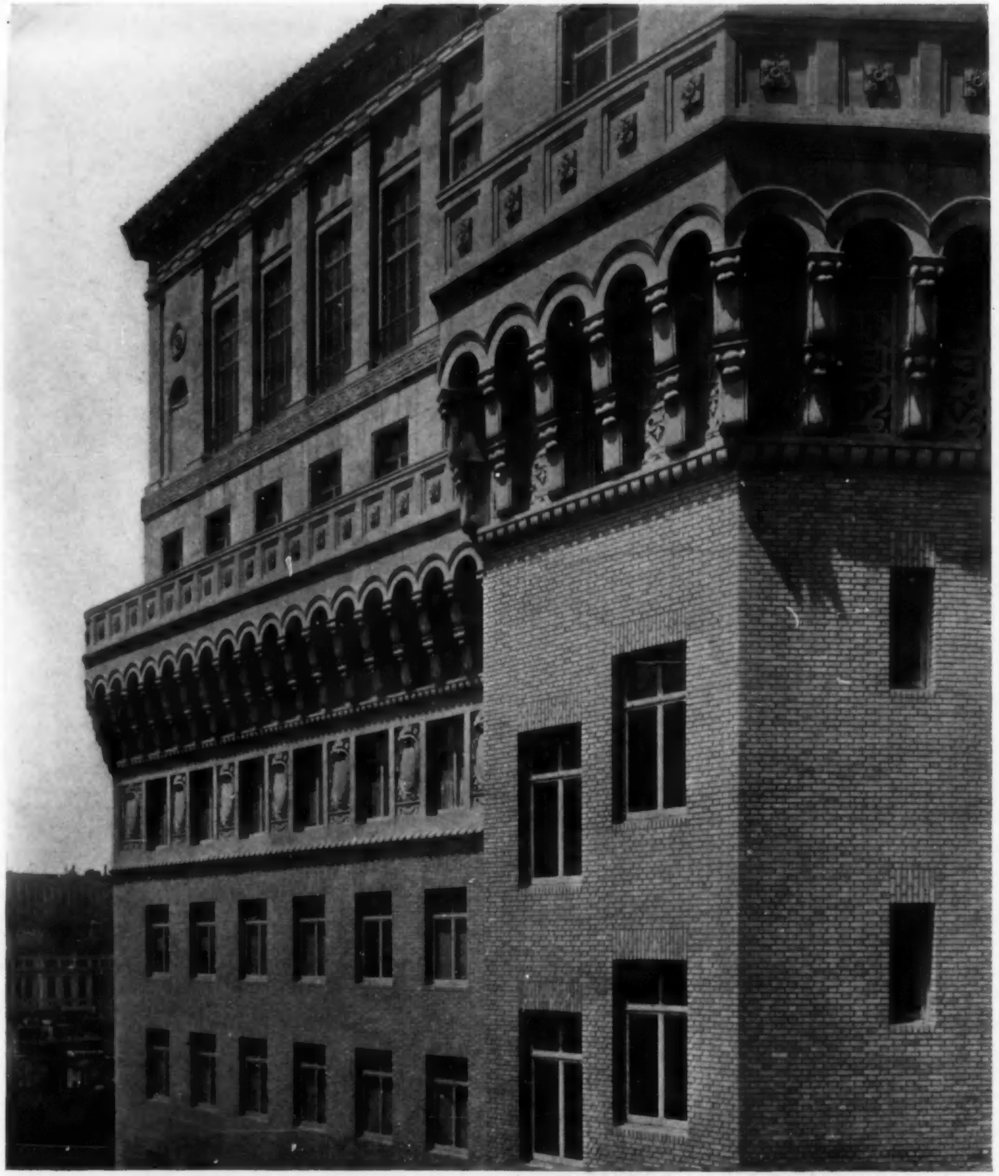
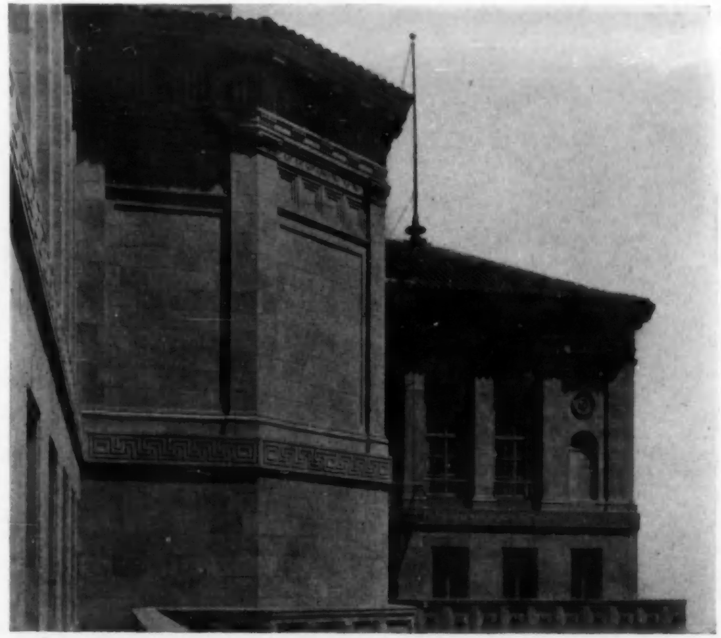
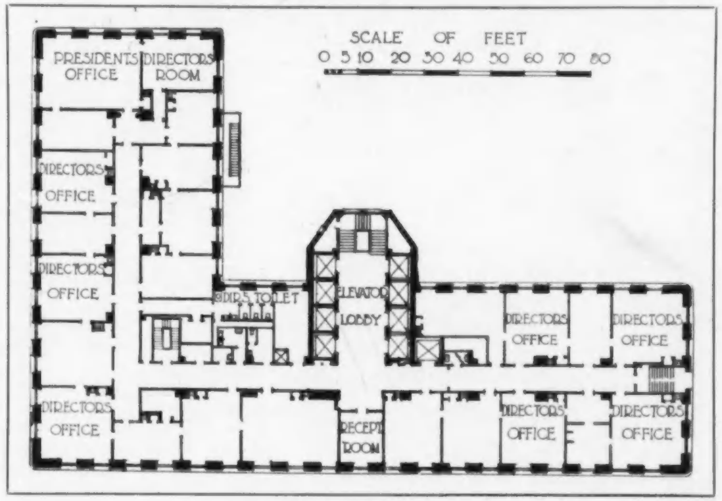


DETAIL OF CORBELED GALLERY USED TO CROWN THE MAIN FACADE



DETAIL OF TOP OF STAIR TOWER



TYPICAL FLOOR PLAN

STANDARD OIL BUILDING, SAN FRANCISCO.
GEORGE W. KELHAM, ARCHITECT

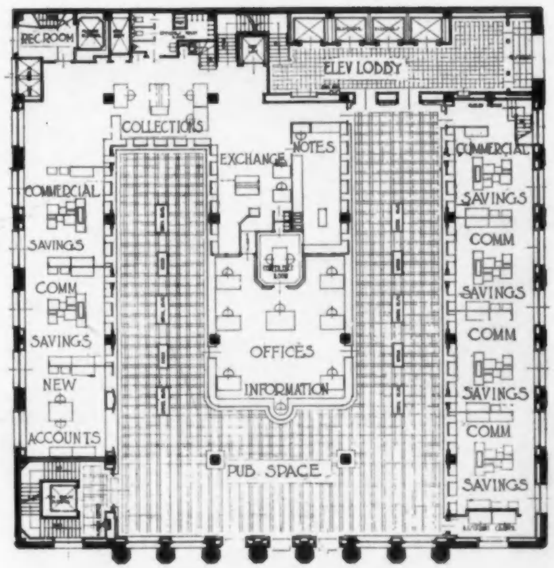
MAIN ENTRANCE TO THE BANK OF ITALY, LOS ANGELES
MORGAN, WALLS & CLEMENTS, ARCHITECTS

GENERAL VIEW OF THE BUILDING

In the Bank of Italy Building materials are granite for the first two stories, brick for the intermediate stories, and terra cotta for the upper stories. Construction: steel frame. Heating: vacuum steam. Electric service: typical of office buildings of this class. Type of elevators: 1 to 1 multi-voltage, electric. Windows: steel and wood. Finish of corridor walls and floors: 5-foot marble wainscot and marble floor. Cost per cubic foot: 60 cents. Cost of banking offices on first floor not included.

The plan is shaped like the letter U, with a court in the center, above the banking floor, which lights the bank, and all the inside offices on the ten floors above. As the bank occupies the entire first floor of the building, the entrance and lobby, where the elevators connect with the floors above, are located at the rear corner of the building, back of the bank. Finely executed Renaissance ornament marks the building's detail, adding to its dignity.

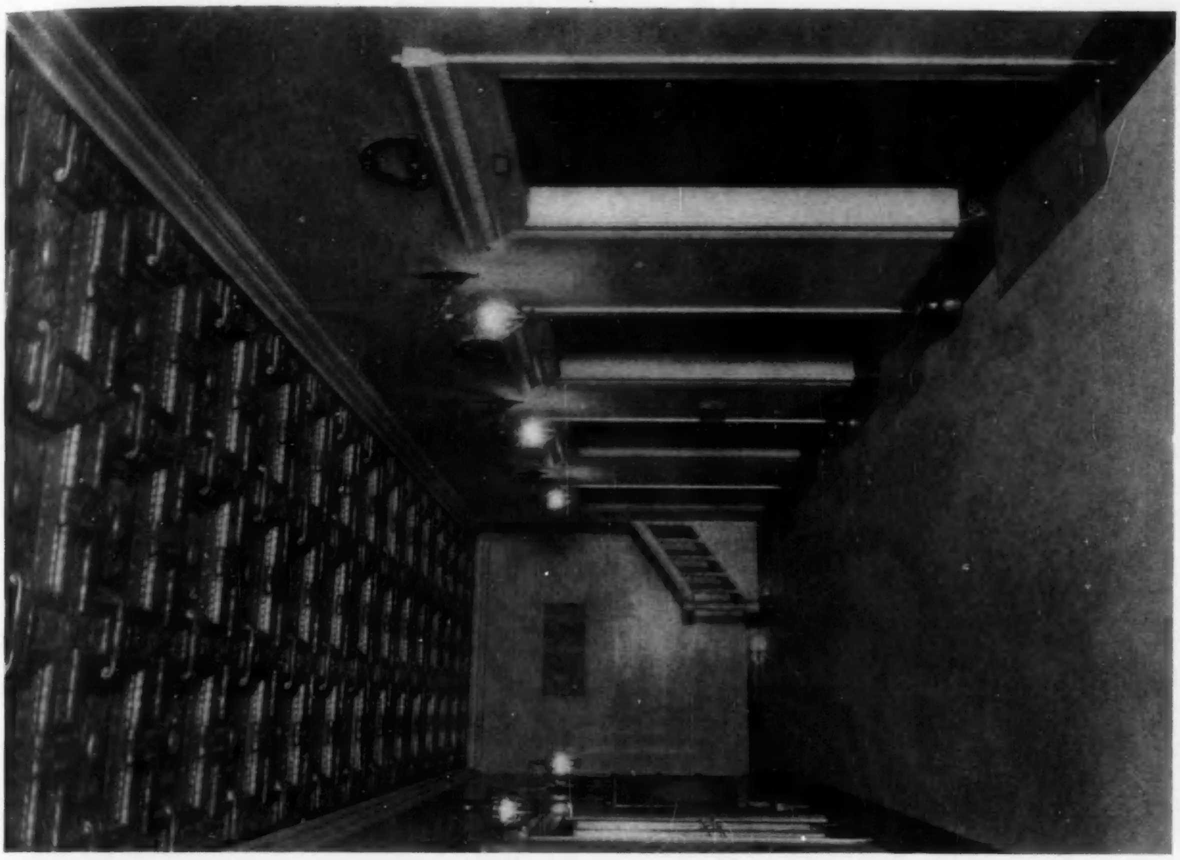
PLAN OF TYPICAL OFFICE FLOOR



PLAN OF BANKING ROOM

BANK OF ITALY BUILDING, LOS ANGELES
MORGAN, WALLS & CLEMENTS, ARCHITECTS

VIEW OF BANKING ROOM



PUBLIC ELEVATOR LOBBY ON ENTRANCE FLOOR

BANK OF ITALY BUILDING, LOS ANGELES
MORGAN, WALLS & CLEMENTS, ARCHITECTS

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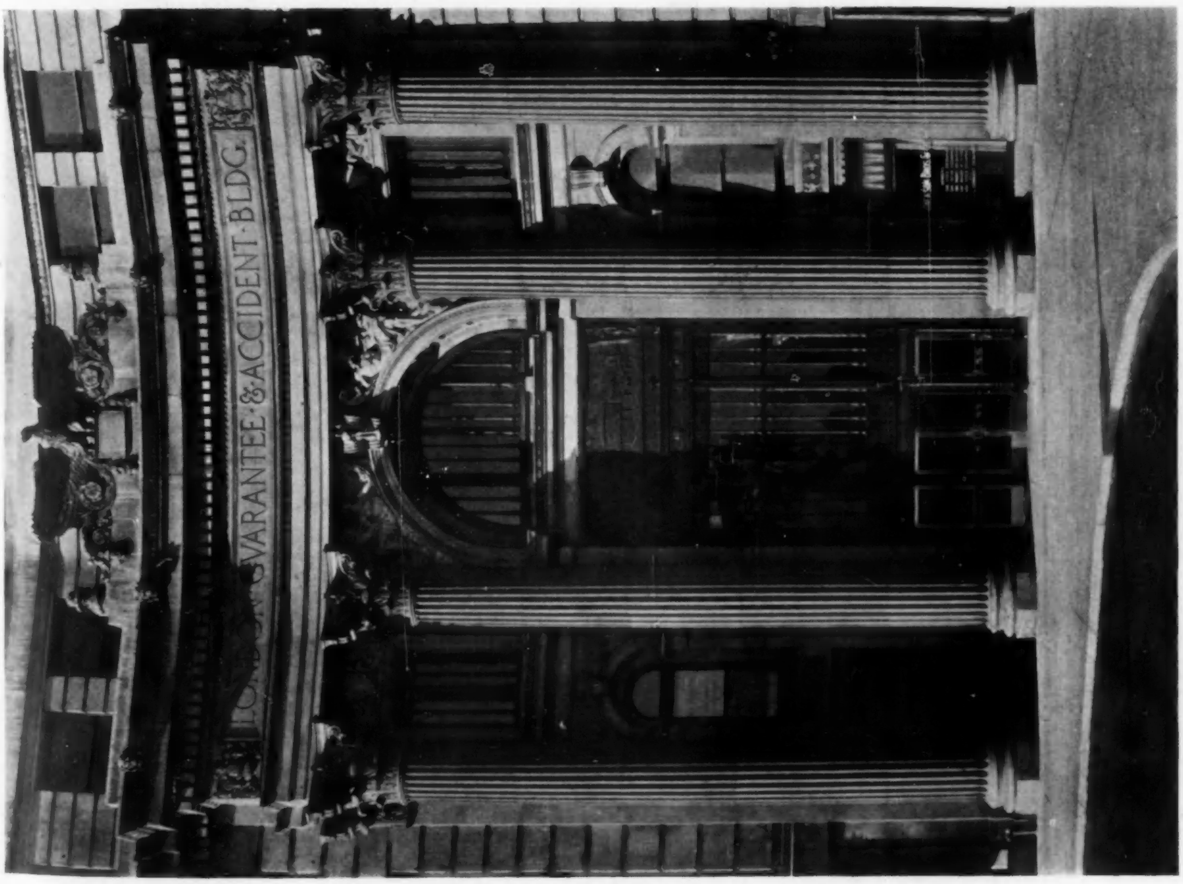
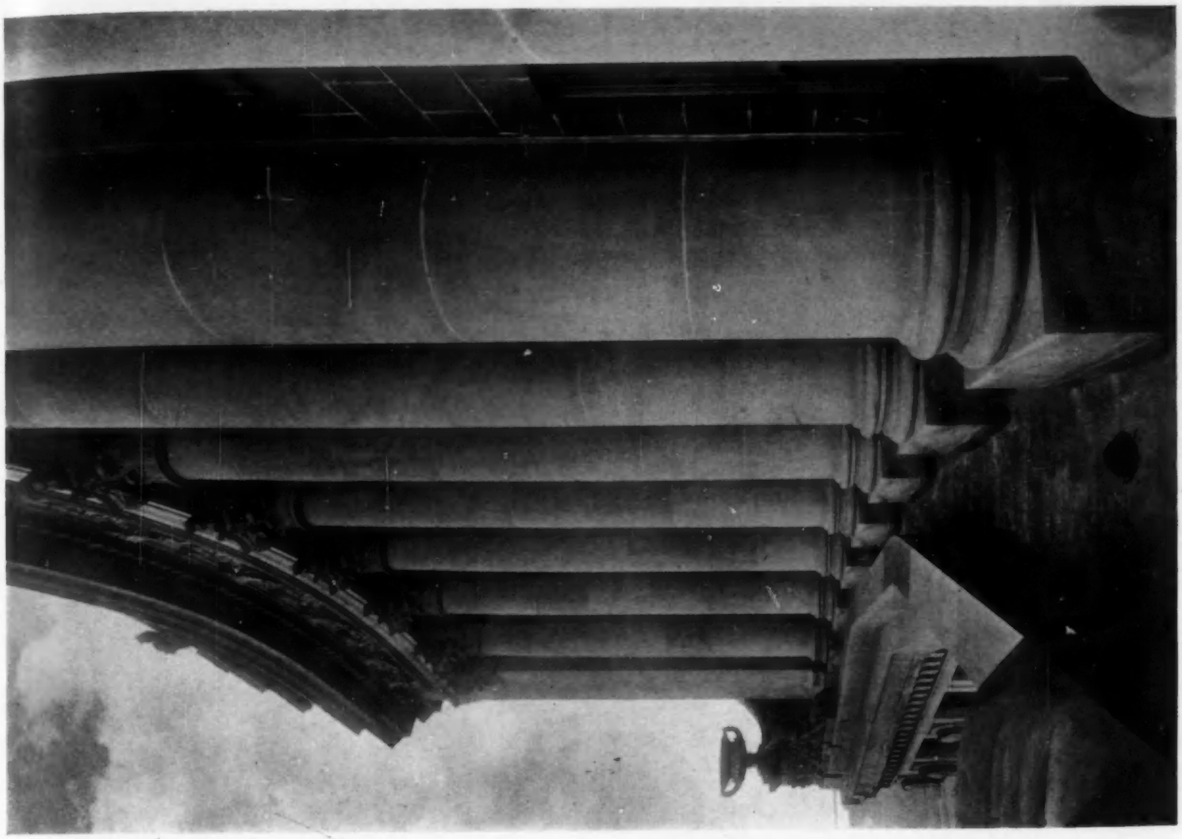
LONDON GUARANTEE & ACCIDENT BUILDING, CHICAGO
A. S. ALSCHULER, ARCHITECT



DETAIL OF THE MAIN ENTRANCE



DETAIL OF THE UPPER COLONNADE

LONDON GUARANTEE & ACCIDENT BUILDING, CHICAGO

A. S. ALSCHULER, ARCHITECT

DETAIL OF ELEVATOR LOBBY

Exterior material of the London Guarantee Building is Indiana limestone. Construction: steel frame, with tile arch floors. Heating: vacuum system with thermostatic control. Elevators: micro-leveling, multi-voltage. Finish: mahogany. Windows except on bank floor: wood, double-hung. Walls of entrance lobby, travertine; floor of marble. A feature of the plan is the curvilinear treatment of the upper stories produced by the setback of the Plaza front to balance the wings of unequal widths.

PLAN OF GROUND FLOOR PLAN OF TYPICAL OFFICE FLOOR

PLAN OF TOILETS ON ALTERNATING FLOORS

LONDON GUARANTEE & ACCIDENT BUILDING, CHICAGO

A. S. ALSCHULER, ARCHITECT

Office Building Vestibules

By WILLIAM F. LAMB
Of Carrere & Hastings, Shreve & Lamb, Architects, New York

WITH the same logic that led to building the gorgeous onyx hallways of Harlem, 30 or 40 years ago, architects are now advising their investing clients to show the best they can afford when the prospective tenant crosses the threshold of the building, and it is not very difficult to convince them that here, at least, an investment in beauty will bring a return many times over. The "onyx era" may have passed, but the logic is still good, and presents one of the very few opportunities in the interior of a commercial building when one may polish up the harness and drive one's thoroughbreds in the ring.

Marble, then, suggests itself for the walls, simple in color and simple in design; Botticino, travertine and many others, monotone in color, but with enough variety in veining and texture to give interest to the surface, the walls usually polished or very smoothly honed for the sake of cleanliness, and the floor of marble or terrazzo on account of the heavy traffic it must bear. One can see many examples of this treatment in some of the recent commercial buildings, especially in midtown New York, where the choice of materials and the restraint in employing them have produced results entirely in keeping with the uses and functions of the buildings.

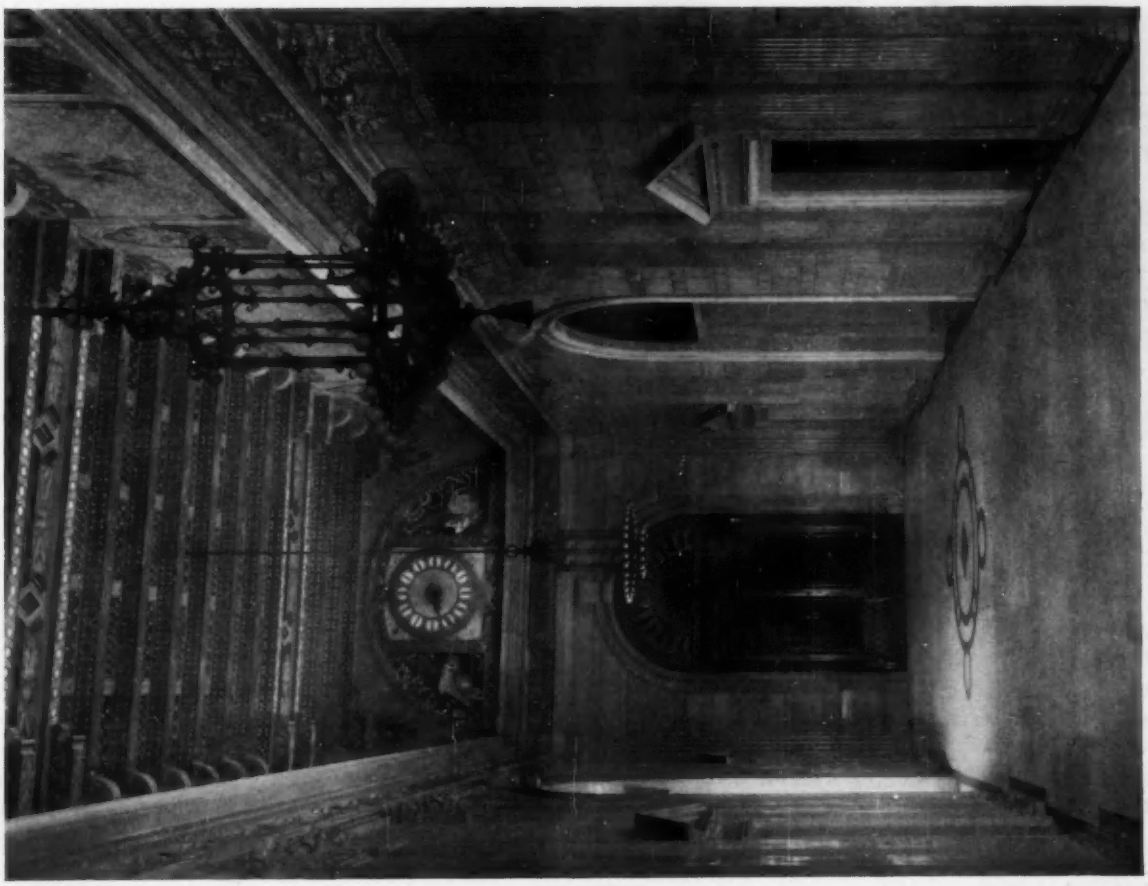
As to the practical side of the office building problem, there is one principle which is of the utmost importance. One must get the public from the street to the elevators with as little delay and confusion as possible. This means that the elevators should be as near the entrance as the typical floor plan will permit, and be so disposed that the confusion of traffic between those passing and those waiting for their cars is reduced to its minimum. The most satisfactory way to accomplish this is, in the case of large buildings having 15 or 20 cars, to divide these elevators into express and local groups, each in turn split up into two banks of four or five cars facing one another, and each group in a *cul-de-sac* off the main vestibule with illuminated directional signs to aid those unfamiliar with the building. In this way the vestibule becomes a real entrance to the floors above—a thoroughfare to the elevators and not merely their bottom landing.

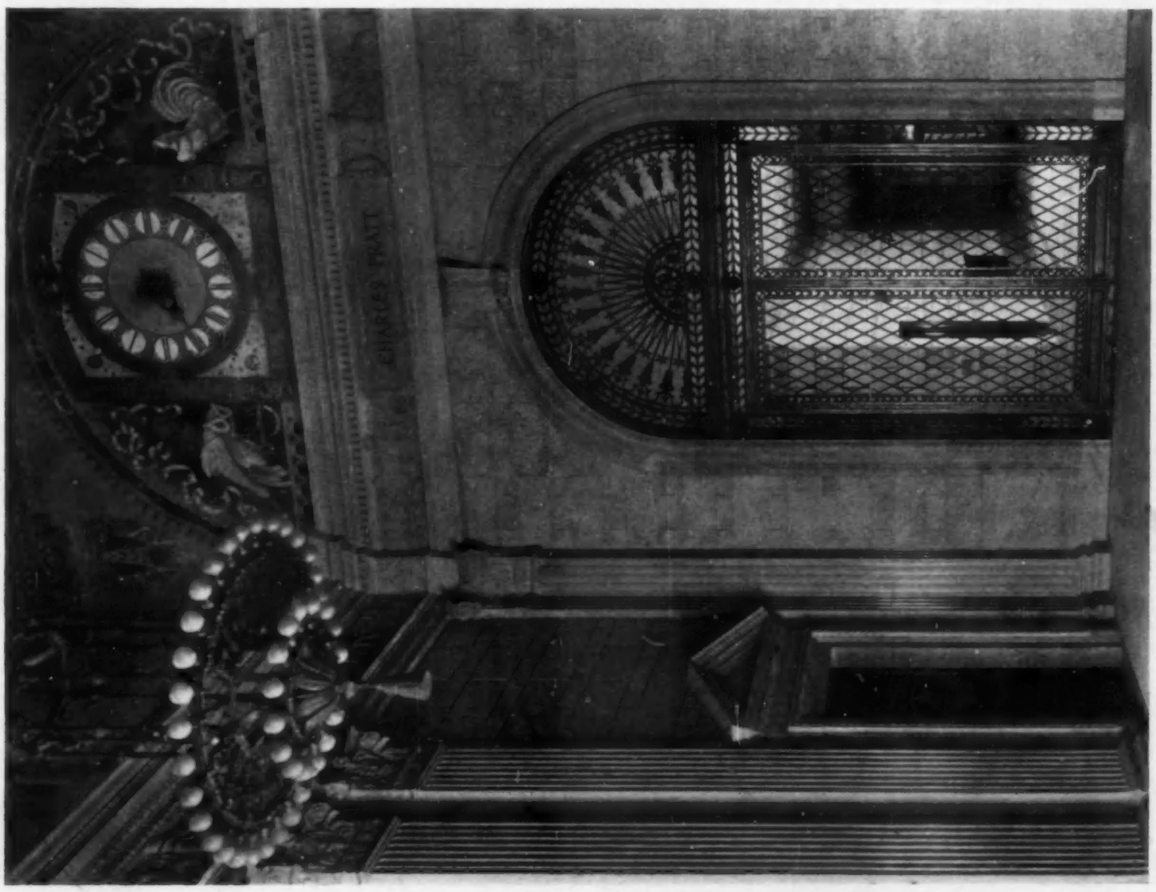
With the decline of the stairway from its one-time great importance as a means of circulation to a purely necessary means of escape from the building, there are not many things left of which to take advantage as "focal points" of the design. The news- and cigar-stand is a thing to be seen and not heard and should be "built into the wall" to keep it out of the circulation area; a show window or the entrance into a store or a bank is not looked on with favor by the great majority of owners and should be introduced only after careful consideration; the building's directory and the mail box should both be easily accessible and convenient, the one because it is obviously necessary to have it so, the other because one is made to! But this lack of pegs upon which to hang garlands and cartouches is no disadvantage, for, with growing ideas of simplicity and directness, the *one* important thing is increased by the elimination of those things not essential. Dignified simplicity is much to be desired.

Walls, black and gold marble; elevator doors, trim and banding of marble walls in a gilded bronze. Floor in yellow and black marble harmonizes with and accentuates the rich tones of the walls

Lobby, American Radiator Co. Building, New York
Raymond M. Hood, Architect

The plan of the entrance hall of the building for the Standard Oil Company of New York shows the use of this "pocket" type of elevator grouping, the vestibule becoming a monumental hall leading from Broadway to New Street, with cross circulation at the central point leading on the one hand into the old building and on the other to what will some day be the entrance from a court on Beaver Street which will give access to the tower elevators. In this plan the hall is reserved entirely for circulation, and the elevators, except those at the New Street end, which are used for inter-floor service, are out of the way of the traffic, the elevator halls being made comparatively narrow to facilitate the answering of the up or down signal



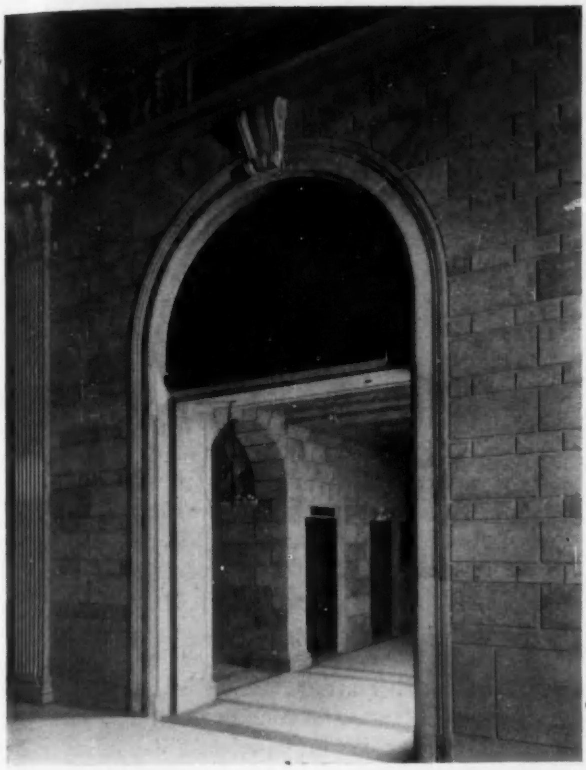


END OF MAIN ENTRANCE HALL

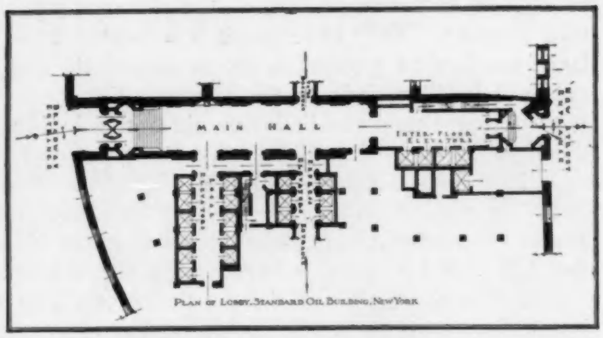
MURAL DECORATIONS OF ENTRANCE HALL BY MACK, JENNEY & TYLER

STANDARD OIL BUILDING, NEW YORK

CARRERE & HASTINGS, SHREVE & LAMB, ARCHITECTS



Doorway Leading into Elevator Lobby
Standard Oil Building, New York



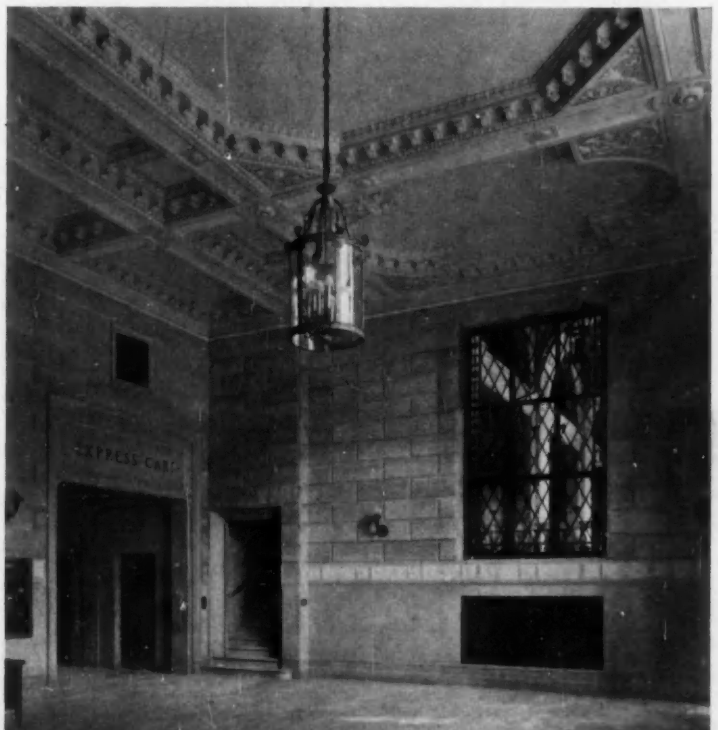
Plan of Lobby, Standard Oil Building, Showing Hallway Extending from Broadway to New Street, with Connecting Elevator Lobbies

on the floors above, and simply treated in marble with decorated plaster ceilings. The main hall is also in marble—low toned rose and yellow—for the walls, and travertine bordered with black for the floors. Alternating arches and small square openings, separated by coupled Renaissance pilasters which with the entablature occupy about two-thirds of the height of the wall, form the motif of the hall, and the frieze above the cornice and the beamed ceiling are very richly painted in polychrome geometrical and heraldic designs. Free use has been made of wrought iron to give contrast and color to the walls and to accent the various entrances. The lighting is indirect by means of low-intensity reflectors behind the cornices, with the addition of two large hanging fixtures opposite each of the main elevator banks.

The Cunard Building, across the street, shows again, in its entrance to the office building proper, this same system applied to conditions which are more often to be met. Here the vestibule is a large square room, very simply and effectively treated in marble and plaster, which gives direct access to two groups of elevators of ten each, arranged face to face, and each group in its own "pocket." Confusion, again, is reduced to a minimum, and a scheme is logically thought out and then successfully treated.

A word may be added as to the practical details of the means of entrance to and exit from an elevator lobby, the focal point of circulation of an office building. An inner and an outer set of doors, each door about 2 feet, 4 inches in width, pivoted to swing without mullions, properly checked to prevent opening too far back, constitute the most effective main entrance protection. Grilles or gates, pocketed in entrance jambs when open for traffic, are provided for use when the entrance is closed.

Revolving doors have a value in preventing loss



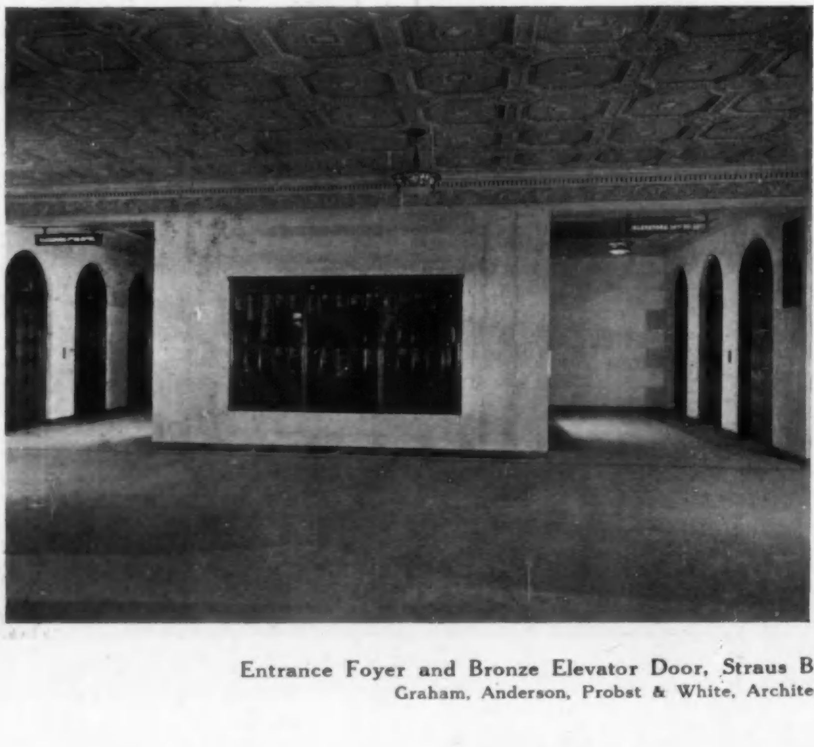
Entrance Foyer, Cunard Building, New York
Benjamin Wistar Morris, Architect

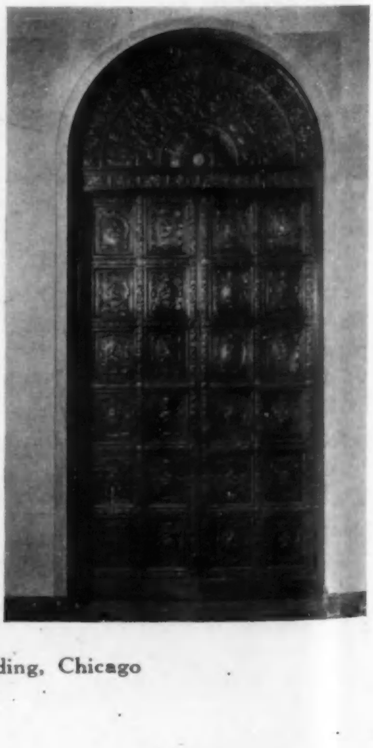
of heat or excessive chilling of the entrance hall in cold weather. They have a use, too, where a very large number of persons tends to crowd the halls at "peak load" periods on the elevators, for in such a condition the controlled flow into the building through the revolving door may be more readily kept in desired lines and volume of traffic. Both swinging and revolving doors, which constitute the actual "entrances," are usually much lower than the full exterior opening constituting the entrance motif. The space above the doors then offers a most interesting opportunity for well studied fenestration, properly related to both the exterior of the building and to the interior proportions and lighting of the entrance hall. The heating of the immediate entrance vestibule is preferably by the indirect method, bringing in warmed air in sufficient volume through grilles in keeping with the design of the entrance; or radiators, if possible concealed, may be placed in enclosures where they do not obstruct the traffic or constrict the passage.

The treatment of the entrances to the elevators, that is, the hatchway doors, should be controlled primarily by the demands of utility; they should be fireproof and of little weight, so as to permit ease of automatic or manual operation, and in some cases in two or three leaves or sections, sliding at two or three individual but properly related speeds to permit a maximum width of opening even where the space into which the door is withdrawn is small. The steel door best meets these demands. The grille or gate is obviously not satisfactory, and the use of glass with it is even less so. Glass may well be omitted for the reason, also, that car schedules may be best maintained with the minimum of complaint from passengers when the operator is not watching the landings and the position of the car and its motion are not evident to the waiting passenger. The truth of this comment, which is not yet accepted by all, is made more apparent by pointing out that the operator should be guided solely by his car signal, where, indeed, the car is not automatically controlled, without discretion on the part of the operator; and similarly, the waiting passenger should get his information from the light which says, "This Car Down," and not from his observation of the positions and motion of the cars. Office building elevator systems are more effective when run as vertical railroads, automatically controlled, and not as jitneys.

It follows from these comments that the use of indicators should be limited to lights or signals showing which car, moving in the direction the waiting passenger wishes to go, is next to stop at the floor where passenger is waiting. Indicators showing positions and motion of all cars at all floors can be dispensed with, but whatever indicators are used should be so designed as to be readily distinguished, positive and legible.

The hatchway entrance to the car should be treated or trimmed with material which will not easily soil or wear away through contact with those passing in or out of the car, and which has durability under the exacting conditions of hatchway door operation. Metal and marble are most largely used, the marble preferably polished. Painted surfaces are not useful. While doorway jambs are usually at right angles with the enclosing walls, the splaying of the jambs may sometimes secure better proportion in design, greater freedom of traffic movement, and increased visibility for operator and passenger. This is especially true where structural conditions affecting the hatchway wall create a deep reveal.



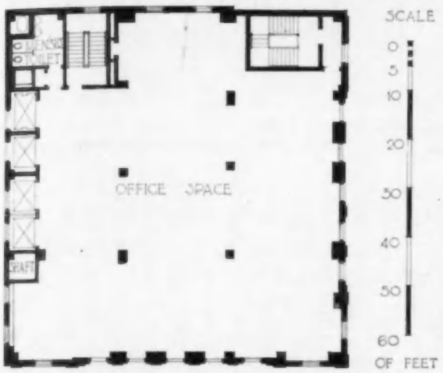


Entrance Foyer and Bronze Elevator Door, Straus Building, Chicago
Graham, Anderson, Probst & White, Architects

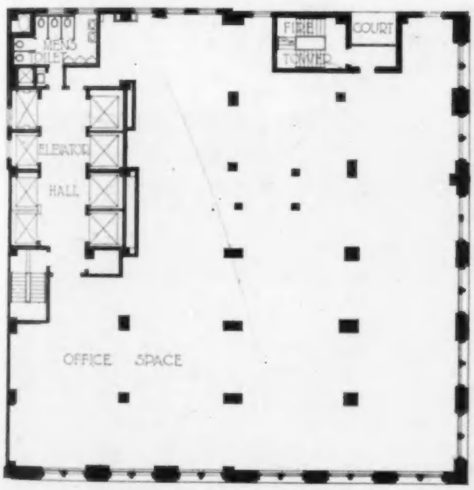
Johns-Manville Building, New York

LUDLOW & PEABODY, Architects

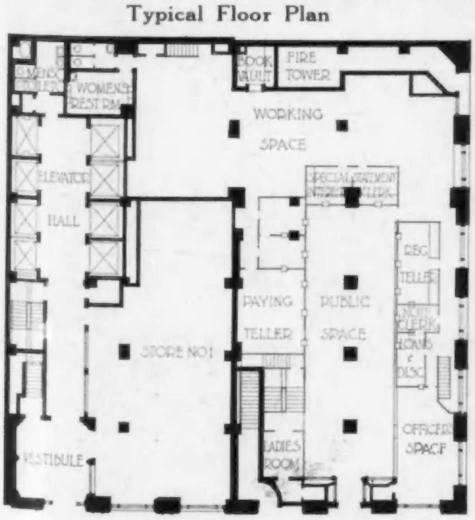
In the Johns-Manville Building granite was used for the base course, limestone for the lower stories, and brick with terra cotta trimmings elsewhere. Construction: steel frame, with reinforced concrete slab floors. Heating: vacuum steam. Electric service furnished by service company. Elevators: 1-1 direct-traction, micro drive. Windows: solid steel, double-hung. Entrance lobby and elevator hall: walls and floor marble. All corridors: plaster walls, marble base, terrazzo floors in different colors.



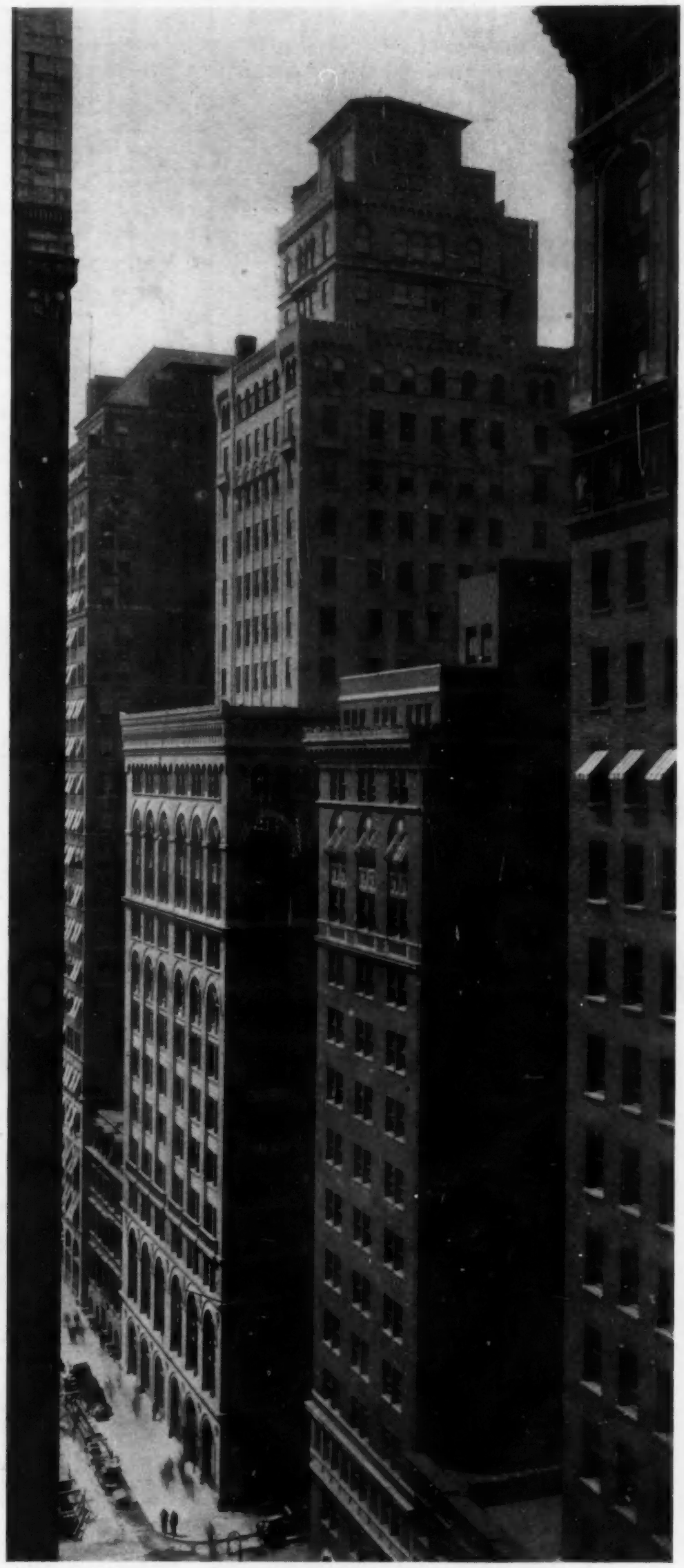
Fourteenth Floor Plan



Typical Floor Plan



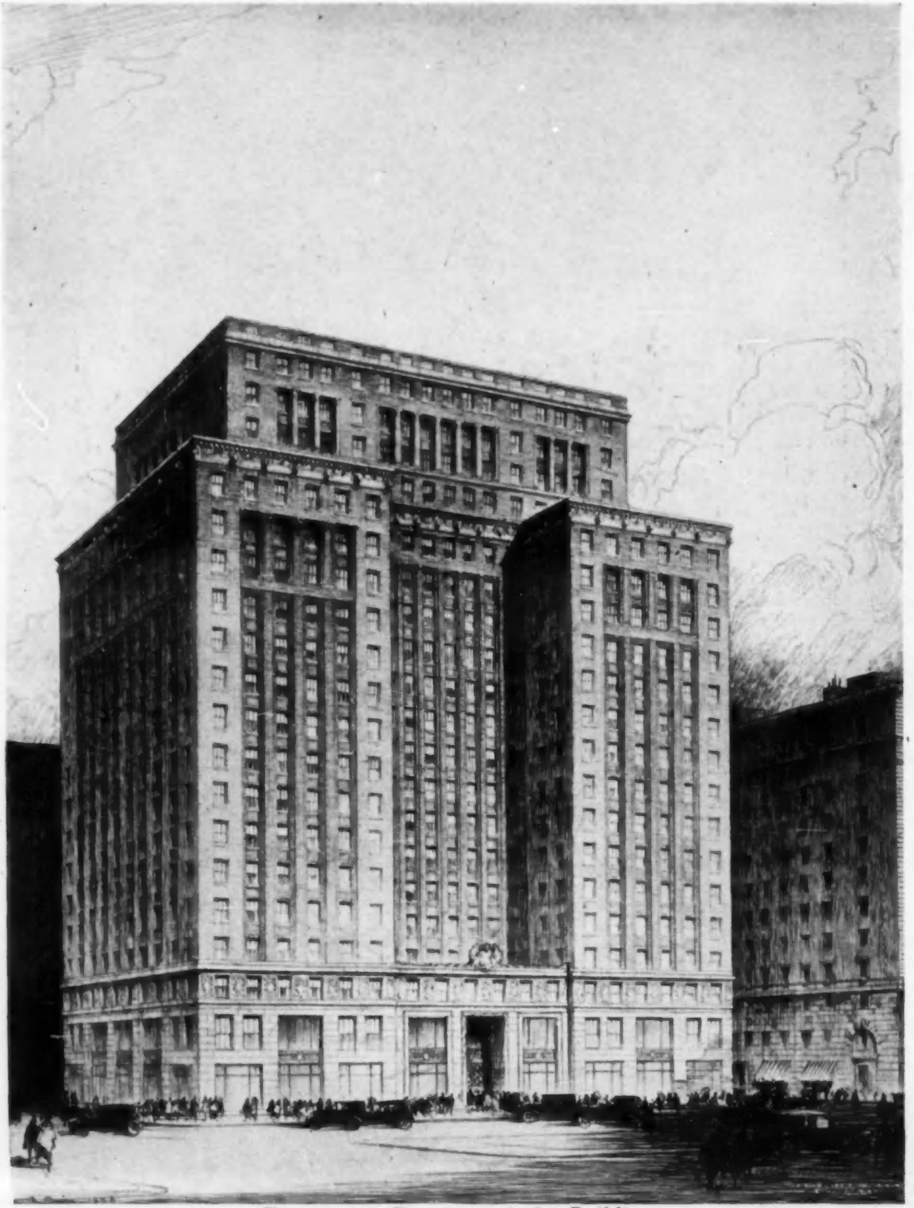
Ground Floor Plan



General View of the Building

Postum Building, New York

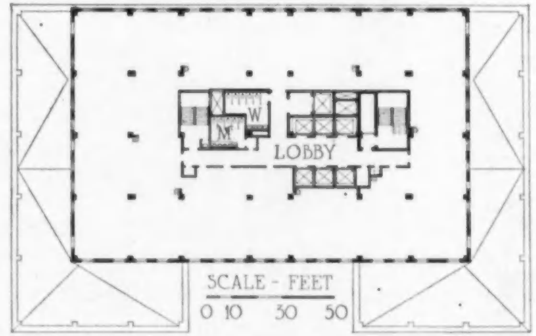
CROSS & CROSS, Architects; PHELPS BARNUM, Associated


Perspective Drawing of the Building

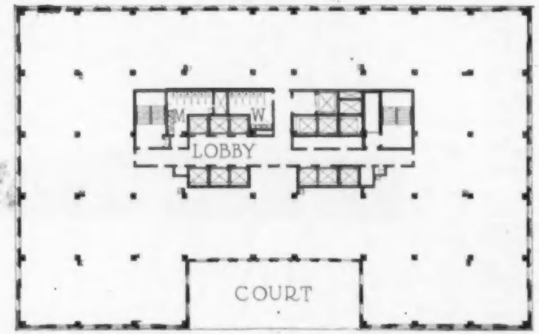
IN the Postum Building the use of projecting bays, and the central location of the elevators, stairways, toilets, and service, permit variety of arrangement of offices, all of which have outside light. As this building is located over the tracks of the New York Central Railroad, no basement is possible.

A low studded machine room, 28 by 40, with mezzanine floor for service, is located at the rear of the building. Limestone is used for the three lower stories, buff brick and terra cotta above.

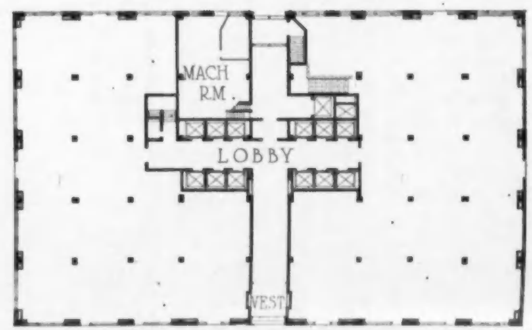
Construction: skeleton steel frame and solid brick walls, with cinder concrete arches for floors. Steam heat and electric service: 120-240 d.c. is supplied by the New York Central Railroad. Elevators: 1-1 traction; passenger cabs, walnut; service car, steel. Windows: solid steel double-hung. Entrance and elevator halls: walls, plaster with marble wainscot and floors.



Top Floor Plan



Typical Floor Plan



Entrance Floor Plan

Four-Story Substructure for a Steel Building

By FRANK W. SKINNER, C. E., New York

THE Barclay-Vesey Telephone Building, now being erected by the New York Telephone Company, occupies all of the city block between Washington, Vesey, Barclay and West Streets, New York. The plot is a slightly oblique parallelogram with sides of about 213 feet and 259 feet on curb line. To a height of 17 stories or about 262 feet above street level the building with setbacks and courts occupies the entire area of the site. The upper portion, about 100 feet square, extends 12 stories higher, 29 stories above the curb, or 33 stories above the lowest floor to a total height of 434 feet above the curb and 497 feet above the lowest floor.

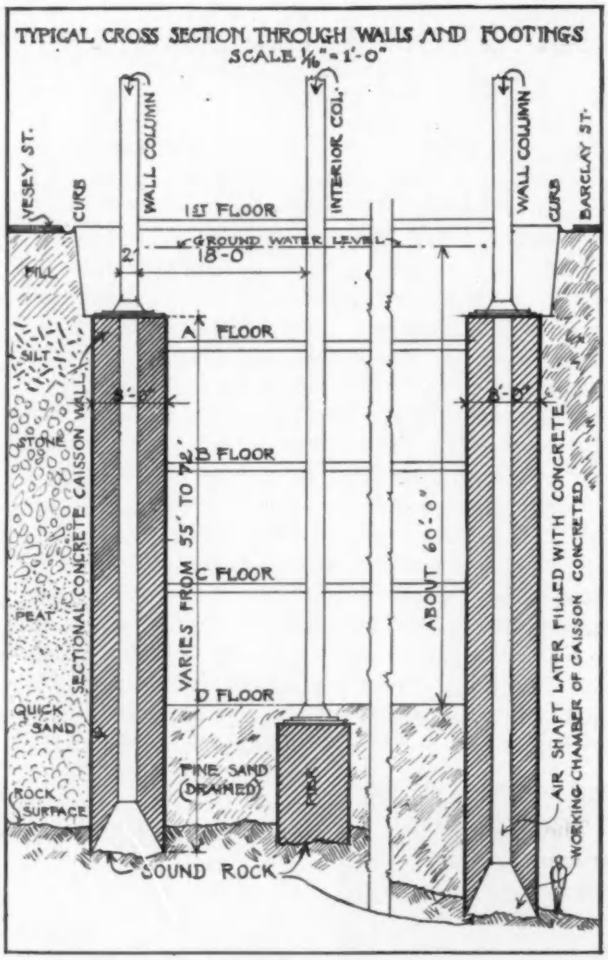
This steel skeleton building will be of the highest type of fire-resisting construction with protected framework and reinforced cinder concrete floor arches between steel beams. It will have a gross content of about 14,000,000 cubic feet, a gross floor area of 925,000 square feet in the superstructure, and will house about 6,000 people. The first story will be used for stores and other commercial purposes, and the remainder of the building will be occupied by the Telephone Company, the second to tenth stories inclusive being used for telephone equipment purposes, and the space above for offices.

The location, on made ground outside the original shore line of the Hudson River, the enormous weight of the building and contents, the high land value and the great depth to rock overlaid by saturated materials containing numerous obstructions, made the design of the substructure difficult and its construction slow and costly. In collaboration with the architects, McKenzie, Voorhees & Gmelin, the consulting engineers, Moran, Maurice & Proctor, made preliminary investigations of conditions, requirements and costs, and developed a plan involving advanced practice for securing deep foundations and providing for safety and rapidity of construction and for stability. The site was explored with 22 preliminary 4-inch diamond borings to rock which indicated the presence, below a large quantity of timber cribwork and filled material, of quicksand, muck, sand, boulders and rotten rock on the irregular surface of the bedrock at distances varying from about 60 to 80 feet below the high water level. Ground water level at the side is from 2 to 4 feet below curb elevation, and the soil is of a treacherous character with numerous obstructions and contains a highly compressible muck stratum about 2 feet thick at a depth of 48 feet below the curb. It was, therefore, felt that the conditions and requirements necessitated the adoption of the subterranean dam type of substructure, which consists of a continuous reinforced concrete wall enclosing all sides of the excavated area. This sectionally constructed wall extends down to solid rock bearing, supports the exterior columns, and, by excluding ground water and retaining the soil, permits free open excavation for all of the material removed for the lower stories of the building and for the foundations of the interior columns.

Scale Model of the Barclay-Vesey Telephone Building
McKenzie, Voorhees & Gmelin, Architects

Economic considerations demanded the utilization of the maximum amount of space below the street level, and four subterranean stories, A, B, C and D, are therefore, provided. The lowest main floor (D) is 59 feet below the curb, but the boiler and engine room floor is still farther depressed to a total depth of 63 feet, 7 inches below the curb, requiring, for purposes of drainage, etc., a maximum depth of floor excavation to 66 feet, 7 inches below the curb, below which rectangular pits from 10 to 20 feet square are sunk to rock in open cofferdams for the foundations of the interior columns.

The subterranean dam



Cross Section Through Substructure, Barclay-Vesey Telephone Building

enclosing the lower stories and serving as a foundation for the wall columns is composed of 22 reinforced concrete sections having a uniform thickness of 8 feet and lengths of about 40 feet. They were sunk by the pneumatic caisson process with clearance of about 18 inches below adjacent units, and were afterwards united by massive vertical concrete keys at each joint to form a continuous watertight wall. The uniform thickness of 8 feet is proportioned to the required strength and is 1 foot greater than would have been necessary if the full-size excavation had only been carried down two stories below street level. The length of the caissons is much greater than has generally been adopted for previous structures of this character, and was made, for economy, convenience and rapidity, as great as permissible by the approximate ratio of 1:5 for advantageous proportions of width and length.

From the indications of the exploration borings, approximate profiles of the rock surface at the lot lines were prepared, and the heights of the caissons were made sufficient to allow for that elevation. The stresses in the caissons were, however, computed to allow for a variation of 3 feet in the position of the cutting edge above or below profile elevation. At the corners of the lot the ends of the caissons were beveled to conform to the angles of the parallelograms, the other caisson ends being square. The caissons are substantially duplicates except for the variation just mentioned and for two caissons which were provided with rectangular cable openings through them, 1 foot below ground water level. All caissons were proportioned to resist sinking stresses, temporary and permanent outside pressures, and permanent combined banding and loading stresses. The maximum exterior pressures were assumed to be 2 tons per square foot of vertical surface, amounting to totals of as much as 2490 tons on a single caisson.

The entire area of the lot was excavated nearly to ground water level, and construction operations carried on simultaneously over the whole bottom of the pit without obstructing or being interfered with by the constant movement of a fleet of motor trucks handling great quantities of materials to and from the site, which loaded and unloaded on a temporary street level platform that covered a considerable part of the lot area and had entrances and exits on three streets. All parts of the lot were commanded by a system of heavy derricks rigged with 15,000 feet of 5/8-inch steel rope and operated by 19 two- and three-drum hoists, and eight swinging engines and a large amount of equipment were installed.

The caissons of reinforced concrete were built up in place as sunk alternately through quicksand and obstructions and into sound rock at maximum working pressures of 35 pounds in which work was continuously maintained in shifts, increasing with the pressure, up to ten in 24 hours. After adjacent caissons were sunk they were bonded together by full-height vertical concrete joints. The 20,000 yards of concrete in the caissons were mixed in two 1-yard machines and distributed over an industrial track to all caissons. The caissons, heavily loaded with cast iron ballast, were sunk from 55 to 72 feet to rock bearing in three or four days each, the 18,000 yards of spoil excavated from them being hoisted in buckets and dumped through loading hoppers to motor trucks that conveyed it, night and day, to the dump scows at the contractors' yard.

After the completion of the caisson work the general excavation was carried on over the whole area of the lot, which was illuminated at night by 500-watt flood lights. The quicksand was drained to a sump emptied by an electrically-driven centrifugal pump. The necessary exterior pressure on the caissons was resisted by enormous cross-lot timber struts in horizontal tiers that were successively placed as the excavation advanced. These struts resisted heavy pressure and were arranged to provide clearance for digging and hoisting and to eventually transfer their loads to the steel and concrete floors.

Compressed air for the working chambers of the caissons for hospital locks and for pile hammers and pneumatic tools was furnished by compressors having a combined capacity of more than 10,000 cubic feet per minute.

Office Buildings, Past, Present and Future

By CLARENCE T. COLEY

Manager, Equitable Building, New York

EVERY branch of finance, architecture, engineering, construction and mechanics, has been drawn upon to develop the beehive of modern American consolidated business efficiency. The development of office buildings during the past 60 years has been from a room in the home, where business was done by the head of the house. In time the business outgrew the private house and the "Inn." Business buildings and business centers were developed. The "Home" or "Inn" had its several rooms rented to others for business. The advantage of doing business in business centers and in business buildings was apparently economic and therefore grew, especially when transportation was very slow, by foot, horseback or carriage, and communication by mail.

In the early days each tenant cleaned, heated and lighted his own office. The sink and toilet were in the cellar or in an upper hall, after running water could be had. Next, the building's occupants clubbed together and hired a man to clean their offices, to light, trim and fill lamps, and to bring coal or wood for the open grates or stoves. As time passed, the landlord furnished these services. A light shaft was cut down through the center of the building and the offices were built around the shaft as well as in the front and back of the house. Natural light and air must be obtained from the windows. Everybody walked up and down stairs. The stair treads were covered with figured sheet metal to resist wear. Finally came the advent of the elevator in the light shaft, with steam engine-driven belts to drive a drum which wound up a cable attached to a wooden cab. The cab creaked, joggled from side to side, jerked its jumpy way up and down the shaft, while the control cable sawed the floor.

Inside the office one found the musty smell of stale tobacco ashes, and sooty chimney breasts and ceilings. Dust covered the floors, desks, tables. papers and books. Red and blue ribbons and sealing wax gave an official atmosphere. Black tin file-boxes lettered in gold, advertising the names of important clients and estates, impressed the caller. Dark oil cloth covered walnut tables, and flat top desks with hinged covers were in style. The tenants by coöperation determined what services they were to receive. Hot air furnaces and steam boilers came later as improvements to give comfort, save time, prevent dirt, and increase business efficiency. The great key for the safe was taken down from its hiding place over the door and tied to the safe handle to be moved out, to make way for the new style combination safe. There were no special facilities for women then, because very few women were employed in business buildings of any kind.

The introduction of steel frame construction, elevators, electricity, service of architects, engineers and capital, made the development of the skyscraper office building financially and structurally possible, and the limited business area and ground values made them develop skyward. The London building manager reports that 12 per cent net is a minimum return on an office building over there, where the legal height limitation permits 80-foot buildings. However, in every other way, American buildings have surpassed European commercial buildings, such as in height, service, appointments, stability of construction and practicability of design, as well as intensiveness of operation. Even so, it is hard to show a 12 per cent net average. This is because land, foundations and structures cost too much. There is a great deal of money needlessly spent in an attempt to make historical architectural forms, specially designed and constructed, meet the needs, when standard stock models could be used just as well.

The present-day building should be strictly a structure of utility, in which every cubic foot is constructed for intensive use and wear. Every piece of material used in construction must have a purpose to warrant its existence in the structure, and its cost and maintenance must be reckoned with, as long as the building stands. The best investments are made in office buildings that are useful and comfortable. Much money is spent and poorly invested, according to the writer's belief, in an attempt to make office buildings agreeable to look upon, beautiful and artistic, as it has been proved that space in them cannot be sold for any higher price. Some American architects admit that there is a lack of beauty in the tall shafts filled with similar windows from the top down to the show windows of the store fronts.

A great French architect, accustomed to the uniform heights of buildings in Paris, saw that there was beauty in the irregular heights of office buildings as they exist in concentrated New York business areas. The nearer the design of an office building comes to fulfilling its purpose, the more beautiful it is. Beauty must be studied and admired from a proper point of view to get a true impression of line, proportion and perspective. In congested areas, where office buildings stand on narrow streets, such view-points cannot be had, so why should money be spent on architectural ornamentation which cannot be seen and appreciated, which has to be paid for by the tenants? Americans are trying too hard, and at too great expense, to improve office building design by the use of the classic. The modern skyscraper office building is distinctly American, and often contains elements of architectural expression which are effective and pleasing and beautiful, because of their great utility and durability, because of the materials used in construction, and because it is a financial success. Ancient architectural forms cannot be successfully followed if they do not answer requirements. An office building which is not a financial success, is a poor investment, and an object of pity and discredit to everybody connected with it. The style of office building design has undergone a great change during the last few years. The rate of progress has created a tendency to go too far, and to include many things which increase the costs of construction, things not at all needed and, therefore, neither appreciated nor desired by the tenant.

Future office buildings, except for special use, will be in large blocks, externally dignified, plain, of right lines and made up of standardized units of construction. The large building houses a great many business interests under one roof, where vertical transportation is more rapid than horizontal travel, and which tends to improve business efficiency. The grade "A" building is determined not by its design and construction, but by its occupancy. It is natural for business men to desire to do business with groups of highly respected and successful men. The more such men are housed together, the easier it is to meet them. There is also a certain confidence developed because of occupancy of space in the same building. Occupancy is a testimonial from the landlord as to a man's rating, which tends to produce a good rent rate. The cost of operation per square foot of rentable area is lower in proportion to the size of a building, on account of the spread of the overhead and the possibility of doing business on a wholesale basis.

Office buildings have a rather short economic life, which should always be borne in mind in determining the design and material to be used. The economic life is longer if the development is an adequate improvement on the lot, within the limits of the law, and if the material is strong and the relation between rentable area and gross area can be maintained profitably. Style plays an important part in office building design, as the simpler the style and the more popular its adaptation, the longer it will remain in vogue. Owners are trying to have their office buildings show individual characteristics, just as they try to do in the designs of their homes. This costs real money, and since the investment is a strictly cold blooded proposition, all sentiment should be eliminated, the building should be standardized and made up of approved and tested units. The owner and architect can establish a contact with the users of office space through the connecting link of the building manager. Through his experience with tenants and his efforts to sell space and his service to the advantage of the owner, he knows what can and cannot be sold. He also knows what materials last, and permit him to render the demanded service to the tenant. The building manager who is the man in the field is the only one to make accurate records of performances, by which the designers of new buildings can profit. Can anyone imagine an automobile manufacturer turning out a new line of automobiles each year without the coöperation of the man who tests the cars on the road, the service station, and the experts to determine where the weaknesses are, what the purchasing public is demanding, and what competition is compelling?

The office building managers are in a position to know the tenants' needs because of their daily contact with them. They have also had to work with the product of many architects' offices, and know what has good reason for its existence and what has not, and what should not have been installed, because it is too expensive to maintain. Thousands of dollars can thus be saved and invested elsewhere.

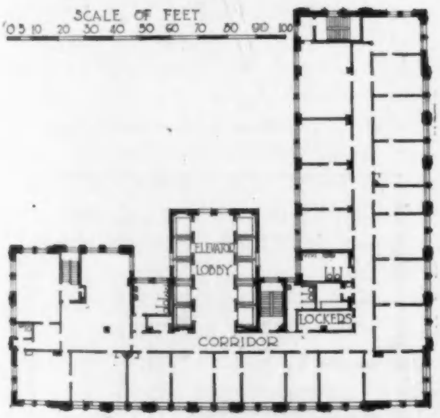
Better and less expensive buildings can and will be built, and more of the income will be available for returns on the investment, if a committee of building managers is called in to advise with owners, architects and engineers during the planning of the building and until the building is finished and operating successfully. Such advisory services are available through the Building Managers Association, established in all of the large cities of the country. A number of large office buildings recently designed and built have had the advantage of this service, to the satisfaction of both the owner and architect.

Skyline of the Business District of New San Francisco

The Pacific Telephone & Telegraph Co. Building, San Francisco

J. R. MILLER & T. L. PFLUEGER, AND A. A. CANTIN, Associated Architects

Elevation of Main Facade

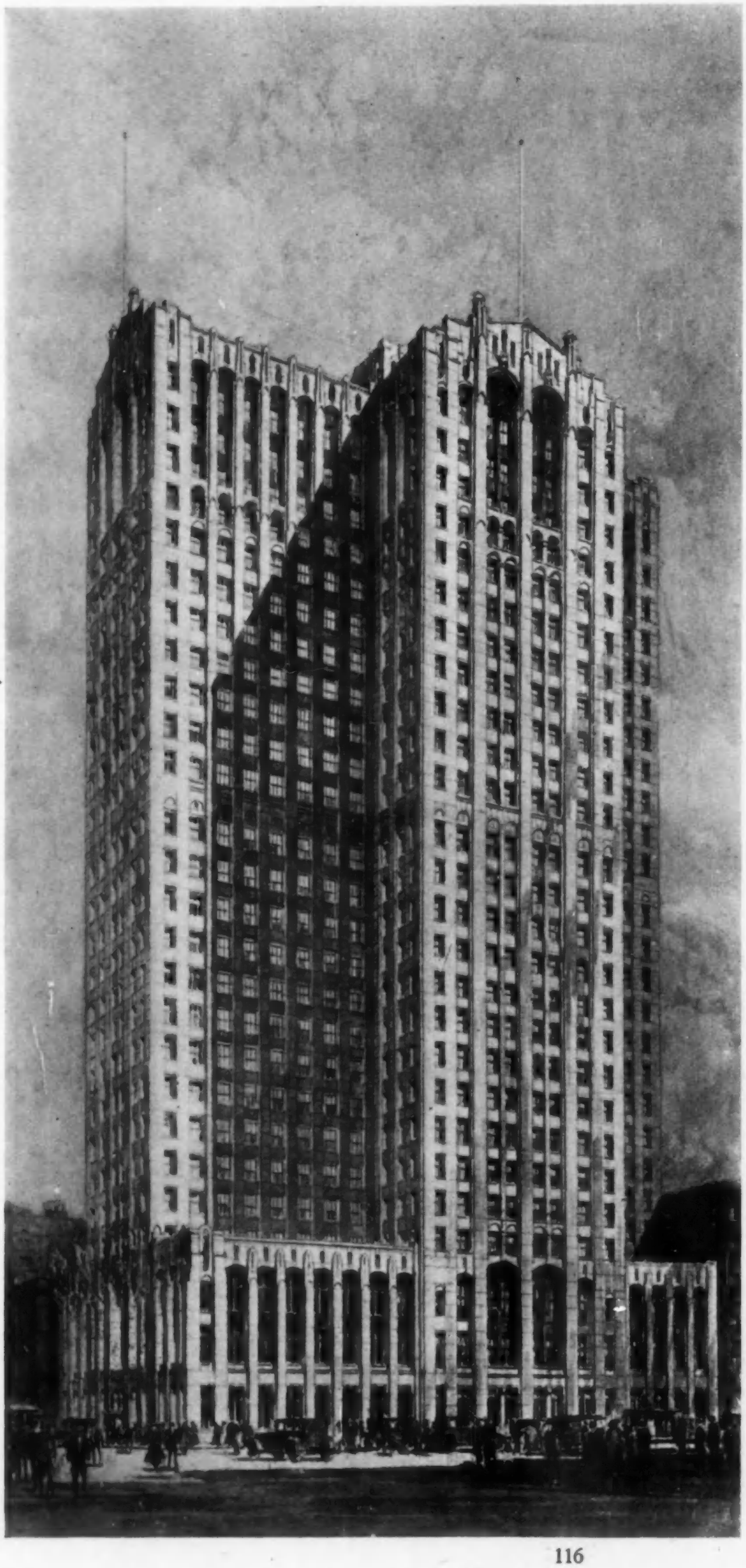


Typical Floor Plan

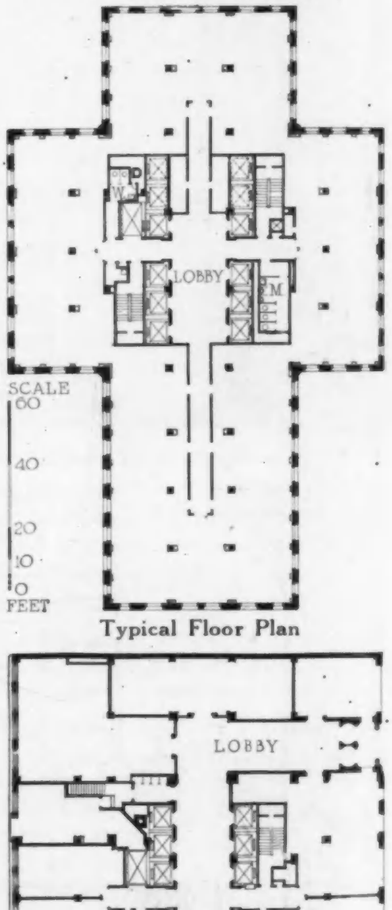
THE Pacific Telephone & Telegraph Building now being built in San Francisco, will cost approximately $3,000,000. Two sections of the building are being constructed at present, leaving a third section of the U-shaped structure to be erected in the future. The 26 stories and two basements will contain, among other features, an auditorium and a cafeteria for the employes. Terra cotta will be used for the exterior.

The Buhl Building, Detroit

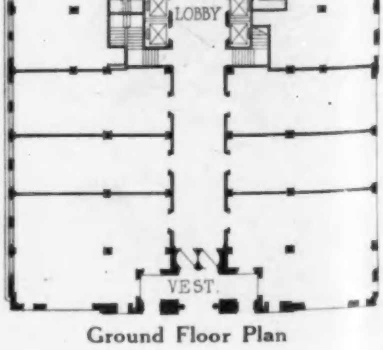
SMITH, HINCHMAN & GRYLLS, Architects



THE Buhl Building, Detroit, is unique on account of the unusual cross plan above the basement stories. Structural work of the building consists of caisson foundations, and steel superstructure, with a combination steel and concrete slab floor. Walls are faced with a special finish terra cotta laid in blocks of random sizes; granite base at street level. Top floors: cement; walls: plaster on tile with slate base; windows: metal, double-hung type. All doors and trim are metal. Elevator lobby and upper halls have marble floors and wainscots. Entrances to building are recessed and vaulted and are decorated with ornamental mosaic ceilings.



Typical Floor Plan



Ground Floor Plan

Eliminating Fire Hazards in Office Buildings

By RUDOLPH P. MILLER

President, National Fire Protection Association

IN considering the modern office building, a tall structure of fireproof construction generally comes to mind. As a matter of fact, however, in the majority of cases, that form of construction is not found. Even in so well developed a community as the Borough of Manhattan, an analysis of the building statistics shows that not more than two-thirds of the newly erected buildings which are used chiefly or in part for office purposes are of fireproof construction. If the floor area is considered, a better showing for the safer type of construction undoubtedly would be made. The records for a 15-year period in Manhattan indicate that of the new buildings for which permits were asked, about 27 per cent were of fireproof construction and 60 per cent were of ordinary, that is wood joisted, construction; but of the total floor area provided in all the new structures, 56 per cent would be found in fireproof buildings, 42 per cent in buildings of ordinary construction, and the rest, 2 per cent, in buildings of frame or unclassified construction. It is fair to assume that the ratios here given are about the same for office buildings.

Ordinarily the contents of an office building do not constitute any serious fire hazard, but the value of such contents may be incalculable. Not that there is any great intrinsic value to such contents, but the results from the loss of business records might be calamitous. So important has this matter of the protection of records become that the National Fire Protection Association has found it desirable to appoint a committee to study the subject. An interesting, comprehensive report submitted by that committee may be found in the Association's *Proceedings* for 1924. As the record losses are generally indirect and "there is a natural tendency toward reticence on the part of those who have lost records," the committee has been unable to give definite figures but hopes in time "to state the consequences of record losses in direct and indirect costs, inconveniences, interference with operations, loss of good will of customers, and the many other factors which properly apply." The protection of the contents of office buildings, therefore, is of vital importance, and accordingly as records become of greater value the fire-resistiveness of the building containing them must be increased.

Although the better form of construction is advocated for office buildings, nevertheless, a well constructed building of masonry walls and wood joisted floors may be made reasonably safe if suitable protection against the hazards from without and within the building is provided.

As we are not disposed to dispense with lighting and ventilation from the outside, the proper protection of the exterior openings, windows and doors, may perhaps be considered the first essential in the fire protection of an office building. The most efficient form of window suitable for office buildings is that of metal construction, glazed with wire glass. Such windows are made either of the usual window construction, that is double-hung sash, or of one of the several forms of pivoted sash. The latter form can be readily made automatically self-closing which, of course, is a decided advantage; for if a window has been inadvertently left open at the end of the day's business, there is still a high probability of protection in the automatic closing when the heat reaches that intensity which becomes dangerous. The effectiveness of the metal and wire glass window, however, depends on its proper construction. If the recommendations of the National Board of Fire Underwriters are complied with, the best protection afforded by this type is secured. The main disadvantage of the wire glass window is the ready transmission of heat through the glass itself. For this reason well constructed shutters, either of the swinging or the rolling type, are, perhaps, still the safer form of protection to use. Rolling shutters can be made automatic without much trouble. To make the swinging shutter automatic, however, is somewhat difficult. The disadvantage of shutters for the kind of building under consideration is that they are too frequently left open after business hours.

To check the spread of fire within the building, several things are necessary. Large interior floor areas are to be avoided in office buildings as in buildings of other occupancies. If the building is not of fireproof construction, interior walls of substantial masonry should be utilized to divide the building into sections of not exceeding 4,000 or 5,000 square feet in area. Building laws quite generally prescribe limiting areas for non-fireproof buildings, varying these according to the location of the building or the accessibility to the interior by the fire department. A building which faces on two or more streets is ordinarily allowed a larger undivided space than one that has only a single street frontage. In the building code recommended by the National Board of Fire Underwriters the proper limitations of area for non-fireproof buildings (not exceeding 55 feet in height) to be used as office buildings are given as 5,000 square feet when the building faces on one street only, 6,000 square feet when it is located on a corner or faces on two streets, and 7,500 square feet when it has frontages on three or more streets. These limits are fixed on the assumption that the building is not protected by an automatic sprinkler system. If there is such an equipment it is suggested that the limits may be increased by two-thirds of the areas specified. The building ordinances of cities generally permit larger undivided areas. The interior partitions that are used to divide the building into small offices frequently accomplish the end sought by using fire walls, but not effectively if constructed in the usual manner with door and window openings.

When not needed as fire stops, it seems useless to make interior partitions of more fire-resistive construction than that which is used for the closing of the openings in such partitions. A hardwood door, thick enough to be regarded ordinarily as a heavy door, will undoubtedly offer considerable resistance to the spread of fire. The partition in which it is located, it would seem, need hardly be of a greater fire resistance. If window openings are placed in partitions, unless they are made of metal frames and sash glazed with wire glass in small panes, it is hardly worth while making the partitions themselves of fire-resistive construction except for the desirability of reducing the amount of inflammable material. Instances are not uncommon of fires having originated within a room of the size of the ordinary office in which the hardwood doors have sufficiently resisted destruction by fire to permit the contents to burn out completely without having the fire spread beyond the room.

Of the interior fire walls in any building, the most important undoubtedly are those that enclose the spaces devoted to exit facilities, either stairways or elevator shafts. Such partitions should be of the type of construction most effective from the fire-resistive standpoint. Door openings leading to stair enclosures or elevator shafts should be equipped with self-closing doors of proved efficiency. Any form of shaft construction or other vertical communication through the building, however, such as pipe and vent shafts, should also be thoroughly enclosed in substantial fireproof construction. The only reason why the stair and elevator shafts, perhaps, are more important is the fact that they afford the means by which the occupants of the building may get away safely in case of fire.

An important element in an efficient fire door of any type is the hardware with which it is equipped. Greater care is needed in its selection for doors in office buildings since appearance must be taken into consideration. The larger manufacturers of interior metal trim generally make doors with suitable hardware that meet the tests of the fire underwriters.

Of lesser importance than the items already referred to are the methods used in the structural elements of the building. Where economic conditions make it possible, a greater use of fire-resistive construction is to be recommended. Well constructed timber floors with double flooring, hardwood upper finish, and metal lath and ceiling protection have a worthy record. Floors of terra cotta or cinder concrete arches between steel beams are, nevertheless, to be preferred because of their higher efficiency rating. It must be understood, however, that in speaking of fireproof construction the encasing of any steel or iron that enters into the structural work is absolutely essential, including floor beams, girders and columns. Unprotected steel, though incombustible, is more likely to fail and collapse within a given time than well constructed timber work.

In spite of what may be done to make the building itself invulnerable to fire, there is still the hazard, small though it may seem in an office building, to the contents. Suitable provision should, therefore, always be made for extinguishment within the building. The most effective and, when properly maintained, most responsive means of extinguishing a fire in its incipience is the automatic sprinkler. Its record of efficiency is very high. Wherever it is possible, a system of automatic sprinklers should be introduced in an office building. There is, of course, some hazard to office records from leakage of the system. Proper care and maintenance will, however, minimize this danger. H. P. Weaver, of the Independence Inspection Bureau of Philadelphia, who has given the matter of the protection of records a great real of earnest thought, believes that the danger is overestimated and cites experiments made by his organization with ledgers submerged in water which after several days' immersion were still legible, although bindings fell apart. They would hardly have survived the ordeal of fire as successfully.

When office buildings attain a height at which it is difficult for a city fire department to reach the upper stories with its apparatus, standpipes, generally most serviceable when located in the stair halls, must be installed. Such equipment should have street connections to which the fire department may couple up and continue the flow of water after the supply in the tank attached to the standpipe has been exhausted. Hose outlets should be inserted at every story in the line of the standpipe and adequate hose to reach the farthest corner of any story provided.

In addition to these fixed forms of fire extinguishing apparatus it is well to distribute throughout the building ordinary 2½-gallon soda water extinguishers of types approved by the Underwriters' Laboratories, even though there may be an automatic sprinkler system. These should be so located in the corridors that they are readily accessible to anyone. Instruction in their use should be given as generally as possible to the occupants of the building.

In this brief outline of the fundamental requirements for fire protection in office buildings, details have been necessarily dealt with superficially. Successful prevention of fires is dependent on a close observance of such details in the planning, installation, maintenance and use of devices and forms of construction. Regulations giving full information and instruction, which have had thorough study by committees of experts, are freely issued by the National Board of Fire Underwriters. Close attention to these rules will undoubtedly reduce the fire hazard to a minimum.

Materials and Maintenance

By EDWARD VAN VLECK
Of Starrett & Van Vleck, Architects, New York

SECOND only to the impression made by an agreeable or depressing entrance hall of an office building, is the reaction on landing from an elevator on an upper floor. Well lighted elevator lobbies and corridors sufficiently spacious to appear to welcome rather than to imprison, with walls and ceilings of material in fairly light and cheerful tones, are important psychological factors in establishing in the public mind the attractiveness and desirability of space in buildings so favored.

It is generally impracticable in metropolitan office buildings to obtain outside light for elevator lobbies and corridors on upper floors, and, with the necessity for permanent artificial light, greater care must consequently be taken in the selection of materials, with particular reference to their color, when expense and durability have been passed upon. In reviewing the practicable materials for corridor floors and walls, the first consideration is quite generally that of the cost, with the factor of durability always in mind, together with the cost of maintenance. Æsthetic considerations are often, unfortunately, subordinated to these controlling factors. It by no means follows, however, that it is necessary to use the more expensive materials in order to render lobbies and corridors attractive to the average visitor or the prospective tenant. It is the writer's belief that harmonious colors, adequate lighting and meticulous cleanliness have far greater weight than the lavish use of costly materials.

On account of the fairly permanent character of elevator lobbies on upper floors, it is permissible and in fact desirable to use more expensive material than may be found practical and economical in the distributing corridors, where a likelihood of frequent tenants' changes must be taken into consideration. A marble wainscot to the height of the elevator door heads will be justified, with a floor of travertine, marble, or high quality terrazzo laid as metal stripped tile,—the travertine being preferable at elevator landings on account of its non-slipping qualities. For office corridors, however, the character of occupancy changes so frequently, with a constant shrinking or expansion of corridors in length and occasionally in width, that permanent floors may prove an extravagance in replacement and patching. More and more it has become the practice to extend cement floors continuously over the rentable area of office space throughout the building, including all corridors excepting permanent elevator lobbies; all subdividing partitions, saddles, floor coverings, etc, are erected or laid over the finished cement floor and can be readily removed without cutting the cement. For corridors, soft tile has become justly popular, as it is not expensive, wears well and can be easily repaired, removed or extended. There are several acceptable tiles of this kind on the market—rubber or cork compositions. These floors are practically noiseless, which gives them an added advantage over marble or other hard floor materials, especially when adjacent to private offices. In any case, the base in corridors should be of marble, or if of wood or steel, should have mop strips of marble or bronze so that paint or varnish finish will not become soiled or marred by the frequent cleaning of floors. Saddles for office corridor doors are preferably of bent or cast bronze, bolted to the cement floors so as to be easily removed when tenants' changes are made.

Office corridors and subdividing partitions may have painted or enameled dadoes, which require frequent repainting, as they are generally subject to hard usage. The likelihood of frequent tenants' changes and the cost of marble wainscoting, however, are more than likely to offset in the owner's mind the higher maintenance of the painted walls.

Many owners object to the use of interior windows or "borrowed lights" as they are generally known, in the corridor walls of offices, the chief purpose of which is to gain natural light for the corridors. If they are not used, a considerably increased amount of artificial light is of course necessary, and more care should be given to the long corridor walls to render them attractive. Where borrowed lights are used, it is the general practice in some cities to set them on the transom lines of the doors, about 7 feet, 6 inches above the finished floors. The writer, however, considers that better light is obtained if they are set about 5 feet, 6 inches above the floors.

Toilet rooms should have impervious floors of ceramic tile or terrazzo subdivided with brass strips, with sanitary cove bases either of ceramic tile or terrazzo or a plain marble base. Wainscots should be provided of glazed tile or marble of a height at least to receive the highest adjacent fixture. Stallwork should be of marble, with back and wall slabs of the same material of a height sufficient only for adequate privacy. Excessive height and heavy capping of marble stallwork are not desirable. The stalls should be of ample width and depth with doors opening in, if possible, so that occupancy may be seen at a glance.

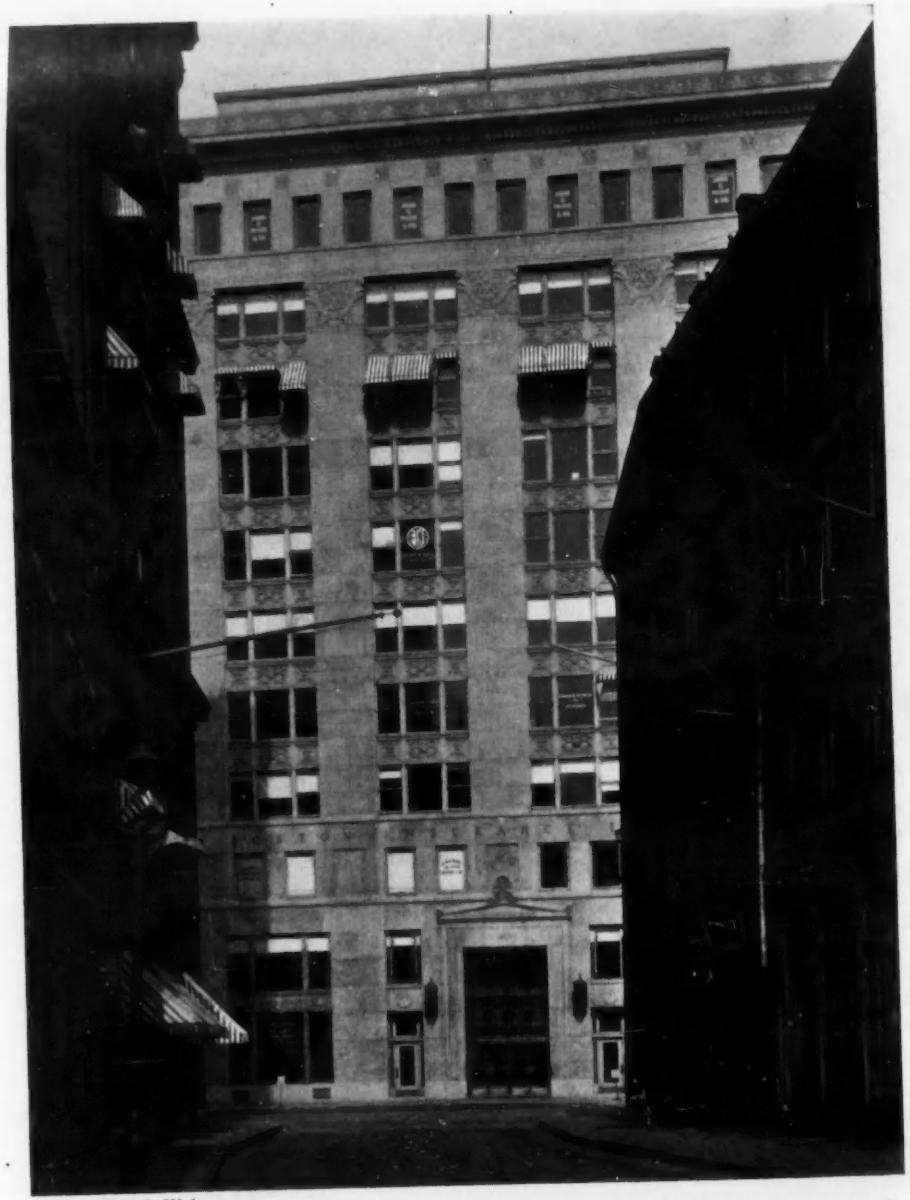
The material and finish of stairs, platforms and stair halls, as well as the ease of their rise and tread, will depend upon whether the stairs serve as fire exits only or are to be used for frequent intercommunication. For fire stairs, bent steel nosings and cement-filled treads and platforms, with cement floors and slate or cement bases for halls, are adequate. Steel nosings used on intercommunicating stairs become polished and are dangerous, and for such stairs either soapstone or similar material having non-slip qualities should be installed or a cement tread provided with ample safety treads of metal or alundum tile. Unless stairs are in exposed locations, where an ornamental character may be desirable, the strings and balustrades should be of simple design with few or no scrolls or mouldings, for sanitary reasons and to reduce the upkeep cost. Handrails of enameled steel pipe require less attention than those of bronze, or brass tubing or wood.

Cement is the most economical material for office floors, and if properly laid is favored by the underwriters with a minimum rate. It may be hardened by the application of various compounds and may be improved somewhat in appearance, but not in durability, by color; but like all hard floors, it is uncomfortable under foot, and should be covered with a soft material. From a utilitarian standpoint, linoleum is the most popular material for floor covering in offices, large and small, on account of its soft composition, sound-deadening qualities, low comparative costs and ease of installation and repair. Where a better appearance is required, linoleum or rubber laid in tile form combines the advantages of a plain linoleum with improved color effect at about 50 per cent increase in cost. In some cities wood floors are still largely used on account of local custom and prejudice in their favor. They are, however, expensive to properly maintain, and in many instances are prohibited by law for large fireproof buildings, and are being less used each year.

For wall painting there are numerous flat wall finishes on the market, generally oil paints, but less expensive than white lead paint and more economical for interior work on plaster surfaces. They are more sanitary and lasting than kalsomines and cold water paints, and may be had in gloss finish for dadoes.

For exterior windows, plate glass should be used. The sash of office building windows are usually large, seldom subdivided by muntins, requiring large lights procurable only in plate glass. There is not distortion of vision such as is frequently the case even with better selected sheet glass. The exterior appearance of the windows is much better on account of the absence of waves, and the breakage is greatly reduced. Plate glass is also desirable for transoms and for interior windows above the line of door heads, although a high quality sheet glass is not objectionable in these locations. For the glazing of doors and interior windows at a lower level, where not required by underwriters to be of wire glass, some attractive form of obscure glass may be used, with prism, plain figured or stripped surfaces. Ease of cleaning, as well as cost and appearance, must be kept well in mind in selection.

Bird's-eye View of Surroundings of Bush Terminal Building, London
Helmle & Corbett, Architects



CUSTOM HOUSE PORTICO AND BOSTON INSURANCE EXCHANGE

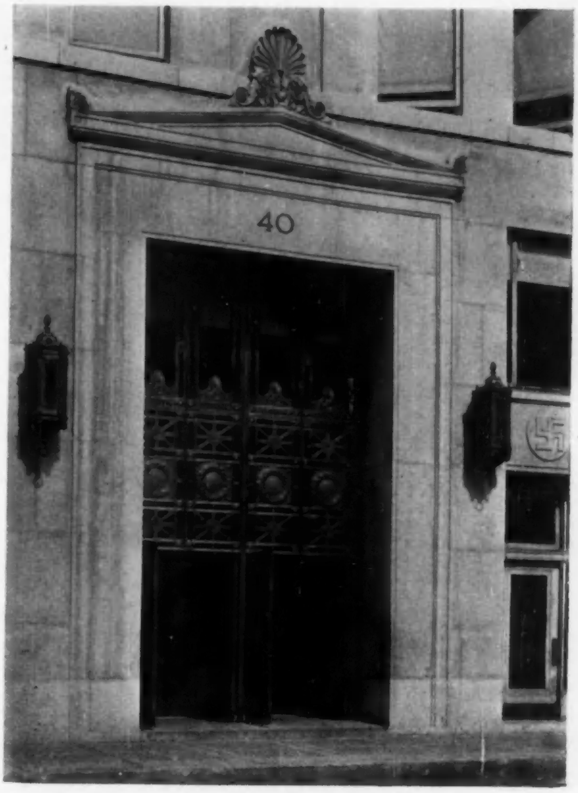
Of the Boston Insurance Exchange the exterior material is limestone, with window spandrels of iron and copper. Construction: steel frame. Floors: long-span terra cotta tile, with concrete joists. Heating: direct steam. Electric service: 110-220 volts, d.c. Elevators: single-gear traction, bronze finish. Windows: wood sash. Finish of corridor walls and floors: marble on first floor, elsewhere plaster walls, with marble base and rubber tile floor. The building covers an entire block, irregular in shape. Decorations were carried out simply in the Greek style, to harmonize with the Doric architecture of the remodeled Boston Custom House opposite on Central Street.

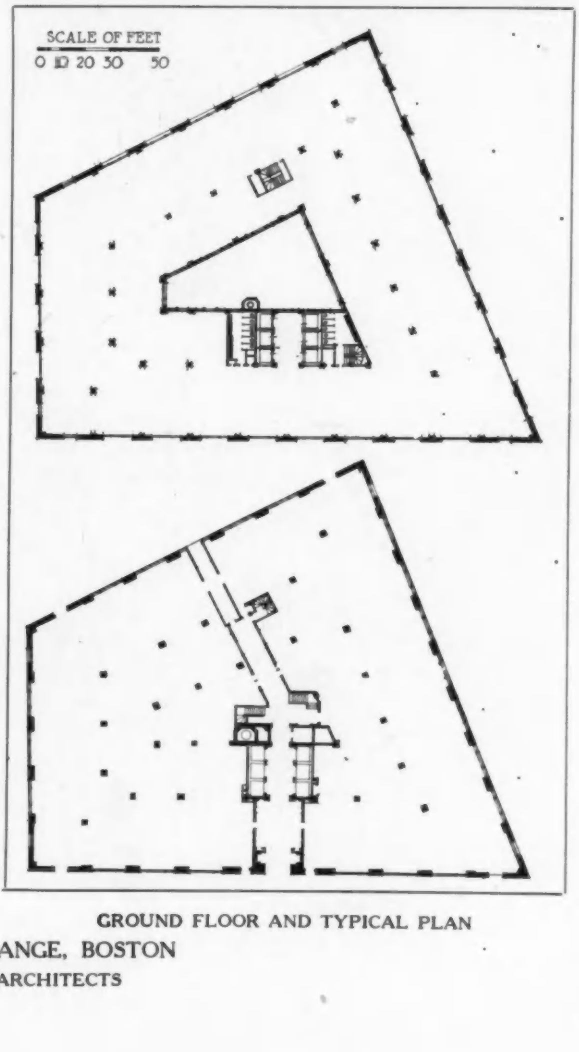
Photos. Paul J. Weber

BOSTON INSURANCE EXCHANGE, BOSTON

COOLIDGE & SHATTUCK, ARCHITECTS

ELEVATION OF MAIN FACADE



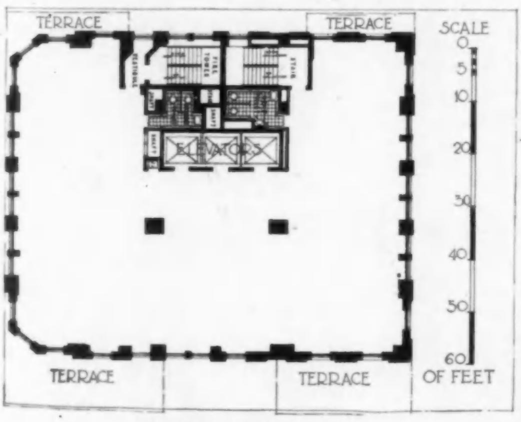


GROUND FLOOR AND TYPICAL PLAN

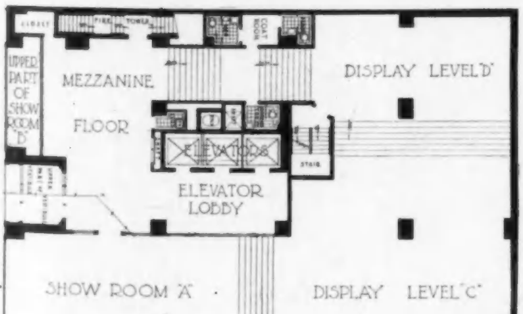
BOSTON INSURANCE EXCHANGE, BOSTON

COOLIDGE & SHATTUCK, ARCHITECTS

VIEW FROM BRYANT PARK



TYPICAL FLOOR PLAN



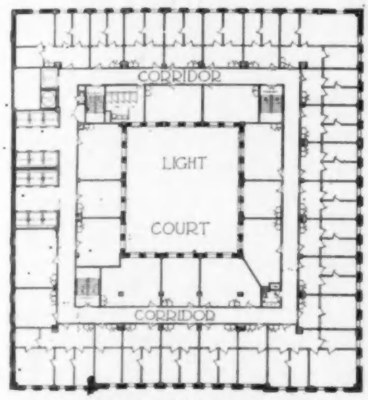
GROUND FLOOR PLAN

PERSPECTIVE SKETCH BY BIRCH BURDETTE LONG

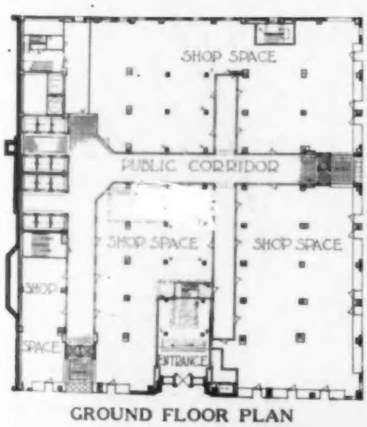
AMERICAN RADIATOR CO. BUILDING, NEW YORK

RAYMOND M. HOOD, ARCHITECT

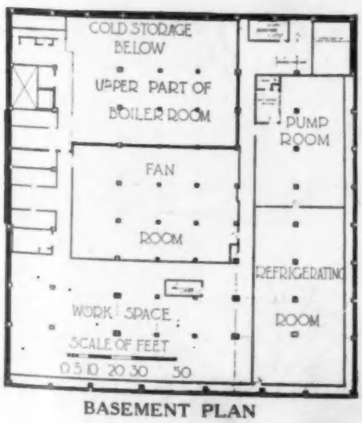
The exterior material of the Straus Building is Indiana limestone. Steel frame construction. Tile arch floors. Two-pipe vacuum heating system, up-feed type. Electric service: three-wire, 110-220-volt, direct current; 30-volt low tension to all tenants for buzzers, clocks, etc. Metal windows. Corridor floors: marble tile 9 x 18 inches. Walls: Tinos green marble. Wainscot: cream marble.



TYPICAL FLOOR PLAN



GROUND FLOOR PLAN



BASEMENT PLAN

THE S. W. STRAUS & CO. BUILDING, CHICAGO
GRAHAM, ANDERSON, PROBST & WHITE, ARCHITECTS

Economic Factors of the Office Building Project

By LEO J. SHERIDAN
Chairman, Building Committee, S. W. Straus & Co.

THE provision of desirable office facilities at prices which will me reasonable to those demanding such facilities and which at the same time will bring an adequate return to those who have been instrumental in supplying them is the fundamental economic problem of the office building business. The return must be ample to attract adequate capital from other opportunities for investment or the supply of office space will not equal the demand, and rents will rise to abnormal heights. Because of the huge capital investment in the modern office building, the relatively long period which necessarily elapses between the initiation of a project and the time at which the resultant office space becomes effective supply in the market, the relative permanence of the building once it has been erected, the frequent changes in architectural or engineering practice and in the character and rate of city development, and the comparative difficulty of ascertaining actual supply and demand conditions in the office space market, it is not easy to secure that nice adjustment of supply and demand, costs and prices, investment and return, which is possible, for instance, in the production of steel or shoes. Obviously, therefore, it is doubly important to give the most careful consideration to the economic factors involved. If the economic purpose of the business is to be served and if vast economic waste is to be avoided, economic considerations must receive at least as much attention as is given to architectural design and engineering standards.

Before any commitment whatever is made, the *entrepreneur* who has conceived the idea of erecting a modern office building should institute a careful economic survey of the city and district in which he proposes to build in order to ascertain whether there is now and will likely continue to be a demand for the proposed additional space sufficient to insure the financial success of the undertaking.

The basic economic factors responsible for the city's present size and prosperity—location, natural resources, industries, transportation facilities, labor supply, power costs, etc.—should be studied in order to arrive at an intelligent judgment in regard to the probable nature and extent of future growth. Total net rentable office area and percentage of occupancy should be secured for a period of years in the past and an attempt made to correlate the city's office space requirements with its population, its bank clearings or bank debits, and other indexes of business activity. Investigations seem to indicate that the average requirement of office space is 3.9 square feet per capita in Detroit, 6.5 square feet in Los Angeles, and 6.4 square feet in Chicago. Another study, based on 12 Southern cities with a population around 300,000, indicated 4½ square feet for each inhabitant and 1 square foot for every $1322 of bank clearings. Present conditions of supply in the office space market should be determined by listing all buildings now offering competitive office space, with their net rentable areas, vacancies, rental schedules, etc., and all new or remodeled buildings with the net rentable areas which they will throw upon the market when completed. On the basis of past experience and present conditions, a conservative calculation of immediate and future office requirements may then be made. Reasonable allowance may be made for space now on the market which is "on the margin" or practically obsolete and which would cease to be a competitive factor if more desirable space offering the most up-to-date service at reasonable rates were available. In the case of an ordinary office building, catering to the general class of office tenancy, there should be a reasonable expectation that the building could be filled to about 70 per cent of capacity within a year after its completion and to about 90 or 95 per cent within two years of that date. Specialty buildings catering to specialized classes of tenants, particularly where, as in the case of medical buildings, expensive equipment is necessary, should be well rented, say from 60 to 70 per cent, before the project is started.

In estimating the logical rental income to be expected, the rates for equally desirable space in neighboring buildings will be the best guide. Reasonable allowances, however, may be made for difference of attractiveness in connection with any or all of the six features of an office building which tenants regard as of outstanding importance: (1) convenience of location; (2) imposing structure; (3) equipment and flexible, well lighted layout to add to their convenience and meet efficiently their requirements; (4) atmosphere and environment which come from the association of tenants of high character; (5) efficient, pleasing service; and (6) attractive rental rates. In developing the rental schedule, the degrees of attractiveness of different space units will need to be considered. Space on the upper floors above "the dust and insect line" will carry a higher rate than that on the lower floors, while the better light and the prestige value of the outside and especially the front offices will give them a higher rental than those with court or alley exposure only. Slight differentials in rate may also arise as a result of the quantity of space bought by any individual tenant.

If the preliminary economic survey indicates that the city offers an adequate demand for the facilities of the general type under consideration, the next step is to continue the survey in order to obtain the best possible site for the proposed structure. The selection of the proper site is fully as important as the correct answer to the question of supply and demand, for the economic wastes due to buildings which are misplaced or unsuited to their surroundings are just as serious as those due to over-development or to too rapid discounting of the future. As a building usually secures the best results when it is surrounded by structures of a similar type and use, the particular site chosen should be in a section which is well defined as the high class office building district. This will usually be found *in* or, perhaps in the majority of cases, *near* the best retail section. Accessibility to transportation facilities and to the financial center is also essential. If legal tenancy is to be encouraged, proximity to the city and county buildings will be desirable. Care should be taken to see that the particular improvement which it is proposed to put on any specific site represents the most advantageous use of that location, not only for the present but also during the entire life of the building. The past history, present stability, and future prospects of this office district should be studied to determine whether there are fundamental economic, social or legal forces at work which will tend to shift the office business away from it. It is obviously dangerous to build in a location from which business is moving away or from which it may move away in the early future. It is also dangerous to pioneer in a new district unless one is absolutely certain that the trend of municipal development is in that direction. It is true, however, that an important building of pleasing design, efficiently planned and efficiently managed, may dominate its neighborhood and act as a magnet in drawing similar businesses to its locality. The rewards of successful pioneering of this type in appreciation of land values are exceedingly attractive, but daring should be tempered with judgment if heavy operating losses are not to be feared in the early years of the venture.

The most successful office building today is not a structure which is used wholly and solely for offices. It is one which draws the maximum possible income from its ground floors by leasing them for retail purposes. In fact, a general rule used by many experts in obtaining a site is that in order to be a financial success a tall building upon the proposed site should be able to earn from the leasing of its ground floors and basement space sufficient to pay taxes and a reasonable return upon the cost of the land. Some experts go so far as to demand that the taxes on the first floor of the building should also be covered; others hold that the income from the basement, first floor and second floor should cover the return upon the cost of the land plus the taxes on the land and that portion of the building. Undoubtedly this rule, in whatever form it may be stated, has varying validity in different cities, and in any case should of course be used only as a very rough guide in the light of actual experience in the particular city. It does, however, indicate the importance which should be attached to squeezing the last cent of income out of the ground floor space.

As retail shops almost invariably pay the highest rentals, the possibilities of different available sites as locations for high class retail shops should receive the most thorough investigation. These possibilities depend upon a large number of factors—ease of access, traffic conditions, width of street, conditions of sun and shade, character of surrounding improvements, class of tenants in adjacent properties, contemplated improvements, etc.—and can probably best be determined by a count and an analysis of pedestrian traffic passing the site, although, where the district is old and well established, the class of tenancy best suited to it is probably fairly well determined by the occupancy of adjoining buildings. The technique of pedestrian traffic counts is now well established. Usually, however, their interpretation is less scientific and authoritative. It is the purchases made by and not the number of people who pass a given site that determine its value. The composition of the traffic (for instance, whether men or women) and the mental attitude of the passersby (for instance, whether leisurely strolling, or rushing to work, or to catch a train) are, therefore, of vital importance. Hence, a careful analysis of the count must be made to determine what proportion of the people who pass the store *enter* the store, what proportion of those who enter actually buy, and what is the average purchase of those who buy. Upon the basis of such an analysis, the precise type or class of shop which is best suited to the location can be determined. With the number of purchases and their average

PERCENTAGES OF RENT TO GROSS SALES FOR VARIOUS CLASSES OF RETAIL STORES

Automobile agencies	2
Automobile accessories	10
Barber shops	$20 to $25 per chair
Books and stationery	8
Candy and refectory	8 to 10
Cigars and tobacco	7 to 10
Clothing:	
Women's cloaks and suits	6 to 10
Men's clothing	6 to 8
Credit clothing stores	8
Dental and medical supplies	5
Drug stores:	
General	8 to 10
Prescription	10
Cut rate	7
Electrical appliances	6 to 8
Five- and ten-cent stores	5 to 8
Florists	15
Furniture:	
Household	7 to 8
Office	5 to 7
Grocery stores	5 to 6
Haberdashers	8 to 10
Hats, men's:	
General	8 to 10
Low priced hats	6 to 7
Hosiery and knit goods	10
Millinery	10 to 12
Musical instruments, pianos, etc.	12 to 15
Restaurants	8 to 12
Rugs	7 to 8
Shoes:	
Men's, women's and children's—mixed prices	8 to 10
Men's shoes:	
Mixed prices	7 to 8
One and two prices	5 to 6
Women's shoes:	
Mixed prices	8 to 10
One and two prices	5 to 7
Tailors—men's	6 to 8
Trunks and leather goods	12
Women's wear	10

purchase determined, it is possible to estimate the gross annual sales, and knowing the percentage of rent to gross sales which the particular types of business can afford to pay, it is a simple matter to calculate the rentals which could be obtained from them. The percentage of their gross sales which various classes of retail establishments can afford to pay in rent is now fairly well known by experience, and data for a rather complete list of such establishments are presented in a table included upon page 122.

The procedure indicated is one followed more perhaps by the chain store real estate experts in establishing the rental values of stores than by building owners and operators. In a well defined district the rental value of ground floor space can be fairly well determined by the rents being paid either on a square foot or front foot basis for similar space in the same general locality, making allowances for special advantages or disadvantages of the site and its improvement. Building owners have not been slow, however, to sense the fairness of percentage leases, and are adopting in many cases a form of lease providing for a guaranteed minimum rental and a percentage of the gross business over a certain stipulated amount. In the Straus Building, Chicago, all of the space on the ground floor, with but one exception, where a percentage could not be applied, has been leased on such a basis. In one case, for instance, a shop was rented to a class of business which can afford to pay 10 per cent of its gross income for rent. The minimum rental was established at $20,000 per annum. On gross sales in excess of $200,000 the lessee pays an additional 10 per cent. This procedure guarantees to the building owner a certain definite established rental, which he is assured from year to year regardless of business conditions, provided financially responsible tenants are secured; it enables him to share with the tenant the increase in the value of the space during the term of the lease.

Before purchasing any lot, it is of vital importance to pay particular attention to its shape and size. If the area is too small or the frontage too narrow, it is impossible to improve it intensively enough to secure for the owner a return not only upon his building but also upon the land for which he has probably paid a king's ransom. The "vertical toothpick," like the inside lot office building, has rarely proved an economic success. Costs of construction are necessarily higher because of the disproportionate amount of enclosing wall; a moment's calculation will show that a building 100 by 100 would bring a saving over a structure 70 by 143 of nearly 15 per cent in the cost of constructing the exterior walls alone. Further, as the floor area is increased, the percentage of unproductive area (i.e., for elevators, stairways and other service facilities) decreases, and the operating cost per square foot declines. Generally speaking, the larger the lot and the more nearly it approaches a square in shape, the lower the unit cost and the greater the efficiency of rentable space. Ordinarily, net rentable area runs to from 60 to 70 per cent of total lot area and from 70 to 80 per cent of gross building area. If, therefore, the lot is too narrow or too small for profitable development, the promoter should look elsewhere, or else endeavor to combine it through sale or lease with other adjacent property. He should also avoid the frequent economic blunder of attempting to develop a lot that is too irregular in shape. Too often these result in too high a construction cost and too heavy a wastage of net rentable area and make it difficult if not impossible to give the tenants offices that approximate the ideal in size and shape. No general rules can be laid down for the solution of these problems of size and shape of lot. In many cases it will be advisable for the prospective buyer of a lot to ascertain from his architect whether the particular lot will lend itself to a good plot solution, and whether at the price asked under the given local conditions it will warrant the contemplated improvement.

There has been much discussion of the economic limitation on the height of office buildings, the prophecy having been made that "the day of the Equitables has passed." It is true that after a certain point a stage of diminishing returns is reached. As the building soars skyward, the cost of construction increases because of the heavier supporting columns, larger pipes, etc., which are required and the expense of hoisting materials, while the net rentable area decreases because of the greater wastage in elevator space and other service facilities. The space used for, and the service given by, the elevators constitute another and perhaps more effective limitation upon building heights. Good elevator service, it is often said, requires one elevator for every 20,000 to 30,000 square feet of floor area. This, like the ground floor formula already discussed, is a rough rule of thumb which is helpful in determining an original layout, but after the plans begin to take shape, elevator requirements should be determined only after a most careful study of the traction problem involved. Specific information in regard to such factors as the probable population of the building, the probable square foot area per person, the character of occupancy, the probable traffic from outside the building, the location of toilets, the probable peak load, etc., should be obtained, and with these data as a basis the number of elevators required to make possible a satisfactory time interval of 25 to 30 seconds between cars during the rush periods can then be determined.

If after a certain point the addition of another story or two makes necessary another elevator to give this type of service, the additional space has to carry the burden of that elevator installation plus the loss of rentable space on every one of the lower floors. But the limit imposed by such factors is much more remote than most of the critics of the skyscrapers seem to imply. A study of 185 buildings reporting to the National Association of Building Owners and Managers * in 1921 showed that gross income and net income increased with the height of the building to the full limit of 24 stories, which was the tallest building reporting. There can be no doubt that upon the land of high value, the economic limit would be much higher than 24 stories. It is clear, for instance, that if the average building obtains, say seven-tenths of a square foot of floor area per floor for each square foot of lot area, and if there were no increase in cost or in wasted space as height increased, the 30-story building would have 21 square feet and the 20-story building only 14 square feet of rentable area upon which to earn a return upon the investment in each square foot of land. Now, cost of construction and waste space will be greater, but, as Mr. Earle Shultz has pointed out, if the lot is of sufficient size, the height can go up to a very great extent before the increased investment in the building per rentable square foot will by any means absorb the corresponding reduction in land investment per rentable square foot. Of course, if the lot is of small size, the economic height will be reached much sooner. In all cases, the promoter should assure himself that the structure he proposes to erect will represent an "adequate" improvement of the site, that is, an improvement which will reflect the highest utility of the site and bring in the maximum net income over the entire life of the structure. The high values of land in the office building districts of our larger cities demand the most intensive utilization of that land, if the total investment is to yield a reasonable profit to its owners or investors.

Building code restrictions in the particular city and the necessity of protecting light and air will always complicate the decision in regard to the proper architectural planning for any particular plot of land. Into the details of building codes there is not the space to enter. Suffice it to say that they have an important effect on building costs and the possible economic development of any particular site which the owner and the architect should very carefully consider. As the value of any site is determined by capitalizing the net return from the improvement upon it, building restrictions which limit the character of the improvement will set definite limitations upon the value of the land. Even in the absence of legal requirements, however, strict economic considerations would dictate the subservience of other desiderata to the necessity for proper lighting and adequate ventilation. For no defect detracts so much from the rentability and income producing power of a building as office rooms that are poorly lighted and ventilated. Hence due attention should be given to the maximum proportion of the lot to be covered by the structure, to the shapes and sizes of light courts, and to the character of reflecting surfaces. The utmost care should be taken to prevent the likelihood of other tall buildings being built which would cut off the supply of light and air and thus cause a heavy reduction in the value of the proposed building. For this as well as other reasons, corner lots are almost invariably utilized for first class modern office buildings. The very large proportion of poorly lighted and poorly ventilated space in the office building erected on an inside lot has in almost all cases condemned it to a life of financial difficulty. In some cases the promoters of skyscrapers have considered it economically profitable to secure light easements or actually to buy up one or two of the adjoining interior lots or low buildings adjoining the site in order to block the erection of other high buildings and prevent the rapid obsolescence which would otherwise be the fate of their own buildings. Similar attention must be given to the proximity and character of adjacent buildings if the proposed investment is to be protected against exterior fire hazard.

*See Bibliography, page 159.

Another physical characteristic is of importance in the original selection of the site, namely, the character and depth of the subsoil. The tremendous weight of the modern 20- or 30-story office building demands that the utmost attention be given to the nature of its supporting foundations. Anything but the very best engineering theory and practice in the solution of this foundation problem and anything but the most rigid supervision and inspection of the underground construction will ultimately mean, at the worst, disaster; at the best, heavy expenditures to maintain the superstructure in proper plumb. In no other part of the project is apparent economy so likely to be false economy. The problem, of course, varies in different cities and in different sections of the same city. Where solid rock or "hard pan" is found near the surface, the solution is simple and relatively inexpensive. Where, however, as in Chicago, the solid rock is found 100 feet or more below the street level, heavy concrete caissons must be sunk. Where, as in New Orleans, no rock is to be found, pile foundations have to be used. Frequently, reliable information regarding proposed foundations may be secured by ascertaining the conditions encountered on adjacent structures. Otherwise, it may be advisable to dig test pits or to make wash or core borings. The owner should ascertain just what his liability is in regard to shoring in the particular city, and he should not forget that if the lot is already improved with a reinforced concrete building it may cost almost as much to demolish and clear it away as it did to build it.

The importance of this discussion is simply that modern conditions impose a rather heavy expenditure upon the builder before the work of erection in the strict sense may actually begin. This expenditure may vary considerably as between available sites. Other things being equal, the site which will involve the lowest expenditure for excavations and foundations should obviously be selected. Incidentally, if the underground expenditure is heavy, the advisability of constructing below ground three or four stories should be considered; these may be used for storage as well as for necessary mechanical equipment. In the new Straus Building, where the sub-sub-basement covered only a portion of the lot area large enough for the power plant, all caissons were cut off at the floor level of the sub-sub-basement and the steel set on grillage at this level. This will greatly facilitate the work of excavation if at a later date it becomes necessary to use the rest of the area, and the space so developed will be free from caissons ranging from 4 feet, 6 inches to 11 feet, 9 inches in diameter.

In estimating the probable total cost of building, a common practice is to compute the cubic contents of the structure and to multiply this cubage by a standard rate of so many cents per cubic foot. Experience of many indicates that these figures for costs per cubic foot are of relatively little value. Office buildings vary so widely in standards of construction and of equipment, and costs depend so much on these factors as well as on size and shape of lot, character of subsoil, location, etc., that arbitrary figures of this sort can be used only for the roughest approximations, or for checking purposes. In S. W. Straus & Co.'s investigations of office building plans submitted to them for assistance in financing, they have found it necessary to depart from the old, inaccurate method of "cubing" and revise the owner's estimates of cost either by taking off the actual quantities from the plans and specifications and making detailed estimates or by carefully checking the plans and specifications with plans which have been worked out from long experience as representing standard costs for various classes of buildings and of various sizes. In these comparisons, full allowance is made for all the deviations from the standard type which any specific project is bound to show. Further, due consideration should be given to the influence of local conditions, particularly to the cost and efficiency of labor at the particular time and place. It is a well known fact that the cost of constructing standard buildings in different cities may show a variation as great as from 20 to 30 per cent. Labor conditions are primarily responsible for such variations, though differences in climate, in distance from the sources of particular building materials and in the severity of local building ordinances may also be important. In many cases the promoter of a proposed building will find it advisable to call for bids from outside contractors; instances might be given where outside bids of this sort have beaten the best local bids by as much as 20 per cent.

Office buildings differ so greatly in shape and size, type of construction, exterior treatment, character of finish and of equipment, etc., that it is difficult to compare costs of different buildings without misleading results. However, as a rough guide to assist the prospective builder in determining his probable relative expenditures on the different parts of his building, there has been prepared a table showing the percentages of various contracts to total costs in the case of a number of important buildings of high grade construction and of approximately 20 stories in height. (See Exhibit A.)

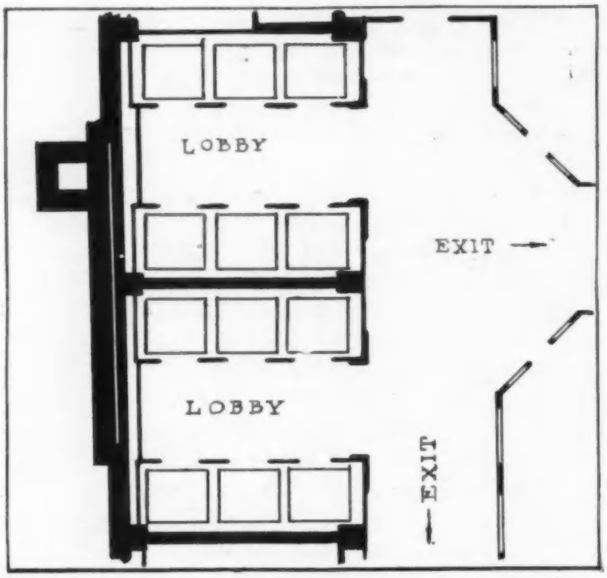
Buildings A and B were built about 20 years ago, but all the others have been erected in the last year or two. Buildings A, E and F house important

EXHIBIT A

Percentages of Contracts to Total Cost of Office Buildings

(Fireproof Construction: 18 Stories or More in Height)

	A 1902 *Bank and Office*	*B* 1903 *Comm'l Office*	*C* 1923 *Comm'l Office*	*D* 1923 *Comm'l Office*	*E* 1923 *Bank and Office*	*F* 1923 *Bank and Office*	*Range*	*Median*
Elevators	5.8	7.7	4.4	5.7	5.1	4.3	4.3- 7.7	5.4
Glass and Glazing	1.4	2.4	1.3	1.9	1.0	1.3	1.0- 2.4	1.3
Hardware	0.6	0.6	0.7	0.9	0.6	0.6	0.6- 0.9	0.6
Heating and Ventilating	4.7	6.5	4.6	4.6	4.9	5.9	4.6- 6.5	4.8
Carpentry	11.8	11.3	(52.3)	15.6	10.3	7.0	..	11.8
Masonry	22.7	26.4		30.3	25.4	25.8	..	25.8
Caissons	..	..	..	7.0	..	4.7	..	..
Brickwork	..	..	..	5.6	..	2.7	..	..
Tile arches and partitions	..	..	..	10.8	..	5.9	..	..
Fireproofing	5.9	7.5	7.7	..	5.9	..	..	..
Cut stone and terra cotta	8.5	7.9	11.0	4.3	5.9	5.3	4.3-11.0	6.9
Marble and Tile	9.2	6.8	6.9	4.5	13.1	9.6	4.6-13.1	8.1
Ornamental Iron	5.9	3.9	4.1	3.2	6.2	3.5	3.2- 6.2	4.0
Painting and Decorating	1.2	0.5	0.8	1.0	0.7	1.0	0.5- 1.2	0.9
Plastering	5.7	4.4	3.1	5.1	3.1	3.0	3.0- 5.7	3.8
Plumbing	4.2	4.8						
Roofing, Sheet Metal and Fireproof Doors			3.6	4.5	3.0	3.3	3.0- 4.8	3.9
and Windows	0.6	0.6	0.5	0.8	1.6	1.6	0.5- 1.6	0.7
Steel (including inspection and erection)	13.8	15.6	12.6	14.6	13.3	16.5	12.6-16.5	14.2
Vault and Vault Equipment	5.6	0.8	..	..	3.7	2.2	..	..
Wiring, Lighting Fixtures, etc.	4.0	3.9	4.3	2.3	3.6	3.2	2.3- 4.3	3.7
Wrecking, Excavating and Shoring	..	..	..	1.5	0.7	3.0	..	..
General Conditions	..	..	..	1.5	..	5.8	..	..
Miscellaneous	2.8	3.8	0.8	1.9	3.7	2.4	..	2.6
	100.0	100.0	100.0	100.0	100.0	100.0		



An Economical Arrangement of Passenger Elevators in Two Batteries of Six Cars Each

banking institutions, while B, C and D are office buildings in the strict sense. In the sixth column the range of the items for the six buildings is presented, and in the seventh column the median of the items. In some of the classifications, for instance, Hardware, Heating and Ventilating, Plumbing and Steel, the proportion of the contract to the total cost is surprisingly uniform. The percentages for Carpentry and Masonry, however, vary considerably because of important differences in the character of foundations, material used for the exterior walls, and type of finish. All of the substantial differences are subject to explanation. For instance, the high percentage for elevators in Buildings A and B is due to the fact that these two buildings use hydraulic installation. The high excavation costs in Building F, as compared with those of Building D, is to be explained by a greater number of basements. Building D is low on marble and high on carpentry because of the character of the finish. Subject to such differences in character of construction and equipment, in the case of any individual building, this table of percentages can be used as a rough guide in preliminary estimates of expenditure on the various parts of the building.

As a building is a durable commodity, its economic soundness can be determined only by what it returns throughout the whole of its commercial life. Its useful or commercial life may be shortened or ended either by physical decay due to wear and tear and the mere passing of time (physical depreciation) or by social or economic changes which cause it to fail to perform efficiently the service which is needed at the time and place (economic depreciation or obsolescence). Physical depreciation is constant and as inevitable as fate; obsolescence is usually more sporadic and sudden, but it is a risk to which all property is subject in our dynamic American cities. Our experience with the modern skyscraper is still too limited to determine with complete confidence the rapidity with which it will depreciate or become obsolescent. Usually, however, the physical life of such a structure is considered to be from 50 to 100 years, while its economic life is expected to terminate in about 40 years. A recent investigation by the National Association of Building Owners and Managers seems to indicate that the life of a modern office building may be divided into two periods. During the first period, which extends from the erection of the building to about the 28th year, the gross income remains nearly constant, though expenses rise continuously. During this period the building is able to maintain itself as a first class building, housing the best grade of tenants and drawing the best rentals. During the second period, which extends from the 28th year to the end of the building's life, the gross income falls very rapidly, as does also its operating expense. The net income continues to decline and at a slightly faster rate than during the first period. As a result of obsolescence (due to the normal expansion of the business district, the shifting in location of the business district, the erection of new buildings, more modern and complete service of newer buildings, or the damage caused by new adjacent buildings cutting off light and air), the building finds itself losing its better class of tenants. Because of the decline in net income, operating expenses are proportionately reduced by giving a cheaper grade of service. The building thus becomes a second grade building, then a non-producer, and then a loser; eventually it is replaced by a new structure.

Physical depreciation will largely depend upon, and obsolescence will be greatly influenced by, the character of the materials and equipment which are selected for the building and the general standards of construction which are maintained. The decision upon these factors will depend partly on whether the building is intended as a strict investment proposition or whether it is in part designed for monumental or prestige-building purposes. Any building should be designed and constructed to fit the purpose for which it was intended. Therefore, in the monumental building, which by the way should bring an adequate return, of either a tangible or intangible sort, upon the total investment in it, the commercial need for economy of construction will be sacrificed to some extent to the desire for beauty, grandeur, artistic embellishment, distinctiveness and general impressiveness—without which the building will fail to achieve its objective. Materials chosen with these ends in view—stone, for instance, for the exterior walls because of the impression of solidity and permanence which it gives—will in all probability show also the maximum physical and economic life, though the first cost may be high.

In the ordinary investment building, the objective is to secure the maximum return upon the investment over the longest possible period. Economy, therefore, is the ruling motive. Sound economy, however, relates not only to original cost but to all the costs that have to be incurred throughout the life of the item. In selecting materials, therefore, the problem will be to secure materials of the maximum physical life consistent with the minimum of cost. The answer to this problem will in many cases call for fine discrimination. For instance, there is still some controversy among the experts as to whether terra cotta, which has probably a shorter life than stone, is to be preferred to cut stone now that the difference in original cost is not great. In other cases the decision will not be so difficult to make. Under certain conditions of water supply, the use of brass piping will undoubtedly prove economical in the long run. So, also, in most cases will the choice of copper flashings and gutters, instead of those made of galvanized iron; mahogany or walnut trim instead of the cheaper woods; a slightly better grade of wire than ordinary code wire; and plate glass instead of ordinary glass for all exterior windows. Further, on account of lower maintenance costs as well as because of their effect on insurance rates and the greater amount of light area which they make possible, metal windows are now probably to be preferred to those of wood.

Special consideration should be given to the mechanical equipment, both fixed and motive, which today makes up from 10 to 25 per cent of the total cost of a building. It is the normal thing for this mechanical equipment to be reconstituted at least once, and in the case of some items even twice or three times during the life of the building. (See Depreciation Schedule, Exhibit B.) The economic importance of selecting equipment of the highest quality and of the most up-to-date standards at the time the building is erected is, therefore, obvious, if the

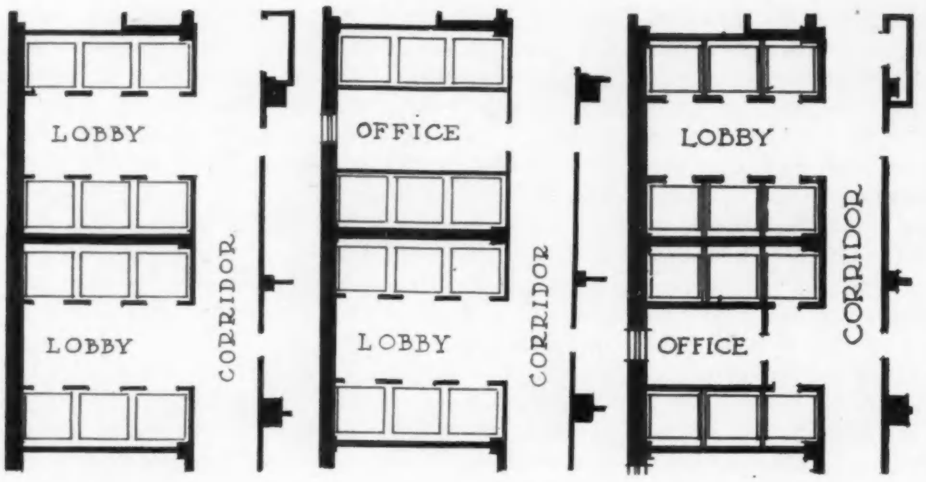
EXHIBIT B

Depreciation Schedule

Group Equipment	*Economic Life*	*Per Cent Annual Depreciation*
A. Buildings		
Class A Construction	50 years	2
" B "	40 "	2½
" C "	33 "	3
Floors, wood	20 "	5
" marble and tile	20 "	5
Plastering	20 "	5
Sheet metal, spouting	15 "	6⅔
Hardware	20 "	5
Roofing, tin	15 "	6⅔
" composition	15 "	6⅔
" shingle	15 "	6⅔
Stacks, brick	33 "	3
" steel	12 "	8⅔
Doors	33 "	3
Windows (complete)	33 "	3
Interior wood trim	40 "	2½
B. Building Appurtenances		
Standpipes		
Flag poles		
Fire-escapes	15 "	6⅔
Deep wells		
Sewers		
Sidewalks		
Paving	25 "	4
Retaining walls	20-50 "	2-5
Tanks, steel	22 "	4½
" wood	12 "	8
C. Mechanical Equipment		
Heating and ventilating		
Sprinklers		
Inside electric wiring		
Elevators		
Fire-alarm apparatus	20 "	5
Fire-prevention apparatus		
Air-compressors		
Shafting, pulleys		
Hangers, belting		
Plumbing	17 "	6
Elec. light and power wiring	17 "	6
Refrigeration mach.	15 "	6⅔
Laundry machinery	15 "	6⅔
Lighting fixtures	15 "	6⅔

Group Equipment	*Economic Life*	*Per Cent Annual Depreciation*
D. Power and Steam Plant Equipment		
Boilers		
Water purifying plant		
Engines		
Steam turbines		
Superheaters		
Stokers—moving parts		
Dynamos	20 years	5
Electric machinery—generators		
Electric machinery—motors		
Switch parts		
Cable, underground		
Elect. wiring-power mchy.	17 "	6
Steam plant equip.	17 "	6
Piping	13 "	7½
Stokers—fixed parts	5 "	20
Storage batteries	17 "	6
Engines—gas and oil	13 "	7½
Fuel oil system	13 "	7½
Gas plant equipment	15 "	6⅔
Hydraulic plant equip.	17 "	6
Pumps	13 "	7½
E. Furniture and Fixtures		
Partitions, wood	13 "	7½
Mechanical office equip.	5 "	20
Telephone equipment	13 "	7½
Carpets, rugs, linoleum	5 "	20
F. Miscellaneous		
Small hand tools	10 "	10
Wood working mchy.	20 "	5
Vacuum cleaners—portable		
Vacuum cleaners—stationary	10 "	10
Vacuum cleaners—hand		
Scrubbing machines		
Meters	20 "	5

(From report of Cleveland Association of Building Owners and Managers on Depreciation, Obsolescence and Appreciation.)



Express and Local Elevators Arranged in the Same Batteries. Floor Area Between Express Elevators Used for Office Purposes. Straus Building, Chicago

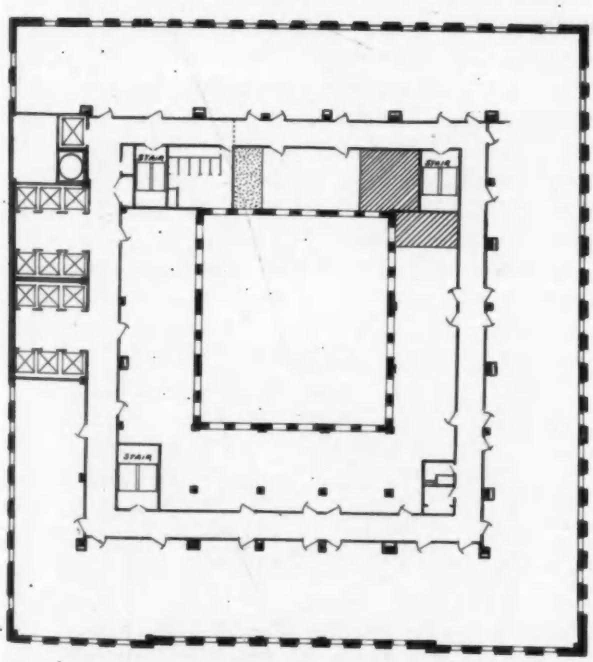
necessity for replacement is to be postponed as long as possible and if the costs of maintenance are to be kept at a minimum. The elevator installation in the new Straus Building may be used as an illustration of the utmost pains being taken to attain these objects. The cars are of super-speed type, their acceleration and deceleration being automatically controlled to insure a smooth and easy start and stop. The cars are brought to a perfect level with the floor by another automatic control. The doors, which are of pleasing design, are operated by air, opening automatically when the car comes to rest at a floor and closing by button control of the operator. In safe and efficient operation as well as in appearance, they represent the most modern standards. Their selection was governed by the desire to give service of maximum efficiency at reasonable cost over the longest possible period.

The importance of postponing obsolescence and reducing maintenance charges by the careful selection of materials and equipment cannot be exaggerated. But the risk of obsolescence can also be reduced and the economic value of the investment immensely increased by giving due attention to the income and management viewpoints in the planning and layout of the building. For years S. W. Straus & Co. has maintained a plan service department, manned by architects, engineers and practical loan experts, whose duty it has been to revise building plans submitted to them with the aim of reducing costs of construction, eliminating waste space, adapting layout to serve most effectively the needs of prospective tenants, and in these and other ways increasing the rate of return upon the investment. Early in 1923 a similar service was initiated by the National Association of Building Owners and Managers, the new Straus Building being the first building to receive the benefits of this service. The Building Planning Service of the Association, in bringing to the planning of new buildings the suggestions that flow out of the ripe experience of the best building managers in all parts of this country, carries rich promise for the future of office buildings from the point of view of efficient service to the tenant and adequate return upon the owner's investment.

Only the briefest reference can here be made to some aspects of planning work of this type. One of the most obvious services that can be performed is the reduction of cubic space and length of exterior wall to the minimum. As the major part of the cost of a project is in the enclosing wall, the importance of such reductions is obvious. By changing the shape, size, and position of the light courts, or by shifting service facilities, using minimum story heights and floor thicknesses, eliminating unnecessary thickness of enclosing walls, revising layout of rooms, and altering the general shape of the proposed building, instances might be cited of savings in construction costs of from 8 to 15 per cent without sacrifice of income-producing area. In determining the proper plot solution, the endeavor should be made to get the ratios of square feet of net rentable area to cubic contents and to square feet of enclosing wall as high as possible. In some buildings a ratio as high as 1 to 18 or 19 has been secured. In others a much smaller ratio of rentable areas has been had because clear ceiling heights have exceeded a satisfactory minimum of, say 10 feet or 10 feet, 6 inches, or because walls have been unnecessarily thick or the shape of the building unnecessarily wasteful.

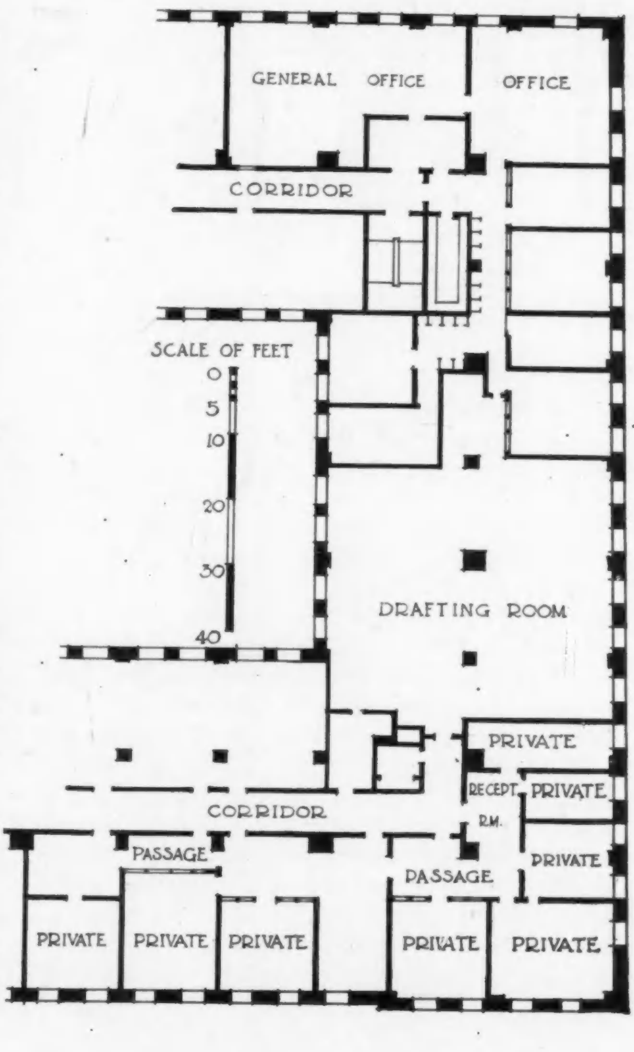
Endless experiment will be necessary to produce the maximum of first class net rentable area at least cost. A large amount of space—from 30 to 40 per cent—will necessarily be required for light and ventilation courts as well as for the physical structure itself and for essential service facilities. If too much of the lot area is covered by the building, light and air are sacrificed, cubic contents increased, and additional cost incurred for relatively unproductive space. If too small a portion of the lot is covered, a return upon the full value of the land is not secured. If elevators, stairways, and other public facilities are unwisely located or if too much space is wasted in public corridors or for other unproductive purposes, similar results follow. In the new Straus Building important economies were effected by utilizing a dark area behind the heavy steel girders on the fifth floor, Michigan Avenue frontage, instead of the basement, for safety deposit box installation, and by so finishing the express elevator lobbies from the second to the 13th floors, and the local elevator lobbies above the 17th floor, as shown in the diagrams herewith, that they could be used for rentable purposes. Dark court space was utilized for toilets, slop sinks, building utilities and stairs. In the development of a plan, however, the mistake should not be made of attempting to get the maximum of net rentable area without due regard to the quality of the space. Depth and exposure of offices, amount of dark or poorly ventilated space, etc., should be considered in working out an average square foot rental for the rentable area secured under each proposed scheme of plan. It is not necessarily the plan which utilizes the largest proportion of the lot that will give the largest return upon the investment.

Perhaps as important as any other single item is the layout of typical office floors. If the maximum flexibility of plan and the best arrangement for subdividing space into floors are to be obtained, provision must be made at the start for the proper spacing of columns. The best size of office will depend in part on the character of the tenants to whom the appeal is being made, in part on the latitude of the city, and in part on the effect of climate, sun, air, light, width of street, open spaces, water, or other natural conditions affecting light. Lawyers with small libraries and purchasing agents or advertising men whose filing needs are important will require more space than the tenant who simply requires room for desk and chairs, while the need for adequate and well distributed natural light, the best rental feature which any building could possibly have, will normally condemn the office with a depth of much more than 35 feet. Under normal conditions, spaces between columns should approximate 17 to 18 feet. This makes possible perhaps the most generally serviceable type of office unit, 17 to 18 feet in width and 25 to 30 feet in depth. Such units can be subdivided by a T-partition into two private offices of about 8 by 16 and a reception room of the same size running at right angles, and can be thrown into larger area when desired. Numerous studies, however, should be made to determine just what are the best depth and width under all the given conditions and just what arrangement will produce the maximum of perfectly and permanently lighted space with the minimum of building area of the typical floor. Window heads should be as near the ceiling as possible in order to assure the maximum amount of light, while window sills are well placed at 2 feet, 6 inches from the floor, a convenient height.



In the diagram above the shaded areas show the spaces originally planned as toilets on a typical floor of the Straus Building, Chicago. Toilets as actually built are shown at upper left-hand corner of the interior court. Dotted portion next the actual location indicates floor area saved, and also shows that only one window is used. This arrangement makes it possible to construct a partition across the corridor as indicated by the dotted line and to include all or any portion of the corridor in rentable area without affecting the accessibility of toilet locations.

Diagram at right shows part of one floor of the Straus Building arranged for occupancy of two tenants; it indicates the extreme flexibility of the plan, since offices requiring one space unit or an entire floor can be taken care of without making unduly expensive alterations.



Too much emphasis cannot be placed upon the necessity for elasticity in all the arrangements made for the subdivision of office space. With the ever-changing tenancy of modern office buildings, flexibility is of the utmost importance if heavy alteration costs and rapid obsolescence are to be avoided. Interior columns, for instance, should be spaced, wherever possible, near the corridor lines so that subdivision into areas larger than the unit spaces is possible. Light outlets should be placed on the outer columns instead of on partitions in order to save expense when partitions are moved. Plumbing and heating facilities should also be so arranged as to

Ground Floor Plan, Straus Building, Chicago
Graham, Anderson, Probst & White, Architects
Entrances from Both Streets Give Direct Access to Elevators, Show Windows Forming the Walls of the Corridors

secure the maximum economy in making future alterations of space. Corridors should be so arranged that dead ends may be closed up and thrown into open spaces for large suites. A certain number of typical undivided floors should be specified in letting the original contracts and a definite price per unit provided for additional partitions, doors, wiring outlets, plumbing, etc. Otherwise the bills for shifting partitions and other alterations for tenants may prove excessive. The size and arrangement of windows also should be considered from the point of view of adaptability of space to the varying needs of successive tenants. Windows should be so arranged as to permit the greatest flexibility in the subdivision of space through the shifting of partitions. For the same reason corridor doors should be placed opposite windows and never opposite the stonework dividing windows, and they should open away from the direction of approach from the elevators. Illustrations of typical floor plans in the new Straus Building are presented, showing maximum office depths of 27 feet (with few more than 26 feet) and indicating the possibilities of flexible treatment by means of the actual layout of a large office. A study of the floor plan itself will indicate the possibility of accommodating tenants requiring areas ranging anywhere from a single unit to an entire floor. This has been made possible by the care exercised in locating toilets, stairways and other building utilities. Obviously, the use of a complete floor as a single unit would have been impossible if men's and women's toilets had been located on each floor, properly separated on court space, instead of alternating them with men's on two successive floors and women's on the next. This plan is practical and economical.

As has been already found out, the ground floor should be the greatest revenue producer in the whole building. If this be true, the utmost care in its arrangement and fittings will amply repay the owner. The precise types of tenants who should do best in the particular location have already been determined by the original economic survey. Every endeavor should, therefore, be made to get the leaders in each of these types. But if these desirable tenants are to be attracted, the ground floor stores should be so constructed as to appeal to their particular requirements. A special study should be made to determine the proper widths, depths and ceiling heights for such occupancy, the location of entrances, the adequacy of freight receiving rooms, the requirements for mezzanine floors and for storage space in the basement. Too often these fundamental questions are decided arbitrarily. If at all possible, column spacing should be adapted not only to the upper floor offices, but to the ground floor stores as well. In this connection it is well to remember that if specialty shops are secured as tenants, a store width of only 15 to 17 feet may be required. This will not only solve the problem of column spacing for the whole building but will probably make possible one or two extra stores on the ground floor, each paying probably as much rental as stores with wider fronts would have paid. Depth is also important. Some types, such as novelty stores, etc., require only a very shallow store, while for shops of the general merchandising type a much greater depth is usually necessary. Another vital point is the shop windows, for, assuming the location, the real value of a store to a tenant lies in the tenant's ability to display his merchandise. In too many of our older buildings heavy monumental columns and other architectural embellishments divided the store fronts and destroyed most of the display space and consequently the rental value of the stores. Today the attempt is made, insofar as sound engineering standards make it possible, to eliminate everything that breaks the store front's glass line. Needless to say, uniformity and dignity should govern the general exterior treatment of store fronts under office buildings.

Where the office building is being built by a bank or is to have an important bank as one of its tenants, the modern tendency is to put the bank on the second floor, because of the desire to conserve the first floor space for high class shops, and also because of the deleterious effect of a bank on the value of adjoining sites used for shopping purposes. Where the second floor is not preëmpted for banking rooms, consideration should be given to the utilization of the street frontage at least for upstairs shops. Such space is in demand for an increasing number of kinds of business. If sufficient demand exists for this type of space, the second floor may be made to pay higher returns than if utilized for ordinary office purposes. In such case, attention must be given to the column and window arrangements to provide adequate display space.

In the provision made for the main entrance, public corridors, elevator lobbies, and other public space, the endeavor should be not only to satisfy every demand of convenience but also to give the effect of beauty, dignity, and spaciousness without undue waste of valuable space and without undue expenditure on artistic embellishment. These conflicting motives should be reconciled in a manner in harmony with the general character of the particular building. In the strictly commercial building, however, whatever of income is sacrificed to impressiveness and beauty in the provision for public space should be considered to be made up elsewhere; for instance, by better occupancy or by a slightly higher rental schedule because of the greater distinctiveness of the building.

In this discussion of the problems which confront the business man who is contemplating the erection of a modern office building, the writer has endeavored to apply to the solution of these problems the economic touchstone. He has recommended that principles and practices be followed which will lead to (1) the most economical but not necessarily the least investment in land; (2) the reduction of the cost of constructing the improvement to a minimum consistent with the highest utilization of the site and with minimum operating and maintenance costs; and (3) the production of the maximum rentable area consistent with desirable quality of the space and with the requisite efficiency of service facilities. The thorough carrying out of such a program will undoubtedly bring to the owner the maximum return upon his investment during the entire life of the property. But the application of these principles in the planning of his building and the analysis of actual operating results, once his building has been erected, will be greatly facilitated by the use of a simple yardstick for the comparison of costs and returns. The owner must regard himself as a producer or manufacturer of office facilities and use ordinary cost accounting methods as an essential tool for the control of his business. Cost accounting requires a basic unit in terms of which costs and returns can be stated in order to facilitate accurate record, intelligent analysis and effective planning for the future.

In the office building field, the square foot of rentable area is gradually becoming established as the most logical single unit. It is increasingly used as the standard unit even in the sale of office space. When one remembers that some competitive offices are 15 by 40 in size and others 18 by 25, the absurdity of comparing office rentals on the "per office" or "per room" basis is apparent. Yet, for renting purposes, not even the square foot can be standardized. So variable is the attractiveness of office space that the renting appeal to the tenant should probably be made on no single basis. On the other hand, the square foot unit provides a reasonably satisfactory basis for calculating the average rental of his available space, as well as for comparing it with the various items of his operating cost and with the returns and costs of other similar buildings. Other units have been advocated, but why the square foot of rentable area is usually regarded as the most satisfactory cannot be considered here.

If the office building owner is to be a manufacturer of office facilities, it is essential for him to know what his cost of production and his return upon his investment are likely to be. As has been already found, he selects from the various plan

OPERATION COSTS OF SEVEN EFFICIENT CHICAGO OFFICE BUILDINGS—1922
(In Cents Per Square Foot of Rentable Area)

	A	*B*	*C*	*D*	*E*	*F*	*G*	*Median*	*Arithmetic Average*
A 1 Cleaning	31.7	28.4	28.5	36.2	27.7	28.0	37.1	28.5	31.1
2 Elec. system (incl. power)	1.3	1.7	1.2	.9	1.1	1.0	6.6	1.2	2.0
3 Heating and ventilating	20.3	9.9	7.6	11.1	4.1	14.0	15.3	11.1	11.8
4 Plumbing system (incl. power)	1.4	2.9	2.0	.9	.3	2.0	1.4	1.4	1.6
5 Elevators (incl. power)	12.9	14.2	13.0	11.2	9.9	23.0	17.1	13.0	14.5
6 Gen'l exp. (incl. power)	6.7	14.8	3.2	10.2	7.9	16.0	15.7	10.2	10.6
7 Power	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	.2
Total Operation Cost	74.3	71.9	55.5	71.6	51.0	84.0	93.2	71.9	71.6
B 1 Alterations	4.9	2.3	0.0	4.8	.7	5.5	3.9	3.9	3.2
2 Building repairs	1.1	2.0	8.6	3.0	3.5	5.5	1.5	3.0	3.6
3 Decorating	0.0	4.9	2.1	5.4	3.5	3.5	4.4	3.5	3.4
Total Construction Cost	6.0	9.2	10.7	13.3	7.8	14.5	9.8	9.8	10.2
C 1 Insurance	1.9	2.1	2.7	3.3	2.0	1.0	3.1	2.1	2.3
2 Property taxes	43.8	49.4	36.9	63.3	28.4	51.0	50.8	49.4	46.2
3 Depreciation	18.3	15.7	21.1	11.9	13.2	8.0	23.1	15.7	15.9
Total Fixed Charges	64.0	67.2	60.7	78.5	43.6	60.0	77.0	64.0	64.4
D 1 Ground rent	11.5	30.0	0.0	12.2	0.0	20.0	..	..	..
2 Bond interest	17.1	17.2	0.0	..	30.3	..	..	..	..
3 Interest on notes	0.0	0.0	30.8	..	18.8	..	..	..	..
4 Income and capital stock tax, etc.	8.6	2.7	.3	..	7.2	..	..	..	..
5 Net income	46.7	73.6	67.7	..	22.3	96.0	181.0	70.7	81.3
Total "D" Accounts	84.0	123.5	98.9		78.7	116.0	181.0	107.5	113.7

schemes submitted to him that which promises to yield him the greatest return upon the funds which he will have to invest. Hence, the number of square feet of rentable area which each plan scheme will produce is calculated, and this is divided into the total estimated cost of the building and the land. The resultant figure of investment per square foot of rentable area will under present conditions vary as much as from $15 to $40. The next step is to take the *average* square foot rental, which it has been estimated can be secured from all the rentable area (due allowance in this estimate having been made for undesirable space), and figure it as a percentage of the investment per square foot of rentable area. This computation will give a gross rate of return upon the investment which is probably sufficiently accurate as an indicator of the relative efficiencies of the various plan schemes submitted by the architect. Upon the basis of this test, the final choice of plan to be developed can be made.

But the soundness of the investment can be determined only by the determination of the *net* return upon the investment. For that purpose operating and other costs must be estimated and reduced to a basis of so much per square foot of rentable area. In the Experience Exchange of the National Association of Building Owners and Managers,* which has been published since 1920, is to be found an extraordinarily valuable compilation of data upon this subject. Actual operating figures for over 150 buildings in all our leading cities are presented and subjected to several different types of analysis and comparison. As an *average* of the figures for a number of buildings of different degrees of efficiency in construction, layout, equipment and management and located in all parts of the country may mean very little, it has been attempted here to arrive at a better norm or standard by taking the figures for only a few buildings which are known to be comparable in size, height and general character and which are well located, efficiently constructed and equipped, and managed according to the best modern standards. All seven buildings are also located in Chicago. The data for these buildings for 1922 are presented on page 131. The arithmetic averages and the medians for each classification of expense are given in the last two columns. A study of this table with due consideration given to a few special features which explain important deviations from the mean or median will indicate that the owner of a proposed office building which will offer to tenants the highest grade of building facilities and of building service should in his calculations of net income allow about 72 cents per rentable square foot for the cost of the ordinary services and an additional 9 or 10 cents per square foot for alterations, repairs and decorating. The table calls for 64 cents for insurance, taxes and depreciation, but these items can probably be figured more accurately by a specific estimate in each individual case based on knowledge of local conditions in regard to tax valuation, tax rates, insurance costs, etc. The accounts in Group D will depend so largely on the particular type of financing adopted, and the possibilities are so varied that it would be impossible to discuss them here. It is only necessary to say that the average rental per square foot minus the total of the accounts in Groups A, B and C will, if figured as a percentage of the investment per rentable square foot, give the rate of net return.

One important qualification to these calculations needs to be made. They have made no allowance for vacancies. As no building can hope to run 100 per cent full year in and year out throughout its entire life, it is imperative that such an allowance be made. Its amount will depend on experience and conditions in the individual locality. A study of vacancies in Chicago office buildings over a 10-year period showed an average vacancy of only 6 per cent, but investment bankers normally allow 10 per cent in their estimates of probable earnings. Not only should earnings be figured in this way on a 90 per cent occupancy, but sound accounting would require the setting up of a vacancy reserve built up by rents above 90 per cent in good years and designed to maintain the income of the building in the depression years. Such a policy would tend to prevent that deterioration in service, physical condition of building, character of tenants and renting policy which is too apt to occur in years of excessive vacancies. Having determined the investment per square foot and the probable operating costs per square foot, it will be possible to compute the average square foot—gross and net—rentals which the owner will be required to get with, say, occupancies of 100 per cent, 90 per cent, 80 per cent, etc., in order to give him a net return of 7 per cent, 8 per cent, or 10 per cent.

In brief summary, sound economics requires that the decision to build an office building be based upon an ascertained public demand over a reasonable period of years for the facilities to be provided; that the site be wisely selected; that the structure to be erected represent the logical improvement of the site; that it be built at a cost in keeping with the service which it is designed to render; that it be equipped in such a way as to insure the lowest possible maintenance and operating cost during its entire life; and that it be so planned and so managed as to secure the maximum of net income over the longest possible period. These are the tests which a financial house would apply before making a loan upon the project. The banker will also need to be assured of the moral and financial responsibility of the borrower, and that the net income will be sufficient to equal from two to two and one-half times the greatest annual interest charge. If these tests are successfully met by an office building enterprise in one of our larger cities, the net income should run 7 per cent or more and should net the owner a reasonable return upon his equity.

*See Bibliography, page 159.

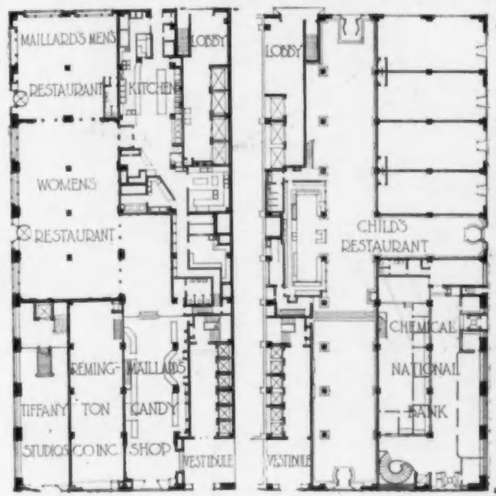
General View of the Joined Buildings

The Knapp Buildings, New York

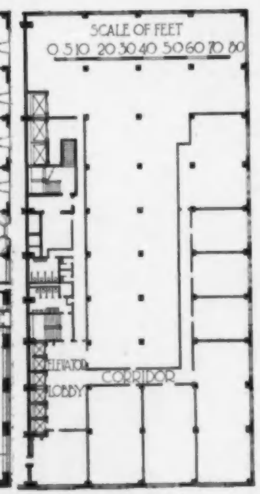
CROSS & CROSS, Architects

IN the Knapp Buildings, the original plan was to occupy only the northern half of the block, but demand for floor space was so great that before construction work was started, it was decided to duplicate the building on the southern half of the block, thus making twin buildings. A single foyer connects the entrances and the elevator halls of both buildings. In method of construction as well as in plan the buildings are identical. Limestone is used for the three main facades, with terra cotta trimmings at the top, and face brick for the rear. Construction is steel frame, with cinder concrete arches and terra cotta backup tile in curtain walls. Heating is by forced circulation hot water. Electric service, 120-240 d.c. Elevators, 1-1 traction. Corridors built with building have plaster walls and marble or terrazzo floors; those laid out later have plaster walls and rubber tile floors in blocks of several contrasting colors.

Double Entrance to the Buildings



Combined Ground Floor Plan

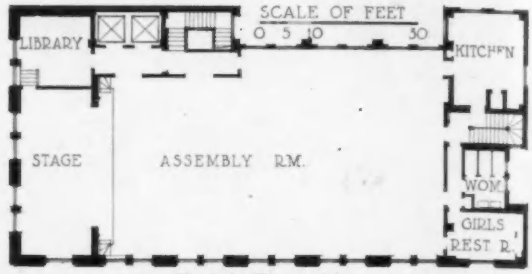


Half Typical Plan

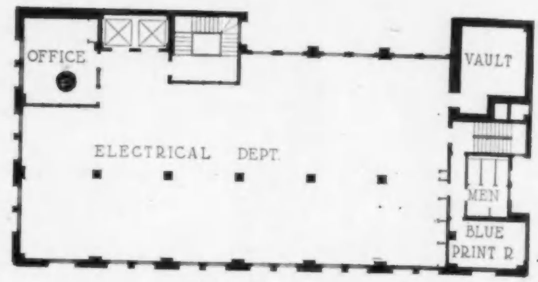
The Pacific Gas & Electric Building, Oakland, California

CHARLES WILLIAM DICKEY, Architect

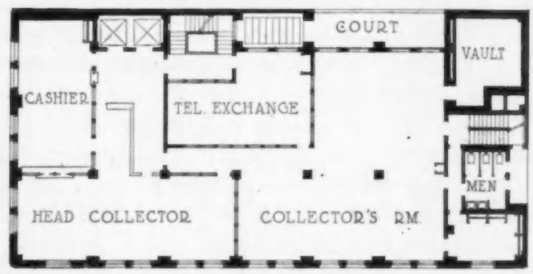
General View of the Building



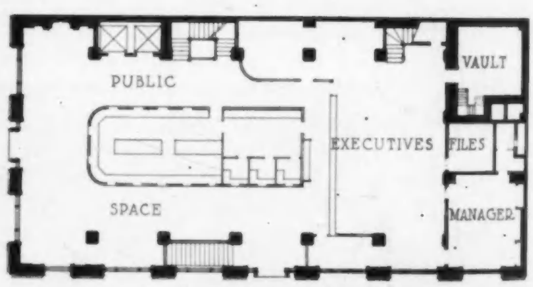
Eighth Floor Plan



Fifth Floor Plan



Third Floor Plan



Ground Floor Plan

THE Pacific Gas & Electric Building is a strictly fireproof structure with walls of red brick and terra cotta. It is eight stories high and is occupied entirely by this company. On the ground floor is located the main office, with marble floor and wainscoting, imitation Caen stone walls, and mahogany counters. In the center is located a working space surrounded by counters where orders for service may be placed and bills paid. In the rear are the desks of the executive officials and their clerks and the manager's office, as well as a large vault connected by a stairway with a similar vault in the basement. From this main office two marble stairways and two elevators lead to the basement, the front portion of which is given up to a display room for gas and electrical appliances. The rear portion of this floor is given up to service rooms. There are two high-speed electric passenger elevators, and stairways to the top of the building. On the upper floors are located successively the bookkeeping, collection, accounting, electrical, gas and dispatchers' departments. These departments are connected with the main office on the first floor by means of a pneumatic tube system and intercommunicating telephones. Each department has a fireproof vault.

On the eighth floor there are a lunch room with a kitchen served by an electric dumbwaiter from the basement, and a library and a large assembly hall.

The Architect and the Building Manager

By WILLIAM MARSHALL ELLIS
President, National Association of Building Owners and Managers

EDITOR'S NOTE—The National Association of Building Owners and Managers has recently developed an Advisory Service to assist architects and owners in the planning of large investment buildings. This movement to make available advisory service based on practical operating experience offers an interesting opportunity for increasing the economic and physical efficiency of such buildings. Accordingly this explanation is presented for the benefit of architects facing problems of planning.

IN designing and building an office structure, the architect desires to accomplish two important results: 1. To provide a building that will adequately and efficiently house office tenants; 2. To provide a building that can be rented at good prices and operated economically so as to earn a reasonable return on the investment in land and building.

Naturally, the architect does not have experience in operating the building which he plans. As soon as the structure is finished, it is turned over to a building manager who must find tenants to rent the building and who is expected to earn for the owners a profit on its operation. The manager very quickly finds its strong and weak points from both the standpoint of the tenants and that of operating efficiency. In designing new models or improvements in automobiles, the manufacturers make great use of the experience and knowledge obtained through their service stations. Service stations soon know how the automobile is "standing up" in actual use. In the office building field the architect should consider the advisory service of the building manager and should make the utmost use of his experience.

The requirements of tenants in office buildings are continually changing. A few years ago the average amount of space used per occupant was 125 square feet. Today, in many cases, this has been brought down to 75 square feet per person. This change is due to the increase in cost of space and also because tenants are planning their offices more efficiently. As a city grows in size, changes occur in the kinds of space which the tenants in that city can use. In the medium sized city, where the average tenant uses less than 1000 square feet, offices more than 25 feet deep are a mistake, as they can be used only by the few large tenants. In Chicago or New York, however, space 30 or 35 feet in depth finds a good market because it can be efficiently used by the large clerical departments of the great companies. Some years ago office space was lighted by the cheapest fixtures that could be purchased. Today efficient lighting is a distinct selling point, made use of by the building manager. He realizes that if his space is so well lighted that the employes of his tenant can do more work in his building than elsewhere, he has a distinct advantage over the other buildings.

The same is true of the operating equipment of an office building. Continual improvements are being made in mechanical devices and in methods of operation. Labor is one of the chief elements of cost in building operation, and the quantity of it used varies from 2½ hours per square foot per year to as little as one-quarter of an hour per square foot per year. This variation is due both to difference in type of service rendered and to difference in service layout and equipment of the buildings. The architect fixes, to a large degree, the future operating costs by the layout he gives the manager with which to carry on his work.

It is not the purpose to enumerate here the specific ways in which the building manager can be of assistance to the architect in planning and equipping an office building. It is simply desired to point out that the manager is the principal source from which the architect who desires to embody in his building the most practical ideas may obtain his information. He should urge the owners to employ a competent building manager as soon as they decide to erect a building, so that his knowledge may be utilized in the planning of the structure.

The building manager realizes this fact very keenly, perhaps because it has been his problem to rent poorly designed space and to endeavor to correct the bad operating layouts handed him. This statement does not mean that all office buildings are badly designed. It is a pleasure to recognize the ever increasing practical ability of the firms building office structures. On the other hand, however, there are probably few buildings that do not have some points which might have been improved if the knowledge gained from experience had been used The practical problem of getting the utmost efficiency out of a building and at the same time keeping down the investment cost per square foot of rentable area has become much more serious as a result of the very large increases in construction and operating costs following the war. To help meet this necessity for better planned buildings, the National Association of Building Owners and Managers has developed a Building Planning Service which is at the disposal of owners and architects. By means of this Service, it is possible to get together the most experienced operating men in the country as committees to consult with architects and owners on the plans of new buildings. The influence and membership of the National Association of Building Owners and Managers are such that it can command the service of men who probably would not take individual assignments of this sort except at very large fees. This Service has already been effectively employed on a number of recent large buildings to the satisfaction of architects and owners.

The general plan by which the Building Planning Service functions is thus described: For each building a different committee is selected, composed of those building owners and managers best qualified by experience to analyze the plans of the particular building under consideration. If, for instance, the structure is a bank building, there would naturally be upon the committee one or more managers who have had experience with bank buildings; if a shop building, entirely different managers, having retail shop experience, would be chosen. In this way the Service gives to the owner and his architect exactly the experience necessary to develop his individual building.

A brief outline of the work done by the Building Planning Service on the several structures so far served will illustrate how the committee works and the results which it accomplishes. In all cases, plans and detailed information not only as to the building but as to the character of its location, the desired type of tenancy, etc., are obtained and forwarded to the men who are to serve on the committee at least one week prior to the meeting. This affords the members opportunity not only of becoming familiar with the problem before them, but also of studying it themselves and of having it considered by their office organizations as well. A meeting of the entire committee is then held in the city where the building is to be erected, thus giving the committee an opportunity of studying the problem on the ground.

In analyzing any building problem, the first step is to consider carefully the character of the immediate locality of the structure and its relation to the rest of the business district for the purpose of determining how to make the most advantageous use of the land, not only for the present but also during the entire life of the building. The next step is to determine the character of tenants available at present and desirable in the future. With these points determined the committee turns its attention to a comparative study of the several alternative floor plans evolved by the architects. In comparing these plans, it is necessary to give due weight to several different factors. First of all are determined the amount of rentable area which each plan will produce and the investment per square foot of rentable area for land and building. It is also determined what percentage of the lot each plan utilizes. Next is computed the average square foot rental that will be obtained over an entire typical office floor. Such an average rental takes into consideration the influence of depths of offices, their exposure, the amount of dark space, etc., and a comparison of the figures thus obtained for each plan indicates very clearly the quality of space which each plan gives. Having already determined the investment in each square foot of space and knowing the average square foot rental that may be expected, the percentage of return on the investment is easily computed. This figure is the real test as to the rental efficiency of any plan. It is not necessarily the plan which utilizes the most of the lot that produces the best return on the investment.

Having determined in a general way the best plan development of the lot, the committee then takes up a detailed consideration of the typical office floor plans and the main floor and basement plans. In the consideration of these plans, detailed study is made of the office layouts, the mechanical equipment of the building, the service equipment for the offices, etc. The object of the committee is to develop space of the greatest possible rentability, in which the tenant can be given the utmost service and which can be operated at a minimum of cost. One item in the cost of operation often overlooked is that of changes and alterations in partitions to suit different tenants. If proper consideration is given to the location of lighting outlets, plumbing fixtures, the type of partition used, etc., large economies in future alterations in the building will be possible. In the consideration of strictly engineering and mechanical problems, the committee necessarily limits itself to the application of the experience derived through actual operation, pointing out certain results that must be obtained from the equipment, and sometimes cautioning against the failure of certain arrangements to accomplish the results desired. It does not, for instance, recommend any make of elevators, but does go into the building's problem of elevator service and points out to the owner and architect the kind of elevator service which should be provided. If the building is to cater to any special class of tenants, such as physicians, the necessary equipment for them must be provided. The final work of the committee is to give the owner and his architect all the help possible in formulating the building's renting policies and in preparing for the sales campaign to fill the building.

Such, in general, is the work of one of the Building Planning Committees. The committees are usually in session two days, morning, afternoon and evening. The stenographic report of their meetings generally covers 500 to 600 typewritten pages. As the committees consist of from five to ten men, depending upon the size of the building, this Service secures in the short space of 20 hours the benefits of at least 100 years of building management experience.

The benefits of the Building Planning Service to a new building may thus be summarized:

1. It increases the rentable area of the building with a consequent reduction in the investment per square foot on which a return must be earned.

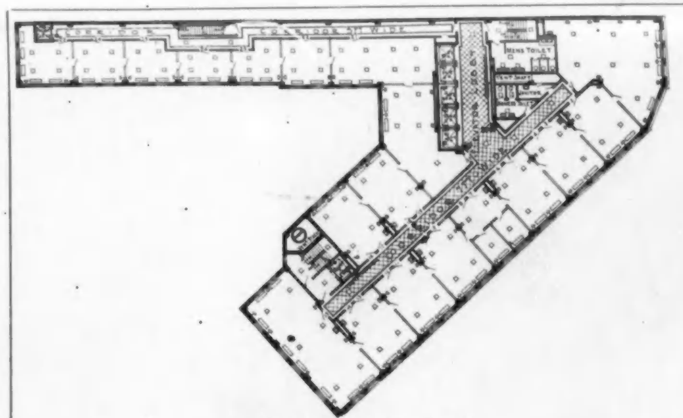
2. It reduces the construction costs, which also reduces the investment per square foot.

3. It increases the rentability and quality of the space obtained.

4. It also increases the efficiency of the services and utilities of the building.

5. It decreases the operating costs of the structure.

6. And lastly, but most important, it increases the economic stability and profitable life of the building through planning the structure not only to fit the district in which it is, but also to build up the district to be an efficient home for a definite tenancy.



TYPICAL FLOOR PLAN

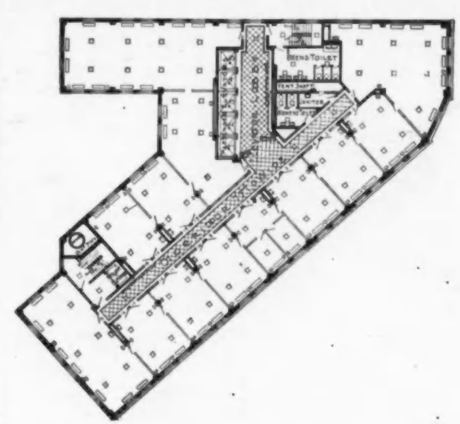
GROUND FLOOR PLAN

Of the Genesee Building the exterior materials are cast iron show fronts for two lower stories; brick and terra cotta, upper stories. Construction: steel frame, concrete slab floors. Steam heating. Electric service: 110-220-volt, with transformers, 110 d.c. breakdown. High speed electric elevators, bronze finish. Double-hung steel windows. Corridor walls: plaster with 4-foot gray marble wainscot. Floors: gray marble, green marble base. Cost per cubic foot, 34 cents for general construction only, excluding fees.

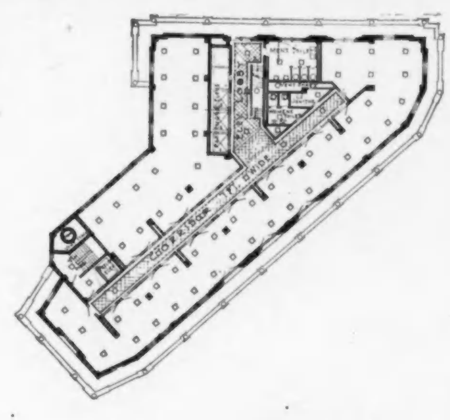
THE GENESEE BUILDING, BUFFALO, NEW YORK
EDWARD B. GREEN & SONS, INC., ARCHITECTS; MERRELL CLEMENT, ASSOCIATED

VIEW FROM MAIN STREET

ENTRANCE FOYER



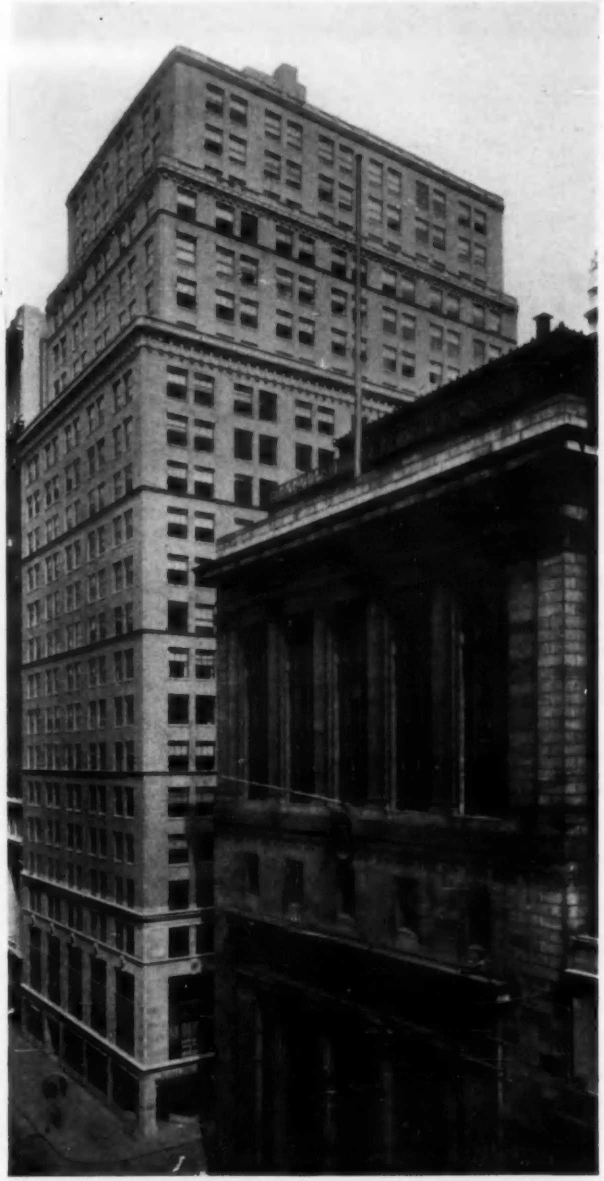
PLAN OF EIGHTH AND NINTH FLOORS



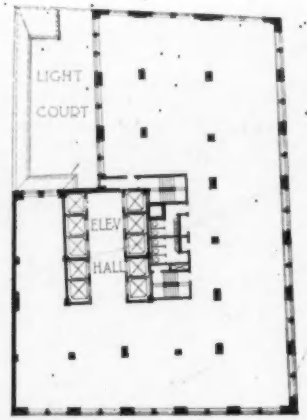
THIRTEENTH FLOOR PLAN

THE GENESEE BUILDING, BUFFALO, NEW YORK

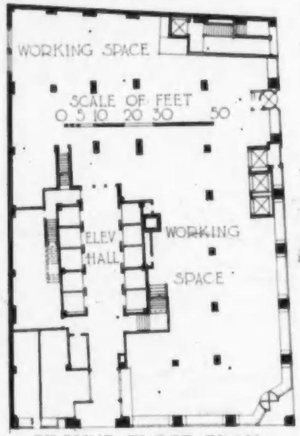
EDWARD B. GREEN & SONS, INC., ARCHITECTS; MERRELL CLEMENT, ASSOCIATED



VIEW LOOKING UP BROADWAY

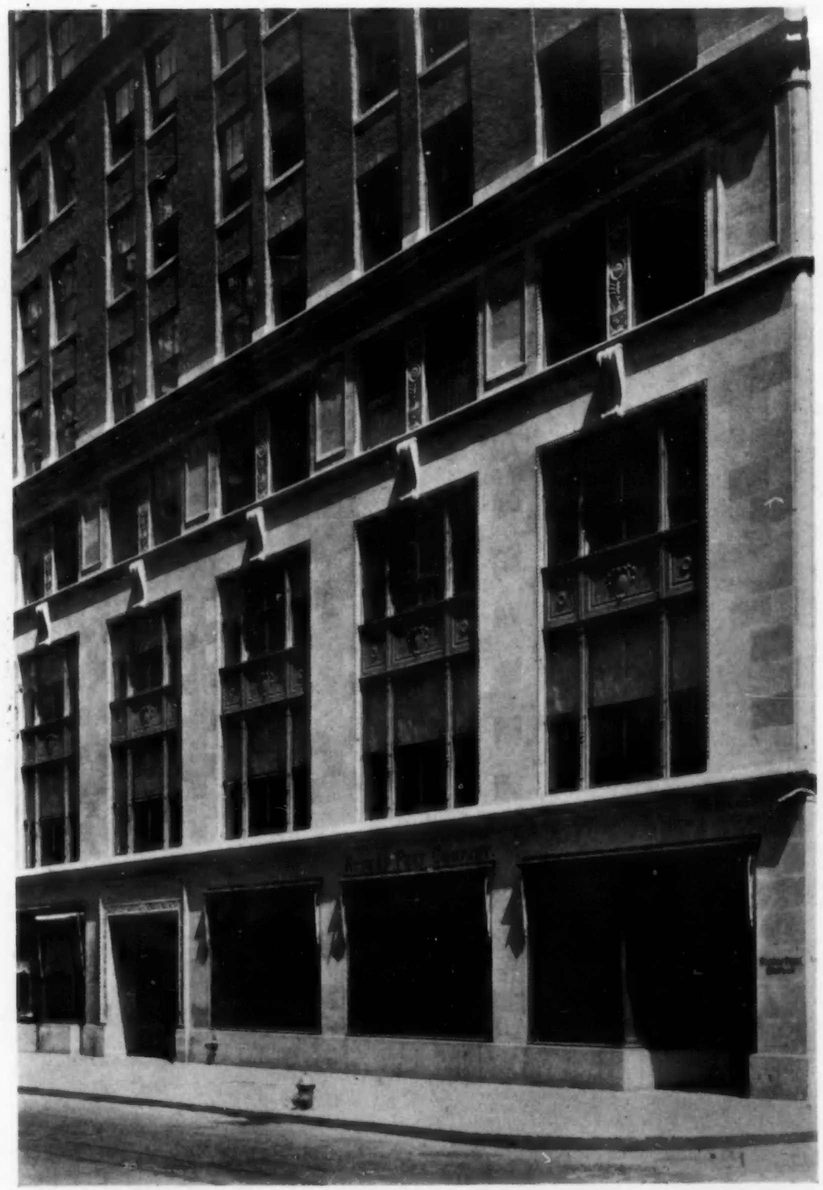


TYPICAL FLOOR PLAN



GROUND FLOOR PLAN

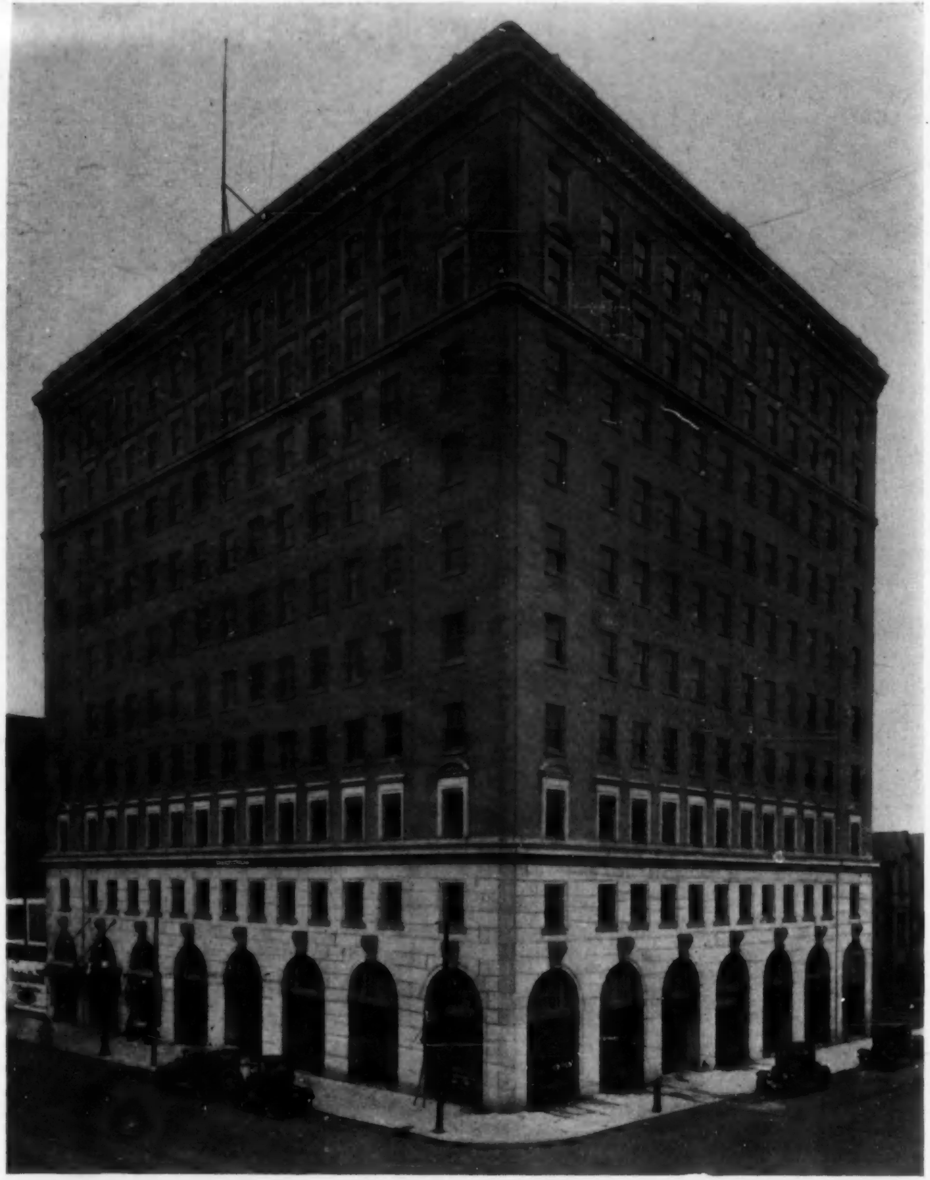
Of the Westinghouse Building the walls are limestone and brick; cast iron decorations. Construction: steel frame; reinforced concrete floors. Heat and electricity furnished from public service stations.



DETAIL OF THE LOWER STORIES

TWO VIEWS OF THE WESTINGHOUSE BUILDING, NEW YORK

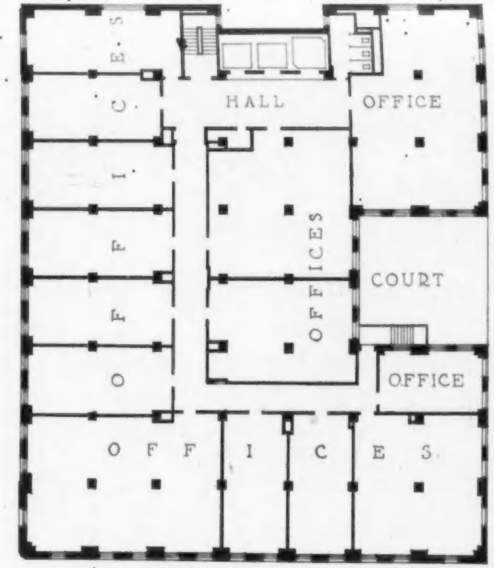
STARRETT & VAN VLECK, ARCHITECTS



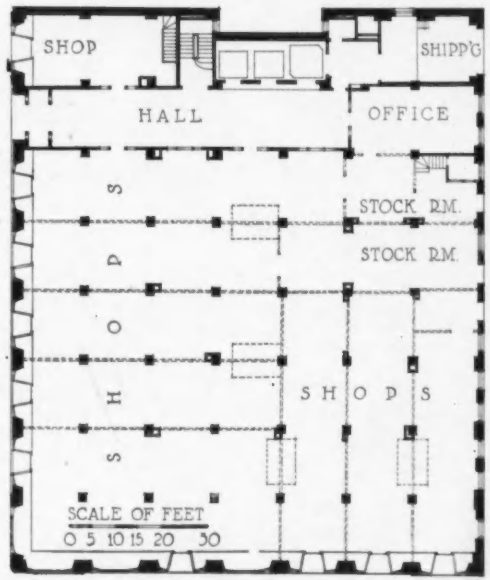
GENERAL EXTERIOR VIEW

Exterior material of the Keefer Building is Indiana limestone for the two lower stories, light gray brick above. Floor construction: reinforced concrete. Open return low-pressure steam gravity system for heating. Electric service: 110-220 volts, three-wire for lighting; 550 three-phase a.c. for power. Elevators: two-speed a.c. type, 385 feet per minute. Cabs are metal, painted. Windows: double-hung metal frame and sash. In entrance hall and elevator lobby, floors are terrazzo, with black marble borders. Office corridor floors, linoleum field with terrazzo borders. Cost per cubic foot, including stores and costs, was 37.4 cents. Building was begun in 1923.

Ten stories in height, this building shows a careful study of horizontal and vertical lines. Strongly defined piers strengthen the corners. The character of the design recalls some of the Italian Renaissance work of McKim, Mead & White, such as the Gorham Building, New York.



TYPICAL FLOOR PLAN



GROUND FLOOR PLAN

KEEFER BUILDING, MONTREAL
ROSS & MACDONALD, ARCHITECTS

Financing the Office Building

By C. STANLEY TAYLOR

THE problem of financing the office building must be considered in four stages before actual construction can be started or working drawings and specifications completed. These stages include drawing up the prospectus of the proposed project; mortgage financing; equity financing, and finally the determination of income and maintenance figures and other items of direct interest to the prospective investor. The general method of financing the office building project is usually predetermined by the motive for such investment, which may be purely of a speculative or investment nature, for the purpose of housing a large business organization, or directly promoted as a coöperative venture for the benefit of several tenant-owners.

The architect's business relations in the early stages of an office building project usually take one of two forms. If the building is being planned primarily for single occupancy or represents a direct investment by an estate or with private funds, the architect will be retained in the usual way to carry out the project, and he will normally be paid in accordance with the advancing stages of his work and under a schedule similar to that recommended by the American Institute of Architects. If, however, the project is of the type developed by promoters, either for speculative purposes or as a coöperative venture, the architect will more probably be called upon to risk a certain amount of his time in the preparation of sketches, plans and cost figures.

No definite recommendation can be made as to the feasibility of the architect's sharing in the risk of such an enterprise during the stage of the promotion, since a project of this nature presents itself for individual analysis. There are several practical considerations which will aid the architect in determining whether he wishes to risk some time and expense in order to develop a possible commission for his office. The points suggested here should be given serious consideration in arriving at such a determination. The promoter's past record should be studied as well as the logical need and the probable success of the proposed building, both as to type and location. The architect should be certain that the promoter has either an option, contract or title which gives him control of the site which has been selected. It is also quite necessary that the architect be taken fully into the confidence of the promoters and kept informed of progress in both mortgage and equity financing negotiations. In this relationship the architect can provide a definite and valuable contribution to the ultimate success of the project. Before any successful prospectus can be drawn up to cover such a proposed office building operation it is quite necessary to have well presented sketch plans, outline specifications and closely approximated cost figures.

Plans used in the prospectus should include carefully developed floor plans and elevations with a rendered drawing (preferably in color) to indicate the actual finished appearance of the building. Through consultation with dependable building contractors it will be possible to arrive at a preliminary cost figure which should be carefully checked against costs of similar operations in the locality in order that it be not far from the figures represented by final bids.

It is suggested that as soon as preliminary plans have been drawn an experienced real estate management organization or an individual well versed in operating and managing office buildings should be brought into consultation for the purpose of drawing up a schedule of rentals and operating and maintenance costs, as described in detail in another article in this issue. It is highly important to the architect that such real estate management consultation be employed in the early stages of the project, as it will be found that this expert opinion will materially affect the plans for the building. On such advice, together with careful observation by the architect, rests the final decision as to the planning of the ground floor, and whether it should include store rentals; logical sizes of offices; provision which should be made for various special occupancies in other parts of the building as determined by local conditions and needs and practical types of equipment.

First Mortgage Financing

The types of first mortgage financing for office buildings generally include the ordinary form of first mortgage and the amortizing form, for which funds are obtained through the sale of mortgage bonds. The ordinary first mortgage is a straight loan of approximately 60 per cent of the appraised value of land and building. This mortgage is made at the prevailing interest rate and for a period of from five to ten years. It is usually placed in the form of a building and permanent mortgage loan on which money is advanced during the various stages of construction, and the permanent mortgage is placed on the building after it is completed. Mortgage loans of this type are usually obtained through such channels as savings banks, life and fire insurance companies, land title insurance companies, and from estates whose funds are controlled by attorneys or real estate firms. It is customary to present the prospectus of an office building, including the architect's sketch plans and cost estimates, to various mortgage sources in order to obtain preliminary consideration and information as to the possibility of ultimately obtaining the mortgage money required.

First mortgage financing for office building through the issuing of mortgage bonds has become a highly favored method of obtaining the necessary funds. In this field large mortgage bond companies have developed a highly specialized service through which an agreement is reached to provide the necessary building and permanent mortgage loans through underwriting an issue of mortgage bonds established as one lien on the completed building and land. The mortgage applications, presented in the usual way to such mortgage companies, are carefully checked for the proposed location and building plans; and suggestions are made by lending concerns regarding any practical changes which may occur to them in the light of extensive experience in financing such buildings. The mortgage loan obtained through such sources is actually of an amortizing type, being payable in even installments over a period of from 10 to 15 years. In view of the fact that the owner begins to reduce the mortgage the first year after the building is completed, it is usually possible to obtain a more liberal loan than by means of mortgages which expire completely at a definite time several years later. While the appraisals may be equally conservative, the amortizing feature reduces the hazzards of market rental fluctuations and rapid depreciation. The cost of obtaining first mortgage money of this type must of course include the cost of selling the bonds and the overhead and profit of the mortgage company. There is no standard basis on which this cost can be estimated, because the marketability of the bonds is determined by the conditions of the project. A general figure of cost, however, might be said to be from 9 to 12 per cent of the face value of the mortgage, which is taken as a discount and the proceeds given to the borrower.

The Architect's Commission

Before a final decision is made or a mortgage contract entered into, the mortgagee usually requires that working drawings, specifications and operating cost schedules be complete with dependable contractors' bids. It will be seen, therefore, that between the preliminary stages and the final stages of financing, someone must take the responsibility of employing the architect to carry out the work before a final agreement for a mortgage can be obtained. This responsibility rests either with the promoters or with the investors in the equity (the proposed owners).

It is presumed that a holding company has already been organized and at this stage has taken title to the land. Before proceeding with actual working drawings and specifications, the architect should be certain that his commission comes direct from the owning company or is approved by the owning company or the individual who may have acquired title to the land on which building is to be built. This is the requirement of the mortgagee in his dealings, and the architect should be equally sure that he is dealing with the corporation or the individual obtaining the mortgage loan so that he may be certain of eliminating the risk of non-payment as the project proceeds. Usually the original promoters do not figure as actual owners in the final stages. If the building is to be coöperatively owned by several of the larger users of the proposed space, it is customary to form a holding corporation for the amount of the equity, which includes the promoter's profit.

Participating in Financing

It is sometimes the case that a promoter or proposed owner of a building may not have sufficient funds to provide the necessary difference between the first mortgage and the ultimate cost of land and completed building. In such cases, the building contractor may be asked to take the second mortgage, or even the architect may be asked to participate by taking part of his fee in the form of debenture bonds or a similar interest in the equity. Usually, if the architect is asked to coöperate in this manner, he is actually paid about one year after his work is completed.

Another method through which assistance is obtained for equity financing is called "land participation," in which instead of paying in cash for the land the sellers agree to take a second mortgage for all or part of the selling price. Under such an agreement and in payment for such coöperation a somewhat higher price is usually paid for the land than if it were a cash transaction.

Where the project is highly speculative in nature, the direct borrowing of second mortgage money is sometimes resorted to. In such cases the first mortgage loan will amount to about 60 per cent of the total cost of land and building, and the amount borrowed on second mortgage will be from 15 to 20 per cent, leaving a small equity to be provided by the owners. Borrowing second mortgage money under these conditions is difficult and invariably involves paying a high premium, usually from 18 to 20 per cent of the face value of the mortgage.

Equity Financing

The term "equity" in a real estate operation means simply the difference in the cost or value of the land and completed building and the amount of money which is borrowed on mortgage; in other words, the equity is the necessary net investment or net value. There have been already touched upon some of the methods through which the necessary investment funds are provided. The various sources of investment money provide funds for the construction of office buildings of these kinds:

Investment for Single Occupancy. This type of building is financed by and planned for a large corporation which intends to occupy the entire building or to occupy a large portion of it, leasing the remainder at market rentals to help carry the overhead. In such cases all necessary equity financing is usually provided by a company or by an investor who erects the building for such a tenant under a long-term lease. In this type of project the architect is usually commissioned in the regular manner to draw up plans and specifications.

Coöperative Office Buildings. This kind of project is similar to the single occupancy building except that several prospective tenant-owners form a corporation and mutually agree to provide proportionate shares of the necessary financing, in accordance with the space to be used by each in the building. Very often this type of project is promoted by a real estate operator, in which case the architect may be asked to risk some of his time in the preparation of necessary plans and cost figures.

Private and Estate Investments. Many office buildings are built for the purpose of providing a sound investment for funds of estates or individuals. The equity financing is provided in this manner, and the architect is usually selected without being asked to risk time in preparation of plans and cost figures.

Speculative Office Building Operations. Usually carried out by professional real estate speculators or speculative builders who provide the net equity themselves, after borrowing all possible mortgage funds and obtaining any participation possible in the equity financing. Such buildings are built for logical occupancy and for the purpose of resale as soon as they are well rented. Here the architect will often be called upon to risk his time in the preparation of plans and costs during the earlier stages of promoting the enterprise.

Leases and Leasehold Investments. Where land values are particularly high, a favorite method of developing office building projects is to lease the land on which the building is to be erected for a long term instead of making an outright purchase. Such leaseholds are usually contracted for a period of 99 years or for three terms of 21 years each or divided into shorter periods with renewal clauses.

Important Factors in Financing

It is quite obvious that both mortgage and equity financing are made easier in proportion to the increased excellence of architectural design; practical planning to meet local rental needs; the selection of good materials and equipment to lessen maintenance and depreciation costs; the introduction of any other factors which would tend to make the building more attractive from the viewpoint of the tenant, to check obsolescence, and to protect against direct loss and disturbance by fire.

This introduces the factor of insurance engineering, which is highly important, not only from the viewpoint of the owner and tenant but from that of mortgagee and investor. When the plans for the building have been tentatively drawn, the architect will find that local insurance companies, underwriting concerns and large insurance brokers and agencies maintain a service for checking plans and making suggestions for better protection against the origin and spread of fire. This service is called "insurance engineering" and involves a number of intricate points which would not ordinarily come within the scope of the architect's knowledge. By inquiring from fire insurance companies it will be possible to learn where such service is available locally, and it will be found that it is usually rendered without charge, particularly by insurance brokers or agents through whom the insurance can be placed by the owner in exchange for rendering such service. In planning many large office buildings it has been found that by calling in insurance engineering advice the rates of insurance have been cut to half or less. This point of safety against disturbance by fire proves to be very attractive to prospective tenants. Some of the details involved in insurance engineering service will be found in the article in this issue written by Rudolph P. Miller, President of The National Fire Protection Association. Architects are strongly advised to familiarize themselves with local sources of such information.

A definite aid in financing is the presentation of a carefully prepared prospectus which provides in detail full information covering the economic and physical aspects of the project. This prospectus should include:

Analysis of Proposed Site. Diagram showing location and dimensions of land, with an appraisal of its value by a recognized expert. A report should be given on the character of excavation and foundation work necessary, and sounding should be made if there is a question as to ground conditions.

Plans and Estimated Cost of Buildings. Should include an attractive perspective drawing, preferably in color, and clean-cut floor plans, well lettered and with all dimensions plainly indicated.

Outline Specifications. Should include a fairly complete description of major materials, finishes and equipment.

Building Costs. Based not only on the architect's estimate but on opinions by reputable building contractors, if possible, substantiated by actual costs of similar operations.

Analysis of Rental Market. Explanation of various types of rentable space to be included in the building, with evidence of local demand and market rentals based on opinions of real estate experts.

Income and Operating Cost Schedule. Preferably drawn up by experienced office building manager, and based on relative facts and experience. Figures should be conservative and subject to the careful analysis which may be expected on the part of mortgage companies and other investors.

Financial Schedule. A full statement of estimated costs and income, showing logical net profit and appraisal value of completed property under established rental schedule.

It is obvious that a complete and well presented prospectus of this nature develops confidence on the part of proposed investors and assures more serious consideration by mortgage money sources. If the building plans are efficient and the facts and figures given bear close analysis, the financing is made much easier for the owner. In presenting rental estimates, it is sometimes possible to include tentative lease agreements for stores or large spaces. This is evidence of the practicability of the project.

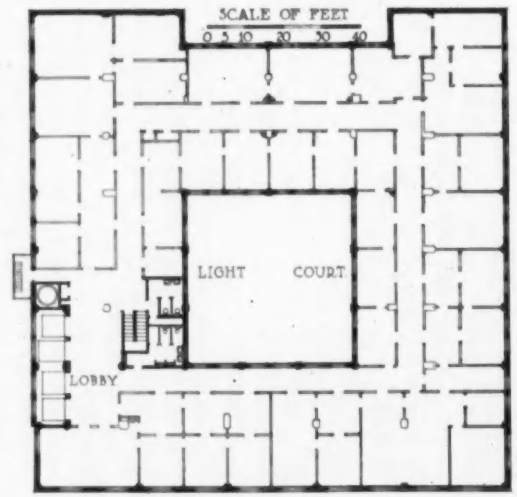
General View of the Building

U. S. National Bank Building, Denver

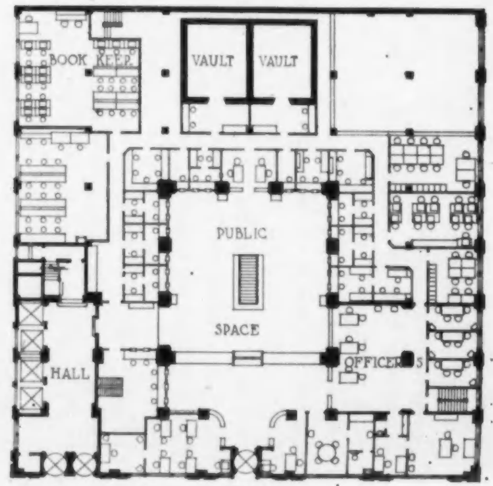
W. E. & A. A. FISHER, Architects

THE U. S. National Bank Building, Denver, shows a simple and straightforward design in the Renaissance style, carried out in Indiana limestone on the street facades, with brick elsewhere. Cast iron ornament enframes the windows on the first and second floors and fills the spaces between the pilasters of the classic order which forms the base of the building. The entrance to the elevator lobby is at one corner,

Construction is reinforced concrete, flat slab system, for the floors; steel frame and girders for walls and floors. Heating is by vacuum steam. Electric service for lighting and elevators, supplied by city service. Finish of elevators: bronze in banking portion, baked enamel on steel for public service. Finish of entrance lobby: walls and floor, marble. Corridors: ceramic tile with black marble base; walls: wainscot and plaster.



Typical Floor Plan
Showing Possible Office Arrangement



Ground Floor Plan

The Office Building and The City

By EARLE SHULTZ

Past President, National Association of Building Owners and Managers

THE important part which the modern office building plays in the functioning of our American cities is probably not fully realized, even by architects, the banks, or the owners.

Last year the volume of production in the United States would have required the labor of two billion men 100 years ago. To handle this enormous output, probably one out of every 15 city dwellers is employed in a clerical or managerial position. As a rough average, 1 square foot of office space is required for each $2,000 of annual bank clearings of a city. In the 20-year period 1900 to 1920 the bank clearings of the 15 largest American cities increased from $7,325 per capita to $23,250 per capita, or over three times. This means that there is required today three times as much office space in proportion to the population as there was in 1900. Aside from New York, the other metropolitan centers have from 5 to 8 square feet of space per inhabitant. In New York the figure is probably 20 square feet of space per inhabitant.

The tall office building is the outcome of the demand of business for close coöperation and contact. The "loop" district of Chicago is built up to an average height of eight stories. In this area there are many distinct centers about which different lines of business cluster for the purpose of speeding up their operations. Imagine the disadvantage and loss if those businesses were housed in one-story buildings and spread out over eight times the area!

This necessity for concentration of business results in the building up of great capital values in land and building, not only in office buildings, but also in retail stores, hotels, theaters, apartment houses, etc. Under the present conditions, the earning power and useful lives of these tremendous structures are far less than believed by the public. The average income of 150 buildings in 45 cities of this country, according to figures compiled by the National Association of Building Owners and Managers, was only a little more than 4 per cent of the full value of land and building. In a study on the obsolescence of office buildings made a few years ago, it was found that the average term of existence of office buildings as first class is only 28 years.

There are several factors responsible for this unhealthy condition. Perhaps one of the most important might be termed the "growing pains" experienced by our rapidly developing cities during the last 20 years. In other words, the business districts which were adequate to house the business of 20 years ago very rapidly became inadequate with the increasing volume of business to be carried on therein. In developing to meet this situation, the business districts have, in most cases, been enlarged without any plan except the promotion schemes of speculative builders and the unnatural height limit restrictions imposed by zoning ordinances. Growth of our American cities shifts property values from one locality to another, and unless prevented by special conditions, business districts move one block in every five to ten years. This means that in from 25 to 40 years office buildings that were once well located for the highest class of office tenants are no longer in that district. Deterioration then sets in.

This tendency of a business district to shift has been much aggravated by two things:

1. By the unwillingness or inability of many owners, having property in the heart of the business district, to improve it adequately at a time when office space was needed.

2. By the speculative builders' deliberately putting up unneeded office structures outside of the business district, thus establishing new business centers to which values have been pulled, although at a heavy cost in vacant space while the district is developed.

Another very powerful influence on the shifting of business districts has been the fallacious idea on the part of zoners that high office buildings are unsafe, uneconomical, unsanitary and generally undesirable. As a matter of fact, there never has been, so far as can be determined, a loss of life by fire in a fire-resisting office building. They are much more sanitary and the living conditions in them are much higher than in the average home. The most injurious effect of height limitation is that it forces the business districts of cities to grow *horizontally* instead of *vertically*. This means an acceleration in the shifting of downtown property values that is extremely wasteful.

To understand the peculiar economics of office building investments, it is necessary to realize that office space is not a commodity, such as shoes, that is produced, sold and delivered to the purchaser. In office buildings it is only the *use* of the space which is sold. If an office building were to remain entirely empty, the taxes, insurance, depreciation and interest on the investment would require an amount equal to three-quarters of its entire income if rented. From this point of view the fallacy of speculative overbuilding in office space is very apparent, and overbuilding is also entirely unnecessary. In each city the requirements of office space bear a definite ratio to the population of the city. In Chicago, for instance, the yearly absorption of office space is six times the annual increase in population. The supply of office building space is a matter in which all the financial concerns handling office building securities should be vitally interested. Let us hope that the day is not far distant when office buildings will be recognized as essential services to the public and will be built as required and not for speculation.

Ashland National Bank Building, Ashland, Kentucky

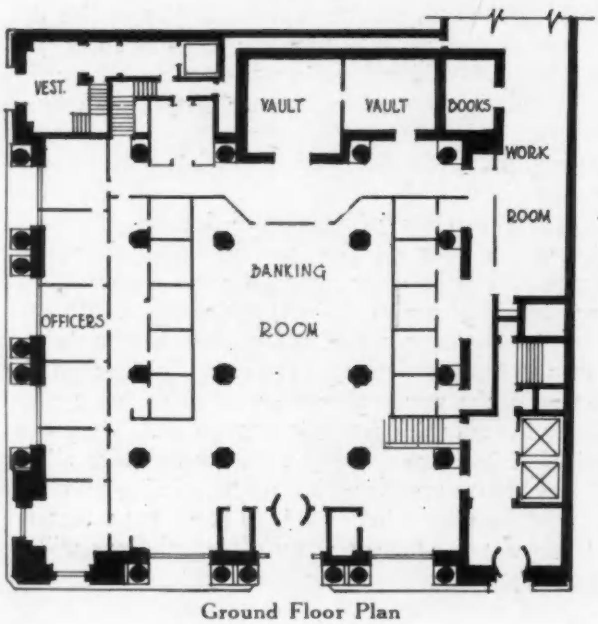
SCHENCK & WILLIAMS, Architects

Perspective Rendering of the Building

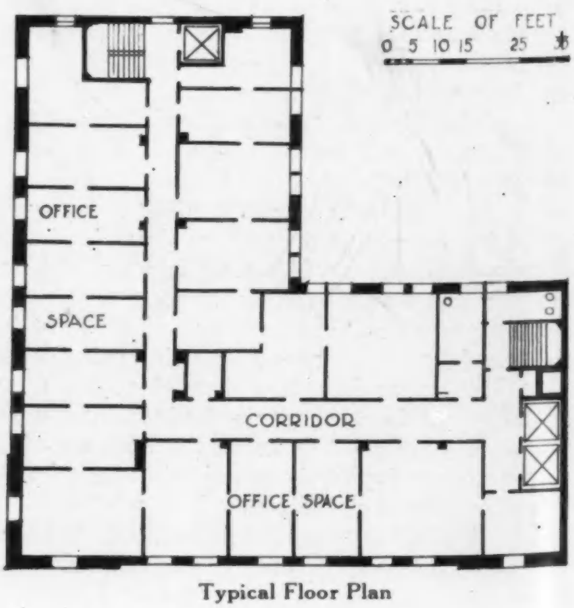
THE Ashland National Bank Building is a good example of a small city office building, showing consistency in its design and refinement in its detail. It is a tribute to the courage and foresight, as well as the civic pride of a commercial institution in a city the size of Ashland, that such a building should be built as a precedent to be followed by other ambitious business organizations.

The architectural details of the building are carried out in the style of the Italian Renaissance, using buff Indiana limestone for the two main facades, and buff brick elsewhere. Steel frame with reinforced concrete slab floors, is the construction used. A vacuum steam system heats the building. One freight and two passenger electric elevators accommodate the tenants. Entrance lobby floor is in colored marble, with walls paneled in Italian marble. Corridor floors marble.

Water for the building is provided by the bank's own well, carried down to bedrock; water is delivered through the building by a duplicate system of heavy-duty pumps, insuring a constant supply of water at all times. Every effort has been made to make this building one of the finest and best appointed in the country, a definite step forward in the city's development.



Ground Floor Plan



Typical Floor Plan

Office Interiors

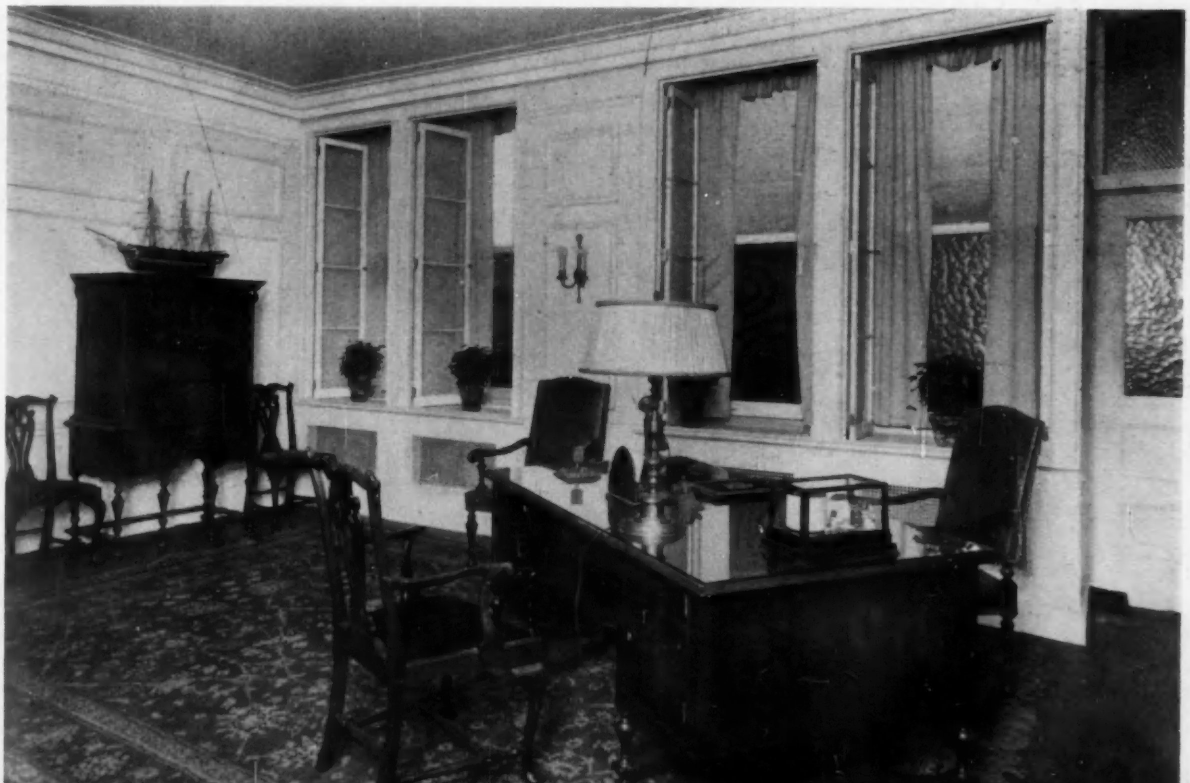
By JOHN TAYLOR BOYD, JR.

TO make interior decoration a handmaiden of American business—this idea, in times not long past, might have seemed novel, but now it is becoming familiar. Today the more progressive leaders of the commercial world hold no prejudice against art, and are as willing to make use of it as of anything else which serves their purpose. They are asking, "Is it profitable to force people to work, for the greater part of their waking hours, in bleak, cheerless, badly proportioned offices with bare walls and clumsy furniture, when elsewhere, in home or club or church, they are becoming accustomed to beautiful surroundings?"

A generation ago the answer to this question might have been, "Why not? People who work should keep their minds on the job and not be looking at the walls!" But those were our more Spartan days, when American civilization was narrower, and when the weaknesses of modern commercial and industrial life had not stood forth so clearly. We had not then felt keenly the intensity, the standardization and the mechanization. Since then human nature has revolted at too-barbaric practices, and those practices are beginning to give way, as often happens. Today the impulse is to make business more human. Hygiene was first called in to establish saner working conditions, thus overthrowing the older dictum that people are not in business for their health; and more lately, architecture is asked to make these working conditions more beautiful.

This development is scarcely a generation old. It began with the more monumental buildings, particularly of those companies whose profits depended on attracting the public with fine display. First appeared, toward the opening of this century, the great city banks and railway stations and a few fine stores. At first, emphasis was on the exterior. Interiors of architectural merit were confined chiefly to the huge rooms for public use, like the banking halls and the concourses of the metropolitan railway stations. The practice spread, until now there is no type of business structure in which, in the most progressive examples at least, one will not see evidences of an effort to make the business environment beautiful.

"Interior decoration" in its purest form is invading business. Here again, the public gets first consideration from the business man. Who does not know the luxurious "outer" office, with carefully



Office of the President, American Press Association, New York
Leigh French, Jr., Architect

DIRECTORS' ROOM

PRESIDENT'S ROOM
BORDEN BUILDING, NEW YORK
BUCHMAN & KAHN, ARCHITECTS

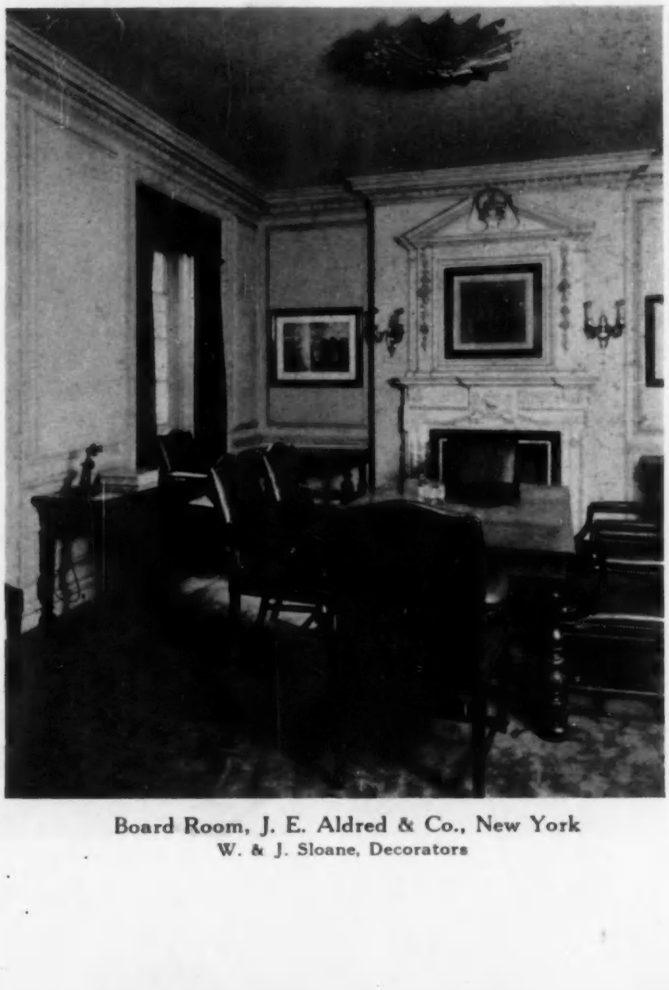
City Editor's Room, *Evening News*, Detroit
Albert Kahn, Architect

paperman, helped make famous —a vast, shapeless space, a jam of desks, railings and files, a thick litter of paper, a clatter of typewriters, telephones and telegraph, amid which shirtsleeved men, working like bees, darted about. From such picturesque and very human surroundings, though discordant, the modern newspaper began to graduate but a few years ago into the spacious, precise, orderly and efficient and thoroughly mechanical quarters of modern business organizations, as might be seen in the offices of the New York *Times*, or in fact in many another new office.

But with such offices as these of the Detroit *Evening News*, the newspaper undergoes a third transformation. It becomes more than a practical business office, efficiently planned, well furnished and equipped; it takes on architectural form, amenity, style. When business has done this for its workers, it has not pampered them with luxurious trappings, but it has made their environment harmonious and even attractive. It has taken steps to restore the human atmosphere which business often had in the days of smaller units.

decorated walls in pure, but subdued colors, and period furniture in quiet taste? Or the customers' or clients' reception room, where deals are closed—or where an architect clinches a commission—in an atmosphere of paneled oak, ancient furniture, stained and leaded glass! In such surroundings Bassanio in "The Merchant of Venice" may well have obtained his celebrated loan from Shylock. With such settings does the twentieth century attempt to stage again the old romance of commerce. And if our stagecraft seems at times too obvious, we must keep on in patience until practice brings the ease which marks a finished work of art.

One sign of progress is that no longer is it only the customers and the officers and directors who are well provided for in the better establishments, for interior decoration in business is serving the working people as well. Business architecture is becoming democratic. To many, this development is the most interesting. One may note much of technical value in the illustrations of the offices of directors and chief executives, but what arouses enthusiasm is such an interior as the editorial room of the Detroit *Evening News*, designed by Albert Kahn, whose fine monumental design of beamed ceiling and plain plaster walls, giving relief and scale by the paneled oak screens which form the alcoves for the individual workers, seems to breathe the very spirit of business architecture. It is no effect of club or mansion carried over into business, but is characteristic of business alone. How different is this from the older American newspaper office of the Victorian age! One thinks of the office of the Brooklyn *Eagle*, the journal which Walt Whitman, as a news-



Board Room, J. E. Aldred & Co., New York
W. & J. Sloane, Decorators

THE EDITOR'S OFFICE

LIBRARY AND EDITORIAL ROOM

THE *EVENING NEWS* BUILDING, DETROIT
ALBERT KAHN, ARCHITECT

The Mechanical Equipment of Office Buildings

By CLYDE R. PLACE, *Consulting Engineer, New York*

THE modern office building as now erected in the large cities may be rightfully compared to the human body in that its form is artistic; the steel frame is the skeleton; the foundation, the legs; the elevators, the arms; the windows and light, the eyes; the ventilation, the lungs; the heating system, the heart and blood circulation; the acoustics, the ears; and the sanitary system, the digestive organs. Consequently, these modern office buildings demand that all their mechanical systems and equipment shall be as nearly right and efficient in their installation and operation as are parts of the human body. In this article it is the purpose to review, briefly, the basic design and general present-day practice that combine to bring out the working part of the office building.

Heating

The general heating system now adopted is the two-pipe, low pressure vacuum system with the radiators placed under the windows, either on legs or brackets. The adoption of such a system has resulted because of the quickness and effectiveness of the steam circulation, the smallness of its pipes, and its quietness.

The steam supply for these radiators comes from a main supply loop in the basement or in one of the upper stories. In the former case the steam is fed up, and in the latter the steam is fed down. The down-feed system may be used to advantage when the lower section of the building is used exclusively for banking space or stores requiring heat at different periods than the office portion. For this section a separate and independent up-feed system is used, and this does not necessitate the heating of the entire building to accommodate the store or bank portion. If the building covers a large area, over 200 by 200, often the heating mains are sectionalized to apportion the heat and not to necessitate shutting down the entire building for repairs.

In special finished spaces, such as banking rooms, private offices and the like, the radiators are generally provided with grille enclosures. Where exceptionally high winds are encountered the down drafts from windows must be considered and eliminated or moderated by special adaption of baffles and radiation.

The heating of interior corridors is not found necessary unless ends of corridors terminate with windows at exterior walls; but for entrance vestibules ample radiation properly placed must be installed to care fully for the heavy inrush of cold air when entrance doors are being opened.

All large mains and enclosed piping are covered; radiator branches and exposed risers are not covered. The tendency nowadays is to use welded nozzles on the large steam mains, so as to do away with the numerous joints and extra fittings, and thereby decrease the possibility of future leaks.

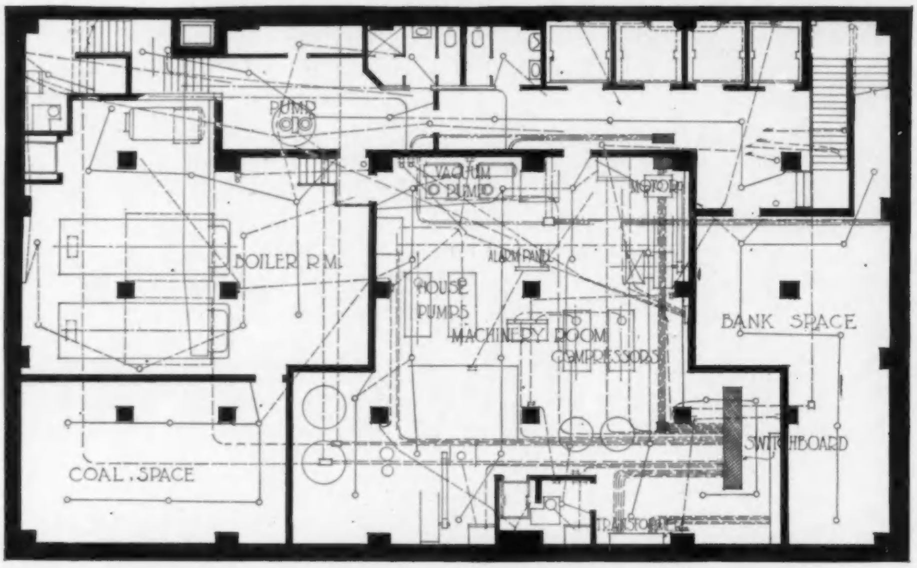
Ventilation is not provided to any great extent,—especially in office buildings designed for rental purposes,—except for interior toilets and basement sections. If the lower and basement floors are intended for banking or restaurant purposes, air intake and discharge shafts must be provided to accommodate future ventilation apparatus. Special consideration must be given to the utilization of the basement spaces, and if they are likely to contain any great number of people, the psychological aspect of ventilation or the perceptible movement of air must be considered, as well as the proper quantities for purity of air according to accepted standards. Safe deposit vaults must be extremely well ventilated, generally by a pressure fan system with the addition of oscillating fans. Where large office buildings are constructed for single occupancy of insurance or other corporations and many persons are on one floor, ventilation should be provided for these occupants. Temperature and humidity control are not now generally used in office rental buildings, but for structures occupied by insurance companies or large corporations they may be considered.

The selection of either coal or oil for fuel cannot be made a hard and fast rule. Degree of availability, insurance and continuous supply, comparative costs, amount and location of storage and volume of combustion chambers, are all determining factors for analysis and decision. Generally the office building has its own heating boilers with power-driven vacuum pumps to take the condensate from the radiators and the heating mains and return it to the boilers. Occasionally, if the building is located conveniently near a large central heating plant and steam rates are economically available, steam service is obtained from this plant.

Boilers for large office buildings are generally of the steel shell water or fire tube type, either brick set or portable in battery formation with high settings and large volume combustion chambers. Both hand and mechanical stokers are used for firing.

Plumbing

Water Supply. One of the essential details of the plumbing system in the building is the matter of adequate water supply and proper method of piping to the various utilities and fixtures. The location, size and pressure in the neighboring public water mains are an important consideration in the final determination of the piping scheme and the amount of building storage to be considered. The pressures carried on the public mains vary with the amount of consumption in the community, and it is well to store a



Electrical System Plan of Sub-basement, Liberty Title & Trust Co., Philadelphia
Dennison & Hirons, Architects

where buildings are high and the fixtures on house flow are supplied say above 60 pounds, it is well to install pressure reducing valves so as to maintain a moderate working pressure on all fixtures. Intermediate tanks have been considered, but in view of the valuable floor areas taken up by these tanks, the overhead loop piping in the office ceiling, and the initial cost of the multiple systems of pumping necessary, it comes back to the individual reducers on the branches to the fixtures.

supply to carry over during a low period or in case of a total loss of the supply due to a break in the public utility service. For this reason it is well to place a large tank above the highest fixtures and to supply it by gravity. When the height of the building is greater than the working water head on the supply from the street, pumping must be considered, and it can be so arranged that it can be automatic in every respect.

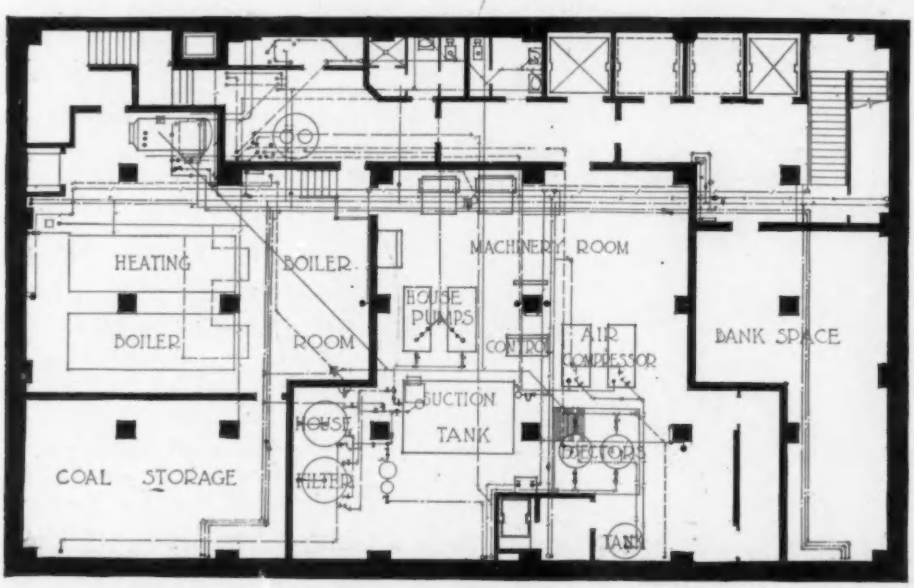
There are various types of pumps which can be used for the purpose. The centrifugal pump with open impeller is usually considered the most advantageous because it will permit the passage of the street pressure to find its own level, and then in itself sometimes overcome the use of the surge tank or basement storage tank for pumping. On the gravity supply from the house storage tank, and

Hot water supply in buildings is always a valuable rental asset and may now be considered a necessity. Various systems can be used for the circulation of the heated water, and the right system for each individual building is a matter to be considered. If possible, it is best to run the hot water piping in such a way that the temperature of the water will cause the water to circulate by gravity, provided the pipes are not air-bound or locked and no traps are installed in the piping. Pumping is also used in very large buildings.

The tank for hot water is usually placed in the lower part of the building and the water heated by steam from the building's heating boilers or by a separate boiler unit, which can be used independently during the summer. It is well to meter the separate items as cold water and hot water for consumption.

In the course of construction of a building, water supply is a known requirement, and for construction purposes temporary piping provided with hose end bibbs is often installed. An analysis of the local water supply, which should be made, usually determines the amount and kind of filtration necessary and whether water softening is required.

Plumbing Layout: It is well to consider the future requirements of the tenants of a building in determining the layout of the rentable floors in an office building, because when partitions are installed and some-



Plumbing System Plan of Sub-basement, Liberty Title & Trust Co., Philadelphia
Dennison & Hirons, Architects

times taken down and installed in other locations, the same thing is likewise done with the plumbing fixtures, and in locating the risers it is well to keep all these changes in mind. The riser lines are preferably placed by the interior columns.

The drainage system should be made up of proper sizes and run in such a way as to eliminate sharp turns and allow for proper pitch. Stoppages usually result because of lack of care in designing these features. The drainage of the soils, waste and the like, is by gravity to the public or private services. Often fixtures are located so that they are below the sewer, and for this reason automatic pumps or ejectors have to be installed.

The proper method of ventilating a plumbing system should be carefully studied. Throughout the whole country municipalities have entirely different methods of venting systems, each being called for as its own approved system. Many of them could be greatly improved upon. Toilets are sometimes located in such a manner that windows to the outer air are impossible, and in such cases a system of forced ventilation should be installed. The piping installed in office buildings should always be of such quality and workmanship as will assure a great degree of permanency, and pipe spaces or shafts should be located in such a manner as to allow easy access in case of repairs. All trunk lines should be assembled in one available shaft.

Toilets and Fixtures. The accommodation for toilet fixtures should never be for more than say 15 persons per toilet water closet, and the toilets should be arranged and located in such a manner so as not to waste valuable rentable floor area. Basins are usually installed in the offices, and when none are installed therein it is well to provide a lavatory in the toilet room,—about one for every 20 persons; when office lavatories are installed, a few should always be located in the toilets. The types and makes of fixtures should be selected and the fittings for them carefully compared before final selection is made.

In the office spaces usually *roughings only* for lavatories are installed, and it is well to include about 33 per cent of the fixtures as per the number of roughings installed, the fixtures to be installed as directed when spaces are rented.

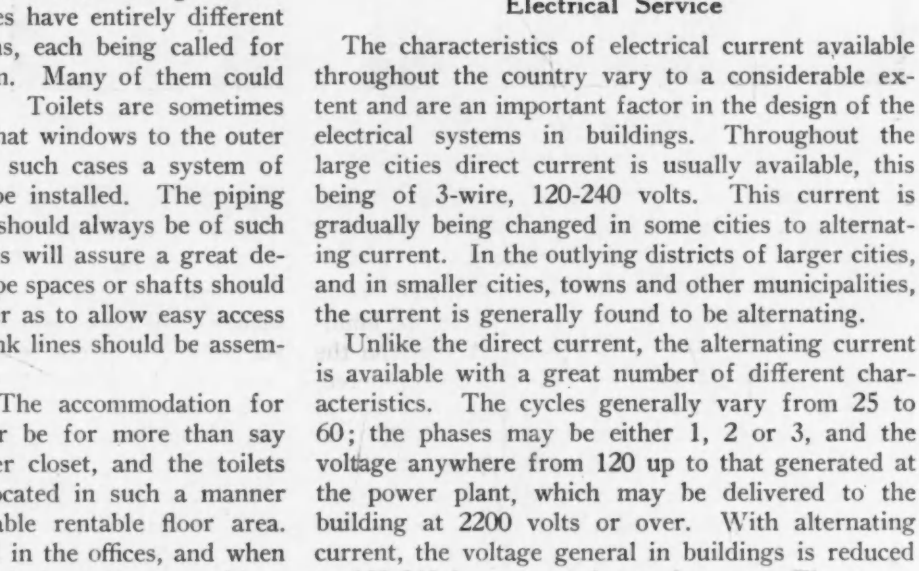
Fire Protection System. The fire protection system for an office building of any nature must never be overlooked. The best position for the hose rack is in the stair location, as lengths can be extended from other floors to the location of a fire. This gives persons using the hose an opportunity of backing away from a fire to the last resort, which is the stairways.

A reserve of water, generally in a separate compartment of the roof tank, should always be maintained in office buildings for fire purposes, for use before the arrival of the fire fighting apparatus. In large office buildings it is good practice to install an automatic fire pump in the basement to take the water load prior to the arrival of the city fire apparatus. In tall buildings, when pressures on the hose are excessive, say above 80 pounds, reducing or pressure regulator valves must be installed on the risers or at the hose outlet control valves.

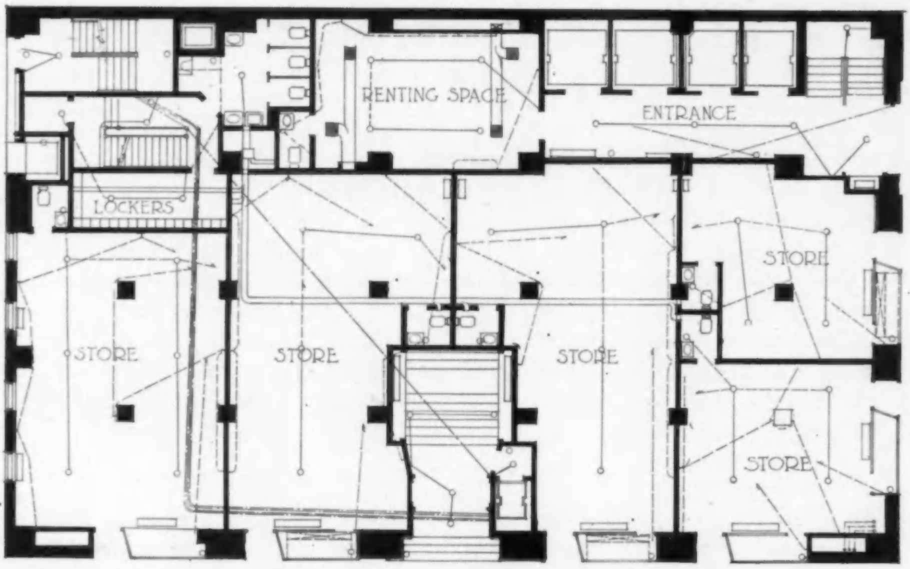
Electrical Service

The characteristics of electrical current available throughout the country vary to a considerable extent and are an important factor in the design of the electrical systems in buildings. Throughout the large cities direct current is usually available, this being of 3-wire, 120-240 volts. This current is gradually being changed in some cities to alternating current. In the outlying districts of larger cities, and in smaller cities, towns and other municipalities, the current is generally found to be alternating.

Unlike the direct current, the alternating current is available with a great number of different characteristics. The cycles generally vary from 25 to 60; the phases may be either 1, 2 or 3, and the voltage anywhere from 120 up to that generated at the power plant, which may be delivered to the building at 2200 volts or over. With alternating current, the voltage general in buildings is reduced to 120-240 by means of transformers. The transformers for small installations are usually located on the power company's poles, and for larger installations the transformers are installed in trans-



Heating and Ventilating System Plan of Sub-basement, Liberty Title & Trust Co., Philadelphia
Dennison & Hirons, Architects



Ground Floor Plan, Showing Plumbing, Electrical, Heating and Ventilating Systems, Liberty Title & Trust Co., Philadelphia
Dennison & Hirons, Architects

former vaults located inside the building. These transformer vaults are usually provided by the owner of the building, and transformers and primary switching equipment are furnished and installed by the power company. These transformer vaults must be ventilated and drained independently of the building or sewage system.

Where poly-phase current is furnished to the building, the power equipment is usually operated on current of the phases as delivered and the lighting split up on single-phase circuits, these being balanced as nearly as possible to give equivalent load on all phases entering the building. The 120-240 volt current is taken from the transformer vault to the main switchboard in the building, and from there distributed to panels and all points of utilization.

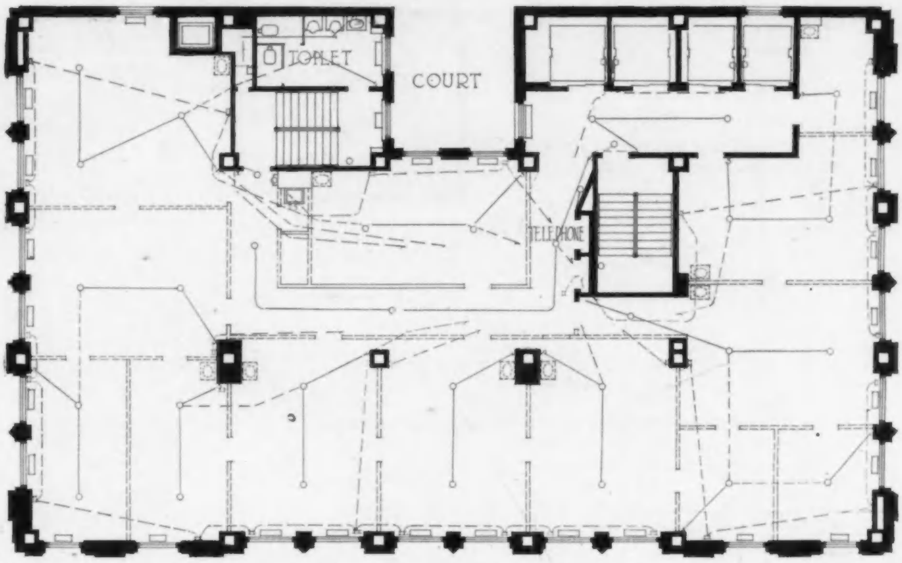
Isolated Plants. In large developments the question of generating electrical energy in the building or the purchasing of current from the power company is generally brought up, and a careful analysis must be made to determine if current can be manufactured more economically than purchased, and under which plan the service would be more reliable. The continuity of service is an important factor, especially from an industrial standpoint, where a shutdown of the manufacturing plant means a considerable monetary loss to the owners. The basis for the decision upon installation of an isolated plant is lengthy and complicated, and cannot be discussed here. The tendency in large cities, where the majority of office buildings occur, is to use central station electrical energy for lighting, elevators, fans and pumps rather than install independent generating plants.

Current Consumption. In determining the income to be derived from a contemplated building, it is generally necessary to make an estimate of the current consumption for the year, this to be added to the other operating expenses. No hard and fast rules can be given for current consumption in buildings, as this varies with the character of the building, its location, the surrounding buildings, and the character of tenants who will occupy it.

Electrical Outlets. The outlets throughout the building are located according to the type of tenants and the character of business to be carried on in the building. These outlets are located so as to give good general, uniform illumination throughout the working spaces, and are spaced on varying centers depending on the character of fixtures to be installed, height of ceilings, spacing of beams, and special illuminating conditions. Generally for offices the lights are controlled by push-button switches, located on the office sides of corridor partitions at doors on opposite sides from hinges.

In buildings where the locations of partitions are not determined, where whole floors are likely to be rented to one concern, and where the partitions will not be erected or determined upon until the electrical installation is installed, the switches cannot be installed in position as just noted. It is then necessary to either place the push-button switches on columns or to provide pull boxes on ceilings for future extensions as concealed work in partitions or extensions as exposed work on the faces of partitions. In most large office building operations the majority of offices are leased from the plans, and the tenants' changes and locations of partitions can be determined before the completion of the roughing of the electrical installation.

Panels. The electrical circuits are collected from the various outlets or switch positions and extended in conduits to panel board locations. These panel boards are located at various points throughout the office building floors, the number varying with the size of the building and with the positions available for shafts and the maximum run allowed for the pulling of wires and uniformity of voltage drop. In very small office buildings it is sometimes permissible to install a panel board on every third floor, a panel board taking the circuits on the floor on which it is installed and from the floor directly above and the floor below. The panel boards should be located one above the other for ease of installation and facility of pulling of the cables. The cables are usually connected to several panel boards and fused cutout in panel, and these cables extended down to main line switches on the main switchboard.



Typical Floor Plan, Showing Plumbing, Electrical, Heating and Ventilating Systems, Liberty Title & Trust Co., Philadelphia
Dennison & Hirons, Architects

The panel boards throughout the building may be of the "knife switch type" with enclosed fuses, or of the "safety type" with enclosed fuses, or switches may be omitted entirely and simply the "cartridge" or "screw type" fuse installed for each circuit. The panel boards are enclosed in sheet metal and are either placed in a separate closet with a standard door or recessed in partitions and provided with smaller doors and trim to match the interior finish of the rest of the building.

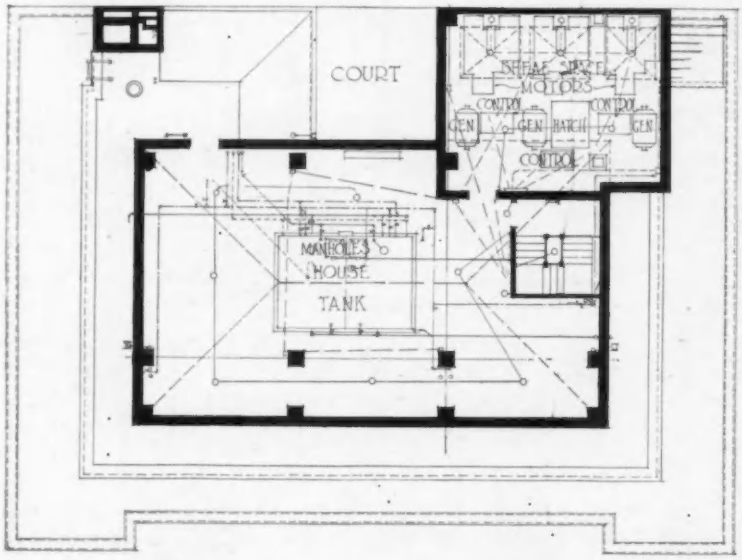
Generally cost of electric light for offices is estimated and included in the rental fixed per square foot of floor space. It is sometimes desirable to install meters for the tenants, and when this is done metering type panels are installed. These panels are so arranged that any one or a number of circuits may be combined and placed on one meter. The metering type panels are provided with frames, upon which the meters can be conveniently mounted. In order to facilitate the reading of these meters and to relieve the agents or owners of doing this work, there are now companies which are established for just this purpose and who for a nominal charge will install meters and read them.

The advantage of selling current to the tenants apparently lies in the fact that the owners are purchasing the current in large quantities and are billed at wholesale rates by the light and power companies, whereas the owners in turn sell to the tenants at retail rates.

Wiring Systems. In office building work it is not generally customary to install any complicated conduit or wiring system for flexibility or possible changes desired by tenants. The conduit system and outlet boxes are located for uniform and even distribution of light, and for economy of original installation. If re-location of outlets is desired by tenants, this work is generally due at tenants' expense, as what are known as "tenants' changes." It is not economical from an investment standpoint to endeavor to install any electrical illumination system that would meet the desires of all the tenants, and that would be adaptable to the needs of all. The electrical illuminating system is generally so designed and operated that the drop in voltage throughout the building is uniform.

Special Problems in Office Buildings. Generally, in large office buildings, the lower floors are devoted to stores or banks. Where banking facilities are installed, usually in conjunction with safe deposit departments, the electrical facilities demanded are numerous and the locations of outlets are dependent upon the equipment to be installed. Electrical equipment for banks, comprising the general illumination, illumination of working space, tellers' cages, officers' quarters, and the mechanism of daylight raider, vault protection systems, telephones, telegraphs, telautographs, burglar alarms, time clocks, time stamps, call bell systems, and the like, is usually installed. These systems, the location of outlets and their advantages, are a subject too extensive to be considered here.

Telephones. The telephone system throughout the rentable portions of office buildings usually consists of one or more closets on each office floor, wherein the telephone company's strip boxes can be located. These closets have shafts in which the telephone companies can install their main telephone riser cables. The floors of these closets are usually provided with slots in the floor slabs which the telephone company uses as vertical rising shafts. The individual telephone lines from strip boxes are usually run in corridor picture moulding and from there through a sleeve placed over doors to offices, and the wires are carried in the offices concealed behind the picture mouldings. The main telephone cables are continued to the main telephone strip boxes, usually located in an accessible position in the basement. A conduit system is usually installed from this main strip box to the point of entrance of the telephone company's service into the building. In the large open work spaces under the floors, conduit systems are generally installed in conjunction with raceways in the baseboards. These systems are usually provided with outlets at predetermined points or are of such a character that they can be tapped into from the floor above and outlets installed at positions desired, after desks and other



Plan Showing Elevator Machinery and Tank in Penthouse on Roof, Liberty Title & Trust Co., Philadelphia
Dennison & Hirons, Architects

furniture are located. This obviates tearing up floors.

Fire Alarms. Generally, in the office buildings, there is a fire alarm system installed. This system may be of a local type or of a type connected to the fire department street service, depending upon the character of the service desired by the owner and whether or not he desires to take advantage of any reduced rate of insurance which might be accomplished by using the type of fire alarm system installed. This applies also to a watchman's system.

Mechanical Equipment. The character of electrical current delivered to the building affects generally the mechanical installation. For instance, alternating current delivered to a large office building, necessitates the locating of elevator machines in such a position as to eliminate any magnetic hum or other noises if the machines are driven by direct connected alternating current motors. This particular condition is being overcome at the present time through the adoption by the elevator companies of a small motor generator set for the operation of each individual elevator machine or each group of elevator machines. The motor generator operates continuously and delivers direct current to the elevator driving motors. The same general comments apply to the ventilating fans, some of which must necessarily be located on the upper floors of the building, and to the noise from them which will cause annoyance to the tenants. With direct current for driving fans, slow speed fans with direct connected motors could usually be installed, which would be practically noiseless. With alternating current motor drive, it is necessary generally to use a belted connection. Worm gear drives could be installed for operation of fans if the proper gear ratios could be obtained to give the desired fan speeds when operating with standard speed alternating current motors. Good fan service is important.

Generally the mechanical equipment in the basement can be operated on alternating current, unless the character of the machines to be driven is such that a number of continuous speed variations are desirable. Where alternating current only is available, motor generator sets are usually installed for large buildings such as hotels, wherein there are a great number of fans, which must be operated absolutely noiselessly. These motor generator sets deliver direct current to these fan units.

Elevators

The proper type and number of elevators are among the most important problems in modern office design. The present tendency is to use high speed elevators with quick and easy acceleration and retardation, such elevators to be of as simple a design as possible, without gearing or multiplication of cable windings. A successful office building must have such elevator service that a person should not have to wait to board a car over from 20 to 30 seconds, and there should be enough cars and sufficient capacity to empty the entire building of occupants and visitors, in case of panic, in at most 45 minutes. This service can only be accomplished by elevators having a speed varying from 550 to 750 feet per minute and with full electrical control.

Elevator machines and controls are located at tops of shaftways, and ample space should be provided around machines, signal apparatus and controls. Where elevator machines occur in buildings part way up, ventilation must be provided in the rooms to take away the heat generated.

The present gearless traction elevators are considered the most economical and safest type of high speed elevators on the market. Their simplicity of design insures, to a great extent, their safety. The control of this type elevator is exclusively by use of electrical energy, which is varied in degree of pressure as the starting, running and stopping periods demand.

The signal system now generally used is the bracket light flash over each shaftway door with flash light in elevator car. At the starting floor mechanical dials in addition to bracket lights are used to designate locations of elevator cars in shafts.

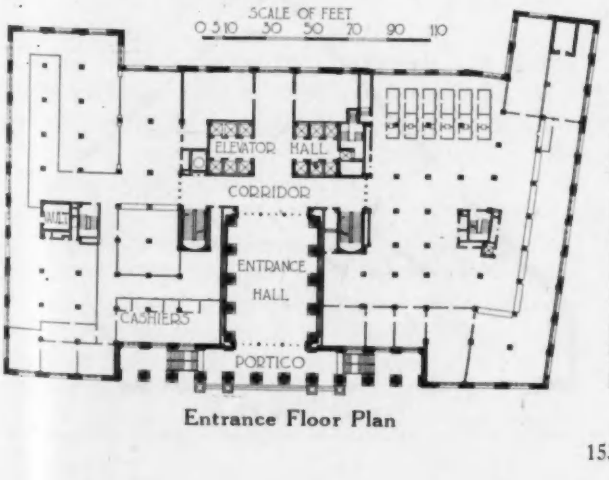
In a large bank of elevators there are located, in a visible place, target boards which show by small lights the progress of the cars up and down the shafts. This equipment assists the starter in determining the locations of all cars and assists him in their operation. The people generally will follow the operation of the dial at the starting floor, and will place themselves at car doors ready for entrance. For the starter's further control of the elevators, there is usually a telephone and call-back system to each car operated.

Municipal Building, Brooklyn

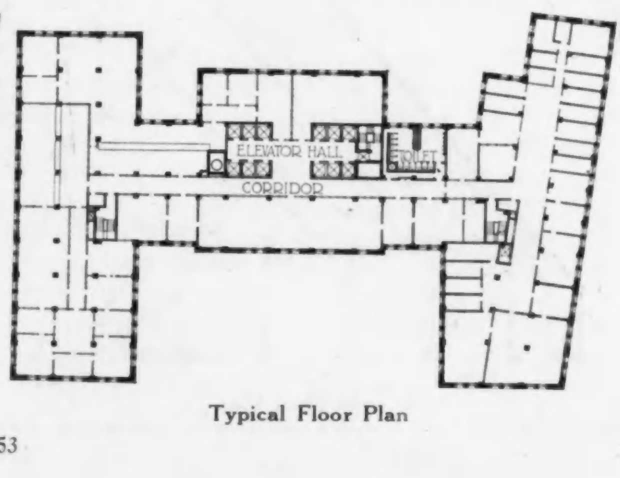
McKENZIE, VOORHEES & GMELIN, Architects

Perspective Rendering of the Building

THE new Municipal Building for the Borough of Brooklyn will be erected at the corner of Joralemon and Court Streets. It will be 11 stories high, and 15 stories in the central part. It will accommodate all the offices of the various city departments that are now widely scattered, occupying rented space in many office buildings in the neighborhood of the old Borough Hall. The H-shaped plan has been adopted to give good light and air to all offices. The construction and equipment will be entirely up to date and planned in accordance with the most approved practice in office building design. The entire exterior will be of limestone with granite base. The building will be simple in design, but will be adorned by a lofty colonnade serving as an entrance to the building and also to the subway.



Entrance Floor Plan



Typical Floor Plan

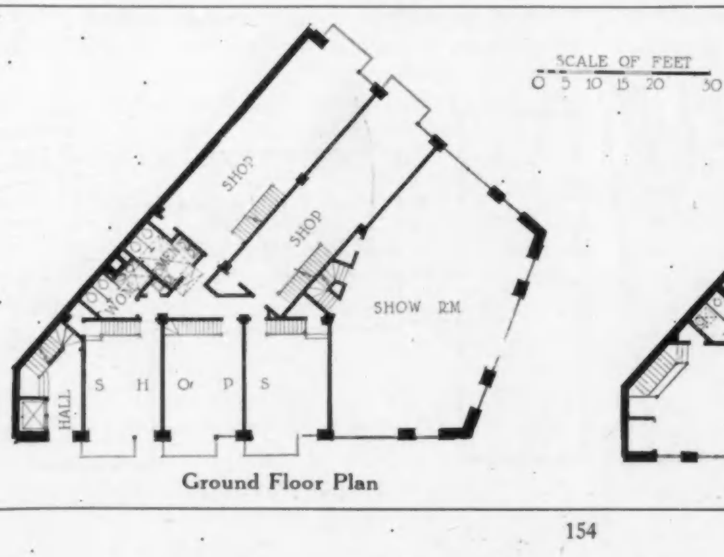
Semmes Building, Washington

GEORGE N. RAY, Architect

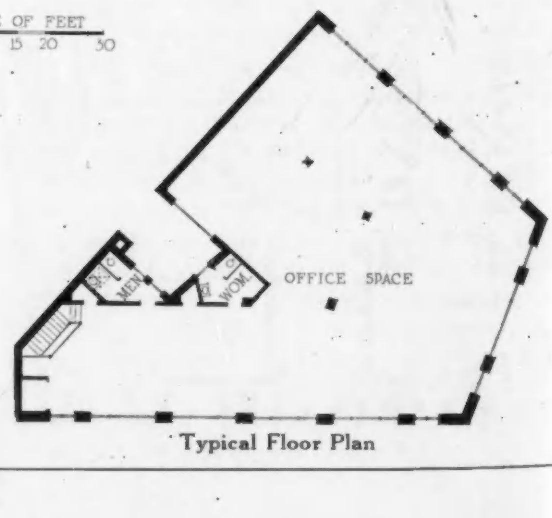
General View of the Building

THE Riggs Bank and the Semmes Building, Dupont Circle, Washington, adjoining structures, were built practically as a joint operation and show a harmonious treatment in their elevations. The major portion of the Semmes Building on the first floor is used for an automobile salesroom, and the remainder is leased as stores. A mezzanine is used by the motor company, and the second floor for offices.

These buildings are of reinforced concrete construction, faced with Indiana limestone. The banking quarters of the bank have marble floors, marble and bronze screens, and decorated plaster walls.



Ground Floor Plan



Typical Floor Plan

Modern Office Building Appliances

By B. H. BELKNAP

Brown, Wheelock; Harris, Vought & Co., Building Managers, New York

THE old adage that "It is the little things that count" may well be applied to office buildings, and with particular emphasis as far as the tenants' general reaction toward the building is concerned. The stability of the structure, the financing of the project, and the imposing architectural effect may pale into insignificance if there is a cold draft from the window or no available receptacle into which to plug the new electric fan just obtained for the President's office! Much is made of small things.

The question of satisfactory windows is of primary importance to the tenant, from whose point of view the window must provide for three things: light, ventilation and complete protection from cold and storms. The matter of light is naturally largely a question of the general fenestration and exterior surroundings. There is no type of window which possesses as many advantages and as few disadvantages as the double-hung window, properly weather-stripped. The small office may, and usually does, depend exclusively on the windows for ventilation, and satisfactory results can best be obtained without objectionable drafts with the double-hung window. The selection and installation of window ventilating devices may well be left to the occupants of the offices. The expense involved will probably never be considered a proper charge against the building, and the preference of the individual tenant will generally be found decided, although perhaps not especially enlightened.

The proper ventilation of large units of office space is impractical if dependence is placed on the windows alone. The only solution of this problem is the installation of blowers and distribution ducts. Any type of window which must remain open or partially so for washing on the outside is objectionable in cold weather. Every office building should be provided with properly secured safety bolts for the use of window cleaners, although they are required by law in New York only on mercantile structures.

On buildings having a southerly exposure it is desirable, if not absolutely necessary, to make some provision other than that afforded by window shades for the exclusion of direct sunlight in summer. This may, of course, be accomplished by the use of awnings, which, however, are not without serious disadvantages. While not particularly expensive in first cost, the annual installation, removal, repairs and storage represent a large outlay each year. Awnings are without question a fire hazard, for building occupants will persist in flipping cigarette butts out of open windows, and the fireproofing of awnings is not practical. Awnings when down make offices much darker, and lights will be burned which would otherwise be out. The outside appearance of a building is certainly not improved by awnings, even when new and of a color harmonizing with the exterior. The use of Venetian blinds to replace both window shades and awnings is worthy of serious consideration in many buildings. The improved daylighting and ventilation of offices may well provide increased revenue, and without doubt constitute a form of service which it is difficult to secure with other means.

There are many days during the year when even a light office will require artificial illumination, and the importance of the proper lighting layout and the selection of the right fixtures are paramount. The old fashioned desk lamp has no place in the modern office. The general illumination should be sufficient so that individual lights are unnecessary. The question of how much light is required is important, and the answer depends on the nature of the work being done. Provided the source of light introduces no glare and the illumination is uniform, there is no such thing as too much light within the practical possibilities of furnishing it. As it is now the general practice for tenants to pay for the electricity used in their offices, adequate lighting may be provided without reacting unfavorably on the operating costs of the building.

The outlets for fixtures should be arranged symmetrically and not more than 10 feet apart, the exact spacing depending on the sizes of the offices. Except from the standpoint of keeping it clean, the ordinary semi-indirect fixture with properly diffusing glass is the most practical for general office lighting. There are now available several types of totally enclosed fixtures, the easiest to keep clean, which also retain the advantages of the semi-indirect fixture in efficiency and appearance. In laying out lighting circuits provision should be made for moving fixtures due to possible future rearrangement of the space. Ceiling lights should be operated from side wall or column switches, and not more than two lights should be included in one circuit. Fan outlets should not be overlooked, since the electric fan is a standard office fixture today.

Next to the lighting and ventilation of his office, the tenant is probably more concerned with the matter of cleanliness than anything else. While supplying this service lies largely in the province of the building management, there are a few points which may properly be considered here. If the offices are large, the use of mopping trucks will greatly facilitate this work, and the porter's closets should not only be large enough to accommodate the truck but if possible should have floor drains so placed that the two tanks on the truck may be emptied direct to the waste lines. Provision for the use of these trucks may make it possible to eliminate a slop sink on each floor, which would be required if ordinary pails were depended upon.

Vacuum cleaning is indispensable in the modern office building. If the installation of the central stationary vacuum machine is decided upon, the piping should receive the most painstaking care as to layout and installation, since the efficiency of the system is greatly affected by minor details of fittings, pipe sizes, etc. In general, the piping work should be done under a separate contract rather than be included with the plumbing or steamfitting. The modern portable machine, mounted on a light rubber-tired truck, meets the usual office building requirements, and the work will be done at less expense if the first cost of equipment is figured upon. If the halls are large, one or more outlets should be provided for the use of electric scrubbing machines. These machines usually have attachments for waxing and polishing linoleum and may therefore also be used in the offices, which should be provided with outlets for the purpose as well as for the use of the vacuum cleaner.

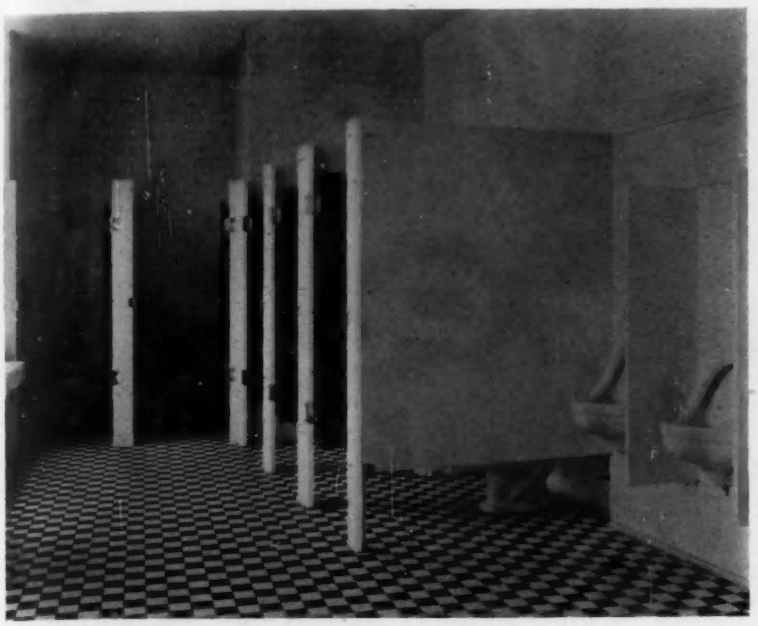
The standard of finish and equipment of toilet rooms in modern high class office buildings has reached a point where even the most particular and fastidious tenants can hardly fail to be favorably impressed with the provisions made for their comfort and convenience. This fact was humorously illustrated by two American "doughboys" who had just returned from overseas. Upon entering a toilet room of one of New York's finest office buildings, one was overheard to exclaim to the other, "Say, Buddy, if a Frenchman came in here, he'd think he was in a toilet in Heaven!"

There is perhaps nothing more attractive for the side walls and partitions of toilet rooms than slabs of white opaque glass. Light Tennessee marble or white tile and marble are just as sanitary, and choice is largely a matter of personal preference. Too much care cannot be exercised in properly anchoring all slabs supporting doors, as otherwise the weight and impact of the door will loosen the slab, which may fall without warning. The closet doors should be arranged so that they are normally open, a spring hinge being used with a combination coat hook and door stop on the partition slab against which the door opens. In tall buildings served by only one house tank on the roof, it should be borne in mind that the water pressure will vary from a few pounds per square inch on the top floor to perhaps 100 pounds or more in the basement. Flushometers and valves should therefore be specified to suit the varying conditions of pressure. Wood is no longer an acceptable material for toilet seats, as the composition seats possess such obvious advantages as being more durable and sanitary, non-warping, easier to clean, possessing permanent finish, etc. Modern ideas of personal hygiene demand that toilet paper in a public toilet be contained in a receptacle from which it may readily be removed by the fingers, touching only the paper taken out. The same argument applies with perhaps greater force to the method of dispensing paper towels, which are now regarded as the only suitable towels for office building use. If soap is provided in the toilet rooms, it should be of the liquid variety, and the holder should be of strong construction to stand hard usage. There is a marked tendency at present, which should be encouraged, to place wash basins in offices and for the building to supply the tenant with individual towel and soap service. This is not only a source of revenue but appeals to the tenant as more sanitary and helps to solve the problem of keeping toilet rooms from being littered with paper towels.

Too much importance cannot be attached to the so-called secondary electrical distribution system. This is the low-tension system and includes wiring for telephones, annunciators, buzzers, etc. Where



Three Types of Windows in New York Offices of York & Sawyer, Architects



Typical Toilet in Pershing Square Building
York & Sawyer, Architects

offices are small it is practical to conceal the necessary wires in the baseboards or mouldings. In large offices this is obviously impossible. The most satisfactory system yet devised for meeting the requirements of this situation consists of a crosswork of semi-circular fiber tile laid on the concrete arches before the finish floor is put down and through which all necessary electric lines are run. By means of special floor outlets it is possible to set a desk anywhere on a large open floor and pick up all circuits without cutting a channel in the floor or exposing a conduit on the surface.

Interior partitions in a new office building are not usually erected until after the space has been rented. The tenant is then allowed to choose his own layout, and the cost of the partition work is amortized over the term of the lease. This is a very equitable arrangement and makes it possible to establish definite rental schedules, based upon "open floor" values. Tenants should be restricted, however, to certain typical layouts in deciding upon the arrangement of their offices so that the space may be readily rented to other tenants without expensive alterations. Obviously, all plastered partitions, with doors, hardware, etc., and all special counters, grilles, paneled walls and similar equipment although paid for by the tenant become the property of the landlord and are considered as parts of the building. Even portable wood and glass partitions are often specified in lease forms as "building fixtures" and are considered as parts of the building, particularly if their removal would result in damage to walls, floors or ceilings.

The question of disposing of waste paper from office buildings in New York is one of comparative simplicity. Paper is usually collected by cleaning women in large burlap bags which are removed from the various floors to the paper storage room by porters. These rooms should be well ventilated and large enough to hold the accumulations of two or three days. Waste paper should be held at the building for 24 hours in the bags in which it is collected, which should be distinctly marked, so that papers accidentally placed in waste baskets by tenants may be recovered as conveniently as possible. The baling of paper in office buildings is not a general practice, because paper must be sorted before it can be sold to advantage, and since office waste embraces everything from newspapers to the finest linen bond, the labor of sorting would be too expensive if performed by building employes.

Wherever possible in planning an office building provision should be made, either in the basement or in such locations as are not desirable from a rental standpoint, for storage space to be used by tenants in keeping their records, letter files, etc. Such storage rooms should be planned so as to be fireproof and can often be rented at very attractive figures. It is, in general, impractical to attempt to provide individual vaults as part of the building equipment, due to the almost prohibitive expense of making them actually burglarproof.

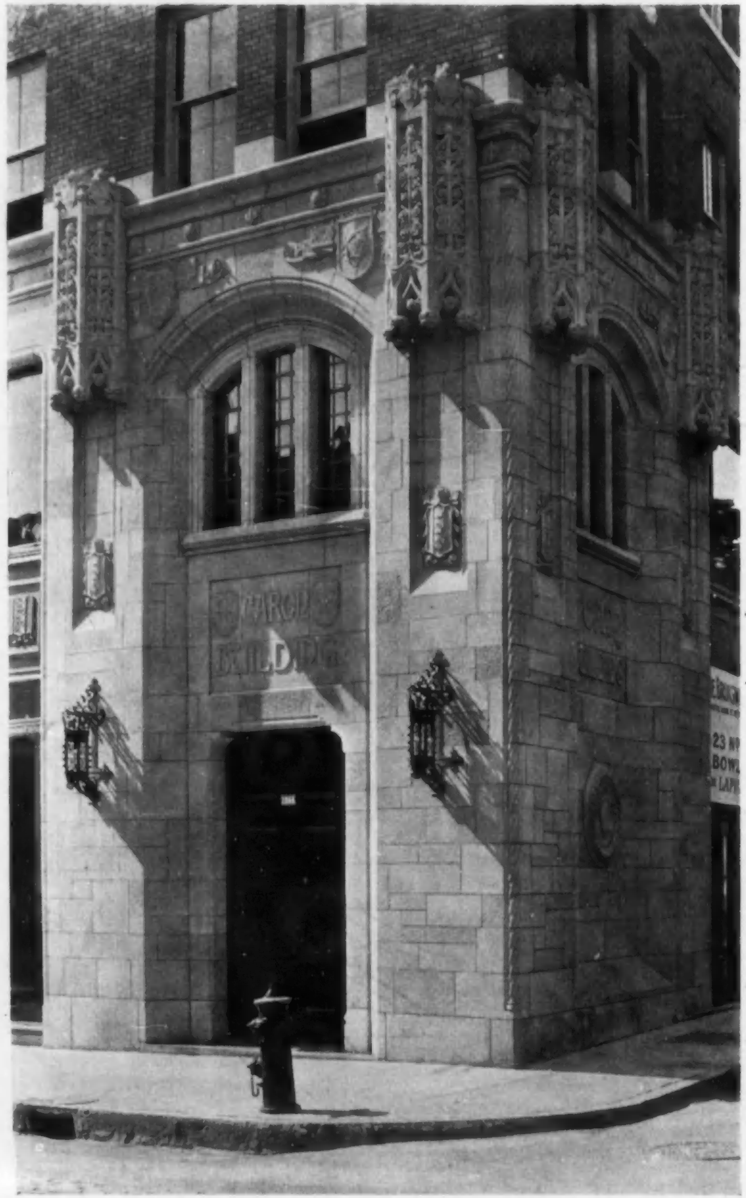
In addition to properly lighting the interior of an office building, many projects now also introduce the problem of exterior lighting at night for advertising purposes. It may be said without fear of contradiction that such lighting has no practical effect upon the rental value of office space in the building and serves only to advertise the building itself or the company or institution which it represents.

The flood-lighting of many downtown office buildings in New York would be impractical from an advertising standpoint because they are so surrounded by other tall buildings that an unobstructed view of them can be obtained from only one or two locations. Then, too, lower New York is practically deserted at night, and even if the buildings could be seen to advantage, there would be few to look at them. Flood-lighting should be very carefully studied, and used so as to be in harmony with the architectural motif. Artificial lighting cannot begin to equal daylight, and to attempt this result is usually to invite failure. An installation of lamps with a wattage of 50,000, together with proper reflectors, projectors, screens, etc., would probably be adequate for the ordinary exterior lighting project. If this lighting were used on an average of five hours per night and current cost four cents per kw. hour, the cost of electricity would be $10 per night, or $3,650 per year. To this amount should be added the cost of the bulbs, which would be about $400 per year, exclusive of the labor of re-lamping.

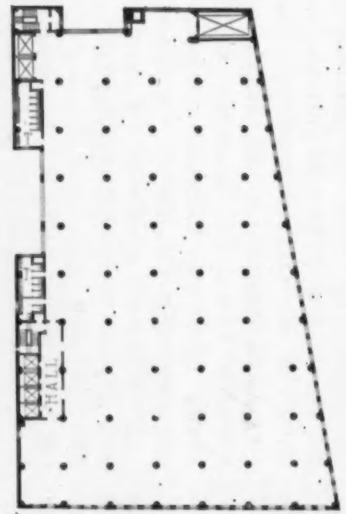
New Caron Building, Montreal

MACVICAR & HERIOT, Architects

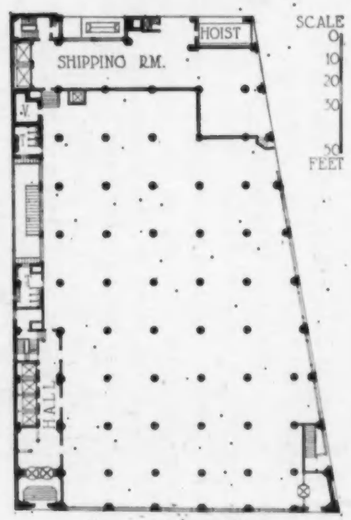
IN the New Caron Building, Montreal, artificial stone was used for the two lower stories and trim, with gray face brick above. Construction: steel frame and reinforced concrete; slabs for floors. Heating: vacuum steam system. Electric service: three 50-kw. 2300-550-volt power transformers and three 75-kw. 2300-115-volt lighting transformers of oil-insulated, air-cooled type. Elevators of single-warp traction type. Windows: first floor, cast iron frames with steel sash; upper floors, double-hung, wood frames and sash. Corridor floors: pink Tennessee marble. Walls: polished Botticino marble. Cost: 35 cents per cubic foot in 1923.



Entrance to Ground Floor



Typical Floor Plan



Ground Floor Plan

General View of Building

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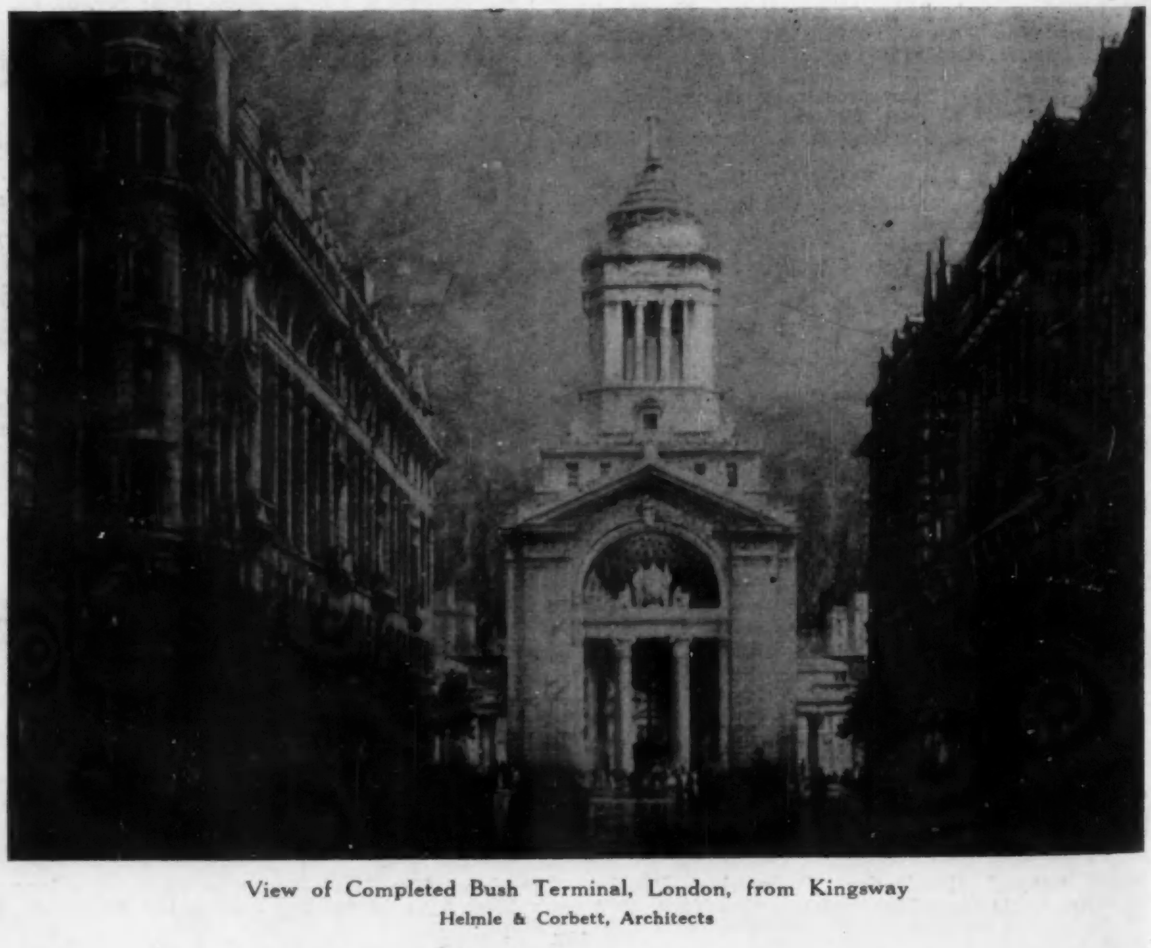

View of Completed Bush Terminal, London, from Kingsway

Helmle & Corbett, Architects