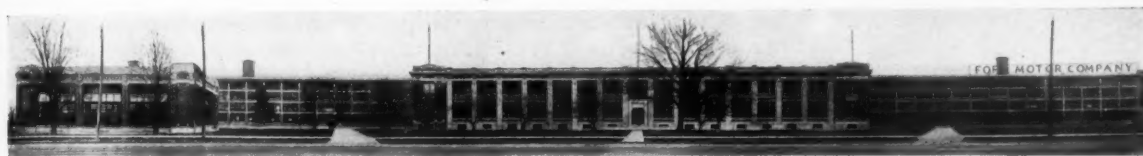


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PLANT OF FORD MOTOR CO., DETROIT, MICH.
MR. ALBERT KAHN, *Architect*. MR. ERNEST WILBY, *Associate*

PRESENT DAY FACTORY CONSTRUCTION

THE subjects of design and construction of modern factory buildings are to-day receiving an amount of attention that will compare favorably with that bestowed upon any other class of buildings. A dozen years ago if one should have visited the average factory he would have found it consisting merely of wooden buildings indiscriminately huddled together, and increased from time to time as capacity was outgrown by additional wooden buildings, the whole ensemble being a mere fire-shell, and of little more protection than a board shelter against rain. So rapidly have certain industries leaped to the forefront of commercial activity in the last dozen years, however, that new constructions have been imperative requirements of several important lines—automobile factories, shoe factories, steel plants, textile mills, agricultural implement factories, ice plants, packing plants, etc.—and now the visitor will find manufacturing interiors which are a pleasure to his eye, a comfort to his feet; clean, light, spacious, sanitary, convenient, practical and satisfying architecturally.

It is natural to inquire what have been the tendencies in such modern building operation all over this country which have brought such results to pass? Have any lessons been learned from the disastrous fires which have visited theater, factory and warehouse

alike, ruining millions of dollars of property and taking hundreds of lives? Has the shock of earthquake and powder explosion, the flail of the hurricane, taught prospective builders any new ideas along the line of a construction which shall withstand such destructive influences? The builder of to-day, we may answer, *has*, almost without exception, taken these adverse elements into consideration and is erecting his structures accordingly. Briefly, the tendency of present-day factory construction is toward such qualities as these: First, speedy erection; second, low first cost; third, daylight illumination; fourth, shockproofness; fifth, maintenance economy, and, sixth, fireproofness.

Manufacturers universally realize the force of the Remington motto that "To save time is to lengthen life." All other things being equal, a factory quickly erected means: That the output is correspondingly increased; that earlier opportunity for alterations in design is afforded as well as a chance to take advantage of market changes; that better facilities are opened up for assuring prompt deliveries before traffic congestion has had time to form. These



ENTRANCE TO PLANT OF LOZIER MOTOR CO., DETROIT, MICH.
MR. ALBERT KAHN, *Architect*. MR. ERNEST WILBY, *Associate*

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ENTRANCE TO ADMINISTRATION BUILDING, FORD MOTOR CO., DETROIT, MICH.
MR. ALBERT KAHN, *Architect*. MR. ERNEST WILBY, *Associate*

are advantages which readily occur to one's mind, and might be multiplied in number upon closer investigation.

Again, it is not merely American, but human, to want that for which, in reason, we are compelled to expend the least money. Not only speedy erection but the smallest adequate cost of erection is very important in the calculation of the factory builder. Every legitimate economy effected in construction means a correspondingly larger possible outlay for equipment or for conversion into capital. Hence a saving of ten, twenty, thirty, or fifty thousand dollars on initial cost bills is a serious consideration in any survey of present building methods.

Then, there is the problem of illumination: How effective can the work of any mechanic be whose surroundings are such that little or no light falls upon his work, and where the advantages of sunshine and fresh air are entirely shut away from him? Just in proportion as the physical condition and manual dexterity of the workman are increased will the quality of the article produced be enhanced. Hence a decidedly important tendency in modern factory construction has been toward the improvement of the efficiency and daily output of the labor employed. Consistent and national

advertising avails little if the quality of the article in itself is not up to the standards set by such advertising. This question of daylight factory illumination is now receiving the attention which it has long merited. Pure, clear, uncolored daylight—the sunshine of roofless fields which doubtless contributes in no small degree to the rare artisanship of Japanese, Indian and Italian handiwork,—is becoming a possession of the American factory laborer as well. Steel window sashes which are weatherproof, give access to a maximum amount of daylighting, and at the same time afford ample protection against driving rains and wind pressure, are being placed on the market to fill this requirement.

These sashes are manufactured to fit all standard or special openings, and are provided with ventilators which admit fresh air to every part of the factory interior.

The San Francisco fire and earthquake, the earthquake in Central America, and in Kingston, Jamaica, have attracted attention both national and international to still another feature of factory construction, namely—shockproofness. Not alone is it necessary to contend against the possibility of explosions from powder or other combustible materials which are massed in factory interiors, nor against earthquakes or other exterior shocks coming upon the construction proper. Many industries, such as elec-

tric lighting plants, power stations, etc., require the concentration of heavy machinery in small space which subjects the floors and walls of these constructions to a continuous, daily vibration. Hence the shockproofness of a factory construction is a feature that cannot possibly be neglected by the prospective builder.

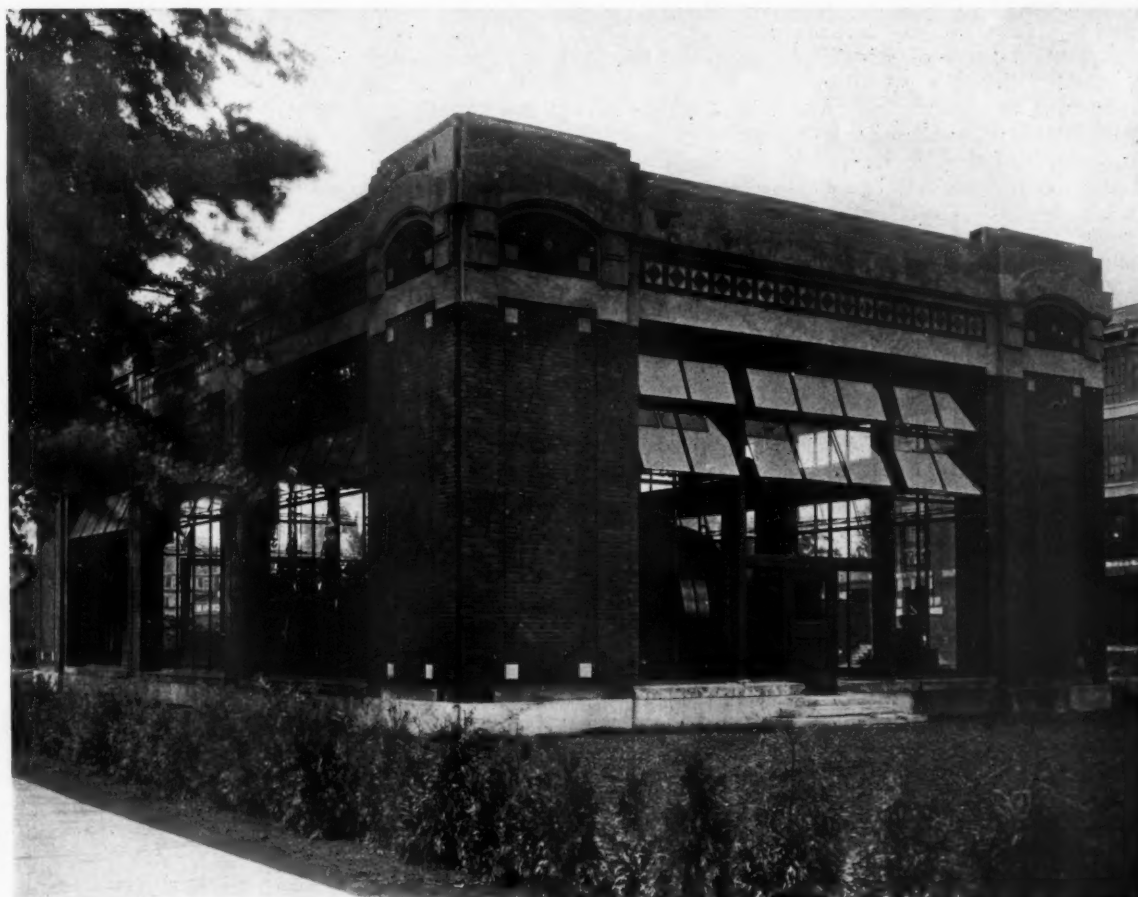
Lastly, we come to the most notable of all these good qualities which every factory construction must possess—fireproofness. According to an address recently delivered by Walter L. Fisher, Secretary of the Interior, before the National Fire Protection Association at the Waldorf-Astoria, in May last, the annual ash-heap amounts to \$250,000,000, consisting mostly of preventable fires. "If the Government," said Secretary Fisher, "should suddenly lay an annual tax of \$2.51 on every man, woman and child in the United States, on a promise of spending the money for some useful purpose, that promise would not avail against the storm of protest which would be aroused. Nevertheless, a tax which in the aggregate amounts to that is being paid by the people of this country. It is the annual fire loss of the nation upon buildings and their contents alone. It is expended not in productive enterprise, but in death and destruction, and an even

larger sum is annually expended upon fire protection and insurance premiums. Not only is this property loss sustained by our people, but in addition, annually, fifteen hundred persons give up their lives, and nearly six thousand are injured in fires."

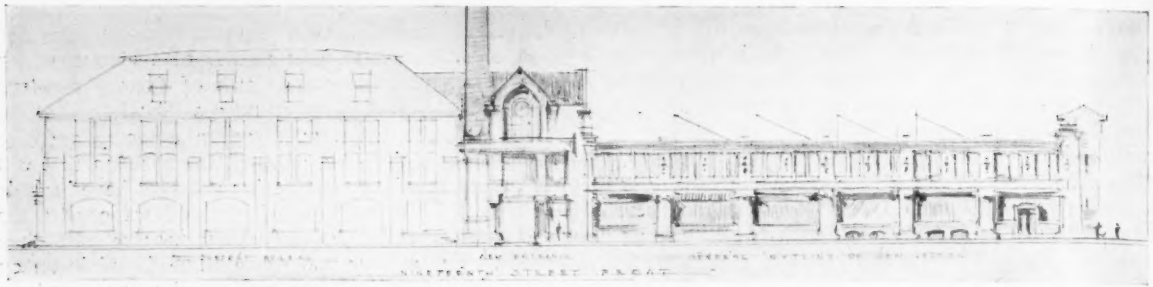
"Fireproof buildings," continued Mr. Fisher, "will be constructed at less expense in the future than in the past, and the difference in cost between the fireproof and inflammable buildings will soon cease to be an encouragement to flimsy construction." It is noteworthy, however, that, in spite of all the fire loss which is occurring throughout the country, this same loss is largely taking place in other industries than those with which our present article is concerned. Some of the most notable fires of the last five or ten years have taken place principally in large theaters, steamships, lumber yards, or other lines than those connected with the factory proper. This, of course, is in a large measure due to the fact that factory construction has almost

inevitably tended toward fireproofness as the first and most important prerequisite of its construction.

If these various requirements of factory construction—speedy erection, low first cost, daylight illumination, shockproofness, maintenance economy and fire-resisting qualities—are granted, the problem that confronts the architect after design and plan have been determined is the selection of materials of construction and equipment that will in greatest measure fulfill these needs. The answer will probably be found in an examination of the well designed, efficiently planned and economically constructed buildings that have been erected throughout the manufacturing sections of the country during recent years. The results that have been attained in good lighting, unobstructed areas, efficient building equipment and, above all, architectural treatment of a high order place a standard, as well as numerous examples, for the guidance of those who are just entering this special field.



POWER HOUSE, FORD MOTOR CO., DETROIT, MICH.
MR. ALBERT KAHN, Architect. MR. ERNEST WILBY, Associate



PRESENT BUILDING AND GENERAL OUTLINE OF NEW SECTION, PLANT OF MESSRS. H. BLACK & CO.
MR. ROBERT D. KOHN, Architect

THE AESTHETIC CONSIDERATION OF THE MODERN MANUFACTURING PLANT

By R. L. TWEEDY, General Shop Manager of Messrs. H. Black & Co.

UP to the year 1900 probably the greatest achievement in factory building had been the perfection of that type of structure known as the "slow-burning construction," examples of which are to-day everywhere common. However useful this style of architecture may have proved toward satisfying the practical needs of manufacturing, it had little to boast of æsthetically over its predecessors.

To be sure the grounds around these buildings were often kept in excellent order and in many instances, as in the case of the American Felt Company's plant at Picton, N. J., ampelopsis was made effectively to cover buildings—shrubs were set out and lawns carefully cropped. But the inside walls for the most part were uninspiring in form and treatment.

Think what a waste of opportunity when three-quarters of the waking hours of every factory workman's life are spent indoors. Only one-quarter of his waking hours left for home life, recreation and inspiration, and how very little of this last the majority gets outside.

Every one needs inspiration and he needs it not once in a while but constantly. Æsthetic surroundings supply this inspiration in one of its most useful, necessary and adaptable forms. Bad and impure air breathed into the lungs poisons the system, makes sluggish the mind and lowers the efficiency of the worker. In like manner monotonous and ugly surroundings may deaden the æsthetic sense in the worker and lower the quality of his product. Beauty around him absorbed through his eye and brain is incorporated into the object upon which his labor is expended. Isn't it the very keynote of good business and sound economics to bring about quality of products?

It was long thought—and how erroneously could easily be shown did space permit—that expensive building materials and expensive architectural methods could alone bring about pleasing and good-looking manufacturing plants. The constantly increasing number of not only attractive, but beautiful homes, shops and factories that are being erected to-day from the lowest price and most ordinary materials, treated, however, in an intelligent and thoughtful way, is all the refutation needed of the foregoing to the most casual observer.

At the time the "Wooltex" plant was erected the ar-

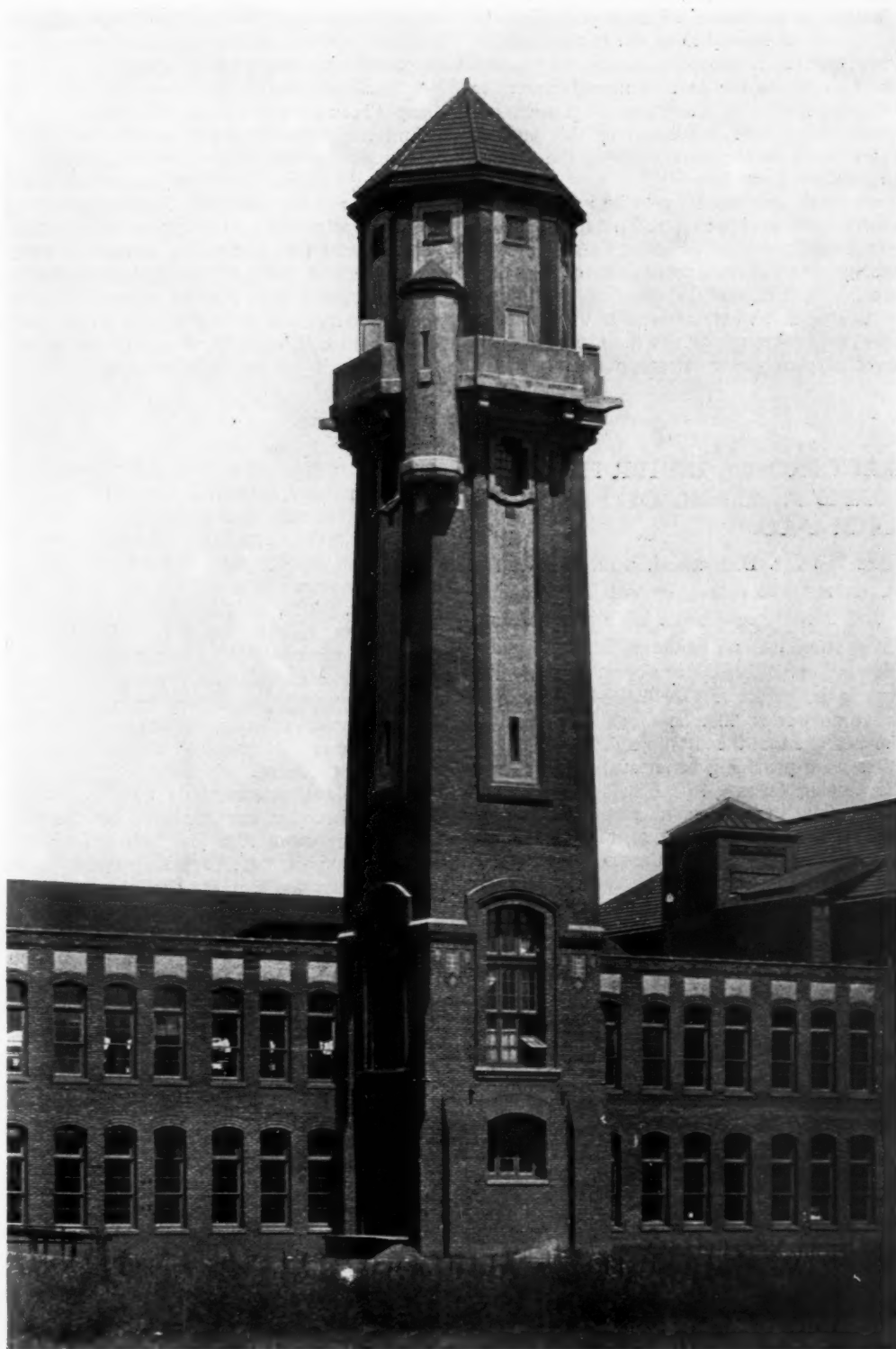
chitect was instructed to build a common-sense, economical factory, practical in every particular, which, in addition to being useful, should be first of all good to look at, and from inexpensive ordinary materials. Offensive features like the water tank towering above on the customary skeleton steel arrangement gave way to an ornamental tower of solid brick, with panels of stucco and tile, which not only improved every other line in the building and typified the general idea of strength, but supplied receiving room, restrooms and storeroom. Blue and green tiles in pleasing panels were inserted at regular intervals in the walls of the building and a red tile roof takes the place of slate. In the large workroom, the walls of which are white, a sample stencil design in green and blue proves a great relief to the eye. Interesting pictures are hung about the walls of some of the rooms. Flower boxes are used in some of the windows, and by numerous other suggestive methods order, general neatness and taste are encouraged in the minds of the workers.

Environment, moral, physical or æsthetic, is a tremendously potent influence upon every individual, and in the case of the factory there is unquestionably a striking reflection in the product of good surroundings. In counting over the great German manufacturing plants one is struck not only with the tremendous amount of power which they represent, but also with the beauty of the ensemble—contrast of glorious and simple color effect, picturesque outlines.

Someone has said, "The more man a man is the more valuable he will be to any concern, and the more he can do and will do to aid its success." Certain it is that breadth of view, depth of character, imagination in foreseeing results and initiative in action make men more valuable as workmen.

Whatever educative force tends to develop these qualities in the mind is a productive force, and one to be reckoned with in any economic problem where human brains and hands are a factor. To draw out the best that is in man, incessant and constant appeal must be made to his better nature, and for that reason his surroundings, moral, healthful and æsthetic, must be made to be upbuilding and uplifting.

Time was when the workman was looked upon by the



THE WATER TOWER, "WOOLTEX" PLANT OF MESSRS. H. BLACK & CO., CLEVELAND, O.
MR. ROBERT D. KOHN, *Architect*

employer as a useful adjunct only in connection with the machine which he operated. And so long as this attitude obtained in the minds of employers it would have been gross inconsistency to appeal to attributes of mind in the operatives which machines did not possess. Only the awakening on the part of manufacturers to the conscious realization of the tremendous wastefulness and economic failure occasioned by this attitude on their part could have brought about the change which is gradually taking place.

Factory workmen are beginning to be no longer regarded as mere machines, but as men. That their influence upon the final product is as great as, if not, indeed, greater in many instances than, that of the machine they operate is established beyond dispute. Every day it is more fully realized that whatever benefits the workman adds indirect benefit through him to the product.

The laws of psychology are being applied to business.

Besides striving to create moral and healthful atmosphere for workers, simple attempts have now been made toward beautifying factory buildings and workrooms because here, too, better work is done in pleasant and congenial surroundings than when these are otherwise. Not until comparatively recent years has intelligent thought been expended along this line.

America is rapidly accepting the idea of the value of beautifying the surroundings of factory workers, with the gratifying result that factory architecture and equipment are receiving the serious attention of artists. It only remains for manufacturers in general to appreciate the fact that æsthetic surroundings constitute an economic force which can be applied to their own particular business, before every factory, no matter how modest in structure, throughout the length and breadth of the land will begin to show signs of a higher life, with the result—an improved product.

EXTRACT FROM A LETTER FROM MR. MORRIS A. BLACK, OF MESSRS. H. BLACK & CO.

Some years ago Mr. Dangerfield, a member of the House of Commons, was visiting in America inspecting workshops and working conditions. Whenever he came in contact with conditions above the ordinary, he asked the insistent question: "Does it pay to provide attractive surroundings to the workers?" He desired in each case the affirmative answer so that he might take back to England the message that the "hard-headed" Americans in many cases were providing better surroundings and that it paid, hoping thereby to induce many English employers, especially in London, to adopt similar policies. And now THE AMERICAN ARCHITECT seems to ask the same question in regard to the factory that you designed for us.

It would be difficult to prove by actual statistical figures that pleasant, attractive surroundings are more remunerative to the builders than would be unattractive, uninspiring ones, and yet we believe that whatever expenditures have been necessary to make the "Wooltex"

factory attractive, pleasant and wholesome have been wise expenditures, and not unwise ones.

If the books were to be examined and an accountant render a verdict, the issue might not be entirely clear or decisive, but if the votes of the people connected with the factory were taken, there would be no question of the answer. After all, the opinions of the workers are at least as valuable as would be the auditor's statement, and in the opinion of the workers there is no question but that whatever additional expenditure may have been required was fully justified in the improved health, the improved mental attitude, the improved moral, physical and æsthetic conditions which the attractiveness of the factory has produced.

And as this attractiveness was produced without great outlay we have no question but that these attractive features were more than justified, and are willing to hold to the faith and belief that these conditions of betterment for the workers produce a better product, and that a better product will earn greater appreciation of the ultimate consumers—the American people.

So we really do not care very much even if our belief in the advisability of making the factory wholesome and attractive be incapable of proof by the statistician!

SOME ESSENTIALS OF THE MODERN MANUFACTURING BUILDING

With Special Reference to the Packard Motor Car Co.'s Plant at Detroit

By CHARLES J. MOORE, Operating Manager

EXPERIENCE has conclusively shown that the essential requirements of a modern manufacturing plant are economy of operation, freedom from fire hazard and ample light, with the most perfect system of ventilation.

These essentials apply with equal force not only to the owners or operators of the building and plant, but also to the operatives as well. While the first essen-

tial may appear as only affecting the owners, it can be readily shown that economy of operation is as important to the employees as to the employer. Modern conveniences insuring the most economical operation are conducive to the best results and these naturally effect and insure a high character of product and a ready market for it as well as a satisfactory scale of wages for operatives.



GENERAL VIEW, PLANT OF THE PACKARD MOTOR CAR CO., DETROIT, MICH.

MR. ALBERT KAHN, *Architect*. MR. ERNEST WILBY, *Associate*

(From a drawing by Jules Guérin)



POWER BUILDING, PACKARD MOTOR CAR CO., DETROIT, MICH.
MR. ALBERT KAHN, *Architect*. MR. ERNEST WILBY, *Associate*

While all manufacturing buildings may be said to be governed by the same general essentials of construction and plan, the type now under consideration is that of the modern automobile manufacturing building.

In buildings of this class, it will be found advantageous to group the entire manufacturing facilities around one common stock building, and again around the manufacturing buildings, the assembling departments which finally produce the finished product.

This plan has in actual operation worked out most admirably and justified its adoption. It gives the shortest possible haul for all material from its receipt at the factory to its shipment, and has covered every point of economy of handling, accessibility and facility of shipment. All the buildings in this group (the Packard Motor Car Works at Detroit, Mich.) are of reinforced concrete construction, either separate buildings or thoroughly divided into sections by fire walls and fire doors. These doors by careful inspection are always maintained in a thoroughly operative condition.

Such structural difficulties as sometimes present themselves in concrete practice have been met and it is believed successfully overcome. These difficulties are varied by the requirements of different departments of the manufacturing plant. The location of doors, the hanging of shafting and countershafting, the placing and fastening of machinery together with the introduction of necessary ventilating and exhaust pipes are a few of the many things that have had to be

taken into consideration. These, while not, perhaps, difficult in the ordinary type of building, become when the structure is of concrete and the imperative need of a perfectly fireproof and well ventilated factory is considered matters requiring the most thoughtful care and closest attention.

The different buildings which, grouped, form the modern automobile factory serve so many and such varied purposes that it is not possible, without largely and unnecessarily expending money, to design them with the same carrying capacity. Buildings adapted for stock storage must of necessity be heavier in construction and with more and heavier supports than the usual machine buildings. But even these latter must be strong in construction, free from vibration and well lighted. In the assembling buildings, where floor space is essential and the best possible light an imperative requirement, the supports must needs be few, and the comfort and convenience of the employees are equally important considerations.

In some cases cement finish floors have been introduced, in others, owing to the character of the occupancy, wooden floors have been laid. But the fact impresses those in charge of the buildings that the introduction of wood, where no better substitute has been found, lacks a large measure of the essential of perfect fireproofing, which would be better secured by the use of incombustible floors and metal window frames. Different varieties of these essentials of good

fireproof construction are now being tested, and it is hoped that in the near future the elimination of wood will have been secured.

All the buildings of the Packard plant are equipped with electric power transmission and heated by a hot air system. Sprinklers are installed throughout. The sprinkler pipes are in every case exposed, experience having shown that any concealing or burying of the sprinkler pipes has resulted unsatisfactorily. The fans for heating and ventilation are all placed in the basement. The ventilating flues are located outside, carrying air to each floor and so constructed as to insure the proper distribution.

The wiring for both light and power passes through beams close to the ceiling, preventing possible interference with moving machinery.

While it is ordinarily customary to install large wash rooms at central points, it is proved by experience in the Packard Works that the placing of a sanitary toilet, wash sinks and lockers in direct connection in each workroom is a better method, as it enables the operative to enter and leave the room in street clothing.

In this plant there is a large tunnel under the main street, connecting the various buildings. This serves as a conduit for steam and water pipes and wires from the power house. This tunnel also contains the drip system from all heating appliances.

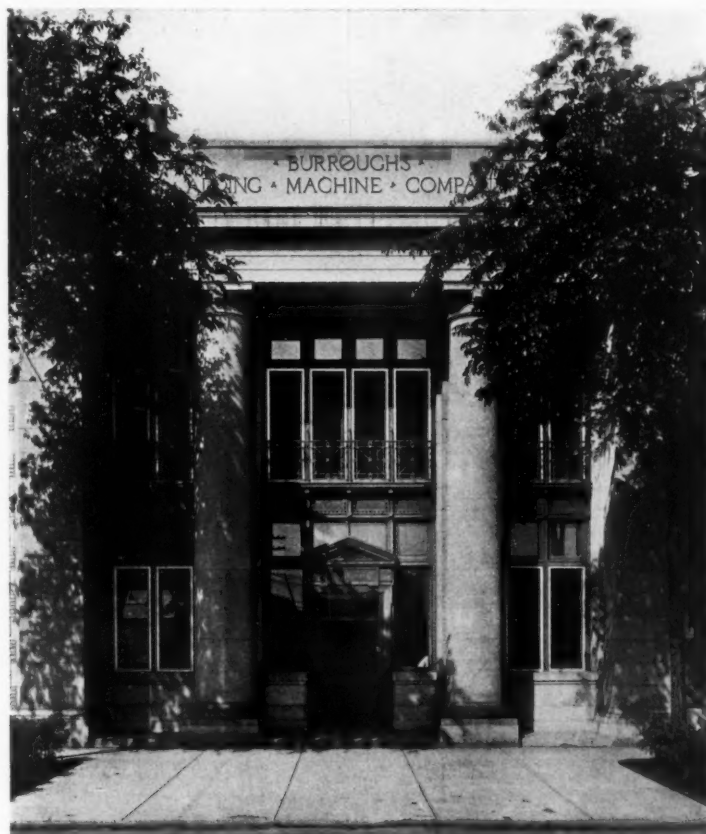
In so large an industry as the Packard Motor Car Co.'s, and where so many people find daily employ-

ment, it has been conclusively shown that the health, both bodily and mental, should receive attention if the best results are to be secured. A sound mind in a sound body will produce better results, and precautions to secure and retain such conditions attract a better class of labor. In addition to such sanitary measures as the law makes mandatory in all factory buildings, the wise employer provides such other features of recreation and comfort as are possible.

It therefore follows as a matter of course that so large a plant has provided dining rooms, a hospital, reading rooms and other recreative centers which will give ample opportunity for a large number of people to find relief in cases of sudden or temporary illness and recreation at such times as they are not engaged in their usual duties.

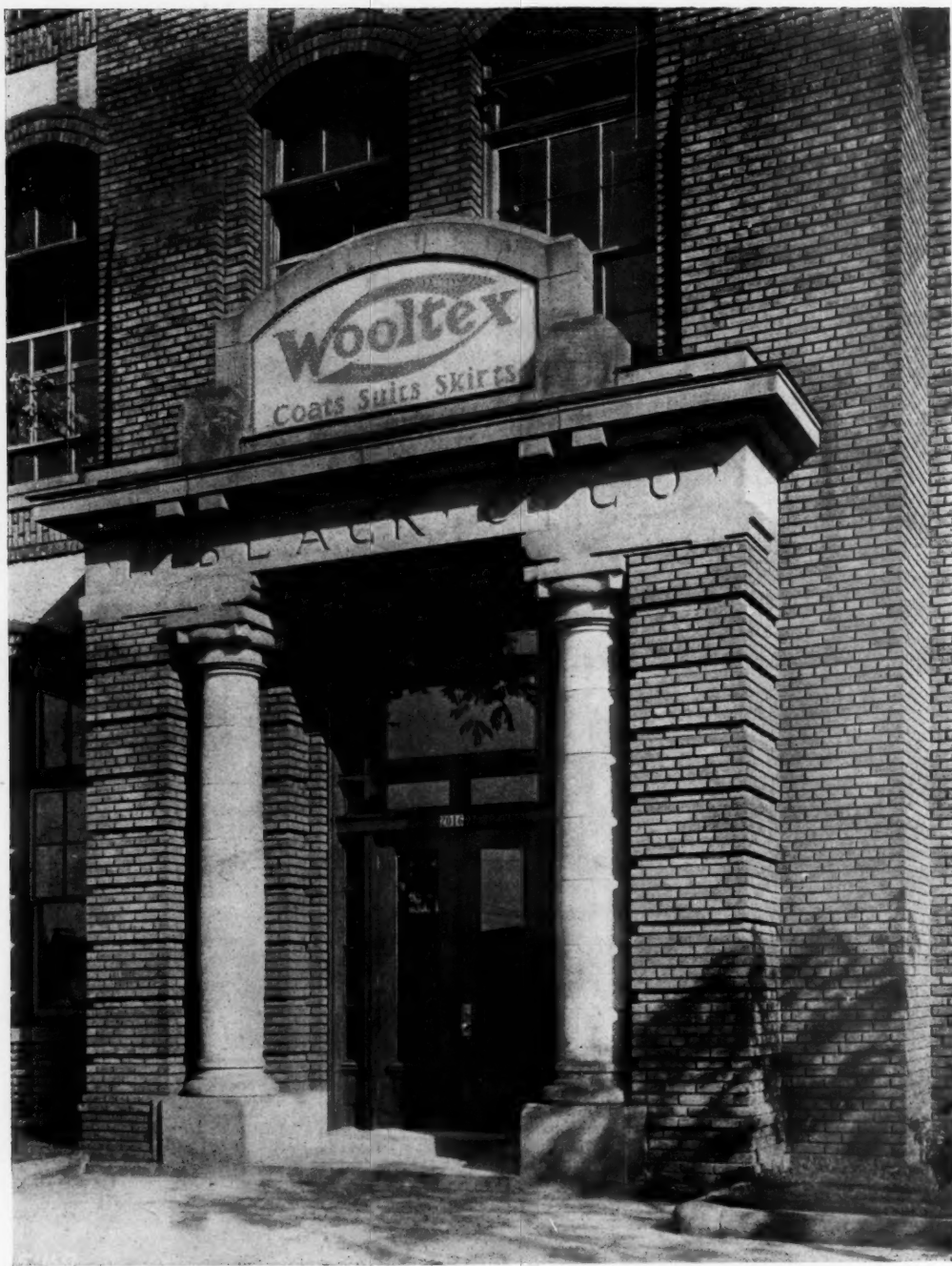
In fact, the designing and planning of the modern manufacturing building has to-day become something more than a group of uninteresting buildings, shorn of everything not purely utilitarian. It is the home of a vast community of workers, each, by reason of the knowledge that those by whom they are employed have gone beyond the actual necessary money outlay to erect a plant, incited to become a more faithful and efficient employee. A group of buildings that combine good architectural treatment with every known modern requisite to make a complete whole may be considered a progressive step in the country's development of more than ordinary importance.

ENTRANCE TO
ADMINISTRATION
BUILDING,
BURROUGHS
ADDING
MACHINE CO.
DETROIT, MICH.



MR. ALBERT KAHN,
ARCHITECT

MR. ERNEST WILBY,
ASSOCIATE



DETAIL OF ENTRANCE, "WOOLTEX" PLANT OF MESSRS. H. BLACK & CO., CLEVELAND, O.

MR. ROBERT D. KOHN, *Architect*



ENTRANCE DETAIL, BUILDING FOR MESSRS. W. M. HOYT CO., CHICAGO, ILL.
MESSRS. NIMMONS & FELLOWS, *Architects*



GENERAL VIEW, PLANT OF THE LOZIER MOTOR CO., DETROIT, MICH.
MR. ALBERT KAHN, *Architect*. MR. ERNEST WILBY, *Associate*

ELECTRICITY IN MODERN INDUSTRIAL ESTABLISHMENTS

By JAMES ROBERT MOORE

IN the natural course of events one of the great industrial establishments of the country some years ago lost the manager who had grown up with it, and his successor upon taking charge discovered that the works were being operated by no fewer than one hundred and ten separate and distinct steam plants, all of which he promptly proceeded to supersede with motors operated by current distributed to them from a centrally located electric plant, and in consequence the concern instead of merely "getting along" suddenly found itself a great dividend payer and is now one of the most valuable components of the United States Steel Corporation. Possibly that lesson in consolidation had some bearing upon the formation of the great industrial combination itself.

To be sure, there are not many works extensive enough to contain anywhere near one hundred and ten power plants, but so effectually has electricity demonstrated its advantages that any industrial establishment devoid of electrical equipment would to-day seem as archaic as a dwelling house devoid of plumbing equipment, and the more modern the establishment the more complete and efficient are its electrical applications.

In those establishments which require steam all the year round for drying or for other purposes, as well as those in which the refuse of manufacturing must be disposed of by burning on the premises, neglecting the opportunity of "making one stream drive two mills" by first utilizing the steam to run an electric plant is grossly profligate, and may even prove downright suicidal, while those concerns which require heat for nothing but atmospheric warmth during cold weather and which have no combustible refuse to dispose of may, or may not, be able to make their own electricity as cheaply as they can buy it; and those small enterprises which occupy quarters in loft buildings heated by the landlord and who merely want power for a few pieces of machinery and some light on dark days must be most uniquely situated in order to afford to do anything but purchase such current as they need.

Undoubtedly a greater number of industrial establishments would possess their own electric plants were it not for the woeful lack of accurate data as to the actual performances of existing ones or as to the real needs for current in various operations and processes of

manufacturing. Very rarely is a factory provided with any means of weighing its fuel and ashes, or of measuring its feed water, and in the vast majority of them no separate record is ever kept of the oil, waste, etc., used in the engine room and the factory proper, and although a few establishments have for some time past been equipped with a single recording steam gauge it is only within the last year or so that owners, architects or engineers seem to have realized the importance of providing means for recording sub-divisions of the output, and it is a surprising fact that many establishments which are utterly deficient in that respect maintain most elaborate and intricate systems of recording everything else entering into their costs of production.

This rule is not without exceptions, however. The new factory of Brewster & Co. has upon its main switchboard one meter which makes a graphic record of the total consumption of power current, and another which makes a similar record of the lighting current, and also six wattmeters respectively recording the consumption of energy by all of the blowers and exhaust fans, by all of the wood-working and metal-working machinery, by all of the elevators and house pumps, by the lights in the showroom and offices, by the lights throughout the manufacturing portions of the structure and by the illumination of the clock tower. The enlarged McGraw Building, which is occupied by a number of allied industries having separate corporate existences, and consequently maintaining separate sets of accounts, obtains its current from the Edison company, has it all recorded upon master meters near the point of service entrance and then has it distributed to three metering points in each of its eleven stories, as well as to a meter at each of its elevator and fan motors. The National Park Bank also utilizes Edison current and separately meters the power for its ventilating and refrigerating equipments, for its elevators and dumbwaiters, for its utilitarian lighting and for its purely ornamental illumination. A few large retail stores have their feeders so arranged as to separately meter the current supplied to each department; and, of course, loft buildings are almost invariably equipped in such a manner that the light and power supplied to each tenant can be recorded upon meters within his own individual premises.

Such sub-divided records not only show the quantity

of current delivered to each department and permit its cost to be correctly calculated and distributed among them, but by enabling ready comparisons have frequently been the means of indicating to the management points of "leakage," the stoppage of which has effected material savings without in any way impairing the efficiency of the establishment.

But no matter whence comes the supply of current there is no operation requiring energy to which it cannot advantageously be applied, as motors of any required capacities and wound for any standard voltage are to be had for installation upon floors or pedestals, for attachment to walls or columns or for suspension from ceilings or girders; may have their shafts either horizontal or vertical, and can be designed for driving either by direct coupling, by direct gearing, by back gearing, by sprockets and chains or by pulleys and belts; and, more-

printing press outfits; by variations in the surface levels of liquids, as in the case of gravity water supply systems, or by fluctuations in pressure of confined fluids, as in the case of compressed air equipments; and alternating-current motors can be started and stopped with equal facility, but their speed control has not yet been as fully perfected.

With such adaptability it is perfectly possible to always apply electric power in the most efficient manner, and thus minimize the operating expenses; but lack of appreciation of this important fact has too often resulted in more or less haphazard purchases of standard types of motors that cannot possibly achieve high efficiency under the peculiar individual conditions which prevail. In most cases machines requiring five horse-power or more should be equipped with individual motors, while those of smaller requirement can usually be advantage-



POWER HOUSE AND MAIN BUILDING, LOZIER MOTOR CO., DETROIT, MICH.
MR. ALBERT KAHN, Architect. MR. ERNEST WILBY, Associate

over, their connections may be at either or both ends of the shaft; or one end may be fitted for one method of driving and the other end for an entirely different arrangement, while the range of possible speeds is marvelously wide for direct-current apparatus and within fairly reasonable limits for alternating current.

Devices for controlling the operation of direct-current motors have now been brought to such a degree of perfection that they can be either started, stopped, retarded or accelerated from an unlimited number of points which may be located at any desired distances, either by manual operation of push buttons, as in the case of

ously grouped for operation by a minimum amount of shafting and belting driven by a single motor; but either arrangement can necessarily be overdone.

But quite as much as the mechanical equipment of an industrial establishment, its artificial illumination should be properly adapted to the various operations which are conducted upon the premises, for the operative who can clearly see to adjust his machine and the material to be worked by it, and, if necessary, can perceive without hesitation the exact point for the application of a tool, will unquestionably turn out a greater quantity and a better quality of work than one who must grope in un-



POWER BUILDING, MESSRS. DODGE BROS., DETROIT, MICH.
MR. ALBERT KAHN, *Architect.* MR. ERNEST WILBY, *Associate*

sufficient light or who must periodically rest his eyes either from a trying glare or from an irritating reflection.

Previous to the commercial development of electric light, as well as all through the era of open arc and carbon-filament lamps, about the only variation of illumination possible was the candle-power of the incandescent lamps, the number grouped in a single fixture and the use of clear or frosted bulbs; but in these days of enclosed arcs, flaming arcs, plastic glowers, vacuum tubes, mercury vapor tubes, metalized filaments, tantalum filaments and tungsten filaments, to say nothing of the great variety of candle-powers and shapes of the filament lamps, there is no excuse for unsuitable illumination, and the scientifically lighted establishment often contains several types and a wide range of sizes of lamps.

The violet rays from Cooper Hewitt lamps are entirely satisfactory in foundries, composing rooms and all other places where form and not color is the dominant factor, but they cannot be tolerated in ribbon mills,

paint shops or other places where shades and hues are all-important. While unfrosted tungsten bulbs are eminently suitable for the latter class of activities, yet they result in serious eye-strain if used in close proximity to either white substances or highly polished objects.

THE AMERICAN ARCHITECT itself is edited in offices equipped with tungsten lamps, "set up" in a composing room lit with Cooper Hewitt lamps, printed in pressrooms having enclosed arc lamps for general illumination and carbon-filament lamps within the presses for local illumination of the mechanism, and is assembled and bound in a bindery also provided with Cooper Hewitt lamps. The elevators which bring up the paper, transport the "forms" and the printed sheets and finally carry down the completed magazine are operated by magnet-controlled motors. The presses are each run by an individual motor whose operation is controlled from push buttons, and all of the type-setting, folding, binding and mailing machines are motor driven.

Although a manufacturing plant is essentially a utilitarian institution, its advertising possibilities should never be overlooked, for if, as generally conceded, the keynote of advertising is "keeping everlastingly at it," why discard the opportunities of maintaining throughout all the hours of darkness a judicious exterior illumination which will render the establishment as noticeable by night as by day. Who, while awake, has ever passed through Poughkeepsie without seeing the De Laval Separator Works, or through Bridgeport and remained in ignorance of the existence of the fact that ordnance is made there?

A rather unusual reason for an all-night electric sign was recently advanced by the management of a textile mill which is so situated that the only people likely to observe it are the inhabitants of the neighborhood, but in consequence of having it always before their eyes this establishment is their first thought whenever out of work, and the result is that the concern enjoys the pick of the local labor market.

Many large establishments have such extensive and intricate signaling systems that primary batteries have proven inadequate, and apparatus has therefore been designed for operation by the same current as the motors

and lights; of course, often reducing the pressure by means of either rotary or static transformers. The possibilities of telephone and bell systems are universally appreciated, but in some works it has been found necessary to devise a distinct method of attracting the attention of various officials when "on tour" through the plant and apprising them of the need of their presence at some specific point, the elaborateness of the system, of course, depending upon the extent of the works and the number of individuals to be communicated with. In one establishment six incandescent lamps of contrasting colors are grouped at a number of conspicuous locations throughout the building, and when necessary to communicate with any official a button is pressed in the office which admits current to the lamp in each group of the color assigned to that individual, who, observing that his lamps are lit, either calls up from the nearest telephone or returns to the office. In another instance the notification is given by taps upon gongs located throughout the works, which "tap" a number in exactly the same way as the alarm is given on a village fire bell; while still a third system includes the blowing of a horn to attract attention, the setting of an annunciator drop to indicate the official wanted and the location of an extension telephone station beneath each horn and annunciator, and the annunciator drops can only be reset by the operator in the office after the required official has replied to the notification.

Special uses in electricity which are peculiar to individual cases exist in any number, but even an enumeration of them would be tedious; but they serve to emphasize the fact that the industrial establishment, large or small, without electrical equipment is anything but modern.

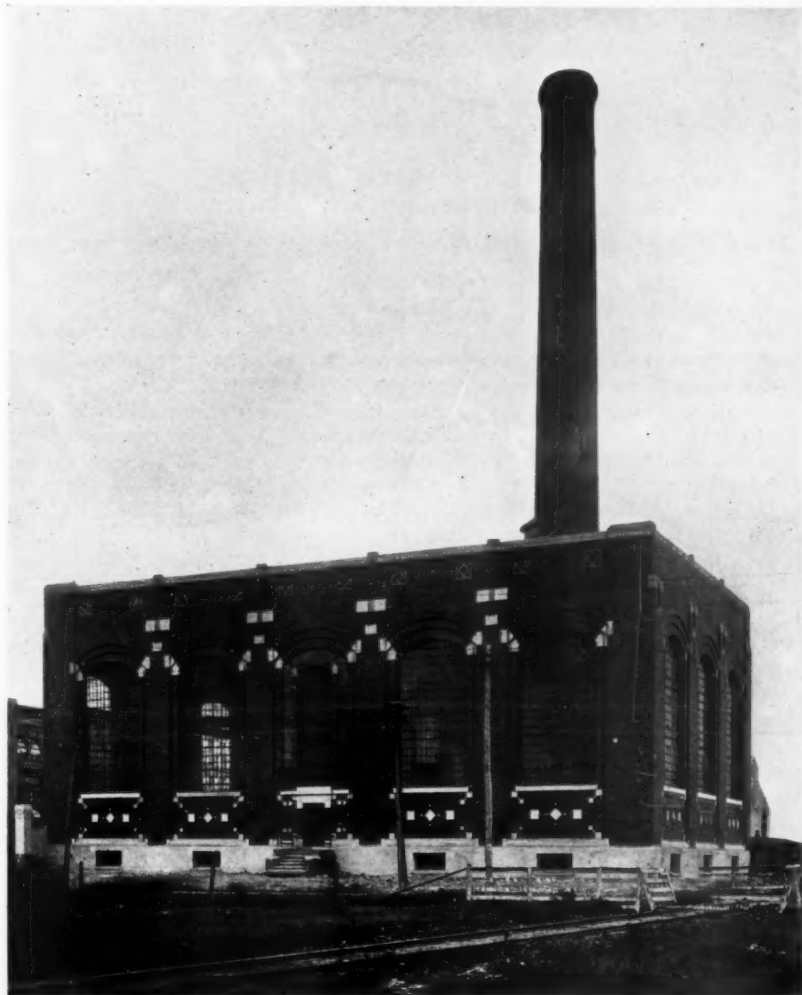
JAMES ROBERT MOORE.

The Modern American Style

Mr. Frank M. Andrews, during a recent visit to England, read a paper on "Architecture in America" before the Royal Society of Arts, in London. During the course of his remarks he stated: "To-day it may be justly claimed that the fundamental elements of our peculiar American type of architectural expression are discernible. Its precise formulation may not yet be possible, but it is a vital and growing

thing, reflecting our rapidly crystallizing characteristics as a people. As an art it has unquestionably found itself, and its underlying purposes and tendencies are capable of analysis and discussion. In method it is bound to no exact tradition nor architectural style, but does acknowledge the underlying principles and authoritative precedents that energize them all.

For the present it is transitional in character, and, as to detail, it is essentially an architecture of adaptation, wedded, as I have said, to no particular style, but seizing for the purpose at hand any suitable architectural form that applies to our situation and environment, and controlled by a trained art intelligence. Here we have the interesting example of an art movement rather typically American, wherein the love of the beautiful and the desire of its intelligent expression are not due to the stimulus of the patron toward the artist, but, on the contrary, have flowed from the artist to the patron, or, rather, from an entire group of architects to an awakening public. The educational influence now at work is as wide as the nation itself."



POWER BUILDING, LOZIER MOTOR CO., DETROIT, MICH.

MR. ALBERT KAHN, Architect. MR. ERNEST WILBY, Associate

SOME PROBLEMS IN THE HEATING AND VENTILATING OF FACTORY BUILDINGS

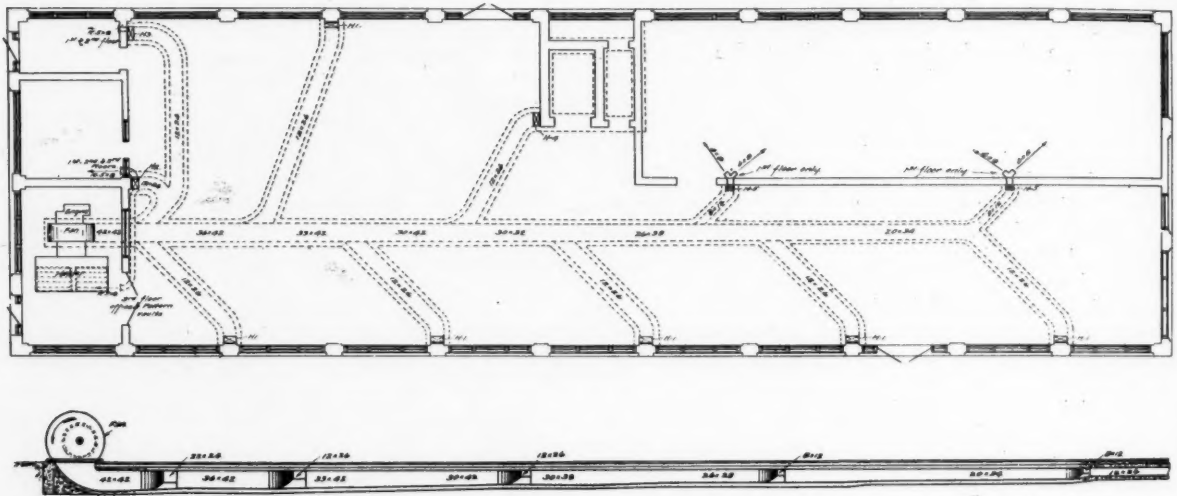
Heating and Ventilating Peerless Motor Car Co. Building

This building is one of the latest additions to the plant of the Peerless Motor Car Co., Cleveland, Ohio. The building is a five-story structure of modern design, and is constructed of steel and reinforced concrete. The shop proper is located on the main floor, the upper floors being used as storage rooms, offices, etc. The heating system is of the hot blast type, using

Heating and Ventilating Lorain Steel Co. Building

A typical illustration of a hot blast heating system installed in a modern factory is that of the Lorain Steel Co.'s building.

The building is a steel fireproof structure, 230 feet in length, 75 feet wide and 40 feet to extreme tip of roof. It is part of the plant of the Lorain Steel Co., Johnstown, Pennsylvania.



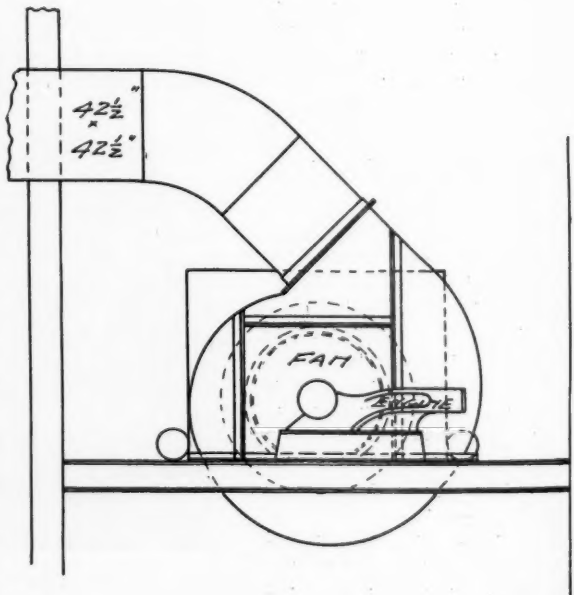
fans and steam coils. The air received by the fan for distribution may be drawn either from the atmosphere or from the building, as desired, and is then drawn through a heater, containing 2,430 feet of one-inch pipe, built on 4-4 row and 1-2 row sections.

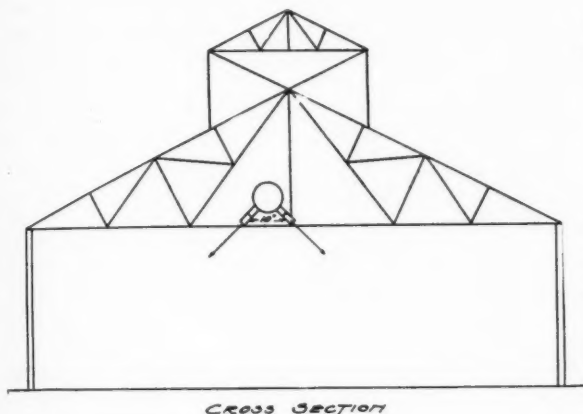
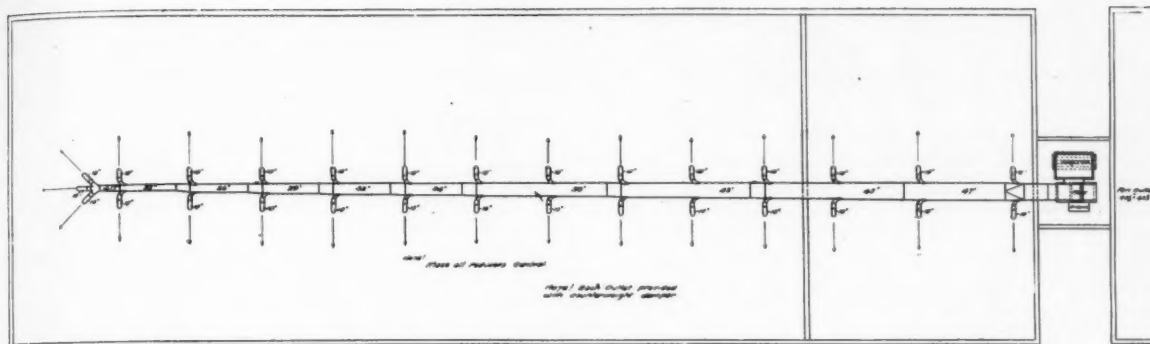
The fan, which is 7 x 4 feet, delivers 40,000 cubic feet per minute at 235 revolutions per minute at one ounce pressure and discharges directly into an underground galvanized iron lined concrete duct, from which galvanized iron flues carry the air to the different floors. The fan is driven direct connected to a 7 x 10½ engine rated at 22 horse-power. The outlets in the different stories are placed above the floor, thus warming the colder strata near floor before rising to ceiling.

This form of lay-out is ideal for factory work, not having roof trusses, or, where headroom is necessary, no portion of the apparatus obstructing any part of the main floor space.

The ducts are proportioned for a velocity of 2,000 feet per minute, the flues for 1,000 feet per minute.

The above values have been found by experience and practice to give the best results in factory and other buildings where large numbers of people are employed.





The building is equipped with powerful cranes and the mechanical equipment is of a high standard throughout.

Every foot of floor space in the building is available, the heating apparatus being in an inconspicuous, unusual space. This apparatus consists of a $9\frac{1}{2} \times 4\frac{1}{2}$ foot three-quarter housing exhauster discharging 52,000 cubic feet per minute at 150 revolutions per minute at three-quarters ounce pressure and direct connected to a 9×12 engine rated at 22 horse power.

The heater contains 9,680 feet of one-inch pipe built in 4-6 row, 7-foot sections.

The apparatus is located in a small out-house situated between two of the main buildings, with a passage headroom of 14 feet underneath. The air necessary for heating is drawn directly from the atmosphere, through the heater at the fan, which delivers it directly to the main duct carried in the roof trusses. Branches are taken from this duct at about 15 foot centers, discharging directly to floor, a distance of 32 feet, with comparative ease.

The main duct is proportioned for a velocity of 1,800 cubic feet per minute, the branches 1,000 cubic feet per minute.

An installation of this kind may be all recirculation or all fresh air, as desired, the result being controlled by dampers.

This form of heating for factory buildings presents one of the latest designs in the way of mechanical equipment, and it would appear, moreover, that the

hot blast system for this class of work possesses many advantages which should not be underestimated.

The Arbuckle Warehouse

MR. WILLIAM HIGGINSON, Architect

This building, erected primarily as a storage warehouse for large stocks of sugar and coffee, offers to the architect certain problems as to materials to be used in construction not present in buildings where general merchandise is stored and handled.

The tendency of sugar to delinquessence makes it imperative that its place of storage be as free from dampness as possible. For this reason that part of the building set apart for the storage of sugar has wood floors in place of the cement floors that are laid in other parts of the warehouse. These floors are constructed of $\frac{7}{8}$ -inch maple boards, laid in five-ply waterproofing.

Large quantities of coffee are stored and roasted in the adjoining building. It having been determined by experience that coffee dust coming in contact with the exposed surface of the roof and moistened by rains and dews sets up chemical action which ultimately destroys, it was necessary to provide a roof surface that would resist this action. This has been secured by paving the roof with brick and waterproofing beneath in the usual manner.

The Arbuckle warehouse is an example of quick construction, having been built in a period of ten months. The concrete structure progressed at the rate of one story a week. The foundation is of the usual "spread" type, and the supporting columns throughout are structural steel and concrete. The building is designed to support the unusual live load of 250 pounds.

An important feature of the plans is the railroad tracks which directly enter the building, where the cars are loaded and unloaded on the platforms shown in the illustration.

A modern sprinkler system is installed, together with the usual standard fire underwriters equipment. As a further precaution and prevention of spread in case of fire, there are cross walls on each floor.

All electric wiring is in conduits on ceilings.

The building is heated by a direct steam system, with pipe coils under windows.

The exterior finish is the so-called "Grady sand finish," a mixture of sand with paint specially prepared for the purpose.

The Plant of the Bush Terminal Company

The Bush Terminal property comprises an area of about thirty city lots and faces the water front of New York harbor in South Brooklyn. There has been erected on this property seven piers, each 1400 x 150 feet and back of this line of piers there will ultimately be erected thirty-four six-story warehouses and eighty-eight one-story warehouses, having a combined floor space of 2,200,000 square feet. Four of these six-story warehouses are built of reinforced concrete, the balance of standard slow-burning mill construction. The one-story buildings are designed so as to make way at some future time for larger structures to keep pace with the growth and development of the property. All of these buildings are equipped with elevators and outside hoists. Serving these many warehouses and back of them lies the railroad freight yard with tracks connecting all the piers, warehouses and factories. This yard is a terminal for all railroads entering New York. Both steam and electricity are used for motive power. Of the factories six are at present completed and in operation and four more are under construction. Three of the factories are 600 x 75 feet, six stories and basement high and three are 700 x 75 feet and equally high. The total aggregate floor space of these factories is 3,000,000 square feet. With one exception they are all constructed of reinforced concrete, the exception being built with a brick veneer. The two factories nearing completion are typical of the others and combined make the largest single structure of reinforced concrete built at one time in the world. In addition to the size of 600 x 75 feet, each has a connecting wing 105 x 204 feet, the whole forming a U with 110 square feet on each floor, the open court facing the harbor. The ground under all these factories is filled, which necessitated piling.

As only the extension or connecting wing of the fac-

tory has a basement, it became necessary to sheet all footing holes in the main building in order to cut off piles below mean low water. All floors of these buildings were designed for 200 pounds live load and the roof for 75 pounds, the column being spaced to give bays 15 x 25 feet.

The reinforcement used throughout consisted of cold twisted steel bars except in interior columns where plain round bars were specified. Octagonal columns varying in size from 31 inches in basement to 17 inches in fifth story and 12 inches square in top story were used for the two lines of interior columns, while rectangular columns were used in walls. The floor slabs are in general 4 inches thick spanning 4 feet, 10¼ inches between beams. Beam reinforcement consisted of two 1¼-inch and three 7⁄8-inch square twisted bars and for girders five 1¼-inch bars, all being held in position by cast iron separators with 5/16-inch stirrups. The slab reinforcement was 5/16-inch bars 9 inches on center.

Ten flights of concrete stairs with safety tread supply ample facilities besides the six exterior fire escapes. Steel sash with solid members was used in all window openings in two of the factories; in the others hollow metal sash were used. The working floors are both wood and concrete, the maple floors being fastened to 2 x 4-inch yellow pine sleepers bedded on rough slab cinder concrete. Where cement floors were desired a 1-inch troweled granolithic surface with 2-inch cinder base is used. Wherever wood floors occur five-ply tar and felt water-proofing is applied under sleepers to insure absolute water-proofness. There are eight electric elevators, each of three-ton capacity, in each main building and two three-ton and one five-ton elevator in the extension. These elevators are so erected as to divide the main building into three separate parts 200 feet apart. This allows a special division of the building to suit tenants and at all times gives access to two or more elevators. Expansion and contraction is provided for in the length of building by expansion joints cutting the 700-foot section into three 200-foot lengths and one 100-foot on center line of column, the columns and beams at such points being built in two distinct operations with a 2-inch beveled recess and tongue to keep out weather.

Power and heat for these buildings is supplied from a central power plant. The automatic sprinkler plant is the largest single installation ever attempted in this country. This installation is controlled by two separate systems of pipes, one connected with the city main, the other drawing its supply direct from the bay.

The Burke & James Building

This building is now roofed in two stories below its final height. It is the intention to carry the building to its final height within the next three or five years. When this occurs we shall



WAREHOUSE BUILDING, BUSH TERMINAL CO., SOUTH BROOKLYN, N. Y.

MR. WILLIAM HIGGINSON, Architect



MAIN FACTORY BUILDING, HUDSON MOTOR CO., DETROIT, MICH.
MR. ALBERT KAHN, *Architect*. MR. ERNEST WILBY, *Associate*

have taken out the name Burke & James executed in the brick work below the fifth story sill course where it now forms a pediment spanning the three central bays. The sills will then be carried through level.

This lettering is with us somewhat of an experiment, and we thought this a good place to try it out since this part of the building is subject to alteration.

We regret that the photographs do not show adequately the color scheme in the brick work. The base of the building is laid up with paving blocks of a deep purplish color, and from there up the wall and pier surfaces are of cherry red paving brick with the spandrels and other trimmings, other than stone, carried out in ivory colored face bricks. The first story walls are battered, giving reveals at entrance features which, though slight, are sufficiently marked by the difference in color of the brick work and the shadows cast. The building is equipped with a sprinkler system whose pressure and gravity tanks are located within and supported by the main stairway tower walls. It is the intention when this building is carried higher to put the upper part of the tower structure on screws hoisting it up bodily with its tanks undisturbed to the final level, that is, gravity tank platform 25'-0" above the future roof.

HILL & WOLTERS DORF.

Building for Brewster & Co.

MESSRS. STEPHENSON & WHEELER, *Architects*

The automobile factory of Brewster & Co. is an unprecedented proposition in factory construction. This firm required an especially complete outfit, as they manufacture a very high grade of bodies, both in design and finish, for automobiles, and it was necessary to consider the design of the building, as well as the completeness of the outfit.

The building extends 200 feet on the Bridge Plaza, 160 feet on Prospect street and 352 feet on Radde street. It is six stories high and the tower rises 174 feet from the pavement. While the building is constructed of reinforced concrete both in walls and columns, the main façade is built of brick in regular brick construction and trimmed with artificial stone. The extra cost of the stone trimmings and the selected brick facing bears a very small proportion to the total cost, and is considered, together with the tower, to be an entirely legitimate expenditure for the advertising thus gained.

This building is a demonstration of the fact, which is becoming increasingly appreciated by manufacturers of high grade goods, that it is entirely practical to



ADMINISTRATION BUILDING, HUDSON MOTOR CO., DETROIT, MICH.

MR. ALBERT KAHN, *Architect*. MR. ERNEST WILBY, *Associate*

design a factory building on architectural lines, so that it is an ornament rather than a detriment to its neighborhood, without entailing any extra expense which could be considered impractical and extravagant. The basement, as well as all other floors, is singularly well lighted. The heating system includes ample ventilation as well. The boiler room has three boilers, 150 horse power indicated each, and the engine room has four units, three of which will develop the horse power required, one being held in reserve.

There is an entirely extra auxiliary steam piping plant, as well as domestic steam supply, air compressor for pneumatic system, vacuum cleaner, shavings exhaust, boiler ventilating system, air washers, tempering coils and all the motors for the interior equipment. There is practically no belting or shafting in the building. The floors are all finished in concrete. There are two vehicle lifts, one automatic electric passenger elevator, one sidewalk elevator and one dumb waiter.

The tower is to be lighted by electricity so that it will be visible for a long distance, thus illuminating the clock from the outside and not from behind the dial, an unusual method. The building is equipped with sprinklers and has a 100,000-gallon storage tank in the basement and two 25,000-gravity tanks on the

roof. These are worked by an Underwriters pump, with a 14-inch suction pipe. All glass is wire glass, and in the offices is plate wire glass. All conditions of the underwriters are complied with throughout. Private offices are finished in ornamental plaster and birch finished mahogany. The show rooms on the second floor are plastered in gray sand finish on columns, walls and ceilings, a space of about 30,000 feet. The building is lighted by electricity and the signal and telephone systems are complete.

When the excavation was well under way it was found that the entire district has underlying it a layer of quicksand, and it was therefore necessary to drive 1,450 concrete piles.

Factory of Simms Magneto Co., Watsessing, N. J.

EUGENE SCHOEN, *Architect*

Much has been written by architects with reference to the advisability of owners employing architects for the designing of factories, in place of those to whom the work has heretofore generally been assigned. The argument has been invariably offered that the architect can design a building with much greater efficiency and certainly with better character than any one else without increasing the cost. While this may be true, the cost

has not always been satisfactory where architects have been employed for such work. This is probably due to the fact that many architects are accustomed to figuring their buildings at a cost of from eighteen cents per cubic foot upward, and when they have succeeded in designing a factory containing many thousands of square feet that does not figure above thirteen or fourteen cents a cubic foot they think that they have solved the problem. As a matter of fact, any reinforced concrete factory, designed to sustain a load of about one hundred and forty pounds a foot and containing an area of fifty thousand square feet should not cost above ten cents a cubic foot, and it is this difference between ten and thirteen cents that has caused the trouble.

In studying this problem the architect has much to learn from the engineer. The engineer's design usually shows a poverty of ideas, the architect's a superabundance. The engineer, however, by devoting much attention to cost of construction has succeeded in establishing a unit system of building, enabling him in some instances to give the owner much more floor area for his money. He has also learned that elaborate exteriors with moldings and ornamentation and variety in materials add considerable to the cost. When he has attempted to use them he has made a failure of it, because he did not know how. But through the very necessity of producing a building as cheaply as possible, consistent with good workmanship, he has learned that these adjuncts are not necessary, but, of course, has not learned the æsthetic value of proportion. His buildings, therefore, fail from an architect's viewpoint, solely in this particular. The successful factory must be absolutely simple; the parts must be so designed as to be capable of many duplications.

In the construction of the Simms Magneto factory at Watessing, N. J., viewed from the standpoint of exterior design, the architect has relied purely upon proportion, and the relation of voids to solids, height to width. These seem to have been the paramount considerations. The architect has stopped just there.

The requirements for factories, especially where considerable machine work and tool work is to be produced,

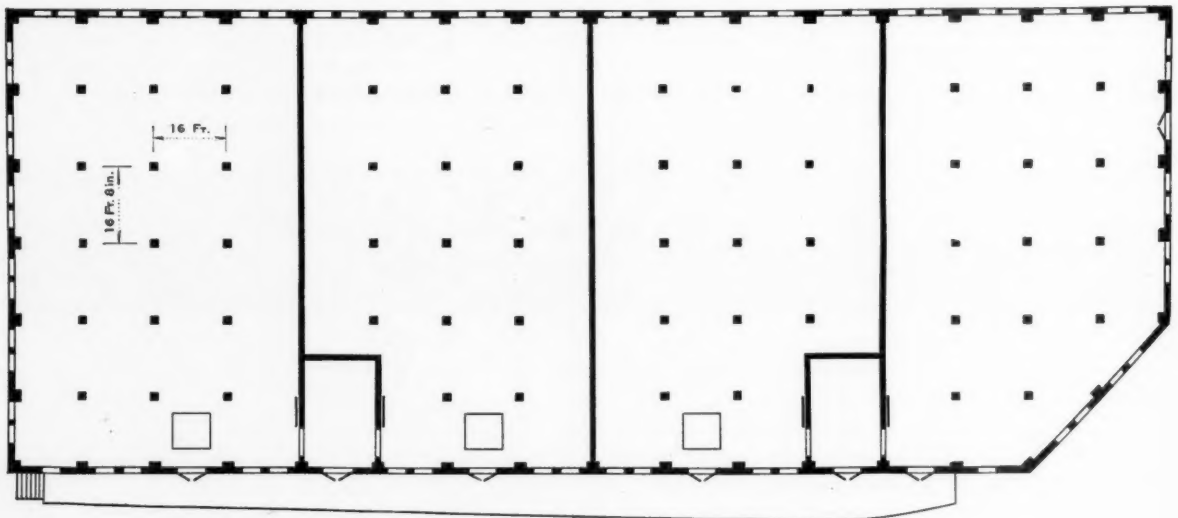
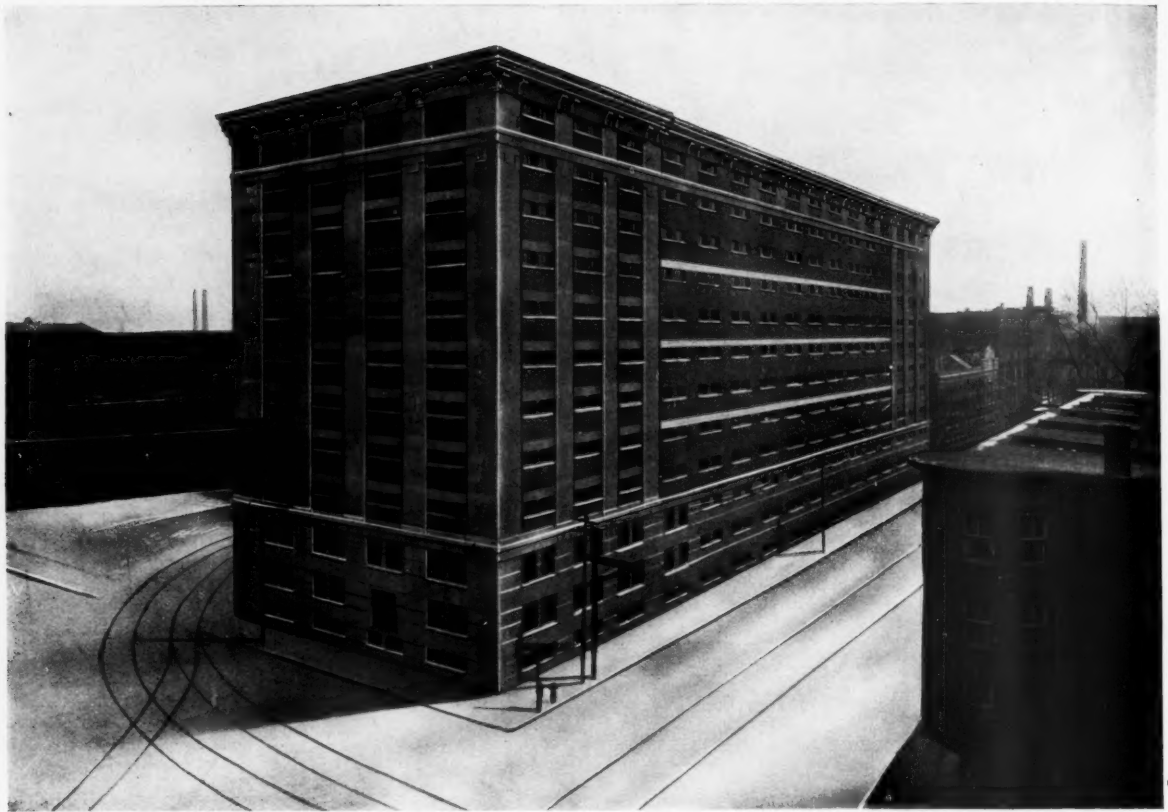
appear to have been carefully considered, first by the introduction of large spans, averaging twenty-two feet in each direction, and then by the use of big windows, so that ample light and ventilation may be obtained. With but very few exceptions, the design of but a single bay, both in plan and elevation, has been sufficient for the entire factory area, thereby insuring the purchase of materials for its construction at a minimum cost.

Recognizing the difficulties of altering concrete that has been set, conveniences have been introduced throughout to reduce the cost of shop millwright work to a minimum. Slots for shaft hangers have been installed in all the bays, making it possible for machinery and shafting to be shifted from one place to another, and the wide spacing apart of columns have made their construction an almost negligible quantity in the rearrangement of shop layout. Toilets, locker rooms and staircases have been placed in convenient and darker corners of the building.

The cost of this plant complete with the sprinkler, toilet, electric light and steam heat equipment has been kept to about ten and three-quarter cents per cubic foot for a story height of fourteen feet from floor to floor. To overcome the necessity of men standing on hard concrete floors a composition material has been placed on top of the reinforced concrete floor slab, which is waterproof, dustproof and easy on the feet of the workmen. The crenulations on the top of the second story are necessary, because there will be a third story added to this plant, and these are put there for the purpose of protecting the vertical reinforcing rods against decay. These rods are encased in brick which has been stuccoed to match the cement work of the lower reinforced portions. The brick can easily be removed and a proper tie established between the new and old reinforcement, thereby obviating the necessity of disturbing any part of the plant while additions are being made. The same is true of the spandrel over the central portion of the front, which is also of brick and can be easily removed, and this may also be said of the rear wall, which the plans show as brick, stuccoed on the outside, thus permitting the building to be increased in length.



HUDSON MOTOR CO.'S PLANT, DETROIT, MICH.
MR. ALBERT KAHN, *Architect*. MR. ERNEST WILBY, *Associate*



FACTORY BUILDING FOR THE AMERICAN COTTON MILLS CO., LOWELL, MASS.
MESSRS. LOCKWOOD & GREEN, Architects

MILL CONSTRUCTION WITH STEEL FRAME AND TILE WALLS

By JOHN O. DE WOLF

IN connection with some new buildings for a manufacturing plant, during the past year the writer made a study of different styles of construction with a view of determining that which would be the most suitable and economical for the conditions under consideration. The plant already had buildings of slow-burning mill construction and of reinforced concrete, each of which served its purpose admirably. There was no need of attempting to match in appearance the existing buildings, and the way was therefore clear for the erection of whatever seemed the best.

After studying the problem and making estimates on different kinds of construction it was finally determined to use plank and timber floors, wooden columns, a steel outside frame and walls of hollow tile plastered on the outside. Concrete pilasters were to be used outside of the steel columns of the frame. The result of this construction was so satisfactory that the writer believes a description of it may prove of interest.

The building is three stories in height, with a basement, and is designed to permit of the addition of a fourth story if desired at some future time. As it was erected on filled land, piles were necessary. The foundations were of reinforced concrete, designed to serve as a retaining wall for the basement as well as to support the structure above.

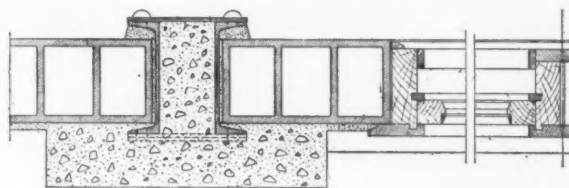
These walls were carried a little above grade and bolts set in them to anchor the steel columns.

The basement height is 10 feet from floor to floor and the height of the other stories is 15 feet. The floors

The outside frame of the building was made of built-up channel iron columns and horizontal irons tying the different columns together and forming lintels over all door and window openings. In designing the columns special attention was given to adapting them to receive the tile curtain walls and the concrete that was to form the pilasters.

Plenty of light was desired in the building and the windows were made about 6 feet 11 inches wide by 11 feet 3 inches high, outside measurements of the frame. These were of the mullion type with swinging transoms and double hung sash, each sash having nine lights of 11-inch by 15-inch glass, and each transom six lights, 11 inches by 14 inches.

Only two sizes of tile were used, all being 6 inches thick and most of them being 12 inches square, but some half-size tile, 6 inches by 12 inches, were used.



Section through Column and Pilaster

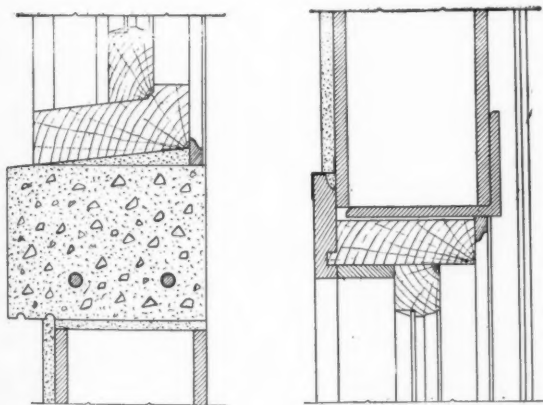
An important consideration in the column design was the use of such size of channels as would suitably receive the tile curtain walls. As tiles 6 inches thick had been decided on they fitted well in to eight-inch channels, and the latter also figured of suitable strength for the loads that were to be carried.

Instead of following the standard practice as to the distance apart of the channels forming the columns, it was varied a little in order that the tile should fit without cutting. Whatever variation was necessary on this account was provided for either in the width of the window mullions or the width of the channel columns, and the design was so worked out as to fit the two sizes of tiles previously referred to.

Great attention was paid to this detail, as it was not intended to plaster the building on the inside, and it was realized that any cutting of the tiles would probably appear unsightly and would also delay and add to the expense of the construction.

Over all window and door openings angle iron lintels were placed to support the tile and prevent its bearing on the window or door frames. These lintels were riveted to the columns and thus securely tied together all of the steel work.

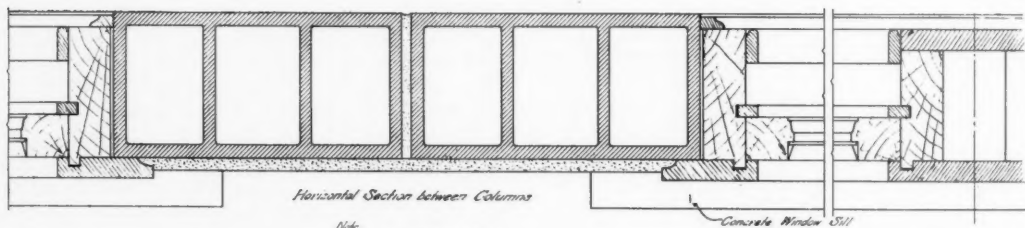
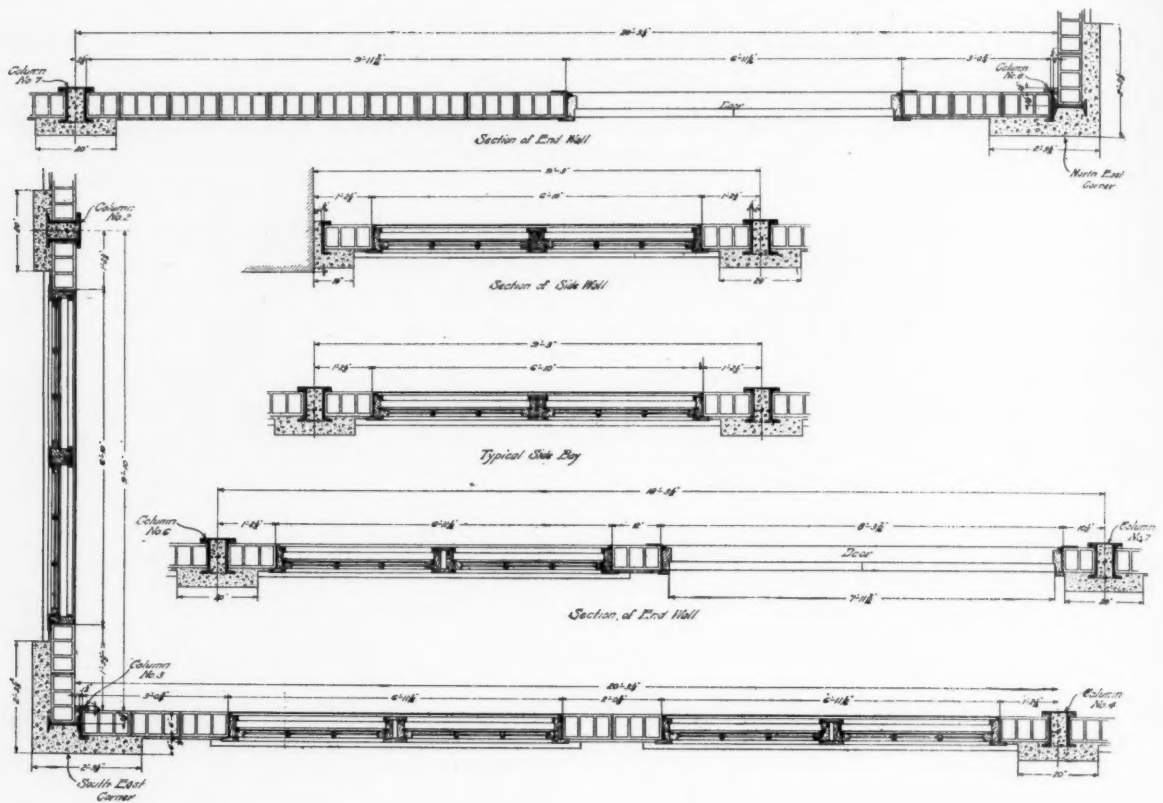
In designing the building it was decided to use plastered construction. The pilasters were designed to be of concrete and to enter into, and form a part of, the steel columns. To permit of this the channel iron columns were made with plates on the inside of the building and lattice work on the outside. The plate on the inside gives a smooth appearance and obviates the



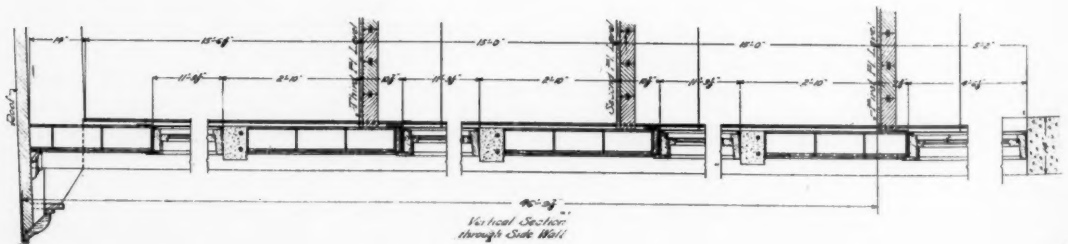
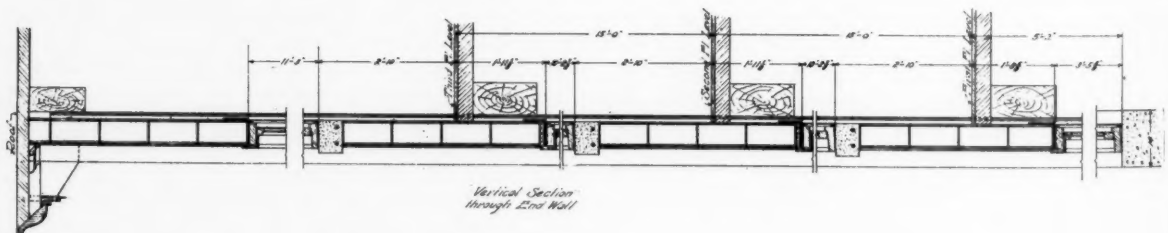
Section through Sill of Window

Section through Head of Window

were figured for about 100 pounds per square foot, live load, and the floor beams were two 8-inch by 16-inch hard pine timbers bolted together. Bays were 9 feet 3 inches in width and the span of the timbers was 24 feet. The main floor was of 4-inch plank, splined, and covered with seven-eighths of an inch of maple flooring. Round wooden columns were used and cast iron caps and pintles. In general the interior of the building followed the familiar lines of slow-burning mill construction.



Note: Beam scale not shown on this drawing.



necessity of any form work to retain the concrete when it is being poured.

No forms were necessary for the concrete pilasters except on the outside. The pilasters were 20 inches wide and projected 4 inches beyond the face of the curtain walls. As the outsides of the columns were latticed, the concrete entered and filled them and added materially to their strength. The finish on the tile curtain walls was cement plaster. The tile was smooth on the inside and grooved with dovetailed grooves on the outer face, so as to better retain the plastering.

After completion and painting the inside of the building presents a very neat appearance. Most of the tiles being 12 inches square, the walls show a uniformity in surface and are divided into 12-inch sections in place of the customary small sections in brick walls. Each column projects inward from the curtain walls about an inch and a quarter and is studded with rows of rivets at each edge. Under each window is seen the window sill, which is of reinforced concrete 6 inches thick. These sills were cast of such shape that on the inside of the

wall they are the same length as the window opening, but on the outside they are enough longer to receive the finish at the sides of the window.

These steel, tile and concrete walls compared with heavy brick walls show economy in the cost of construction and a greater amount of available floor space. In this building each of the three upper floors is of the same size and there is no increase in the thickness of the walls at the lower story. At the pilasters the total thickness is only about 12 inches. The air spaces in the tile walls prove excellent non-conductors of heat and give a wall that has been found well adapted for economical heating.

This building is not being used for rapid-running machinery, but the use of a steel frame with concrete pilasters in connection with the columns would undoubtedly give all the rigidity that would be necessary for any ordinary manufacturing purpose, and this construction would seem to have many uses in industrial buildings. Illustrations of sections and details of the construction are shown on preceding page.

AN EXPRESSION ON THE DESIGN OF FACTORY AND WAREHOUSE BUILDINGS

ACCORDING to President Pond, of the A. I. A., "architecture is the art of expressing in terms of building, concrete use conceived in ideal beauty." To accept this definition without qualification would divide the work of most practising architects into two distinct fields—the aim to create architecture and the content to do building.

With most of these men a factory or warehouse is simply a box of four walls with openings punched through for entrance and light, sufficiently strong to fulfill its function with safety. That is all—no thought of harmony and proportion, of color, of light and shade.

These same men will expend considerable time and thought in an endeavor to make their libraries, clubs, hotels, office buildings and houses attractive and pleasing to the eye.

Why this carelessness towards the workshop of the masses. The fact that the factory must be econom-

ically, even frugally, built, should be no deterrent to the architect to make his building interesting and expressive of its use. Usually he has expanse of wall and

window opening to deal with. Cannot these be so disposed as to produce happy proportion, harmony and rhythm without resort to ornamentation? And is it not possible to use good hard burned brick and show honest bond, thereby obtaining diversity of color and texture without adding very materially to the cost?

All this the writer believes quite possible. The editor's request for these lines suggests a growing interest in this class of building that has lain dormant for too long a time.

Much is written about the planning of cities, location of parks, boulevards, civic centers, and one regrets that with but few exceptions these dreams of perfection or near perfection remain but fancies. Paris, Napoleon III and Haussman are regularly held



ENTRANCE DETAIL, OFFICE BUILDING, FOR BROWN BROS. MANUFACTURING CO.
MESSRS. HILL & WOLTERS DORF, Architects
The door frame is of cast iron

before our eyes as models to go by in the building and rebuilding of our larger cities.

But do not our preceptors in city planning forget that Paris is and must be very different in character from all American cities? Besides being the capital of a nation whose world centers about this spot, Paris is the rendezvous for travelers of all nations.

Now, in planning the American city, we should not forget that even though the principal avenues be lined with monumental structures, as our "Beaux Arts" friends would have it, place must be found for the manufacturing and storage buildings; they cannot be relegated to the remote corners—they must and will be seen and deserve as much consideration as the great office building and fashionable retail mart.

It is in the factory that millions of men and women spend the better part of their working days. Morning

and evening they come and go, gazing upon walls that, if not forbidding and offensive, are deadly monotonous.

Character, psychologists tell us, is affected by color. If that be so, is it not the architects' duty to give thought to all he builds, particularly for the masses? Should he not plot his ground and buildings so that courts may be made gardens? Is not architecture, more than any other, a democratic art?

It is the writer's experience that clients are not averse to making manufacturing buildings attractive, if the architect can obtain such results with slightly increased expenditure. And the architect can if he but try.

Besides, if we are ever to achieve results that are distinctive to American architecture other than colossal elevation, where is there a better place to feel our way than in this particular class of structures?

ARTHUR WOLTERSDORE.



FACTORY BUILDING FOR MESSRS. BLAKE & JOHNSON CO., WATERTOWN, CONN.
MESSRS. GRIGGS & HUNT, Architects

DAYLIGHT ILLUMINATION FOR MANUFACTURING BUILDINGS

THE widespread interest in and study of industrial and economic problems, relating especially to the betterment of working conditions for labor, has brought about, within two years, a development in factory building construction of vast importance to architects.

During this short time the steel window has largely supplanted the wooden framed one for use in the better types of industrial construction.

Large employers of labor have long recognized the value of well-lighted, sanitary workshops. An abundance of daylight and ventilation in the factory is one of the strongest productive factors a business can have. The advent of the steel window has made possible a wall construction that yields to the interior all the natural light and ventilation obtainable in a structure of practical design. This is not the place for a technical description of the several makes of steel windows more generally known. Most architects are already familiar with the relative mechanical merits of these, but the fact that within a period of about two years the steel window has so solidly entrenched itself in favor with authorities on the subject of industrial buildings should lead the progressive architect to thoroughly inform himself of the underlying causes of this development and learn well the lesson of its popularity.

The simple reason why the steel window is used today, in preference to the wooden one, is broader in its application than the energy and enterprise displayed by the makers in the sale of it. Daylight and fresh air are vital to our very existence. The health of factory workers is immeasurably affected by the abundance or dearth of both. An article of building construction which promotes healthier conditions in shops and factories can scarcely be placed upon the common level of a trade commodity, but is sure to be regarded as a necessity for the welfare of mankind. This is the real reason behind the popularity of the steel window, and it is supported by others of comparatively lesser importance, but still of considerable value from the architect's and owner's standpoint.

For example: First, in the modern substantial type of factory building, wooden windows are not exactly in keeping with the collateral construction. An article of greater durability is required, which will, at the same time, do away, to a great extent, with the heavy upkeep expense to which wooden frame windows are liable. Second, in this modern day no material should be used in factory construction which is fuel for fire.

In connection with this development in this country, it is rather an interesting fact to note that in European countries, especially in England and Germany, the ad-



ROOF OF MOTOR TRUCK SHOP, PACKARD MOTOR CAR CO., DETROIT, MICH.
MR. ALBERT KAHN, *Architect*. MR. ERNEST WILBY, *Associate*
This skylighting affords a maximum of light

vantages afforded by steel windows were recognized years ago. In Germany, where the government controls the railways, we are informed that steel windows form a part of the standard specifications for round-houses, shops and other buildings.

In England steel windows long ago took their place as representing the most approved construction from every practical point of view, and they are very extensively used in that country.

The most important consideration, of course, in connection with the use of steel windows is the influence they must surely have on the health of our mass of working people, and for that reason alone their introduction here met with immediate favor on the part of thoughtful men everywhere.

Considered as an investment, there are many arguments to be offered in support of the use of the steel window in factory construction. While its first cost is in some cases greater than that of wood, the subsequent saving in maintenance charges and the increased life of the window itself would ordinarily seem to more than offset the difference. Also the steel window represents another step in the direction of absolutely fireproof factory buildings at a cost which is easily within the limits of what may be called judicious investment for plant.

The remarkable growth which

has attended this article since its introduction is conclusive evidence that the alert American manufacturer is remaining true to his deserved reputation for far-sighted business sagacity, and that he is quick to see the profitable side of an evolution in building methods that owes its popularity to the humanitarian principles involved.

THE GENERATION AND UTILIZATION OF POWER IN THE INDUSTRIES

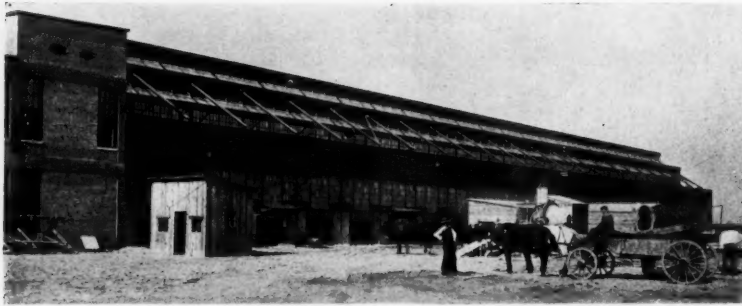
By C. W. E. Clarke

One of the fundamental needs of a manufacturing plant is power. This is provided for in different localities and industries in various ways, such as water power, steam power and electric power.

In some of the industries the amount and subsequent cost of this power is a large item entering into the cost of the articles to be marketed. In plants of this character it is necessary, in order to assure success, that the plant be designed to allow the production of power at a minimum cost. The location of the entire manufacturing plant is often determined by the feature of the cheapness of power. The best illustration of this is the immense manufacturing plants which have been built around Niagara Falls on both sides of the river in order to use the power produced by



INTERIOR OF MOTOR TRUCK SHOP, PACKARD MOTOR CAR CO., DETROIT, MICH.
MR. ALBERT KAHN, *Architect*. MR. ERNEST WILBY, *Associate*



EXTERIOR OF FORGE SHOP, PACKARD MOTOR CAR CO., DETROIT, MICH.
MR. ALBERT KAHN, *Architect*. MR. ERNEST WILBY, *Associate*

the various companies generating at this point.

Where water power is available and the product to be manufactured does not require the use of steam in large quantities, and the cost of hydraulic construction is not excessively expensive, power can be generated in an ideal manner.

Certain classes of industries require, in addition to power for the operation of machinery, large quantities of steam for process work. Also in northern latitudes the heating of the plant in winter is a large item to be considered. In cases of this kind the type and size of various apparatus should be governed by the requirements of the individual case, taking into account the heating and other essentials entering into the proposition. If the item of cost of power is large the plant should be located with a view toward the economical supply of coal, water, labor and other controlling factors. On the other hand, the benefits to be derived in the final cost of the manufactured article may entirely offset any gains which may be derived from considering the plant location as affecting the power end only. Coal in a steam plant is by far the largest item entering into the cost of manufactured power, and the initial cost, the cost of handling and the economical consumption of same are the largest factors wherein the cost of power may be lowered. Where the size of the plant warrants, stokers and coal and ash-handling apparatus should be properly designed to meet the needs of the case under consideration.

The present-day tendency in properly designed power plants is toward not only the restriction of first costs but particularly subsequent fixed charges, and this can be accomplished in several ways, such as the installation of proper automatic stokers which operate at high rates of combustion, thus developing large outputs from a given boiler capacity. Under these conditions, when the plant is properly designed and operated, the total ef-

iciency is increased and the first cost and fixed charges materially reduced. Another field open in this direction is the use of maximum capacity generating units which are capable of being operated at considerably over the previous normal ratings continuously without danger to the unit. This in turn, as will be seen, lowers the first cost of this part of the plant equipment, less capacity being required to serve a given load demand.

The question of the operation of prime movers condensing where location and requirements permit

also opens a field for a reduction of cost of operation of the power plant. The plant is at times of such a character that condensing operation can be carried on when no heat is required in the plant and non-condensing operation as a whole or part when heat is required. Where large quantities of steam are required for processes and heating, non-condensing operation will generally be found to be the most economical, allowing the utilization in the plant of the exhaust steam after passing through the prime movers. The recent development of the mixed flow turbine has made an ideal unit for this purpose. This type of unit can be operated at times when no exhaust steam is necessary in the plant as a condensing unit, utilizing the exhaust steam from other high-pressure generating units, and at times when exhaust steam is required the unit can be operated non-condensing, supplying power and rejecting exhaust steam which is available for heating and process work.

In connection with the combined heating and power plant, the forced circulation hot-water heating system



FORGE SHOP, PACKARD MOTOR CAR CO., DETROIT, MICH.
MR. ALBERT KAHN, *Architect*. MR. ERNEST WILBY, *Associate*
Note method of crane support.



INTERIOR OF FACTORY FOR MESSRS. BLAKE & JOHNSON CO., WATERTOWN, CONN.
MESSRS. GRIGGS & HUNT, Architects

offers many marked advantages inasmuch as it is possible to operate this system in the heating season with varying degrees of vacuum in the condenser and utilizing them as primary heaters, circulating the cooling water, which is heated to a degree varying with the vacuum through live or exhaust steam heaters, and then through the heating system. This permits of added economy in the prime movers with a minimum consumption of steam for heating purposes.

Each condition must be carefully studied so as to arrive at the most economical total cost of power, considering all the various uses of steam, etc., throughout the manufacturing plant.

In some cases it will be found advisable to make the power production plant a separate part of the manufacturing plant and design this solely from a viewpoint of economical power production. This is especially true in southern latitudes where artificial heating is always a negligible quantity.

Cases often present themselves, even in localities where severe heating loads are encountered, which call for the purchase of electric power from the local light and power company and the production of steam for heating by a purely heating plant which operates only in the heating season. This condition usually results from the plant having a very poor power load factor, which, while allowing the utilization of the greater part of the exhaust steam through the heating season, entails large expense in the first and operating costs of the

power end of the plant due to the large maximum power demand and the small total consumption of power through any definite period.

The writer has in mind a condition such as the above in connection with one of the large terminals in Boston, where power was required for grain elevators, docks, lighting, etc., and where the heating load was quite large. Current was purchased from the local power company which provided for the lighting and the power for motors in the grain elevator and on the docks through a transformer station. Considerable steam was required for heating the grain elevator and sheds, and this is supplied by a plant which operates only in the heating season.

In connection with the design of power production plants which are used in the industries, in many cases considerable improvement can be made by the application of the experience of large commercial power

production engineers, that is, those who design and construct power plants whose very life depends upon the economical production of power. The experience gained in this broad field can well be utilized in the smaller plants and in many cases considerable saving in costs should accrue.

Warehouse, American Cotton Mills Lowell, Mass.

This building covers an area of 100 x 256 feet and is twelve stories high. The entire construction, with the exception of the building columns of structural steel encased with concrete, is reinforced concrete, the whole being supported on 1,400 concrete piles. The building is divided transversely by three reinforced fire walls



FORGE SHOP, MESSRS. BILLINGS & SPENCER CO.
MESSRS. FORD, BUCK & SHELTON, Architects

which extend the entire height and completely across the structure. This building is an example of rapid modern construction. The piling was completed in July, 1910, and the structure was finished and ready for occupancy by the first of January, 1911. As soon as a line of piles was in place, the reinforced concrete girder for carrying the building columns was erected. In this manner the general contractors followed the work of the concrete piling company closely, the last girder being placed but a short time after the last line of piles was in. On the completion of the piling and foundation work, the actual work of erection was brought up to the maximum speed. This was attained during the erection of the second story in August and from that point on the building progressed at the rate of one floor a week.



ENTRANCE TO ADMINISTRATION BUILDING, HUDSON MOTOR CO., DETROIT, MICH.

MR. ALBERT KAHN, *Architect*. MR. ERNEST WILBY, *Associate*

Factory of Dodge Bros., Detroit, Mich.

MR. ALBERT KAHN, *Architect*. MR. ERNEST WILBY, *Associate*

The Dodge Brothers' factory, illustrated in this number, is one of a large number of factories constructed recently in Detroit, Mich., for the manufacture of automobiles and auto parts.

It consists at present of four units: the machine shop, forge, power and administration buildings.

The machine shop is a U-shaped building, four stories in height. Each wing is 405 feet long by 65 feet wide, and the connecting building 170 feet by 65 feet. This building is constructed entirely of reinforced concrete, flat slab construction being used for the floors.

The ceilings accordingly present a smooth and uninterrupted surface, especially desirable because of the ease with which shafting for machinery can be installed. One remarkable feature about this construction is that the unsightly flaring caps of columns have been eliminated, this being the first building in which this feature is found.

In order to obtain the maximum amount of daylight steel sash has been used, this permitting a greater area of glass surface than is possible with the use of ordinary wooden sash.

Three freight elevators, electrically driven, serve the several parts of the building. Each, together with the stairs and toilet rooms, is located in a small wing projecting from the main building into the court. Auto trucks fully loaded are taken to any floor and unloaded at receiving stations, from which point the material is redistributed, thus avoiding, in a large degree, the re-handling of materials.

The building is heated by means of a blower system, the air being carried in large underground ducts, from which vertical ducts, with outlets at each floor, are taken off.

Immediately east of the machine shop is the forge shop, a building 400 feet long by 70 feet wide, of structural steel construction. Considerable attention has been paid to working out the details in connection with this building, and it is believed that it presents probably as near the ideal shop as there is for this purpose. The walls above the sill line are practically all glass, steel sash being used. These sash have large ventilators which when opened turn the building into practically an open-air shop. A five-ton crane is used to distribute the materials from the receiving platform at the north of the building to the hammers lined on either side of the central passage.

The power building, located on the northwest corner of the property, is 100 feet wide by 110 feet long. The walls, like the other buildings, are constructed of piers, in this case of brick with large areas of steel sash between. Power is furnished to the plant by means of two 500 kw. direct-connected cross compound Corliss engines.

The engine room is connected with the other buildings by tunnels through which run the electric wires, steam and water pipes, etc.

Hints on Factory Planning

The logical way to plan the building of a manufacturing plant is to handle it much the same as in planning, say, a power building, that is to decide upon the necessary equipment, materials, etc., to be housed and their relative arrangements, and then to put up the building itself so as to best shelter and support its contents.

Accordingly we keep the following features in mind:

1. Process of manufacture; machinery and apparatus employed.
2. Kinds and quantity of material handled, both in the rough and finished product.

(Continued on page 244)

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CONTENTS.

PRESENT DAY FACTORY CONSTRUCTION.....	213
THE AESTHETIC CONSIDERATION OF THE MODERN MANUFACTURING PLANT	216
ELECTRICITY IN MODERN INDUSTRIAL ESTABLISHMENTS.....	224
SOME PROBLEMS IN THE HEATING AND VENTILATING OF FACTORY BUILDINGS.....	228
DESCRIPTIONS OF BUILDINGS ILLUSTRATED.....	229
MILL CONSTRUCTION WITH STEEL FRAME AND TILE WALLS..	235
AN EXPRESSION ON THE DESIGN OF FACTORY AND WAREHOUSE BUILDINGS	237
DAYLIGHT ILLUMINATION FOR MANUFACTURING BUILDINGS..	238
THE GENERATION AND UTILIZATION OF POWER IN THE INDUSTRIES	243

Illustrations:

Modern Manufacturing Buildings (32 pages).

Frontispiece:

View in Grounds of Country Life Press, Garden City, Long Island, N. Y.

AESTHETIC CONSIDERATION IN FACTORY DESIGNS

IT is an undoubted indication of progress in a people when they are not only willing to allow, but are beginning to demand, some measure of æsthetic consideration in the design and arrangement of even their most utilitarian structures. Such evidence of progress is now found practically throughout this country. The development architecturally of no class of buildings has been more rapid than that to which manufacturing buildings belong, and through this development we find a general acceptance of the doctrine that good architecture is a good investment. Probably no longer than a decade ago less than 10 per cent. of the manufacturing buildings erected were designed by architects. Their services were not considered necessary. No value was placed on architectural qualities or general appearance, and the shop manager, whose knowledge of the requirements of space, arrangement of machinery, stock, etc., was and is undisputed, together with the builder, appeared to supply all the knowledge necessary to a successful enlargement of plant or the building of a new one. If some problem of difficult foundations or unusual roof construction presented itself the engineer of the works could ordinarily furnish a solution that at

least provided a safe and secure structure. As long as the manufacturing building was considered simply as a shelter for necessary machinery and operatives, such a disposition of the problem of its construction as indicated above was probably satisfactory. But with the development of the country and the growth of culture which brings with it an appreciation of architecture and all forms of art, the realization that this usual order of things resulted in structures that were blots on the picture and offensive to good taste became quite general. The natural and logical course to pursue under such circumstances was to place the design of these utilitarian structures under the jurisdiction of men whose training and experience has qualified them to fully meet the requirements of good architectural design, and at the same time by consultation with those who have knowledge of the practical manufacturing requirements sacrifice no important detail of construction or plan that would lend convenience or economy to the operation of the finished plant. As a result it is probably safe to assert that under present-day conditions less than 10 per cent. of manufacturing buildings erected worthy the name are built without aid, counsel or advice from architects.

In satisfying a popular demand for better, more artistic buildings and in many cases their own desires to provide physical comforts, and a degree of mental satisfaction and pleasure to employees, by supplying most modern building equipment and beautiful surroundings, manufacturers have discovered that they have apparently conserved their own interests. Evidence everywhere accumulates that the highest grades of goods are manufactured where the health and comfort of the employees are given greatest attention and where the buildings and environment supply the greatest measure of physical and mental comfort and happiness. In fact good architecture as a commercial asset is so indisputably established as to need no defense or explanation from the owner or investor. It is not often that a group of men can contribute to the progress and artistic development of a country, improve immeasurably the conditions of a very large class of workers and greatly enhance their own properties by a single departure from an old and established practice; but this seems to have been the net result of the change made by manufacturers in placing the designing of their buildings and plants in the hands of competent architects, with instructions and authority to make them an ornament to the neighborhood in which they are erected, a source of pride, satisfaction and pleasure to the owners and a place where employees can do their work under healthful, comfortable and pleasant conditions. The circumstance is worthy of more than passing thought and notice.

THE PRESERVATION OF HISTORIC LANDMARKS

THE movement for the preservation of historic buildings and monuments in this country seems to be gathering deserved force and energy. From various sections reports are received denoting activity on the part of A. I. A. chapters, artistic organizations or public-spirited citizens belonging to the cultured class to pre-

serve some building or structure inseparably associated with the early history or art of this country. An instance in point is the interest that has been aroused by the threatened demolition of the old court house at Dayton, Ohio. This fine old building was erected during the late forties and stands to-day a monument to a period in this country's architectural development of which too few worthy examples remain. The movement to convert the building into an art museum and preserve it to posterity appears most commendable in the interest of both art and history. It would be most

unfortunate if considerations of commerce or monetary gain would prompt the destruction of one of the few really artistic buildings that have thus far escaped the hand of the despoiler. Undoubtedly the sites of all or the greater number of these historic structures could be made to yield a greater income by the erection upon them of modern commercial buildings, but in an age when vast sums are being expended in every direction for art and culture we cannot believe that enlightened public sentiment will sanction the destruction of irreplaceable treasures already in hand.

(Continued from page 242)

3. Number and location of people employed throughout the plant.

4. Probably the most important, from the point of view of economical operation (which is the essence of successful manufacture), a closely studied and logical arrangement of the various departments and buildings so that the materials in going through the plant in the course of manufacture in general travel as little as possible and are handled a minimum number of times.

From the above naturally follow the character and size of buildings, their construction, column spacings, story heights, necessary amount of light to be provided, heating, ventilating, plumbing equipment, locker rooms,

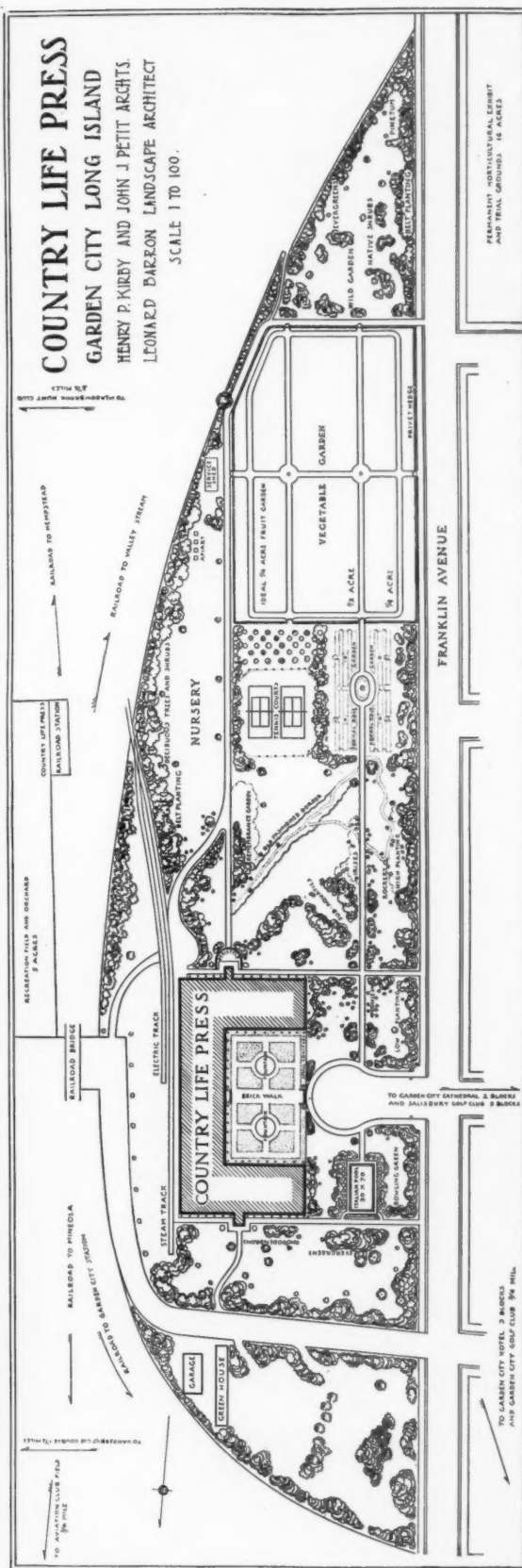
etc., the most desirable location for entrances, stairs, elevators, crane runways, belt conveyors, industrial tracks, bridges from building to building.

In obtaining the final results, of course due consideration must be given the questions of economical construction and sufficient durability, cost of land, insurance rates, location of shipping facilities, distribution of power, location of public connection for water, sewage, etc., necessity of isolating certain departments, possible changes in the plant, or portions of it, the desirability of so laying out the departments and the plant as a whole that future growth can be taken care of without interrupting business, and that such future extension will properly fit in with the portions already built, etc.

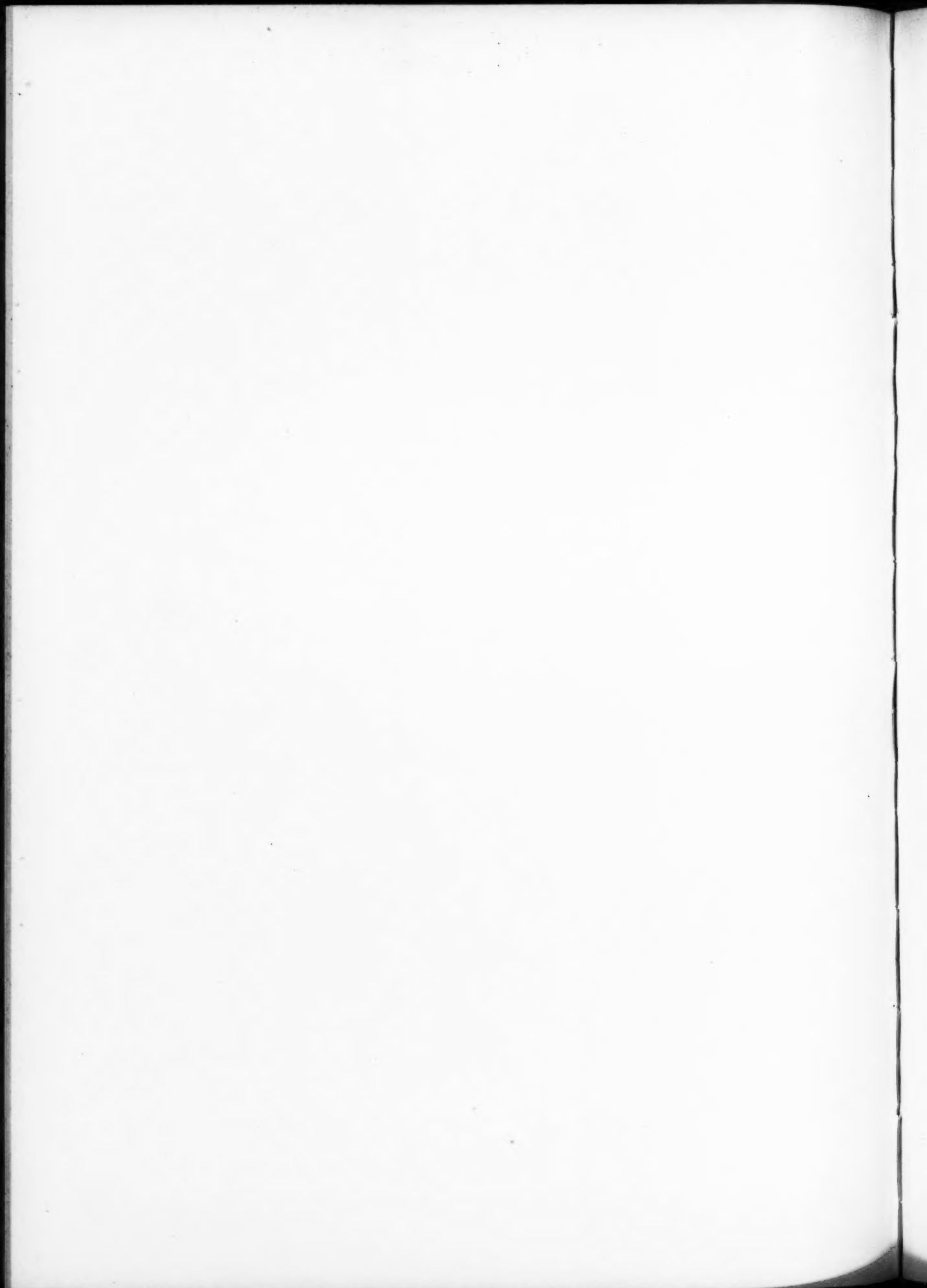


ONE OF A GROUP OF FACTORY BUILDINGS FOR FORD MOTOR CO., DETROIT, MICH.

MR. ALBERT KAHN, *Architect*. MR. ERNEST WILBY, *Associate*



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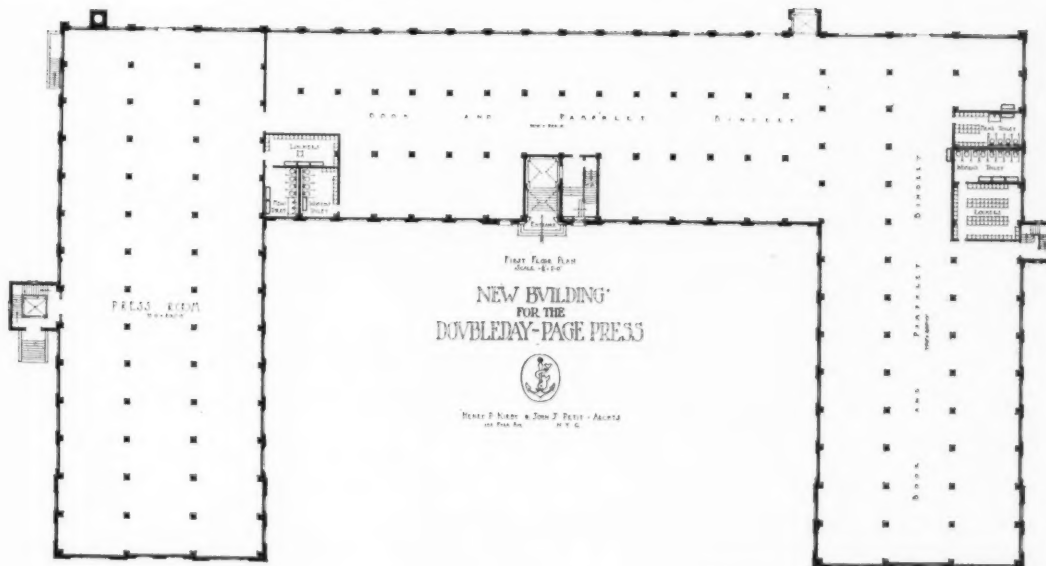
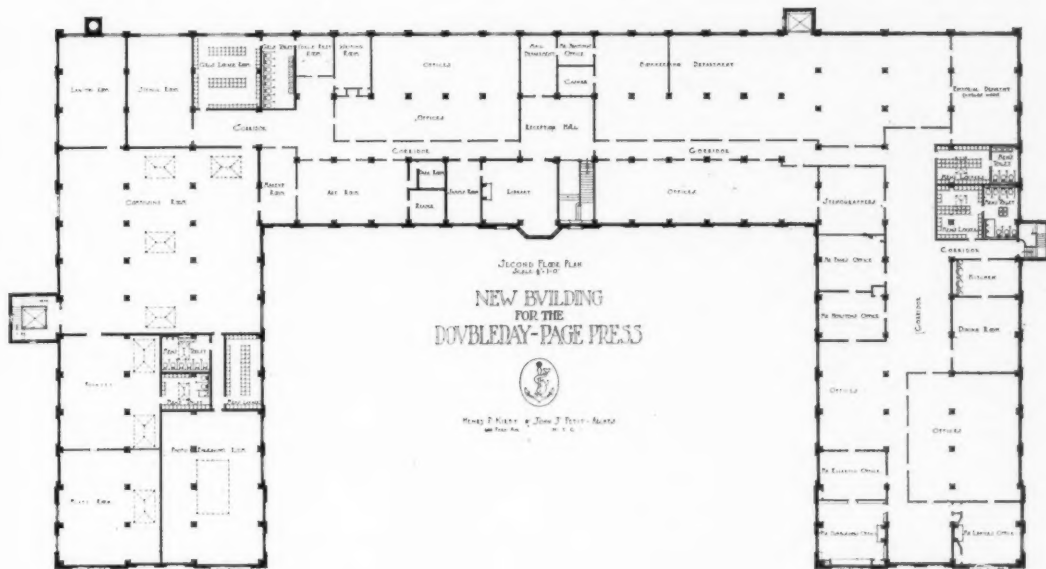




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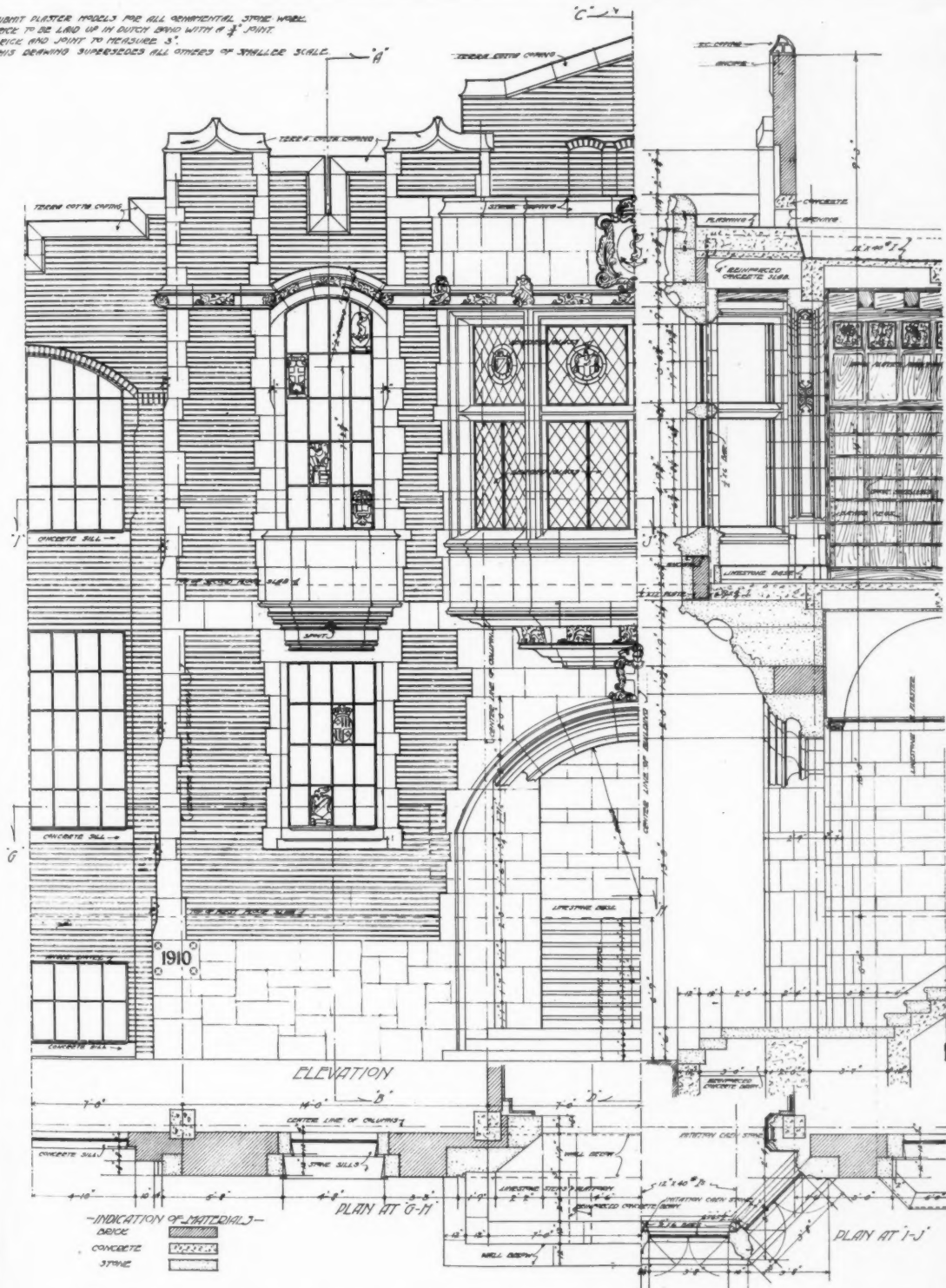
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JOINT PLASTER MODELS FOR ALL ORIENTAL STONE WALL.
 BOICE TO BE Laid UP IN DUTCH BRICK WITH A 3" JOINT
 BRICK AND JOINT TO MEASURE 5".
 THIS DRAWING SUPERSEDES ALL OTHERS OF SIMILAR SCALE.

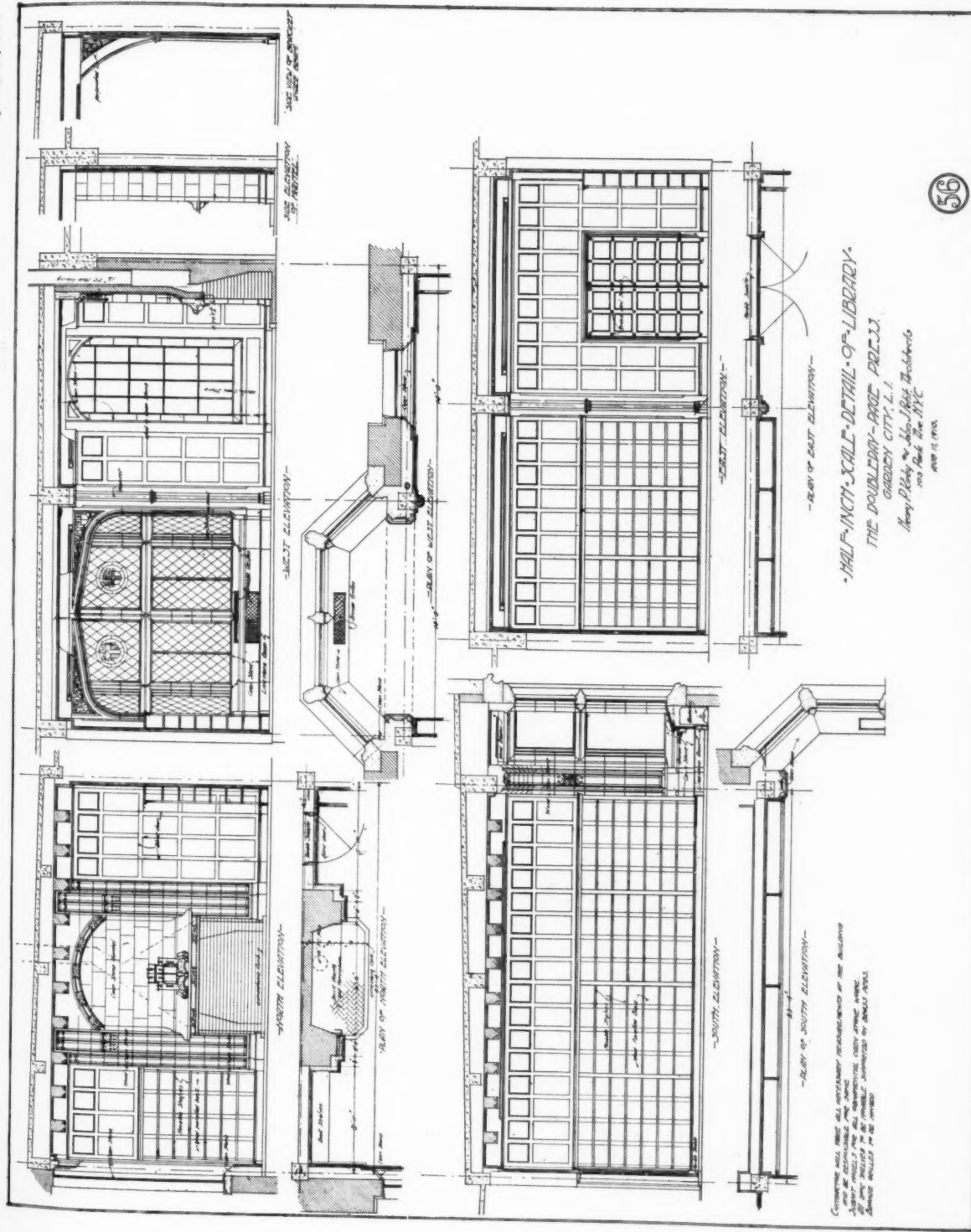


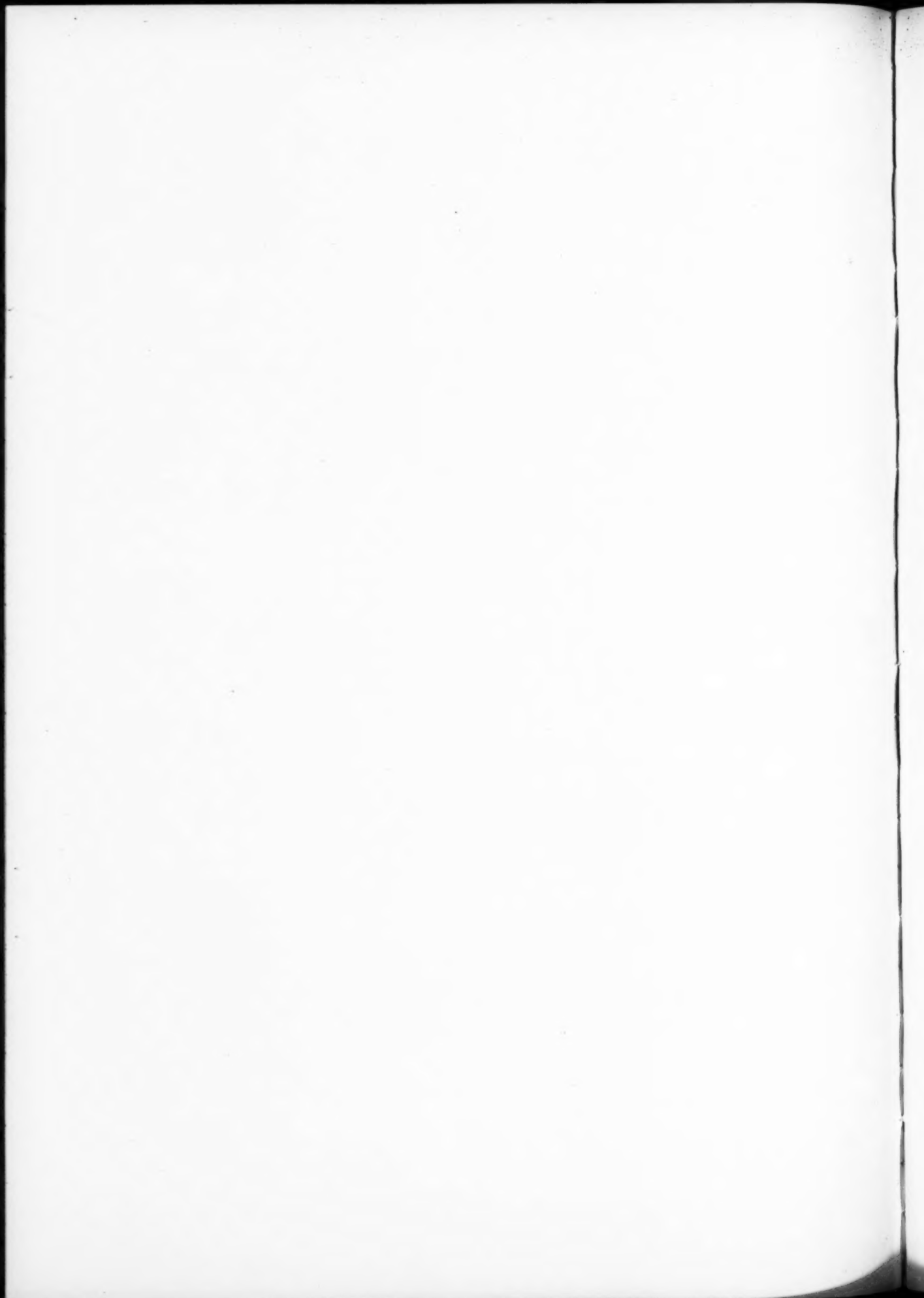
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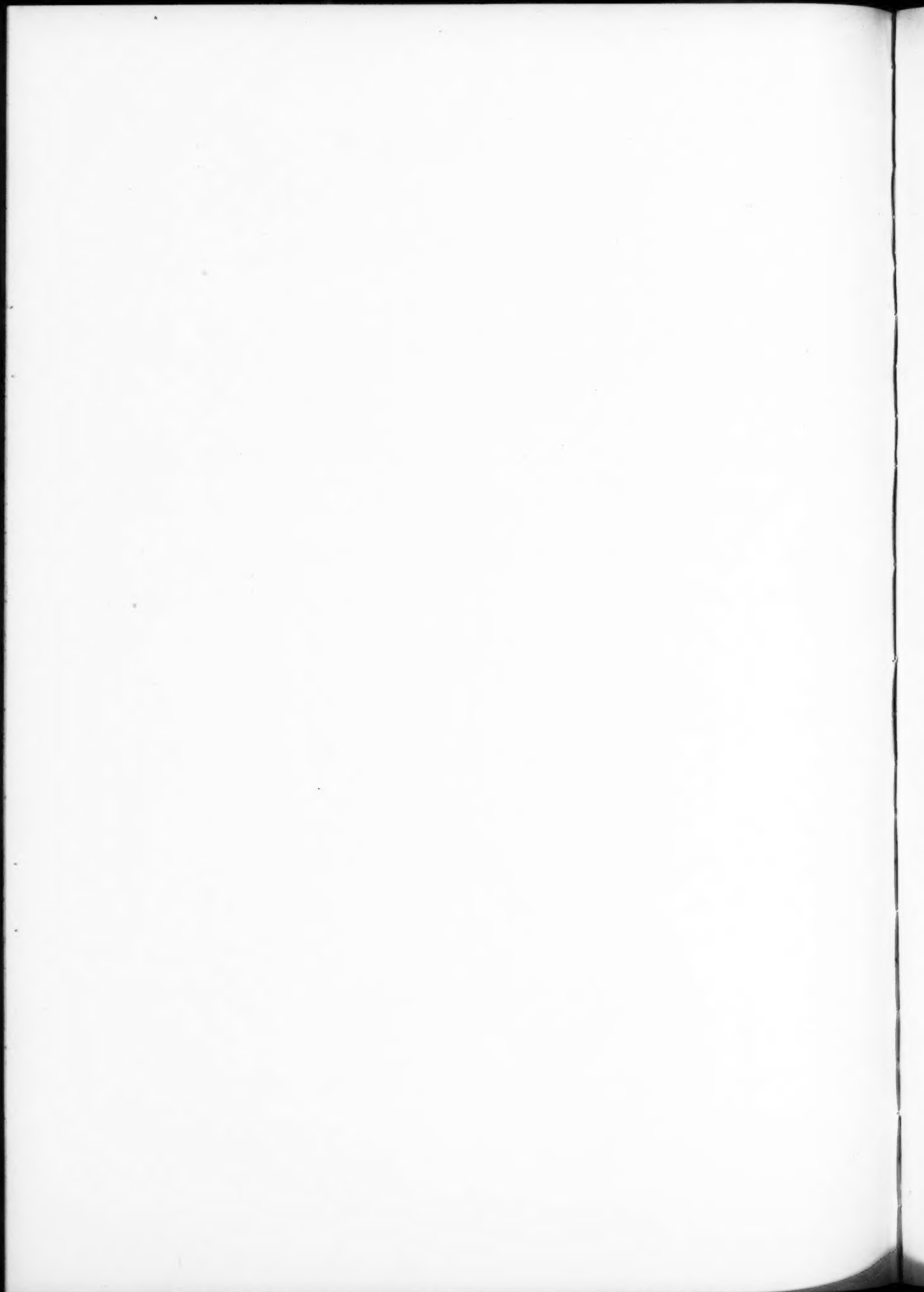


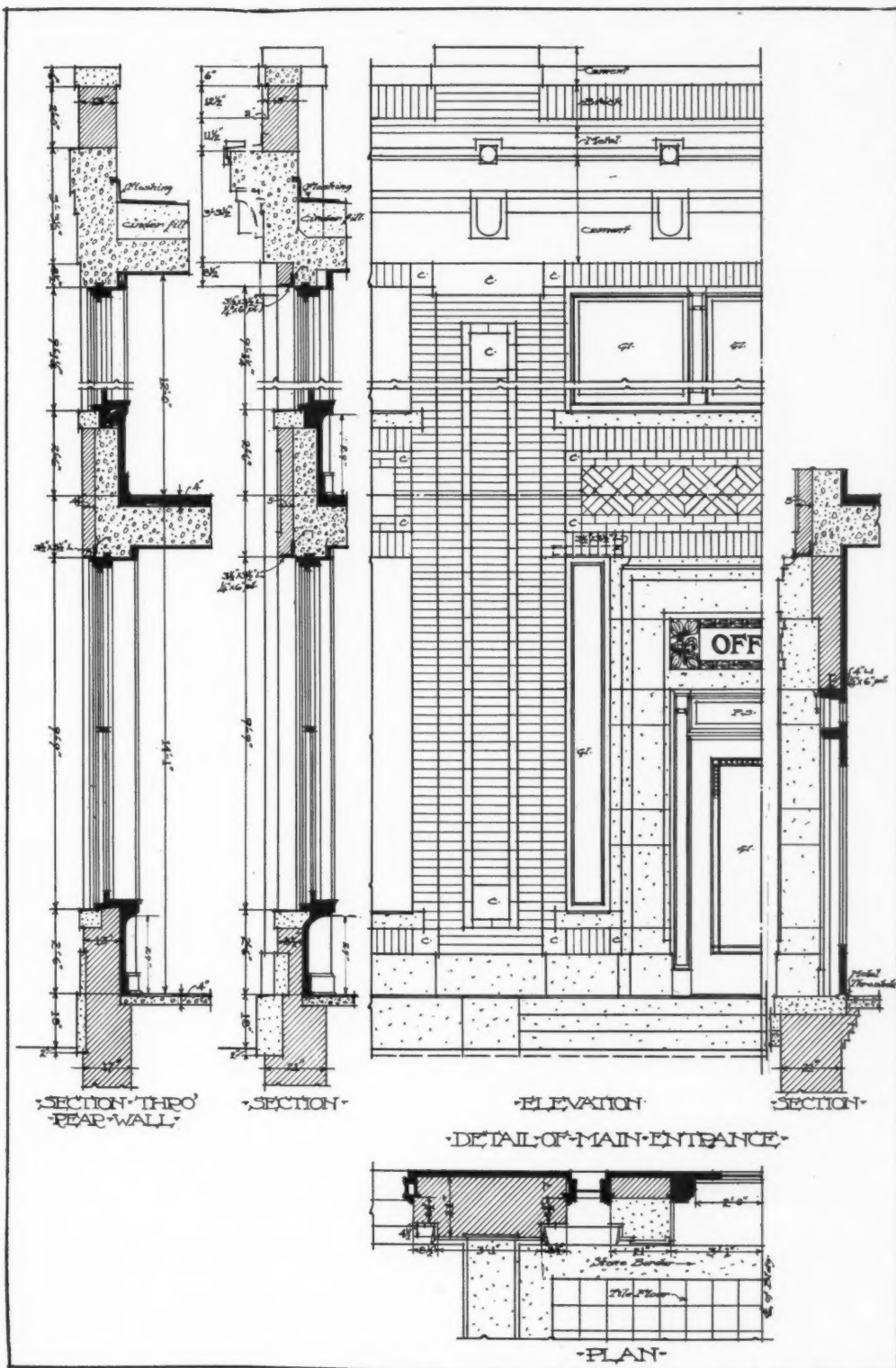




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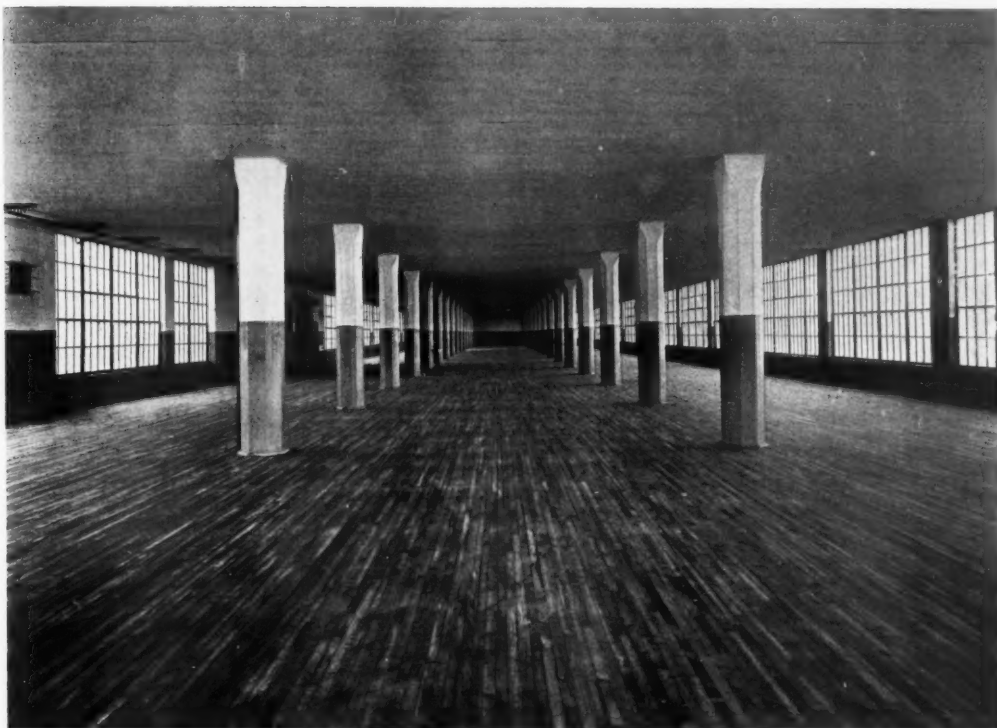
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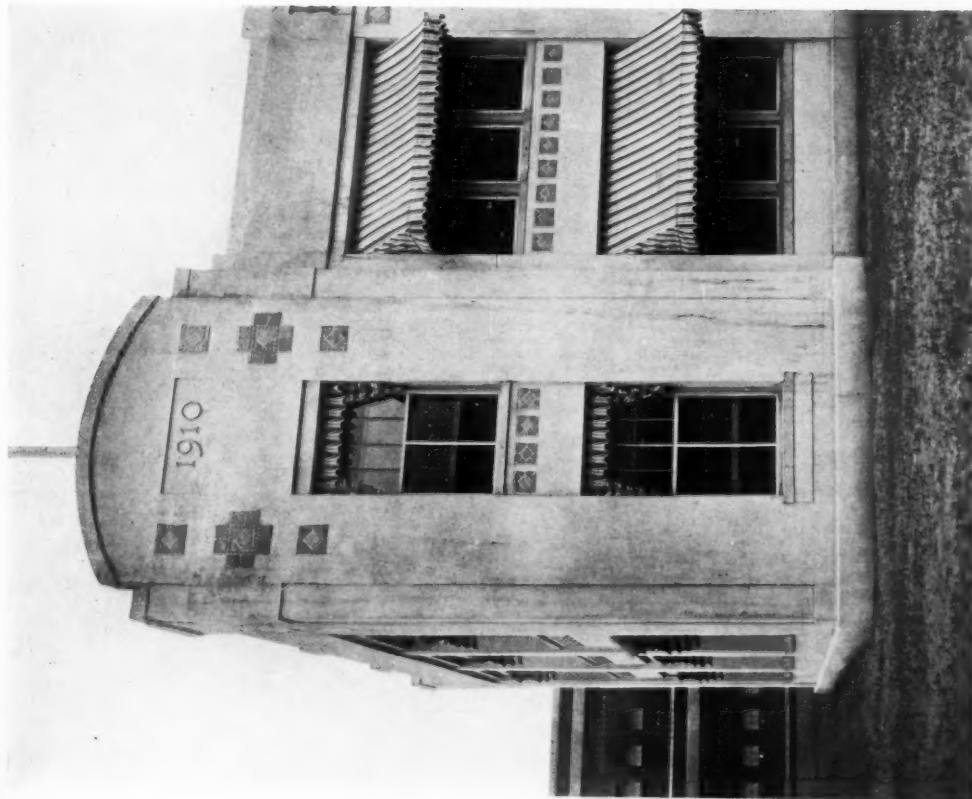


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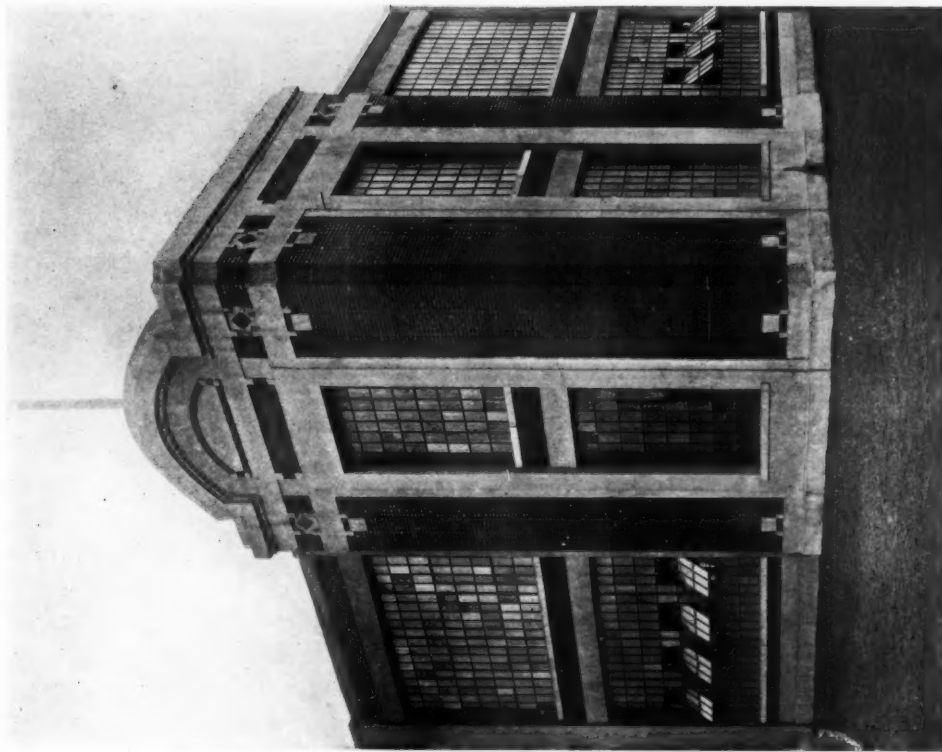
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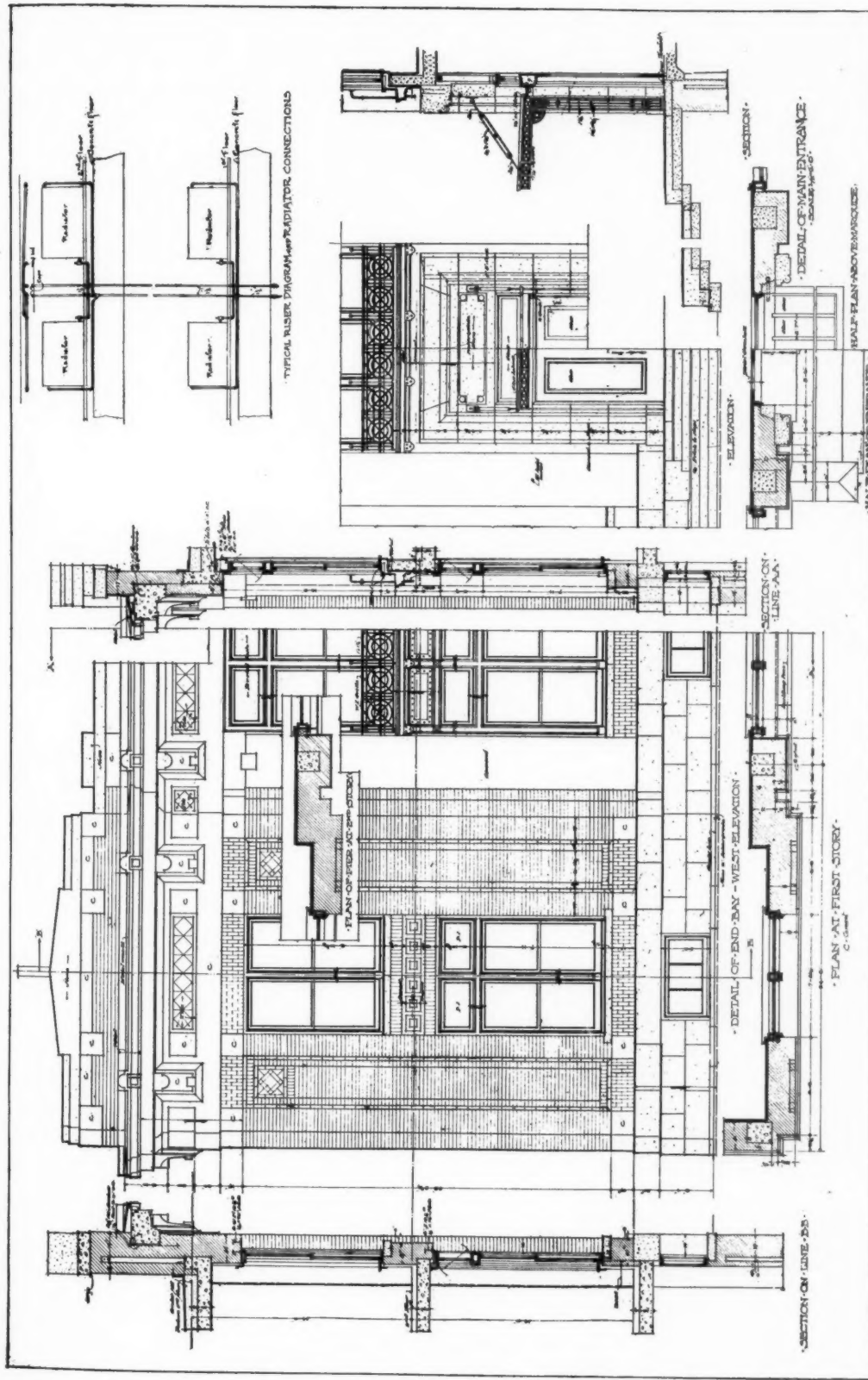
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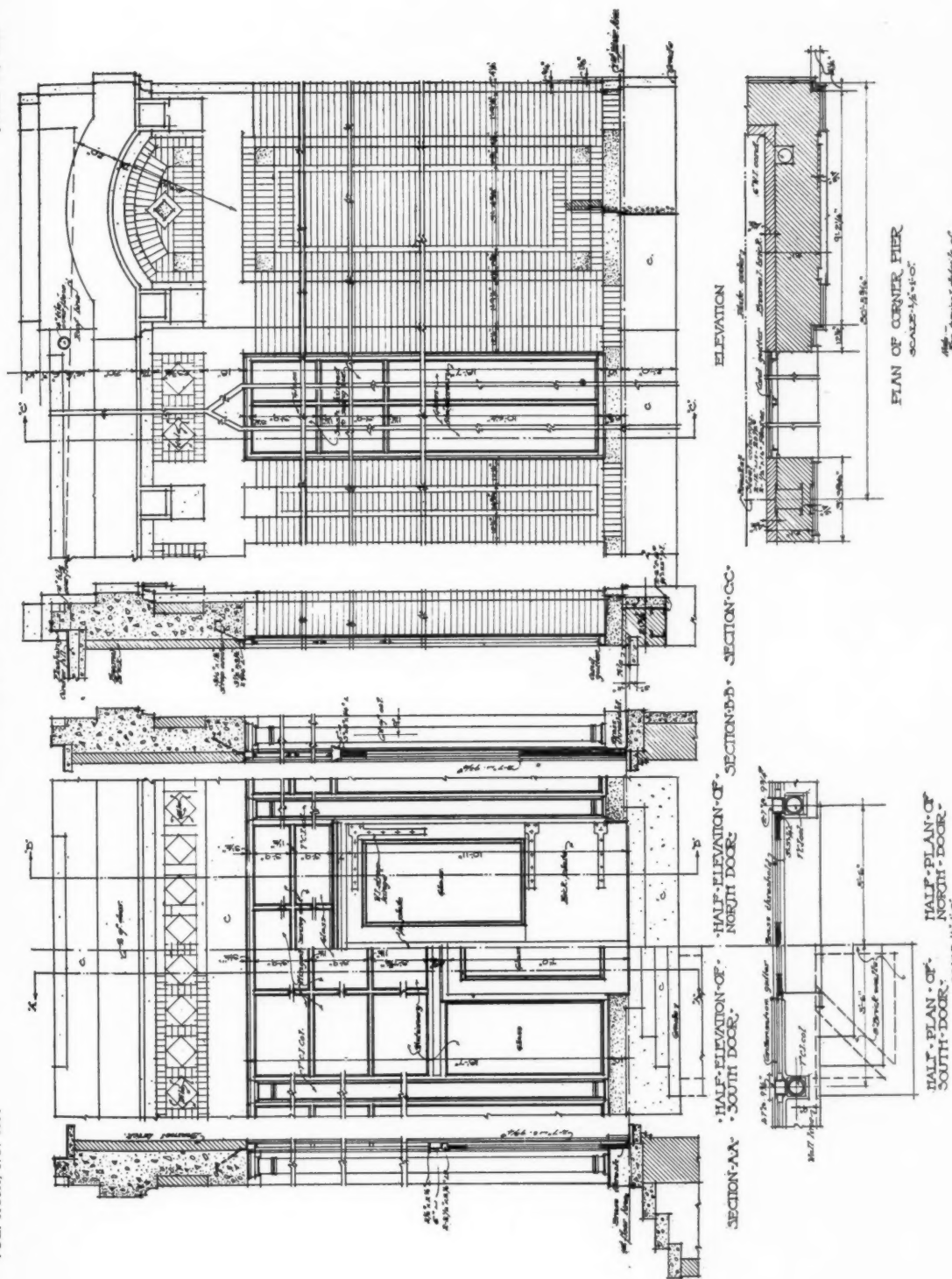
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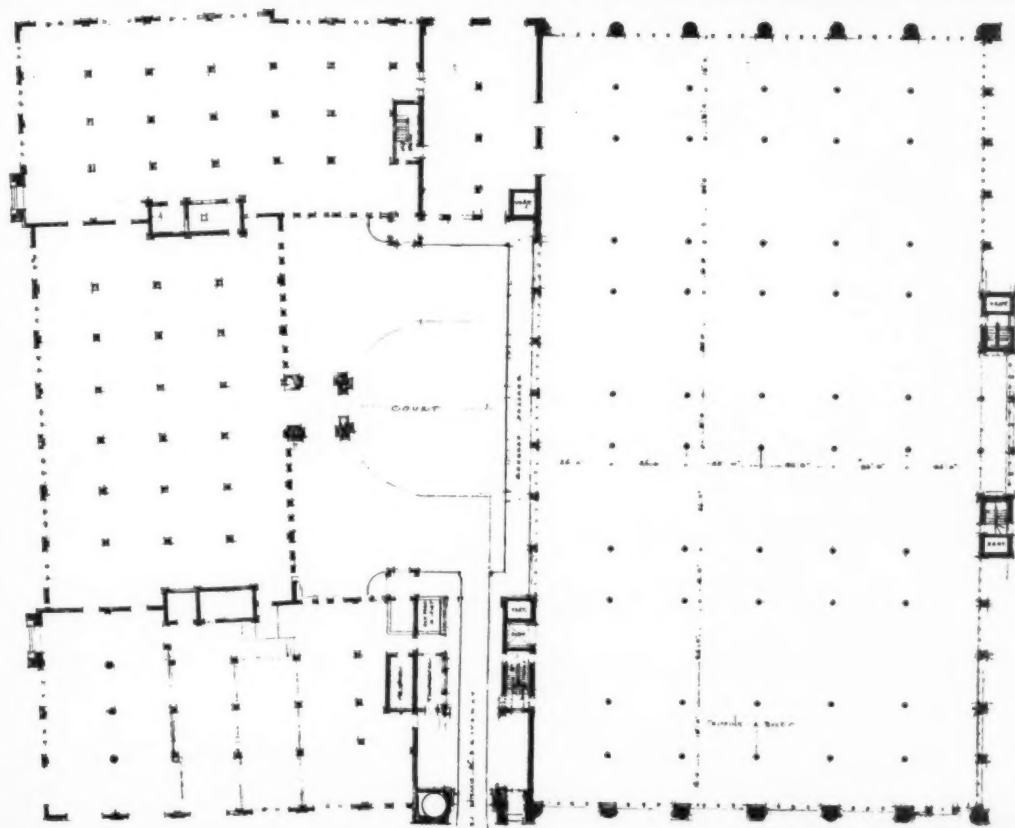
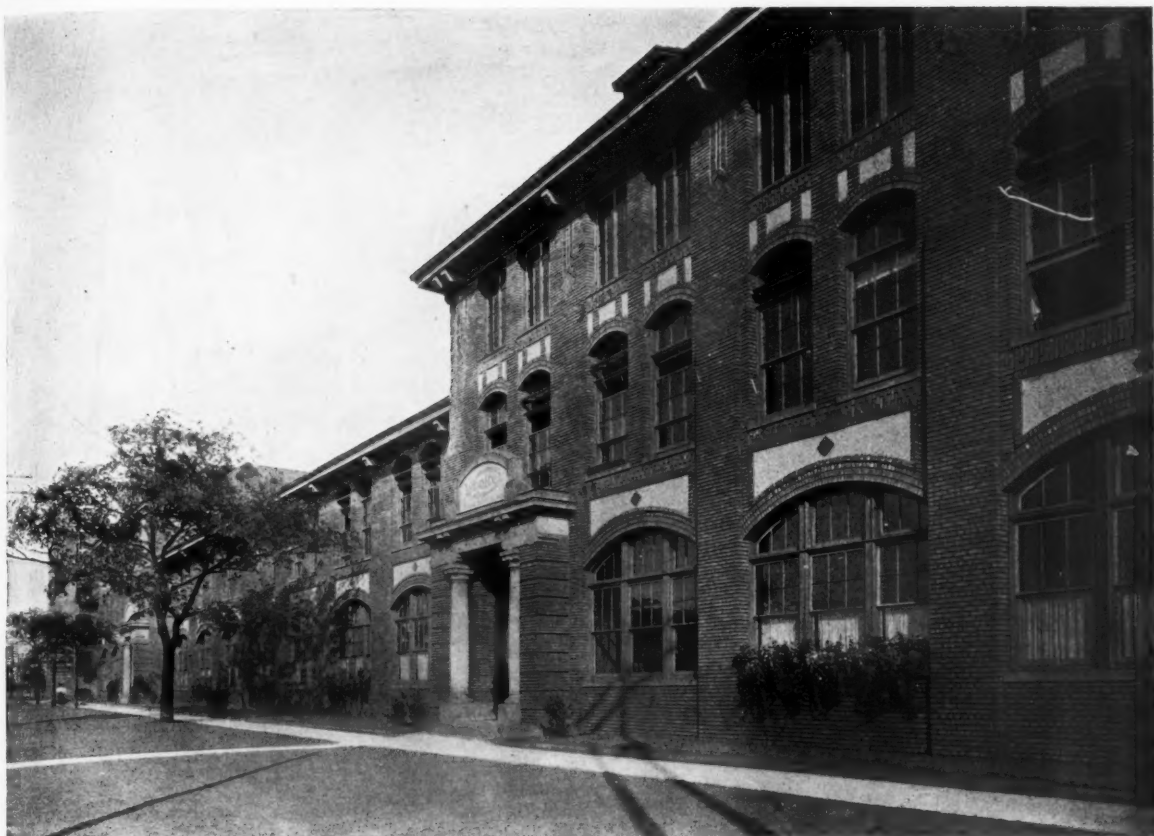
DETAILS OF POWER BUILDING, FORD MOTOR CO., DETROIT, MICH.
 MR. ALBERT KAHN, Architect; MR. ERNEST WILBY, Associate

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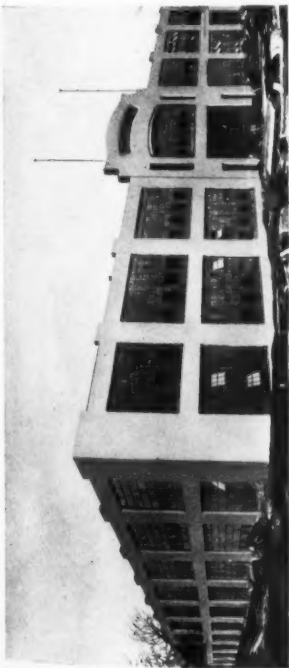
"WOOLTEX" PLANT OF MESSRS. H. BLACK & CO., CLEVELAND, O.
MR. ROBERT D. KOHN, Architect



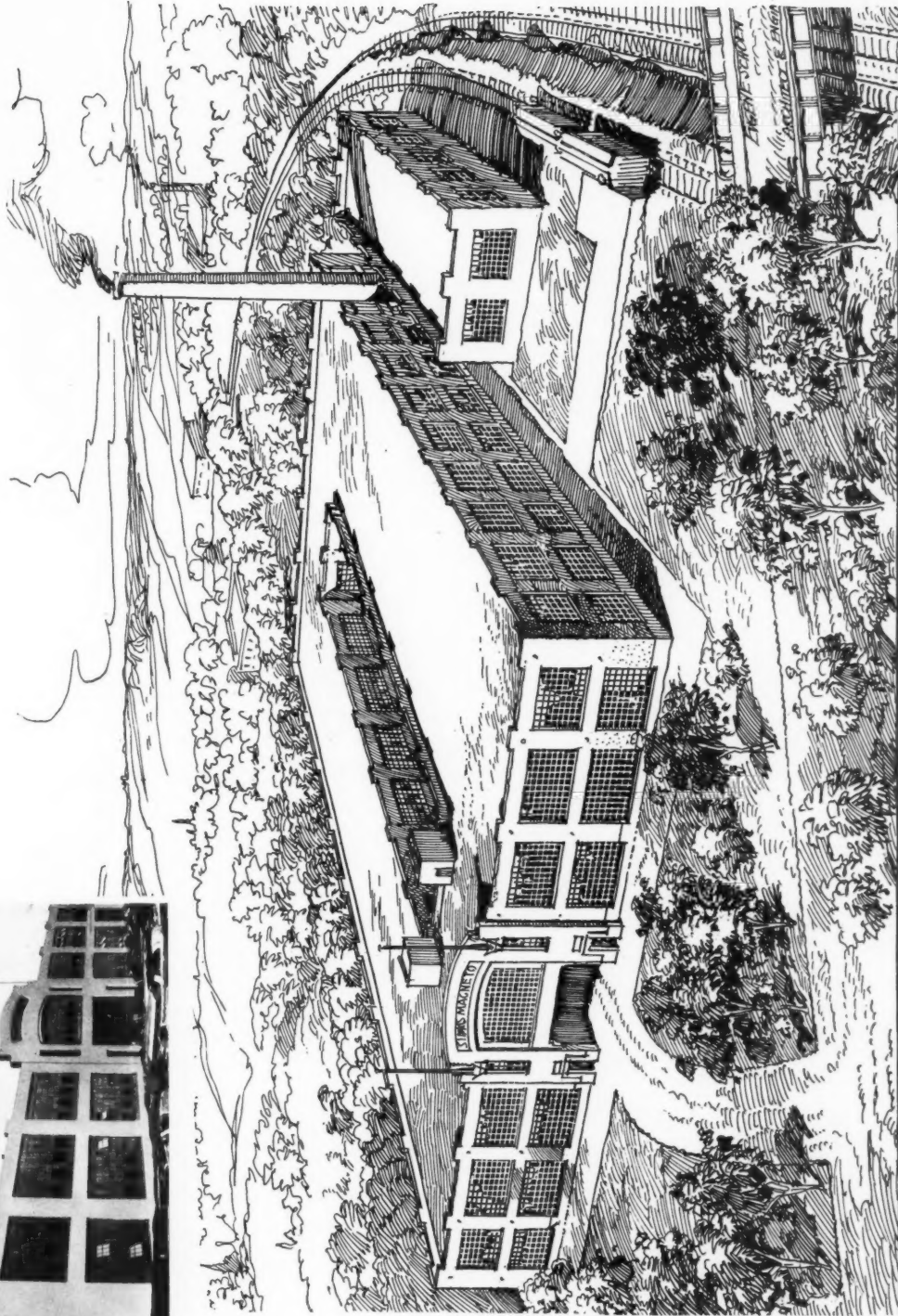
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"WOOLTEX" PLANT OF MESSRS. H. BLACK & CO., CLEVELAND, O.

MR. ROBERT D. KOHN, Architect

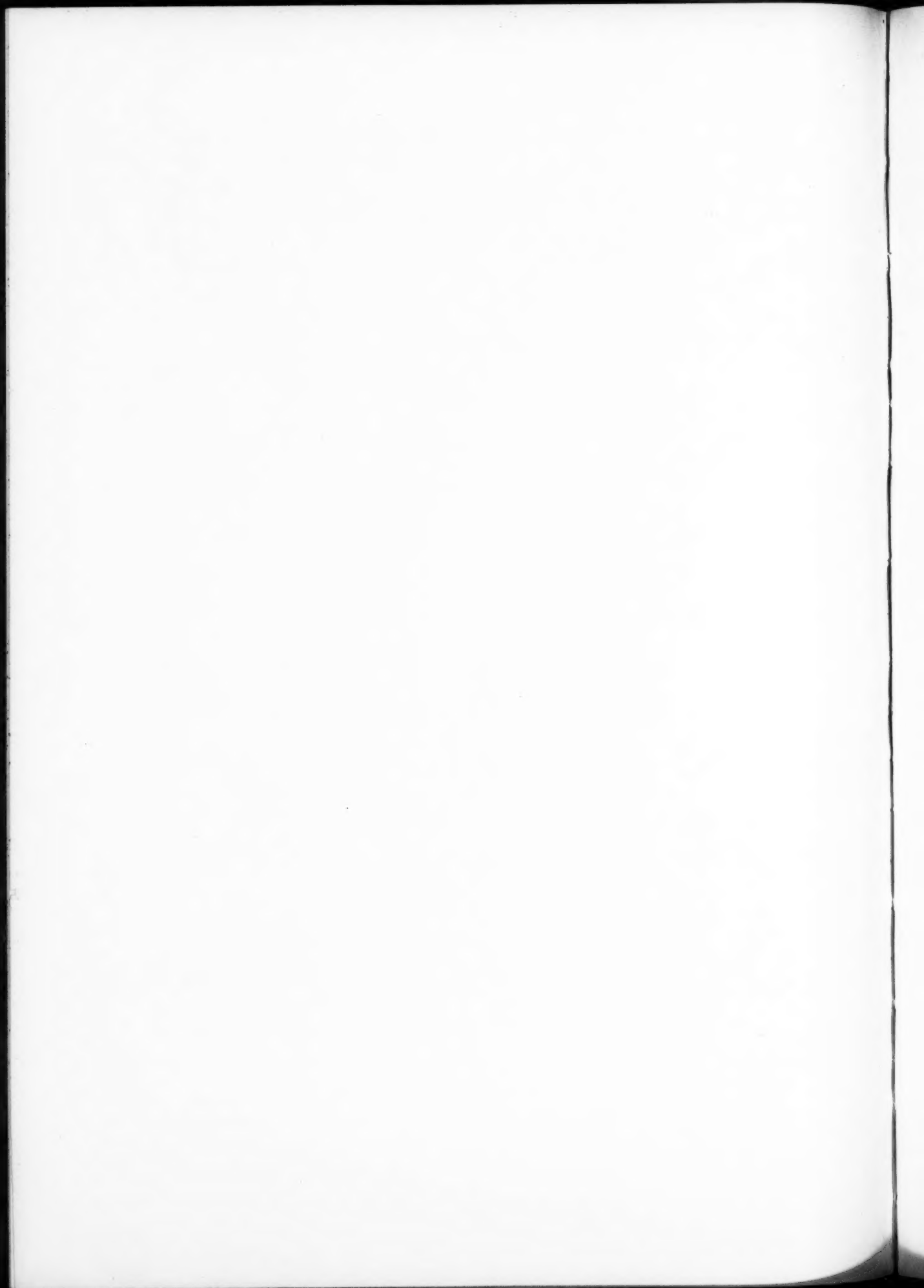


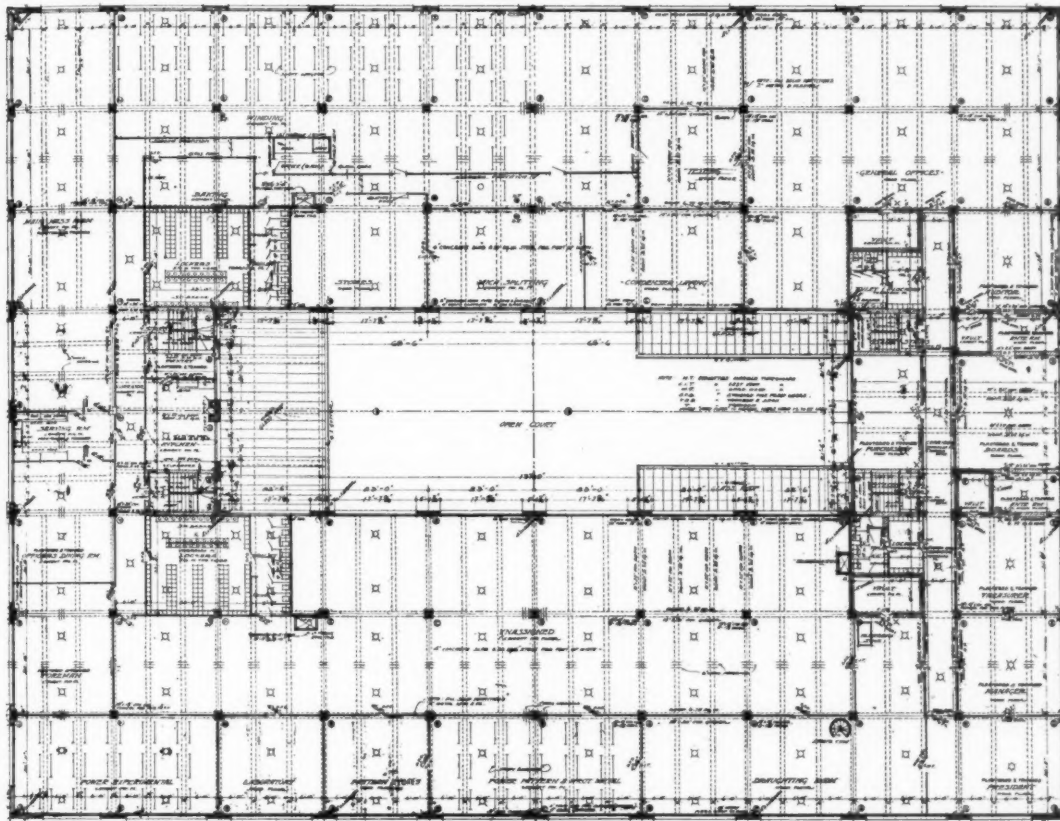
MR. EUGENE SCHOEN, ARCHITECT



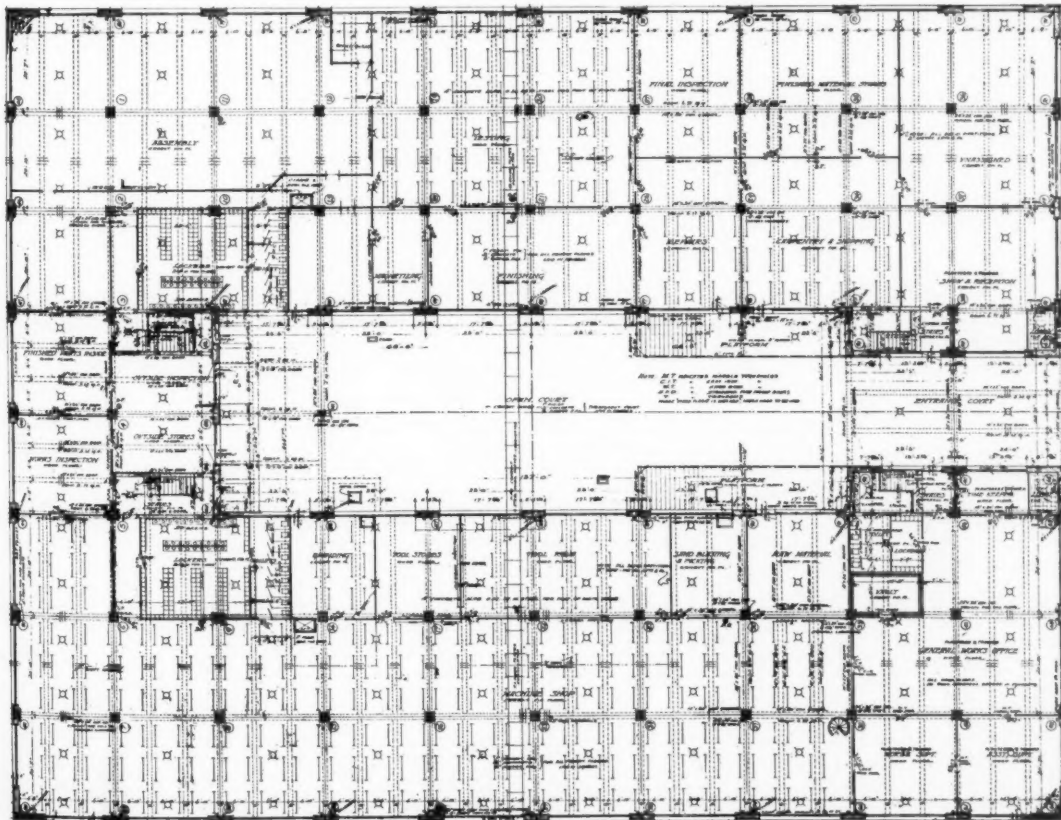
SIMMS & MAGNETO CO. FACTORY AT WATSESSING, NEW JERSEY

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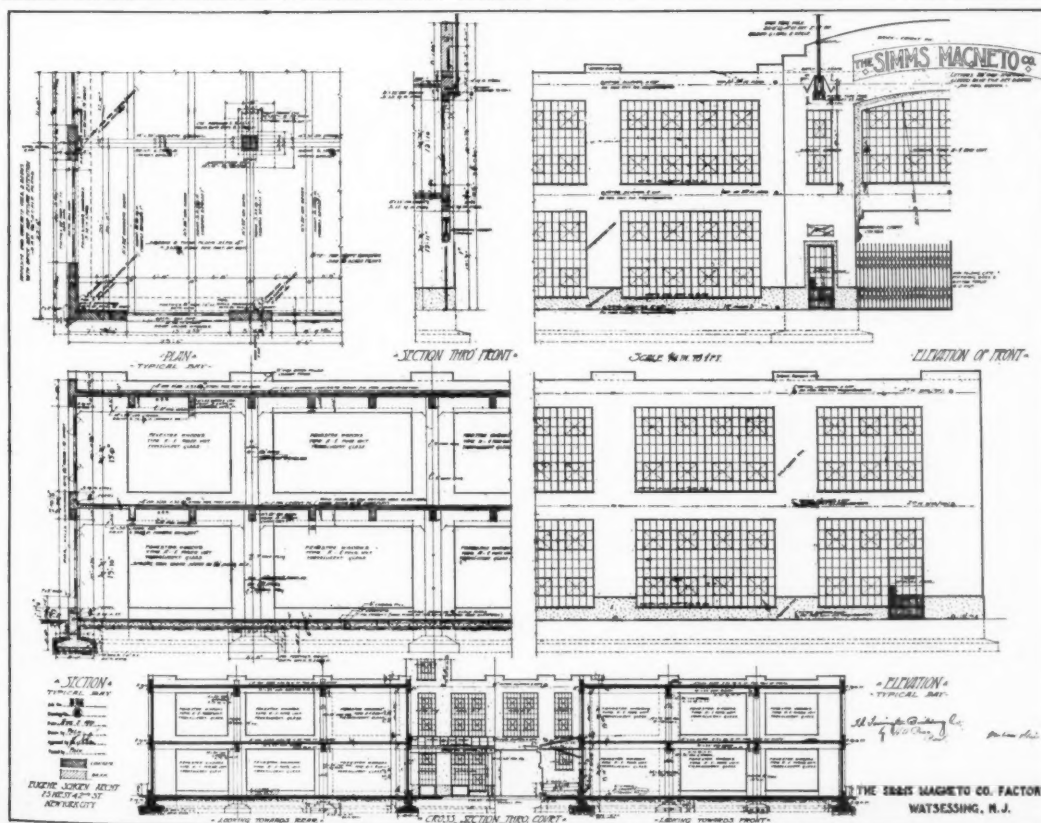
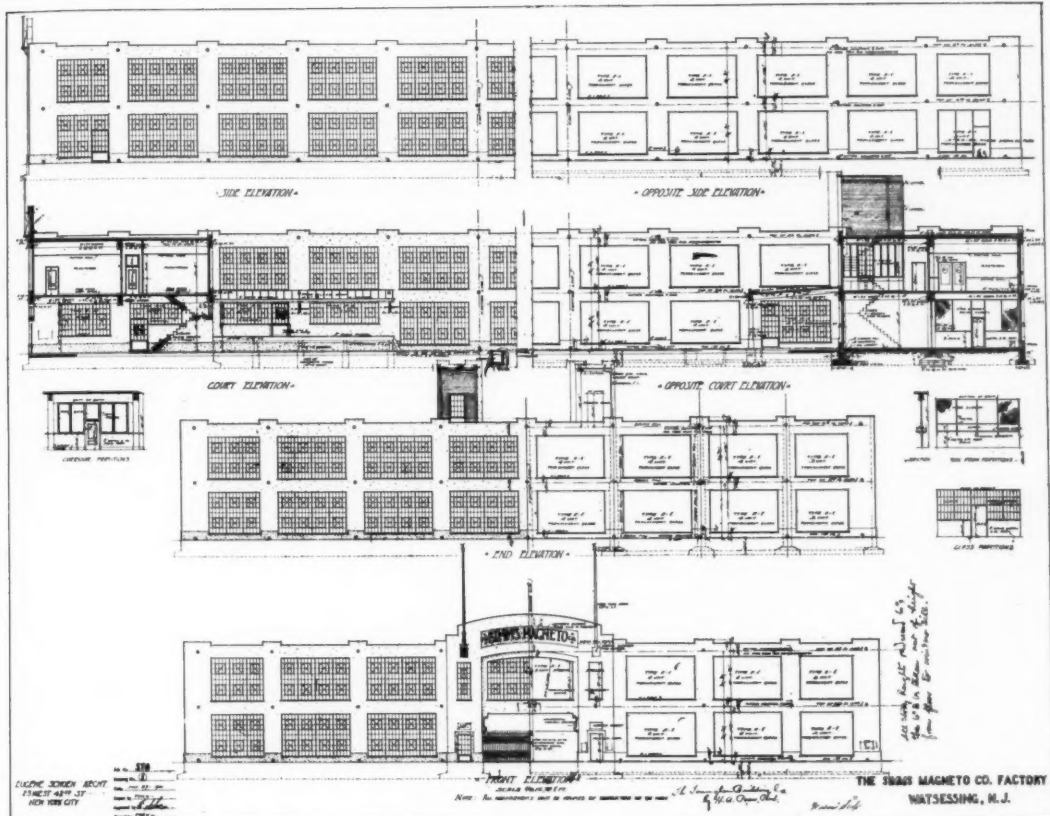
SECOND FLOOR PLAN



GROUND FLOOR PLAN

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FACTORY FOR THE SIMMS MAGNETO CO., WATSESSING, N. J.
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MR. EUGENE SCHOEN, Architect



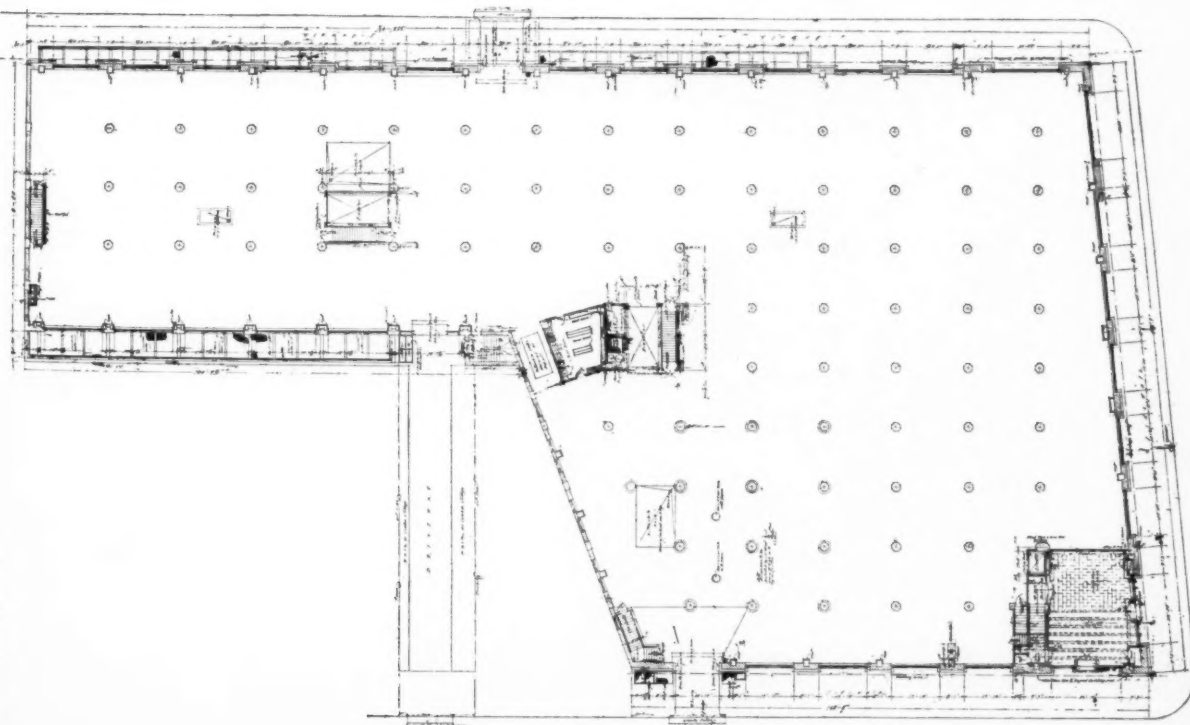
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FACTORY BUILDING FOR MESSRS. BREWSTER & CO., QUEENSBORO BRIDGE PLAZA, NEW YORK

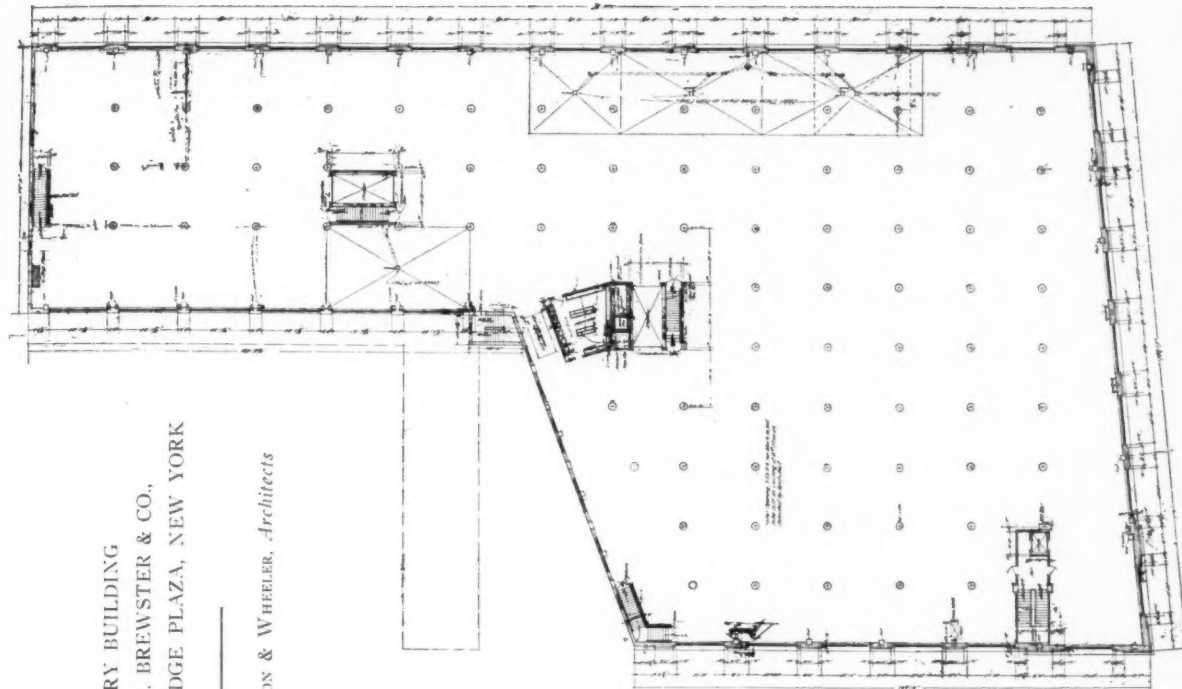
MESSRS. STEPHENSON & WHEELER, Architects

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QUEENSBORO BRIDGE PLAZA, NEW YORK

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AT LEFT
FIRST FLOOR PLAN



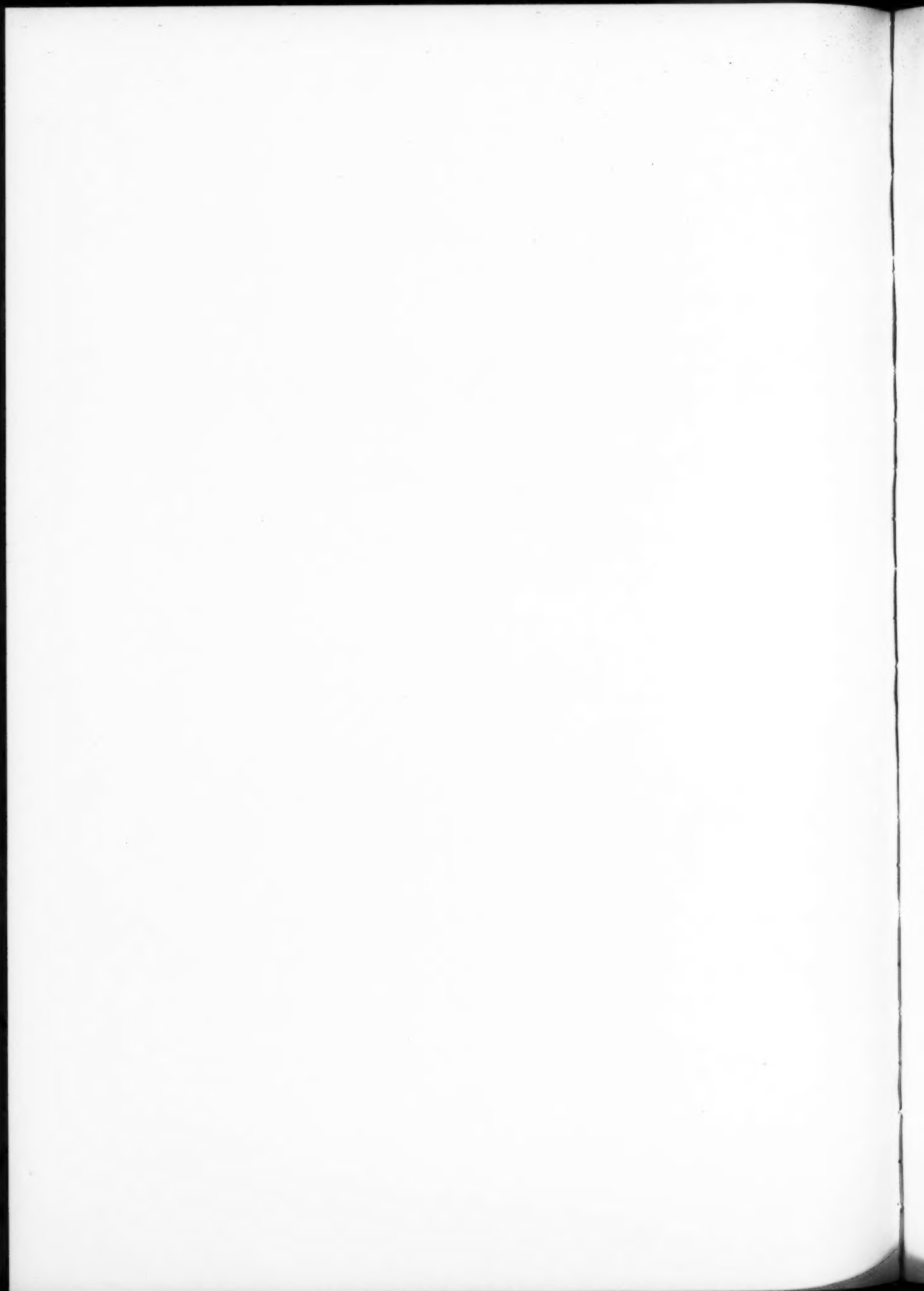
AT RIGHT
THIRD AND TYPICAL
FLOOR PLAN

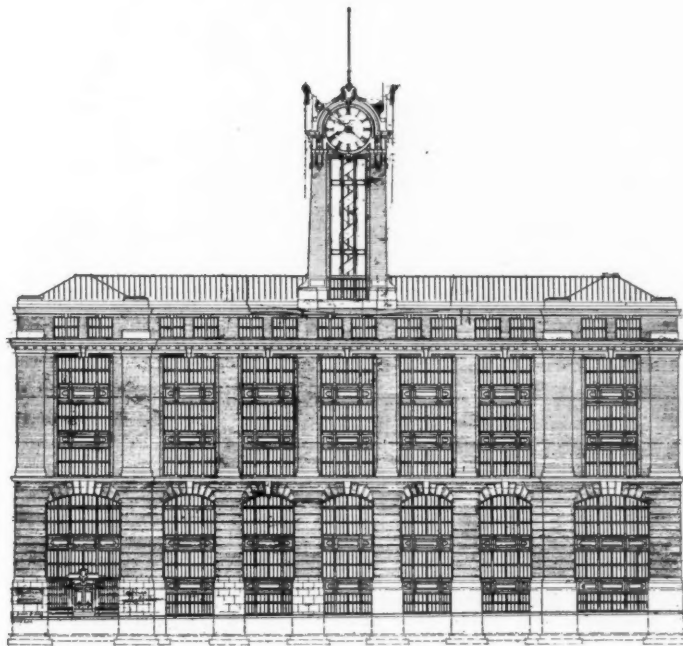


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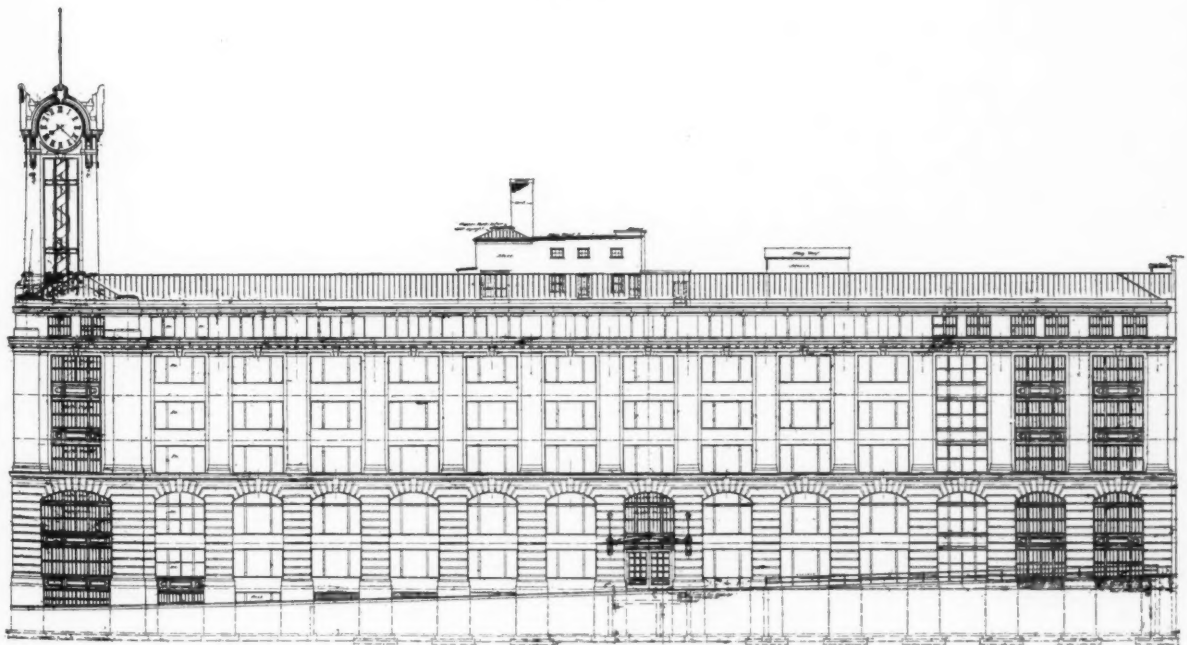
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*Bridge Plaza
N.Y.C.*



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ARBUCKLE WAREHOUSE, BROOKLYN, N. Y.

MR. WILLIAM HIGGINSON, *Architect*

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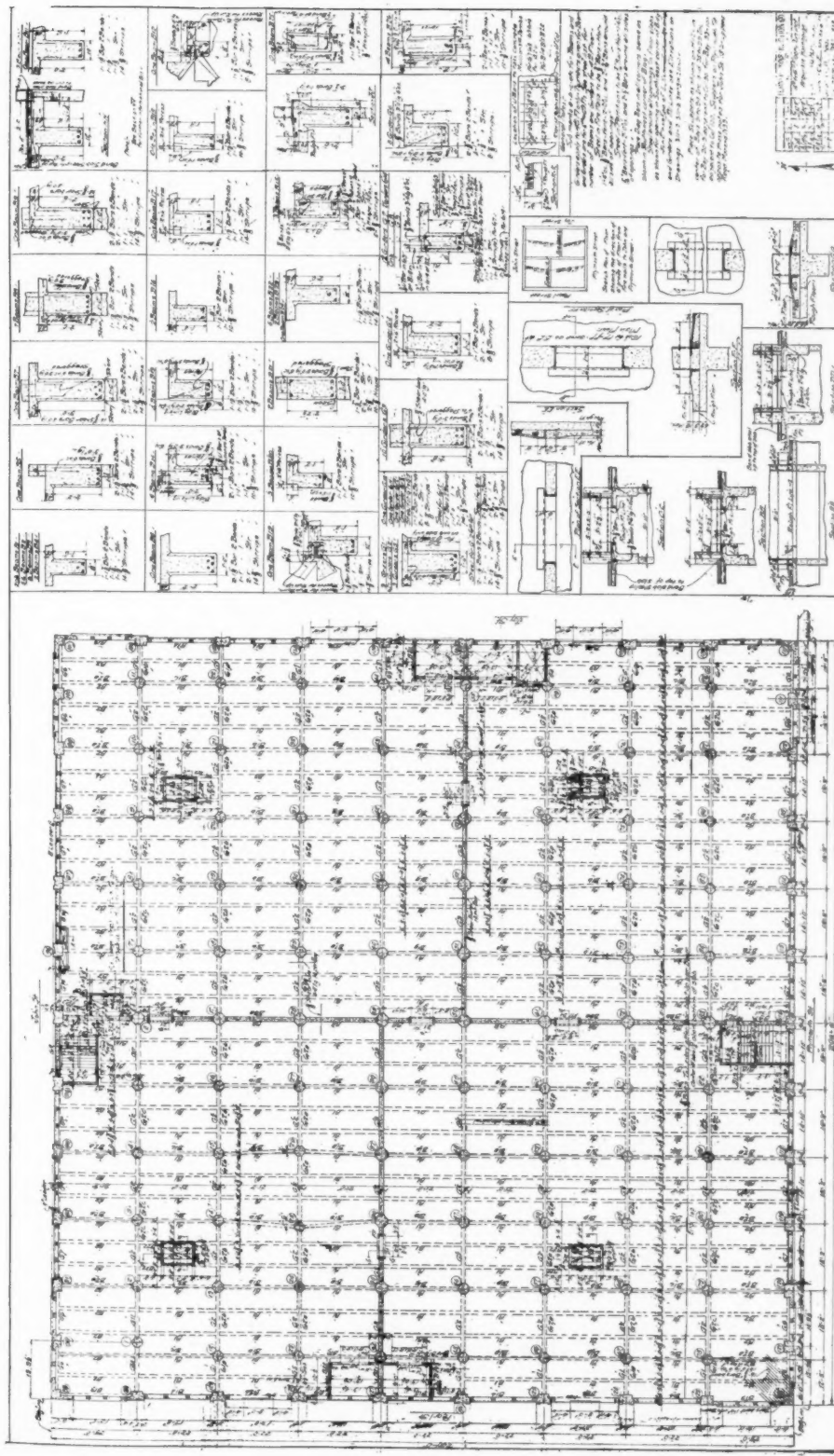


VIEW OF UPPER STORIES DURING CONSTRUCTION



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VIEW ON GROUND FLOOR SHOWING LOADING PLATFORMS
ARBUTLE WAREHOUSE, BROOKLYN, N. Y.
MR. WILLIAM HIGGINSON, Architect



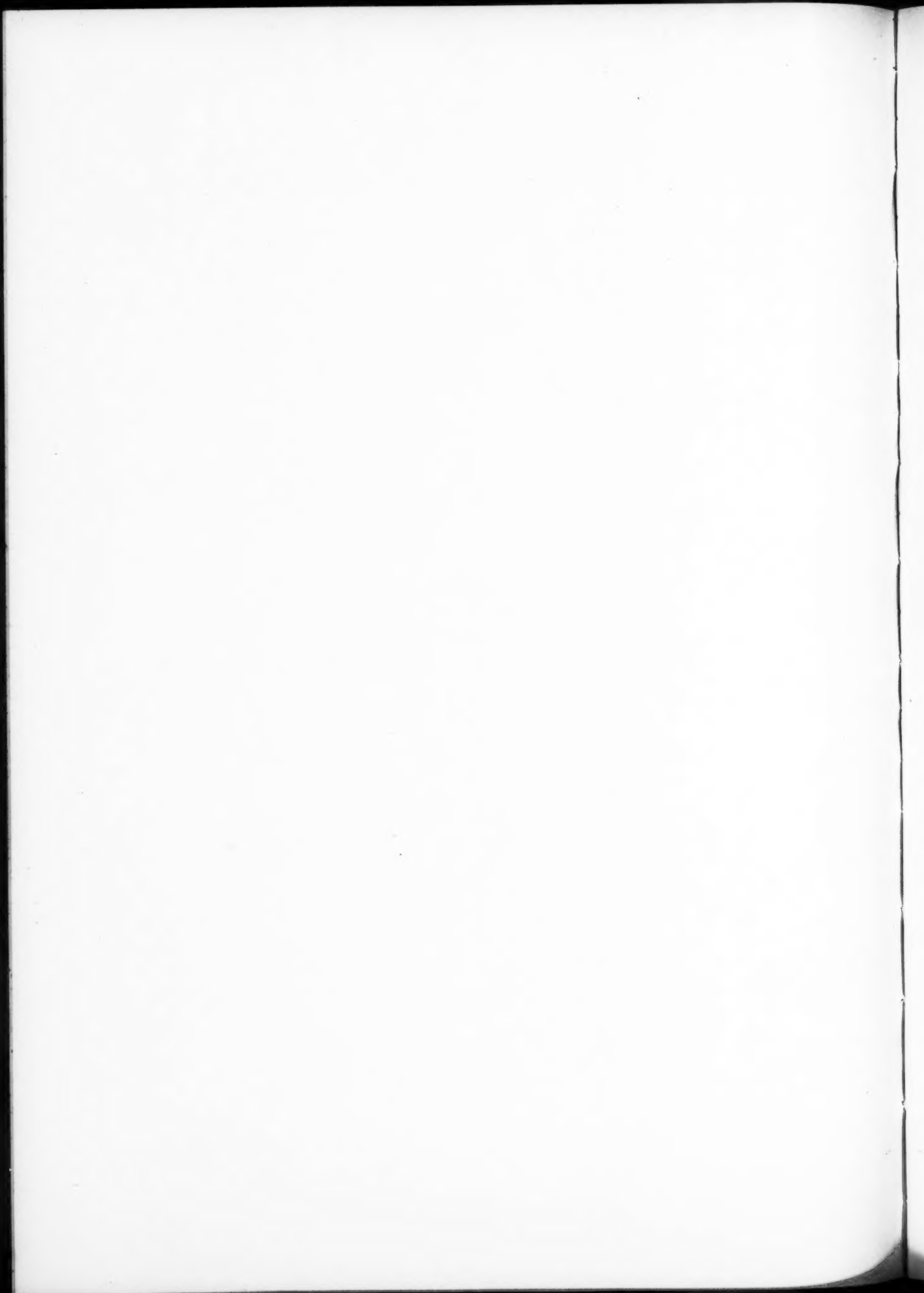
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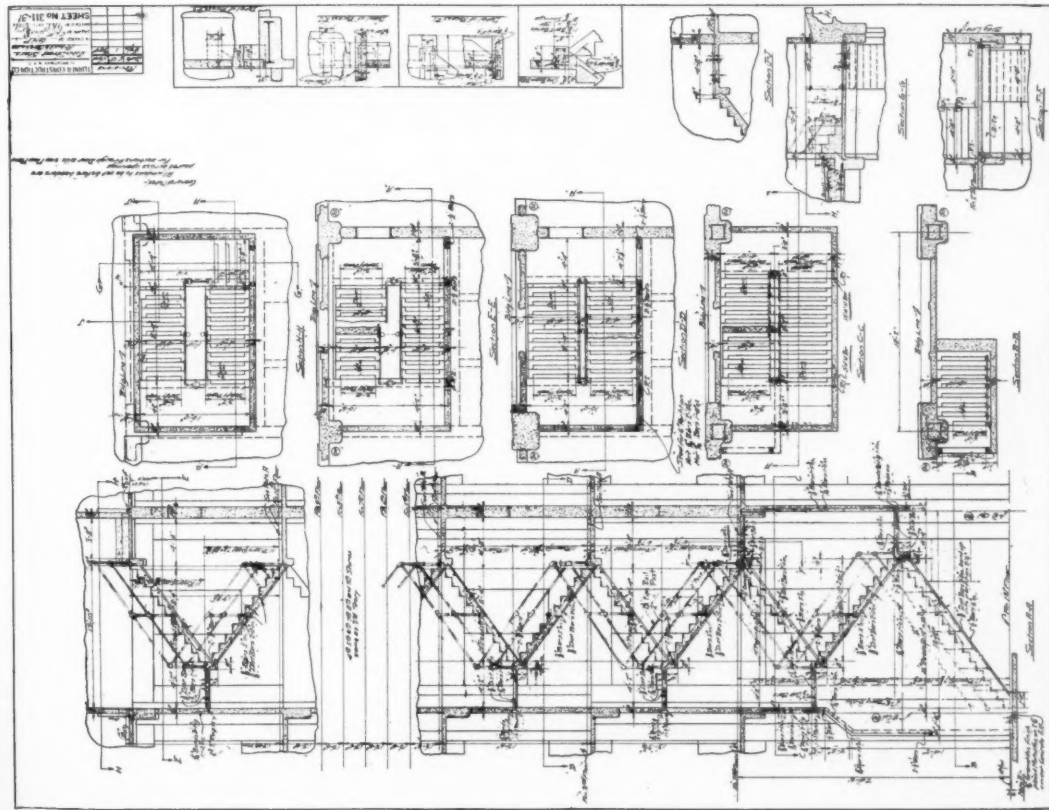
DETAILS OF CONSTRUCTION

TYPICAL FRAMING PLAN

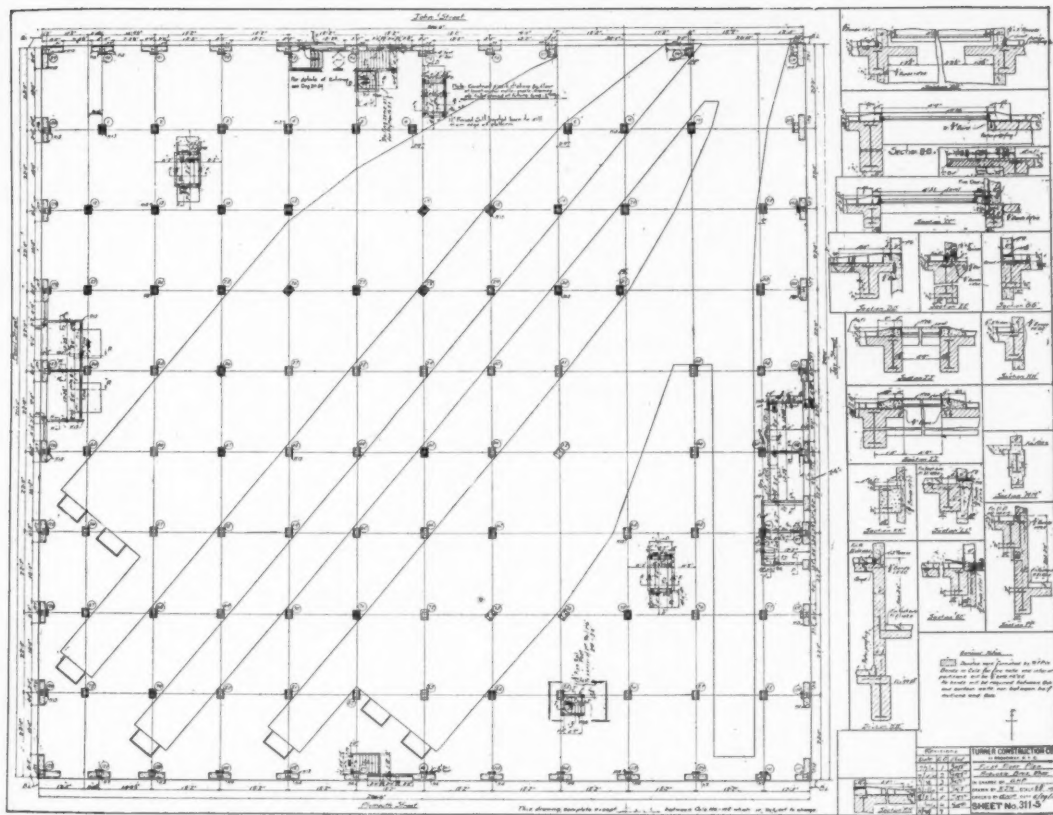
ARBUTLE WAREHOUSE, BROOKLYN, N. Y.

MR. WILLIAM HIGGINSON, Architect





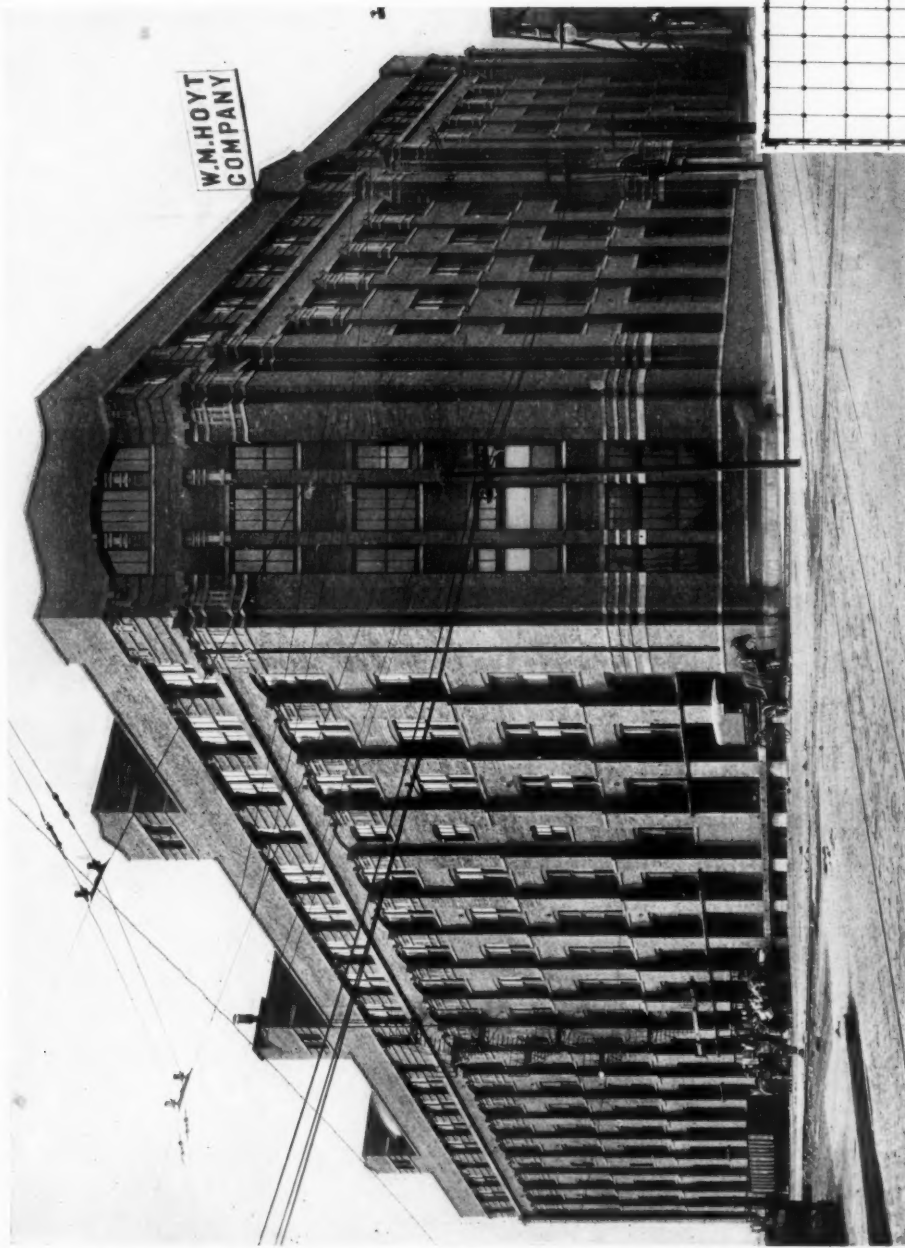
STAIR DETAILS



FIRST FLOOR PLANS AND DETAILS OF CONSTRUCTION

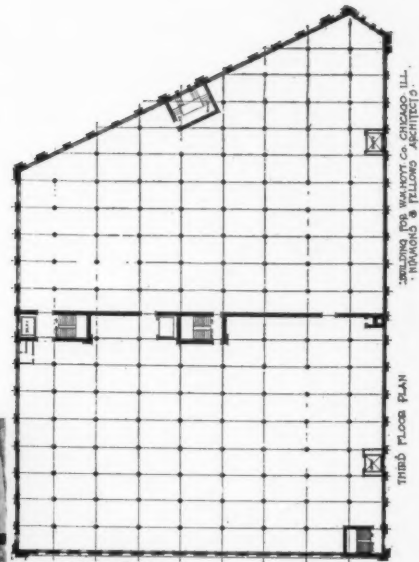
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BUILDING FOR W. M. HOYT CO., CHICAGO, ILL.
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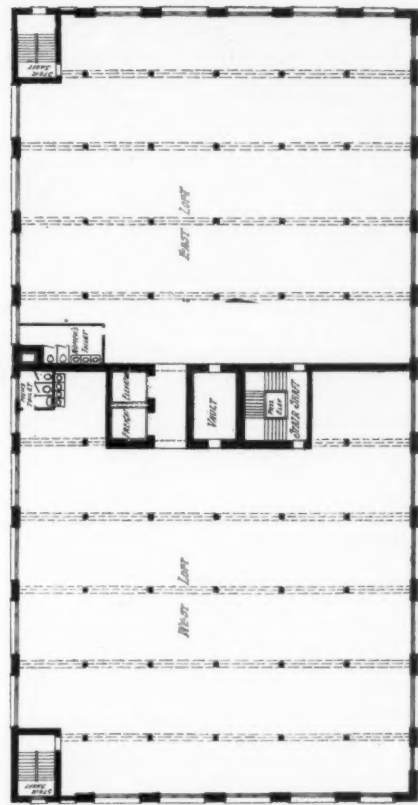
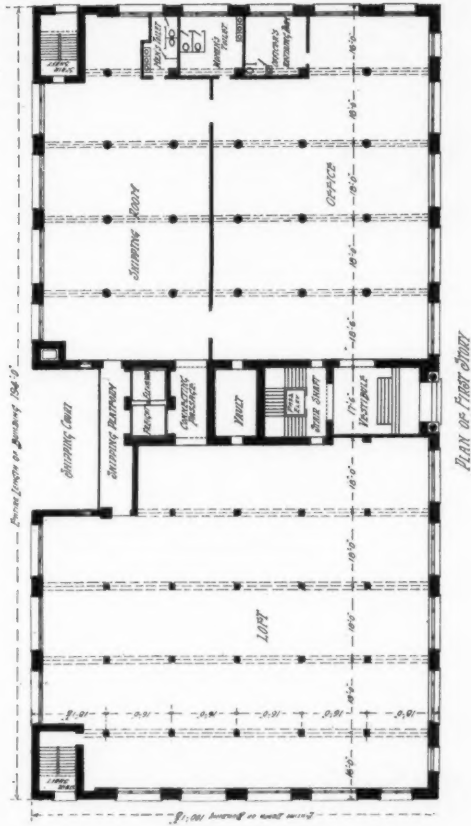




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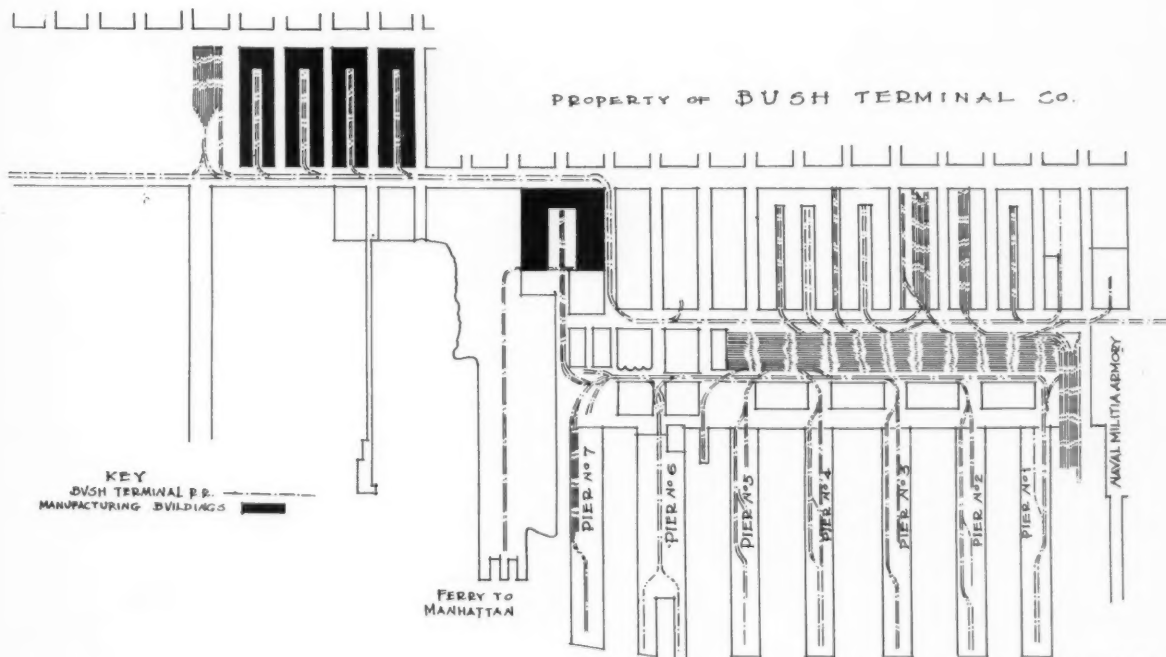


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WATER FRONT VIEW

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XII CENTURY MARBLE BAPTISMAL FONT, CHURCH OF ST. FREDIANO, LUCCA, ITALY