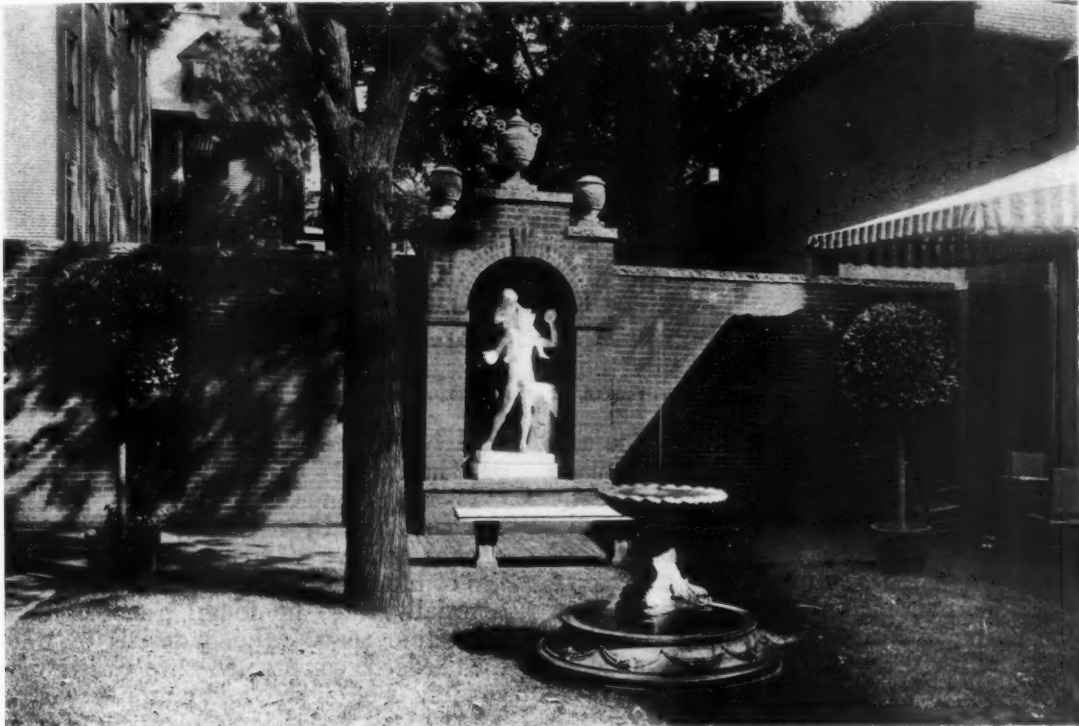


THE AMERICAN ARCHITECT

VOL. CL.

WEDNESDAY, FEBRUARY 28, 1912

No. 1888



THE COURT, HOPE CLUB, PROVIDENCE, R. I.

MESSRS. HOPPIN & FIELD, ARCHITECTS

THE QUALITIES OF BRICK

By CHARLES F. BINNS

Director, New York State School of Clay-Working and Ceramics



I HAVE sometimes wondered why a good fellow is called "a regular brick," but the comparison is not so unsuitable as it might seem, for in a brick there are found qualities which are parallel to those generally admired in human beings.

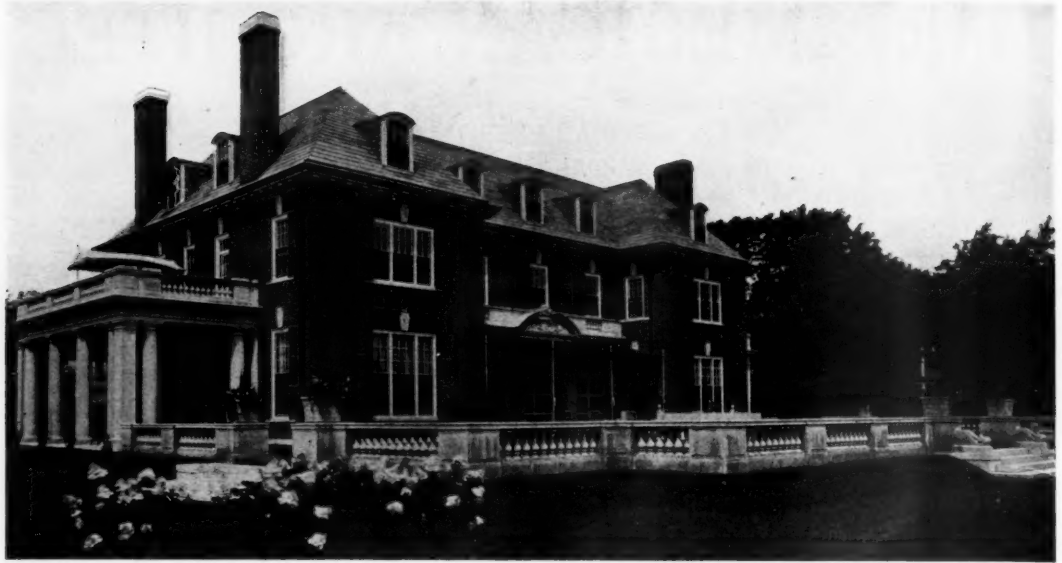
A brick may be humble of origin but through the discipline of fire it has been rendered strong and useful. It may be of

rugged exterior and yet possess a substance of sterling value. It is one of the most unassuming of objects, but is able to perfectly meet the demands which are made upon it.

The story of the brick is of fascinating interest. Bricks no doubt had their origin in the sod wall such as is even now seen on the western prairies, for the human dwelling has, the world over, passed through similar stages of evolution. In countries where the grass sod is scarce the solid mud wall was the common form of building.

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HOUSE OF MR. L. Z. LEITER, BEVERLY FARMS, MASS.

MESSRS. PARKER, THOMAS & RICE, ARCHITECTS

In order to make this conform to line and surface separate blocks of clay were made and these, dried in the sun, were sufficiently permanent in an arid climate. The discovery of the effect of fire in the burning of pottery and the example set by the use of stone for building led to the experiment of burning as applied to brick and the development of the idea as regards permanence and solidity was complete. With advancing ceramic knowledge as shown in the successful making of pottery it is not a matter for wonder that brick were coated with an impervious glaze or enamel. Specimens of these glazed brick are found in the ruined buildings of Egypt and Babylon but it is evident that the bricks of olden times were made in imitation of blocks of stone. Stone is expensive to cut so that large masses are less costly to build with than small ones. A small brick, on the other hand, is less expensive to make than a large one and is much more easily used so that the size eventually became that which could be lifted and set with one hand while the trowel was held in the other. At the same time the proportions of the brick were so adjusted that the length was equal to twice the breadth.

This fact makes possible the bond by means of which two parallel walls of brick laid close together are tied into one solid

wall by a proper use of transverse brick or "headers."

It is, perhaps, a truism to say that things persist by reason of their qualities. Shelter and a roof-tree have been necessities of life ever since man became man and especially since he found a home in the temperate zone. The materials of which the shelter is constructed have varied under conditions of climate and natural resources. The nomad found the tent to be the most convenient because it was portable and because the hides of beasts, wild and domesticated, were easily procured. The cave man discovered or excavated his settled home under conditions which made a wandering life unnecessary. The early settler built his house of logs, which were a by-product of the clearing operations by which he obtained land for cultivation and the lavish abundance of timber throughout the country provided material for the ubiquitous frame house. But the conditions which confronted the pioneer have passed away and timber is, in these days, only to be procured at the expense of future generations. The position in which the American builder now finds himself was reached long ago in older countries where for generations wood has given place to brick. An ancient and primitive building material has outlived all competitors and

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now stands supreme, accepted and acknowledged on every hand as the one substance which is inexhaustible, inexpensive and proof against the ravages of fire and of time. Brick has come into its inheritance.

Last week I saw a frame house burned to the ground. On one of the upper floors a brick chimney had been built and as the fire consumed the supporting beams the structure fell with a crash into the roaring flames below. In each of two flanking wings was a brick chimney built on the ground and extending up through the roof. The fire consumed the walls and ceilings, but when all was over those two chimneys stood amid the ruin, naked but triumphant. The brick had received a baptism of fire already on the occasion of their birth and therefore against them the flames had lost their power.

As these lines are written there comes to hand a French magazine in which there

is an illustration of a brick house which was built at Medford, Mass., in the seventeenth century. Through war and tempest it has stood and is now even better than when new for time has mellowed the color of the walls and vines have grown lovingly over it. And so brick, the ordinary, common clay brick is found victorious in the perpetual conflict with fire and decay.

These facts being recognized, the way is open for a consideration of the development of brick construction from the point of view of appearance. In this regard there have been many changes during recent years as the ideas of architects

and homebuilders have undergone modification. At one time brick were just brick and nothing more. Sometimes on erecting a building the bricks of clearer color and with unbroken corners were reserved for the outer face but more often they were taken as they lay handy to the mason. That buildings so

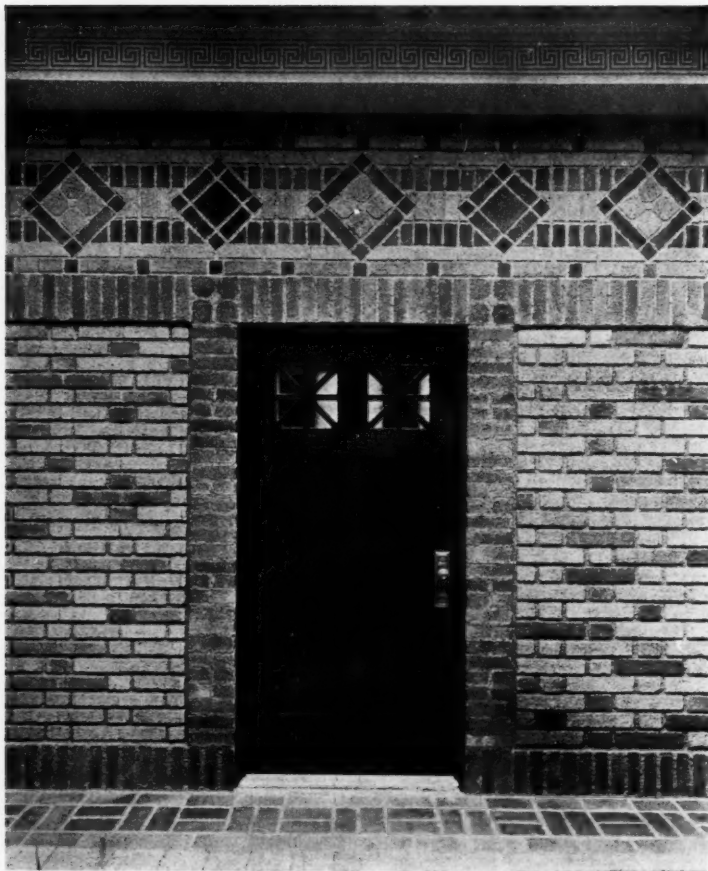


OLD BRICK HOUSE, BUILT IN 1634, AT MEDFORD, MASS.



COACHMAN'S COTTAGE AND GARAGE FOR MR. L. Z. LEITER, BEVERLY FARMS, MASS.

MESSRS. PARKER, THOMAS & RICE, ARCHITECTS



DETAIL OF A DOORWAY OF GREY BRICK OF VARYING THICKNESS AND TEXTURE

MR. H. J. F. LUDEMAN, ARCHITECT

constructed possess a natural beauty is all to the credit of the material but in the development of fashion a superior quality of brick became desirable for outside work. Bricks were then divided commercially into two groups, common brick and face or front brick. The common brick were supposed to be concealed as when a wall was to be plastered inside or to be covered on the outside with terra cotta, marble or face brick. The color of the face brick was controlled by the color of the trimming and so a demand was made upon the brick-maker for special shades and imitative effects. This led to new processes in manufacture. First, the roughly shaped clay brick were repressed in order to secure truth of line and surface and uniformity of size. Following upon this came the semi-dry process by which moist, powdered clay

was compressed into a brick which was thus produced square and true at a single operation. The process of the fire was essentially the same so that in each case a satisfactory structural material was provided. Then there arose the demand for uniformity. The unit was the completed wall and this must present a clear surface of unbroken color. Even the mortar joint was concealed, being either reduced to paper thickness or stained to match the brick. To meet this demand the manufacturer was compelled to sort his product into almost indistinguishable shades, being forced to incur great expense and to carry a heavy stock. From this extreme there was bound to be a reaction. The pendulum began to move in the opposite direction and it swung far and forcibly. Architects sought for odd and unusual effects. Cull piles

and even dumps were searched for misshapen and discolored brick. A manufacturer in Ohio was using a clay which contained numerous small nodules of iron ore. In the hotter parts of the kiln these were apt to swell and dark colored blisters appeared on the face of the brick. For a long time these over-fired brick were rejected and piled up on the yard as being without value. One day these rejected brick were observed by someone who was on the look-out for novelty and lo! blistered brick became a regular article of commerce and a source of revenue to the manufacturer. Now was the time for the mortar joint to receive attention. A dark stain was used and the joint was raked out to deepen the shadow effect, the result being a wall rugged in the extreme but with rather an affectation of crudity. Once again the

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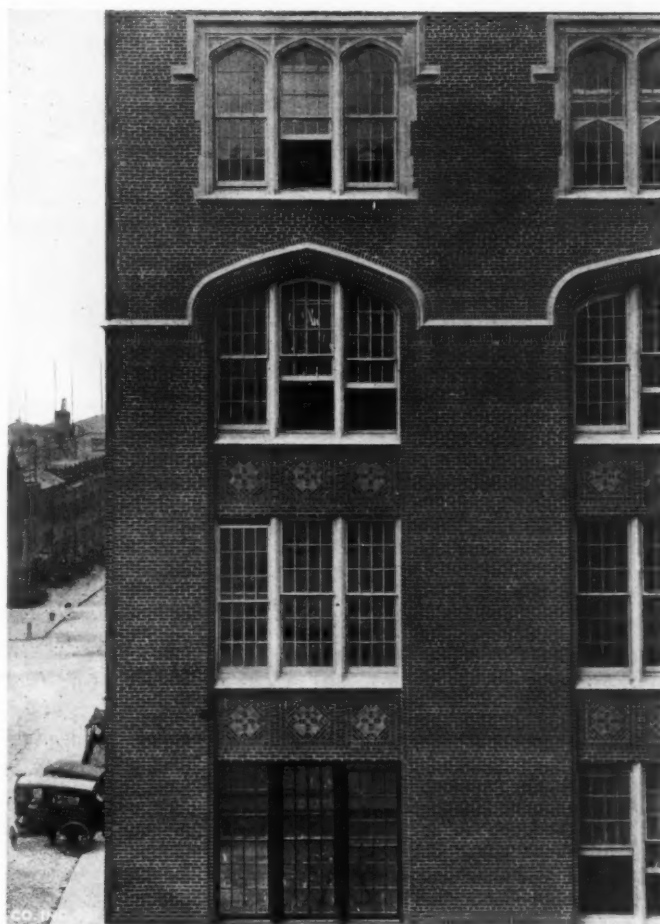
pendulum had reached the end of the swing and the time had arrived for a return to saner conditions.

One of the first evidences of this was the building of the beautiful church in Madison Square, New York. Here by a stroke of genius on the part of both architect and brick-maker a rather rough, gray brick was faced in such a way that the prominences on the surface appeared to emerge through the lighter colored coating. The result is charming almost beyond description. The prevalent tone is a light gray, but the manner of its production imparts a texture and color quality which are unique and completely satisfactory.

Another important note was struck in the erection of the chapel of Saint Paul at Columbia University. This is the apotheosis of the common brick. The brick of the Hudson River yards, hitherto supposed to be, while structurally sound, only fit to be set as a backing for finer material, was boldly acknowledged in its natural beauty. Each individual brick, humble, perhaps untrue as to line and imperfect as to surface, differing slightly from its fellow in tint and even in size loses its identity but blends in the mass into a vibrant glow of rich and restrained color which must be seen to be enjoyed. It takes many brick to make a wall, just as it takes many people to make a crowd and in a wall as in a crowd, the interest lies in the fact that no two individuals are exactly alike.

The common brick mentioned above are pressed in molds which have been dusted with sand in order to secure an easy release of the clay. Some of this sand clings to the brick and helps to impart a texture which, in the large, presents a soft, almost velvety appearance. Clays differing in quality demand the use of a machine from which

the bricks are expressed through a polished disc. The surface of these bricks is, therefore, smooth and clean. The beauty of a rougher face being acknowledged, means were sought for producing this without changing the machine or the process. Like the feat of causing an egg to stand on end, said to have been performed by one Columbus, it is very simple when you know how. A fine steel piano-wire was stretched across the die near the upper edge so that as the clay emerged a thin slice was cut off. The face thus exposed presented a rough, slightly torn surface where the wire had dragged its way through. By adjusting the grinding of the clay, making it either coarse or fine before entering the machine a surface of any desired tex-



DETAIL OF PUBLIC SCHOOL NO. 95, NEW YORK

MR. C. B. J. SNYDER, ARCHITECT
Tapestry brick with mosaic panels

THE AMERICAN ARCHITECT



DETAIL OF UPPER STORIES, NORFOLK, VA., Y. M. C. A. BUILDING

MR. R. E. MITCHELL, ARCHITECT

ture could be secured at will. The color was, of course, provided for in the selection of the clay itself so that buff, gray or red brick could indifferently be finished with the roughened surface. There was also the possibility of modifying the color in the process of burning. The color of any clay will be darkened as the heat of the kiln is increased in intensity. It can be further varied by quick or slow burning and by a proper regulation of the supply of air to the fires so that the brick maker finds at his command an almost unlimited repertoire of variations. But note, now, the change which has come over the sentiment of the situation. At one time variations were the *bête noir* of the brick-maker. He would spend money and take unlimited pains to secure exactitude. But a new spirit has arisen and these same variations have become a source of increased interest in his product and hence a means of profit.

The fine buildings at West Point are an excellent illustration of the effective use of the texture brick. Probably most people look upon cut stone as the ideal building material. This is largely because of the tradition of famous buildings in Europe. The stone-built castles of the earlier civilization and the Manor houses of England embody such perfect ideas of fitness and

permanence that almost unconsciously every building is judged by this standard. But these stone buildings have been mellowed by generations, sometimes centuries of time. Modern brick structures are built to last and upon the receptive surface of the brick under discussion time will have just the same influence. Good building stone is scarce and very expensive to cut. It costs, moreover, very much more to lay up properly. Brick is abundant, relatively cheap, and easy to lay. Brick is, also, more fire-proof than stone. It is a matter of record that costly stone and marble facings have been shattered by fire,

while brick walls have stood unscathed.

There is something honest about a brick house. It conveys an idea of reality and the absence of sham. Stone, too often, is merely a facing. In most cases the structure owes its real strength to the bricks which are hidden away behind the pretentious exterior. Then why not carry the work to its logical issue and allow the bricks to present their unique qualities of surface?

Last fall a party of visitors was looking over a brickyard. After inspecting the process of manufacture, the great machines, the extensive drying arrangements, and the numerous kilns, they came to the stock yard. Here was a pile of parti-colored texture bricks as they had come from the burning. The impression produced by the rich blending of color was such that one of the visitors exclaimed, "It is exactly like a Persian carpet," and, indeed, the comparison was striking. One can easily imagine a home, built of such brick as these, nestling among the foliage of summer or braving the snows of winter and presenting in every season a unit of beauty and strength.

In passing in review the whole subject of the modern manufacture and use of brick one can appropriately paraphrase a well-known passage and say, "Age cannot wither it nor custom stale its infinite variety."



EXTERIOR FIGURE PANELS, ORPHEUM THEATRE, LOS ANGELES, CAL.
MR. J. ALBERT LANSBURGH, ARCHITECT

POLYCHROME TERRA COTTA

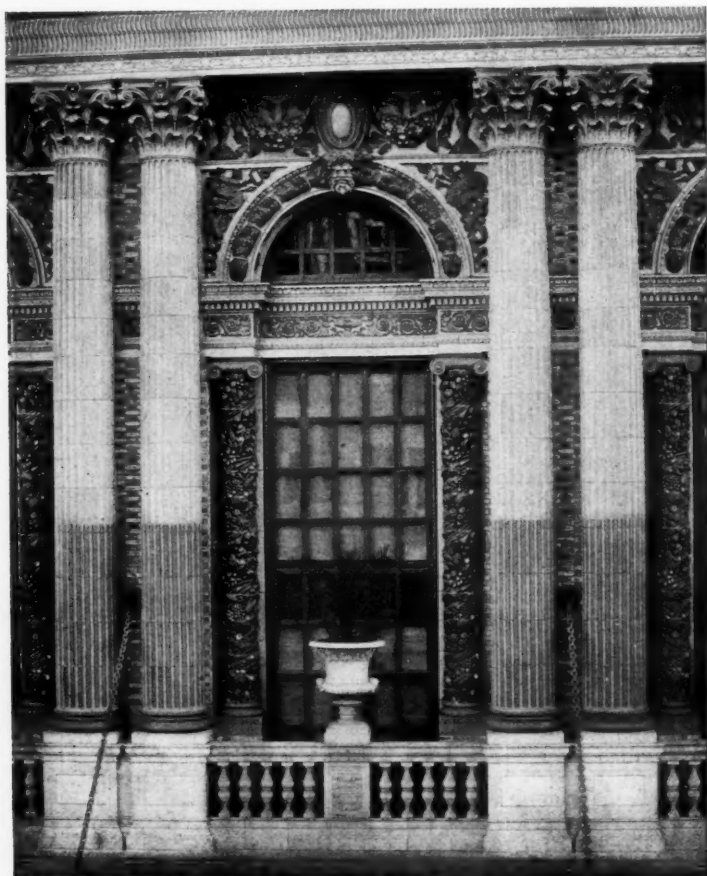
By SAMUEL HOWE



WHAT a glorious thing is color! It is all-important! Although by many this has been called the constructive age, the intensely practical age, the age dominated by ambitious personalities whose stimulating natures have led to the realization of many a "wild cat" dream, the age which knows no architectural precedent or limitation—it is also, in spite of appearances, an age by no means oblivious to the charm of beauty, and beauty as often means color as it does proportion or ornament. Yes! This age of bridges and great towers. This age of the impossible! This active, tireless and exacting age,—demands color. It needs a second Venice. Color of the most distinctive and decided nature.

In a word, the buildings we know today for their cost, occasionally for their beauty, as well as for their measurement, their accommodation, their financial return, might with a little more study and thought be equally famous for some distinctive mark of character and color.

In some such order as this does the story of the peoples who enrich their buildings with color appear upon the pages of history, and it is wonderfully supported by the testimony of the various ruins in different localities. First the Egyptians and following the Persians, Assyrians, Greeks—for even in the frieze of the Parthenon were traces, probably of color, discernible—the Etruscans, Chinese, Japanese, Mexicans, Peruvians, Arabs, Moors and Turks. There are doubtless also to be found buildings by the Gauls, Germans, Scandinavians,



CENTRAL BAY OF FACADE
COLUMBIA THEATRE, SAN FRANCISCO, CAL.
MESSRS. BLISS & FAVILLE, ARCHITECTS

Goths, Huns and Vandals, where color formed a large part of the architectural scheme.

In a most remarkable manner did the localities barren of costly marbles resort to clay, fired and glazed, as a color-bearing agent. There is about everything that has gone through the fire an engaging air of mystery. This is doubtless inspiring to the imagination and difficult to explain, clay bathed in glazes and fired was a child of an enchanted world, puzzling and elusive perhaps at times when veiled with a thin glaze, but promising great things.

The harem at the Palace of Khorsabad at Niniveh, Assyria, had walls of enamel brick, covered with colored enamel. There were six colors: blue, yellow, green, dark ochre, black and white. The decoration

was of the clearness which was highly prized by the Assyrians; blue forms the background of the ornament.

Decoration was also painted on the plaster at Knossos and color by various agents is also to be found in the Abbey Church of St. Savin near Poitiers and St. Anastasia, Church of Verona.

No wonder the Pisans decorated their churches with the bowls and basins captured from the Saracens, because of the wondrous lustre of their surface. The Gate of Justice, at Granada, the cathedral at Amiens, depend largely for their interest upon their color, the tones of the latter being vivid in the extreme, bright vermilion red glazed, crude green and orange, yellow ochre, black and pure white. Occasionally blue appears. The façade of the Palace of Justice at Cologne is enriched with mosaic, also the Ca'd'Oro of Venice, the Miniato Al Monte, Florence, St. Mark's, Venice. One of Gi-

otto's pictures shows a white building crowned with a bright scarlet cornice, and bearing semi-circular panels with mosaic in geometric patterns upon the wall spaces, and so it goes.

The student of the Orient has many such examples before him. For instance, he knows the blue, the green and the red mosque, and he knows them because of the extreme beauty of their domes and minarets. Travelers speak eloquently of their quality to sparkle and shimmer in the sunlight. They tell us that the picture once seen is never forgotten, and that it has stimulated writers and poets, providing a perfume for many a description.

During the last few years, considerable attention has been given to the subject of textures and various devices have been re-

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sorted to whereby interest in the plain surfaces as well as interest in the architectural detail, has been greatly enhanced, whatever the style or the character of the building. Study of material has for the moment, in many cases, persuaded the architect to become, as it were, a craft-worker, busy with the fascinating nature of clay products as well as of the tenants of the hillside, rich in oxides, veined upon the surface of marble or held suspended, as it were, in granite-like formations.

The secret of these glazes—scarce thicker than paper—could surely be rediscovered by our industrial chemists and manufacturers were interest sufficiently stimulated in this fascinating subject. Given one iota of the attention and thought to this question which has characterized the equipment of the engineering side of the architect's knowledge and his grasp upon building problems; and once again will the sky line of a modern city reflect insistently the cultivated taste of a great people.

Regarding the treatment of plain glazed surfaces there is much to be said. There seems to be in the minds of some manufacturers—and I fear at times it is shared by certain architects—a desire to so highly finish the surface of terra cotta as to invite the idea that it is intended to be a copy of stone or of marble, or a delicately enameled surface without flaw or texture. Glazed terra cotta is no imitator! By no stretch of the imagination can anyone be justified in accepting it in this light. To think of it for one moment as a reproduction or copy of another building material must surely be realized as a serious mistake, a grave error of judgment. Terra cotta, be it glazed, semi-glazed or unglazed, has its own individuality,

its own language, its own character. It is as individual as any cube cut from the quarry of any hillside and should be so regarded in the realm of architecture. It is scarcely necessary to recall the enthusiasm of the Della Robbia's and the wild, tireless search by Palissy, the potter, for glazes and modelling adapted to receive glazes. This is a matter of cultivation—of appreciation—if you will; not a fantastic and capricious fancy of the moment.

This means that the color may be mottled? It does. Take for instance a series of quoins or dressings for the corner of a building or window or door opening. Each block has been separately moulded and dipped or "sprayed," to quote the jargon of the workshop, and it has also been sep-



PORTICO ENTRANCE
CHILDREN'S HOSPITAL, SAN FRANCISCO, CAL.
MESSRS. BLISS & FAVILLE, ARCHITECTS



DETAIL OF ENTRANCE
CHILDREN'S HOSPITAL, SAN FRANCISCO, CAL.
MESSRS. BLISS & FAVILLE, ARCHITECTS

arately fired. (Modern science has of late busied itself to determine the exact temperature of each tenant of the kiln without making much headway.) It is as distinct a unit of the building as it well can be to have come from the same working drawing and be moulded from the same strata of Mother Earth. Is it unreasonable to ask that its individuality be respected? Does anyone want to regard it as a mere foot or so of a given enrichment, be it cap, entablature, architrave, cornice or what not? It must, of course, conform to the same rule, line up with and become part of the constructive whole and be subservient in other ways to the general scheme of the design, but forever it will remain individual. Its face may bear some quaint markings, memories as it were of a high

temperature in the fierce struggle. Metallic oxides frequently vary, according to the position of oxidization in the kiln. All this is delightful. Of course there is a limit to this kind of thing and there are certain ceramic changes which are legitimate and others that are not, but are rather the result of careless workmen. The diversified tone might become an affectation, and poor and careless work could be passed off on the plea that it were really a caprice and only a caprice of the kiln. This, of course, must be guarded against.

Glazed terra cotta adapts itself to the seriousness of a monumental or of a picturesque theme. The Renaissance of the Italian revival shows many grandiose conceptions of surprising dignity and simple grandeur, and this without in any way appearing to imitate stone or marble.

The lovers of color have for many years been disturbed by the continued greyness and dullness of the façades and demand something to enliven the life of the man out of doors and offset the monotonous commonplace that confronts him.

Beyond doubt, the coloring of architectural ornament for the sake of additional emphasis is a study by itself demanding the keenest attention and unusual knowledge of a specific kind; a composition may please today and yet grievously disappoint in a year or two. The climate has a different effect upon different colors. Not that they fade, but that the deposit of carbon from the smoke neutralizes some colors without having much effect upon others; for instance, a middle-toned blue, red or purple will withstand the attack for many years, dulling perhaps and generally blackening, while ornament made up of white, yellow, buff, light green, all run together

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and become too often flat, dull, anæmic and uninteresting, if not even unintelligible, viewed even from a few feet. It is this kind of information which is alone to be secured by visiting buildings some ten or fifteen years of age, where the chemical action of the climate can be studied on the site and the situation more easily understood. Again, the question of distance from the sidewalk or elevation counts wonderfully in the arrangements of the palette, and the quality of the color to be introduced is also important.

Some days ago it was my privilege to note an interesting skyscraper crowned, as it were, with a golden coronet. Yet it was a very simple composition; the coronet was a deeply covered portion of a frontage, paneled with orange colored terra cotta blocks. In its position it would never harbor dirt, but would always remain bright and cheerful. Deposits of soot were not likely to dull its surface. The rest of the building was a light tone buff.

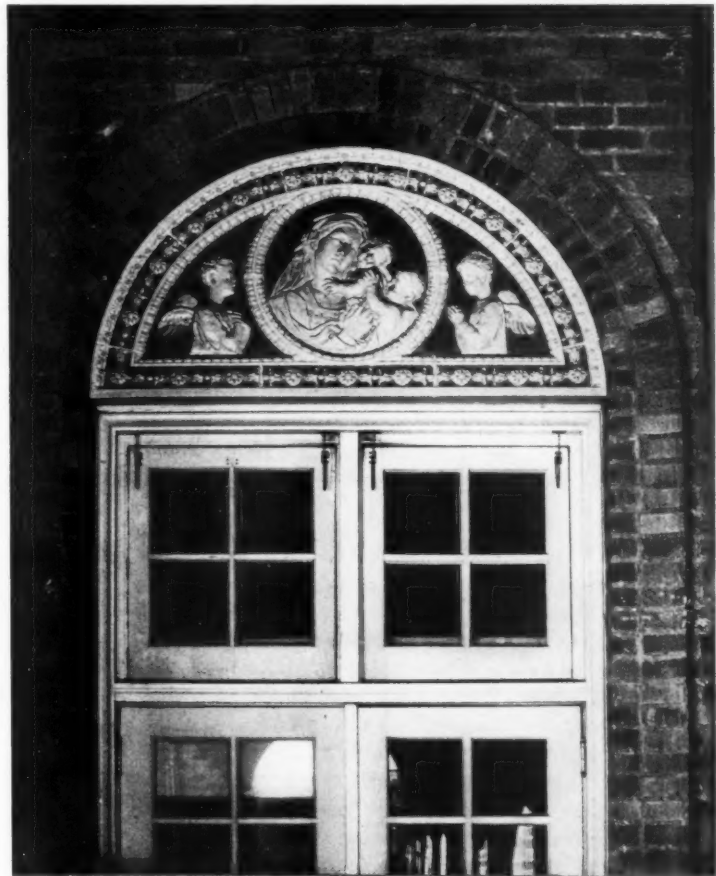
From the "luxurious miracles," as Pliny calls them when he names the grand antiques, the Breche Orientale, the Skyros and the Campan Vert of the Pyrenees—rich marbles—from them must the architect look for knowledge of color likely to be of service, and to them will he naturally point the manufacturers of terra cotta.

He will not, however, forget the lustres by Maestro Giorgio and he will, doubtless, if he belong to this favored country, however, recall the triumphs of opalescent glass—color glaze in another form, nor will he be blind to the memory of that preparation of clay and glass which appeared under the name of ceramo-crystal or vitreous mosaics, wherein the low-toned surfaces of some of

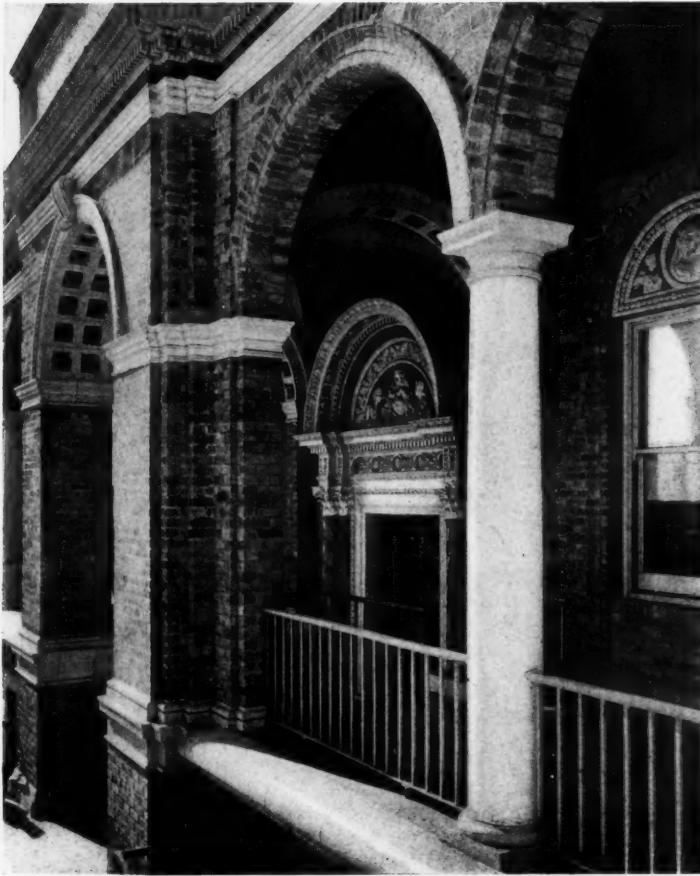
the duller types of marbles are recalled.

These dull surfaces are extremely valuable, they do not disturb the effect of the solidity of the wall, nor do they separate, as it were, from the composition as a whole. They are not disturbing, they express the language of the architect, uniting carving with moulding, and are valuable in a hundred ways, forming as they do a rare change in texture, introducing color without a glassy divorcement, which ennobles and makes happy in a soothing and comforting way. Such changes are of great value where economy has to be studied.

This low-toned color bearing, vitreized, sandy surface is very hard and dense. It is imperishable, much of it having stood from the times of the early Romans as pavements in exposed positions. Almost



DETAIL
CHILDREN'S HOSPITAL, SAN FRANCISCO, CAL.
MESSRS. BLISS & FAVILLE, ARCHITECTS



DETAIL
CHILDREN'S HOSPITAL, SAN FRANCISCO, CAL.
MESSRS. BLISS & FAVILLE, ARCHITECTS

anything reasonable can be done with it. It can be made in slab or tile, about a quarter of an inch thick, and it can be broken in fragments so that the fractured edge enables it to furnish a key to cement. Or it can be cast as projecting mouldings. Tesseræ,—broken fragments of various shapes—form delightful borders when used in connection with marble or stone, or brick; indeed by some they are very skillfully introduced into walls of concrete. In brief, this material also is simply glazed under another classification, made under other conditions, wherein the mystic charm of metallic oxides is swayed by the madcap goddess we know under the facetious name of color. Yes! a right glorious thing is color.

Semi-transparent glazes enabled the early

toys of the Egyptian children to retain a recognizable shape; man is still toying with clay, the material of which the best of us are made.

In this he has doubtless been splendidly assisted by the manufacturers of brick, these gentlemen having attacked the subject firmly and with vim, often extracting from the most unpromising clays bricks of a wonderful color, red, buff and cream fired at the ends a dark purple. Indeed this making of brick is one of the great industrial triumphs of a victorious age. The diversified texture, however, is of greatest value for low buildings whose frontages can readily be washed down should the smoke-begrimed atmosphere deposit its carbon upon them, choking the cells and neutralizing their tender shades. Tall buildings require glazes, glazes that protect, being transparent and thin without altogether concealing the body of the clay. This semi-opaque effect is ex-

tremely valuable and too little understood. By some subtle device the industrial chemist has drawn, as it were, a thin veiling over the rough surface of the body, permitting it to peep out in places and,—as if by some fairy caprice he has skillfully added more color in some places than in others, so that the body is permitted to take part in the scene. Such semi-glazed surfaces are of inestimable value when used in connection with the rougher textures of brick which are devoid of glaze. They also lead up to and enrich the opaque colors where the tone is solid and vigorous.

There are doubtless a thousand and one means whereby decorative contrasts may add interest to large surfaces when viewed from a distance.

As a general rule it goes without saying

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that the smaller the surface the more brilliant must be the color. Still a discussion on this subject can hardly be undertaken here. Its opaqueness and transparency are important. For some unknown reason preference has been given to what is known as matt surface. Tones of white with this treatment are very satisfactory—so far as they go—but the addition of color gives life to the whole thing, particularly if it be brilliantly glazed. At times the vividness of luster or majolica is needed. This is one of the charms of terra cotta, adding comparatively little to the cost, yet it is everything to the picture. It requires knowledge and pluck to lay out the scheme of, say—a projecting string course overhanging cornice, pediment, tympanum, or even cap in brilliant colors—colors that shall sing as jewels in the distance! And the average architect is scared at the result, when confronted with the samples in his office. It takes years of experience to tell just how such detail will count in the fa-

cade when seen at an elevation of two, three or four hundred feet on a dull day!

It is with no little pleasure that I learn from reliable authority of the experiments now being made by a leading sculptor, possibly, I should say, the principal sculptor of this country, in adding to his work the interesting element of color. Just what success has been made is a secret! Just what direction and effect he is striving for, remains also to be discovered, but of this we may rest assured, that if but one-half of the skill that has characterized his work hitherto be devoted to this craft, we all shall be greatly enriched. It is perfectly natural that we should look to the sculptor. Was it not the Della Robbia's headed by Luca of that name, who first conceived the idea of adding to his work a color note of great charm? Is it not the sculptor whose grasp is so immediate and direct who usually helps us in our need, for he knows the value of accent and just where to stop?



TERRA COTTA PANEL, BOSTON OPERA HOUSE, BOSTON, MASS.

MR. BELA PRATT, SCULPTOR.

MESSRS. WHEELWRIGHT & HAVEN, ARCHITECTS

Figures in cream with a gold background

ENAMELED BRICK

A Brief Description of the Methods of Manufacturing, Their Defects, and Suggestions for Testing

By WILLIAM P. VARNEY



THE art of enameling on burned clay bodies or porcelain and metal is of great antiquity. Beautifully enameled brick have been discovered in China which were manufactured probably 2,000 years before the Christian era, and still retain the perfection of their coloring and show no indications of the ravages of time.

Enameling on metals, usually copper, but frequently on gold and silver, seems to have been more generally practised than on porcelain, probably because of the ease with which metal could be enameled. Pieces of enameled metal and brick have been unearthed in the ruins of Egypt which prove conclusively the early Egyptian's knowledge of the art. The Greeks were probably indebted to the Egyptians for their knowledge of the processes, and from the Greeks it was passed on to the Romans who used colored glass and enameled mosaics in the decorations of their buildings. A great many enameled Roman antiquities have been discovered in Britain, where the art was developed by the Saxons and Normans. It is to the English that we are indebted for our knowledge of the manufacture of

enameled brick. In fact, prior to thirty years ago, practically all of this material used in this country was imported from England, and until within a very few years, architects who wished brick on which they could depend, insisted on the importation of the English product. The use of an imported brick was attended with much annoyance and expense, which naturally retarded their use.

About twenty-five years ago four enameling plants were started in a small way, and almost at the same time, in this country. Each of these plants have spent thousands of dollars and years of experimenting in the endeavor to produce durable enamel brick, and have succeeded in producing brick of exceptional merit.

It would be impracticable and uninteresting to enter into the technical details of the manufacture of the various slips and glazes, or enamels, in this article. It is sufficient to say that they are composed of varying quantities of China clay, ball clay, feldspar, flint and metallic fluxes

so proportioned as to crystallize at such degree of heat as is found most suitable for the body used by each manufacturer.

All manufacturers of enamel brick use some or all of the basic elements enumerated above, but differ widely in the treatment or ap-



WALLS IN A COURTYARD, SHOWING EFFECT OF "PEELED" ENAMEL BRICK

THE AMERICAN ARCHITECT



STEGER BUILDING, CHICAGO, ILL.

MESSRS. MARSHALL & FOX, ARCHITECTS

Cream enameled terra cotta and cream enameled brick

plication of the enamel to the body or biscuit. In fact, they are divided into two kinds: those who manufacture by the "One-Burn Process" and those who manufacture by the "Two-Burn Process." In the single-burn process the blanks or biscuits are made in the usual way by the stiff or soft mud process or by hand, and thoroughly dried. They are then dipped by hand in the slips, allowed to dry, and again dipped in the glaze, dried and set in kilns, either in saggars or open. If set open they are so arranged that the flame does not come in direct contact with the

enameled or glazed face. The advantages of this method are to the manufacturer only, as he can save on the cost of the brick over the two-burn process.

The "Two-Burn Process", as the name indicates, consists of burning the green or raw biscuits before enameling and then enameling and burning again. The disadvantage of this method from the manufacturer's viewpoint is that it is more expensive than the single-burn method, although the writer believes that a much more durable brick can be made thereby.

The advantage of using a burned biscuit is not only that the manufacturer is enabled to begin the enameling process with a perfectly formed and well burned brick, but that this burned brick being more porous than a green or underburned plastic clay brick and all combustible substances having been burned out, the enamel in the dipping is permitted to soak in or penetrate the body of the brick farther than is possible in the dipping of a green or stiff mud brick. This body or biscuit should be of fire clay or a clay that will stand a sufficiently high degree of heat to permit the proper fusing



View in court of County Building, Chicago, showing effect of discoloration in enameled brick. The four-inch projection in the wall surface at left, shows a wall surface of enameled brick that will not discolor.

THE AMERICAN ARCHITECT



ST. LOUIS "STAR" BUILDING
MESSRS. BARNETT, HAYNES & BARNETT, ARCHITECTS
Cream enameled brick and terra cotta

or glazing of a high grade enamel without warping or losing shape. First, burning the biscuit or body before enameling destroys any greasy or fatty matter which the clay may contain when green. If brick containing combustible material or oily substances on the face are enameled the gases formed in the burning of these substances will raise the enamel in the first stages of firing and prevent proper uniting or fusing with the body, causing a blister which would after exposure to the elements peel off. The second firing, during which the complete fusing of the enamel takes place, can only tend to make the biscuit harder and the manufacturer can completely disregard the brick and devote his entire attention to obtaining the proper temperature to fuse and thoroughly unite the enamel to the body.

Experience and practical comparative tests of the finished product have demonstrated conclusively that the two-burn process makes a more durable brick.

The writer made a severe test some time ago of two pieces of enamel brick made by

the two-burn process by different manufacturers. Each piece was approximately three by four inches by one inch thick and cut from an English size brick. Both pieces were securely wired together so that each would be subjected to identical conditions and then placed in a closed boiler and boiled for an hour and a half. They were then put in an oven and baked for an hour until all the water was converted into steam. Then placed in a furnace where the heat was about 1,200 or 1,400 degrees for an hour and a half until the bricks were red hot, and then plunged in cold water, boiled again for an hour to get them hot and saturated with water, and placed out to freeze over night with the thermometer ten degrees above zero. A close inspection of both samples the next morning showed slight crazes or cracks in the enamel of one



THE MALLERS BUILDING, CHICAGO, ILL.
MR. C. A. ECKSTROM, ARCHITECT
Enameled terra cotta and white enameled brick

brick and no defects in the other. A well known Chicago architect to whom these specimens were exhibited stated that he was surprised that any enameled brick could be made to stand so severe a test.

Either brick or terra cotta improperly

THE AMERICAN ARCHITECT

enameled is very apt to craze, scale or discolor, "crazing" or cracking of the enameled surface of the brick is caused primarily by the unequal expansion and contraction of the body and the enamel when subjected to sudden changes of temperature. It is therefore of vital importance that the enamel and the biscuit should have the same coefficient of expansion. "Scaling," or "peeling," is one of the most serious defects of imperfectly made brick, and is caused by either underburning or the presence of oily or fatty deposits in the biscuit which prevents the proper adherence of the enamel to the biscuit. Discoloration is also the result of underburning. A brick that will discolor in the wall is almost sure to peel or scale eventually, because the fact that discoloration has set in is evidence that the enamel has not been vitrified or fused to the body, thus making an insecure contact. It is therefore of vital interest to the architect and owner who contemplates the use of enameled material of any kind where it will be subjected to repeated and rapid changes of temperature, that especial care be taken to satisfy himself that the material he proposes to use be of undoubted merit. This can be accomplished by a few inexpensive tests as follows:

Freezing or Thawing: This test is made by immersing the various brick or materials into water for twelve or twenty-four hours until they are thoroughly saturated. Then

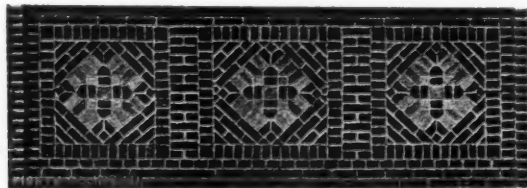
without allowing them to dry out freeze them as hard as possible. A great many of the so-called high grade enamels will craze at the first severe freezing. This test should be repeated several times.

Heat Test: Wire the several samples together so that fair and impartial treatment may be given all. Then heat to various degrees of temperature starting at about 250 degrees and plunge into cold water. This is a very severe test and a very practical one.

The Ink Test for Discoloration: A small hole should be bored entirely through the enamel until the body of the brick is exposed. Then pour black or red ink into this hole, allowing it to soak in and back of the enamel thoroughly.

If the ink stains show through the enamel it is conclusive evidence that the brick will discolor in the wall when used for exterior work, as the result of stains from the rear wall or from dust or soot absorbed and soaked in through the joints.

In addition to making the above tests the architect or owner should require of the manufacturer a liberal guarantee to replace any brick that scale, craze or discolor, free of expense to the owner, for a period of at least ten years. If the manufacturer is sufficiently confident of the merit of his material to make such a guarantee, the owner may feel reasonably sure of having an enameled brick that will defy the elements indefinitely.



BRICK MOSAIC PANEL IN PUBLIC SCHOOL NO. 95,
NEW YORK

A NOBLE MINARET OF BRICK IN NORTHERN PERSIA

By A. V. WILLIAMS JACKSON

NEAR the green city of Salzavar on the road to Nishapur, the home of Omar Khayyam, in Northern Persia, there is a handsome minaret which is an excellent piece of architectural brickwork of the Middle Seljuk Period, and it was set up about 1111 A.D. It is known as the Minar of Khusraugird, from a village by which it is located, and it stands as a monument of a lost town that once covered a considerable area.

This striking column, which like others



THE MINARET OF KHUSRAUGIRD, SALZAVAR,
NORTHERN PERSIA

in Persia might serve our builders of factory chimneys in the Occident as an artistic model of construction in brick, rises to a height of about 120 feet. Its tapering shaft is composed of four great drums, with ornamental designs of raised brickwork on their surface, and banded by richly decorated zones of the same yellowish brown material. The two lower cylinders and the one next to the top have a plastic pat-

tern of diamond-shaped figures, which lend variety to the ornate girdles, while two of the zones are beautifully adorned by Kufic texts in raised arabesques of brick. The top of the column is unfortunately broken, having probably been damaged by lightning, the spiral staircase in the interior is now in a ruined condition so that it is almost impossible to mount to the summit.

The plinth from which the minaret rises is a composite of cement and gravel, about a dozen feet square; and this is set within a brick platform forty feet square and ten feet high. The pavement of this terrace is made of square bricks, and along the edge runs a studding of rounded brick knobs which add to the effect.

A little garden, enclosed by a mud wall, now surrounds the noble minaret which will probably stand for ages yet to come as a beacon light shedding lustre on the brick-worker's art in the past.

A RECENT LEGAL DECISION

ACTION FOR REASONABLE VALUE OF SERVICES—CONTRACT NOT ADMITTED AS EVIDENCE

In an action by a contractor for the use of a machine used by the defendant in making concrete building blocks for the erection of a building, the action was based on the reasonable value of services rendered and materials furnished up to the time he was prevented by the owner from completing the work. The blocks prepared by the contractor were used by the owner after the contractor quit work. In determining the right of the contractor to recover it was held that the jury need not consider whether he made the materials according to the specifications annexed to the contract. The contract could be of no assistance, as evidence, upon the issue of facts in the case, under the pleadings and evidence.

Elliott v. Wilson, Delaware Superior Court, 80 Atl. 35 (J. S.)

We are indebted to the Atlantic Terra Cotta Co. for many of the illustrations of recent examples of terra cotta used in construction reproduced in this issue and also to Messrs. Fiske & Co., Inc., for illustrations of brickwork.

THE AMERICAN ARCHITECT

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Founded 1876

PUBLISHED EVERY WEDNESDAY BY

THE AMERICAN ARCHITECT (INC.)

No. 50 Union Square, New York
(Fourth Avenue and 17th Street)

G. E. SLY, PRESIDENT

E. J. ROSENCRANS, SECRETARY AND TREASURER

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TEN DOLLARS PER YEAR, POSTAGE PAID
ALL OTHER COUNTRIES . . . \$12.00 PER YEAR
SINGLE COPIES (Regular Issues), 25 CENTS

Entered at the Post-office, New York, as Second-class Matter

VOL. CI February 28, 1912 No. 1888

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RECENT EXAMPLES OF BRICK AND TERRA COTTA
IN MODERN CONSTRUCTION.

FRONTISPIECE:—

PALAZZO BARBARANO, VINCENZA, ITALY

CLAY PRODUCTS IN BUILDING CONSTRUCTION

THE adaptability of clay products to building construction has been availed of in various forms for thousands of years. Records of earliest civilization are replete with examples of the use of clay and clay products. Nor has its use been confined to construction work for it is found employed as a material for the expression of art and for purposes of decoration as well as in the manufacture of equipment for buildings; and it has been very extensively used to provide safe conduct for soil, refuse, and materials whose compositions render them dangerous to transport through pipes or conduits of any other known ma-

terial. In two of the uses mentioned, to furnish a medium for artistic expression and a material from which the sanitary equipment of buildings is produced, we find the extremes fairly represented and it is probably safe to say that a wider range of adaptability is not possessed by any known material or substance.

The progress made in the manufacture of the various clay products during recent years is little less than phenomenal. With a keen appreciation of form and texture resulting from and developed by the higher education that is now considered essential to finer architectural practice the architect has called to his councils makers of brick, terra cotta and other clay products. The results evolved by this collaboration is revolutionizing the aspect of buildings and is looked to by many as promising a redemption of our architecture from the monotony of texture and color that at one time characterized it. The production of clay products entering into buildings at the present time is enormous and yet the growth of the industry has not been so rapid as to create the suspicion of abnormality. Newer materials have had their day of popularity and in many cases this has waned while the growth of the clay industry has gone on uninterrupted. It is doubtless true that this growth could have been greater and still remained healthy if those interested from the producer's standpoint had at all times employed proper means of keeping the public and particularly architects and others engaged in the making of plans and the writing of specifications for new structures and their equipment constantly informed concerning the development of the industry and the facilities at hand to meet all requirements either practical or artistic. This fact is tacitly acknowledged by the holding of the Clay Products Exposition in Chicago, March 7th to 12th, and a promise of an annual repetition. The beneficial results of such presentation of clay products, of actual working size and true to position cannot be over-estimated. If it is accompanied and followed by a wise campaign of education, it is safe to say that the clay industry will take on an added importance in the minds of those men who employ either constructional or decorative materials in the pursuit of their vocations. It is to

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be earnestly hoped that no architect or engineer who can attend this Exposition without great personal sacrifice, will neglect to do so, not only in his own interest but

in that of his clients who depend upon him for advice and counsel in matters involving the selection of materials and their employment in design.

AN ENGLISH VIEW

IT was no coincidence that led us recently to publish an editorial on modern architecture side by side with one on planning cities. The topics are obviously related. A good many arguments have been sent in to us on this topic, one of them quoting what William Archer said:

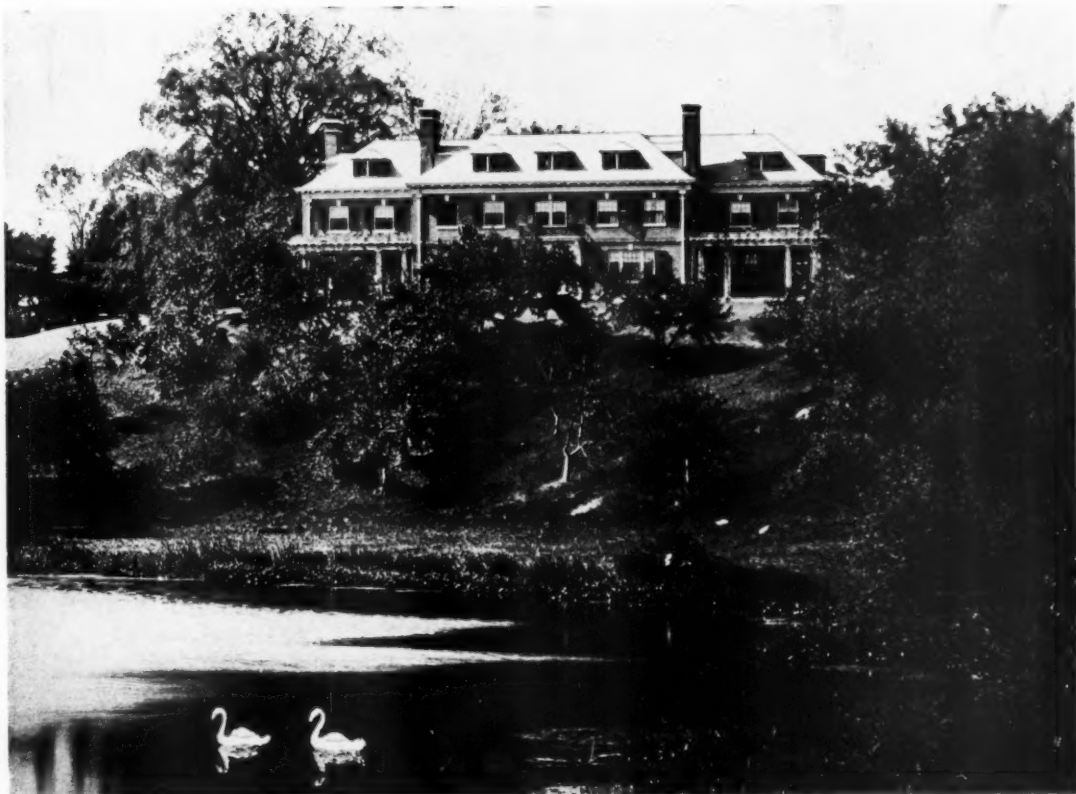
You would "Housmannize" New York! You would reduce the glorious variety of Fifth Avenue to the deadly uniformity of the Avenue de l'Opéra, where each block of buildings reproduces its neighbor, as though they had all been stamped by one gigantic die! . . . Better the most heaven-storming or sky-scraping audacity of individualism than any attempt to transform New York into a Fourierist phalanstery or a model prison.

Whatever developments the future may have in store, I must own my gratitude to the "fierce individualism" of the present for a new realization of the possibilities of architectural beauty in modern life.

Mr. Archer is an optimist and a democrat, and his enthusiasm about the architectural aliveness of the United States is justified. Leading artists from many countries have agreed that architecture is more interesting in our country today than anywhere else. We are not led, however, even by Mr. Archer's enthusiasm, to see any danger of "Housmannizing" New York or any other American town. The danger is the other way. The danger is in lack of any coördination whatever. Questions like the one about to be settled by Seattle, and the one which San Francisco seemed about to settle rightly after the fire, admit of but one intelligent and disinterested answer. We have the individual talent, activity, and originality in architecture, and what we need is the social virtue in citizens, to sacrifice something for the ultimate benefit of a whole city.—*Collier's Weekly*.

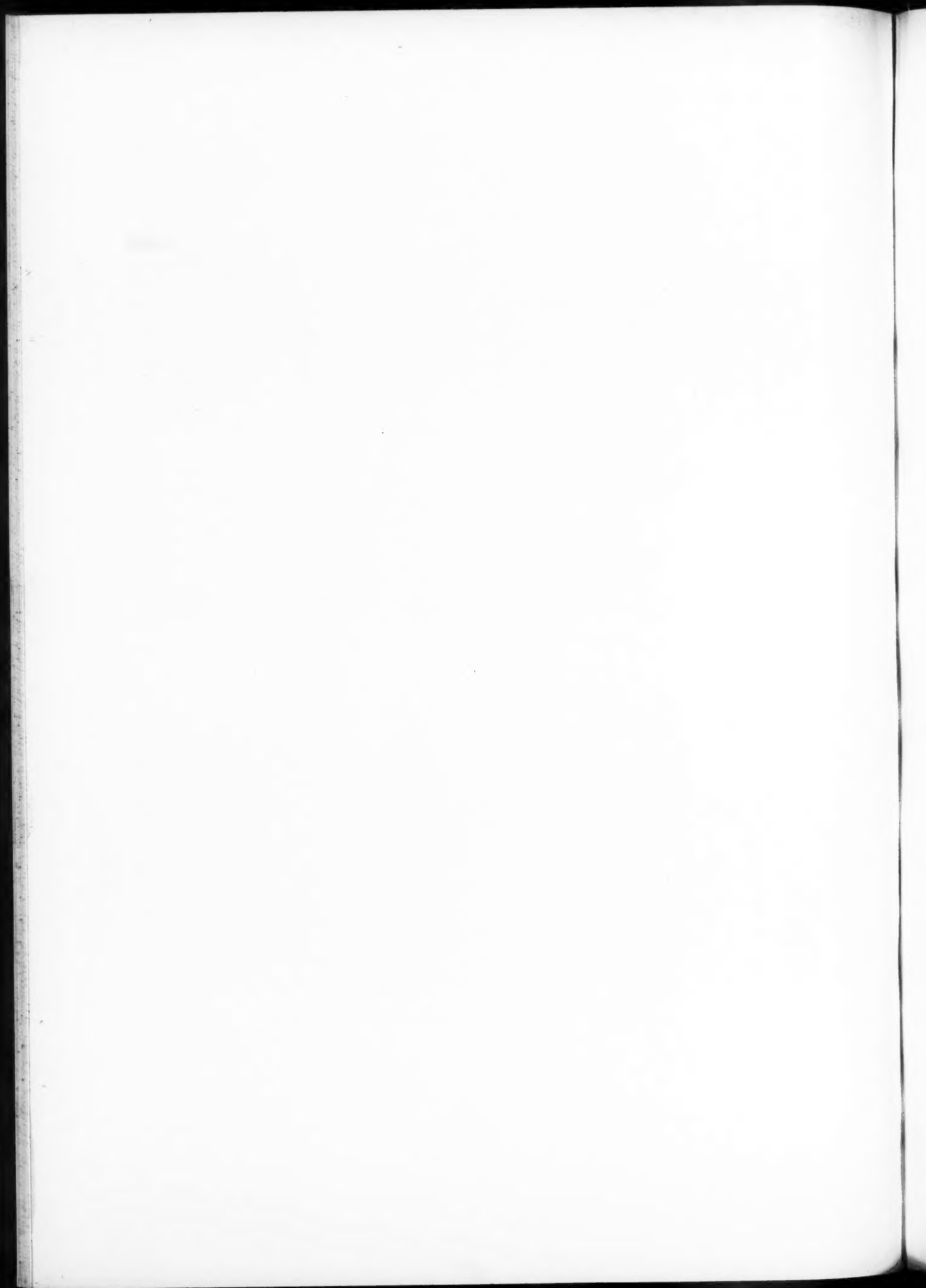


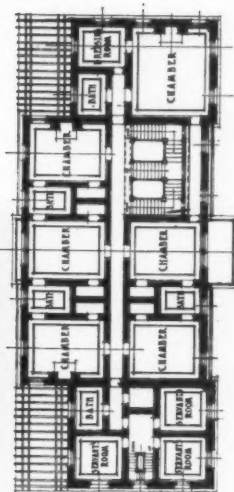
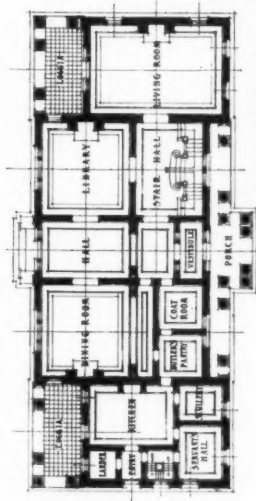
TERRA COTTA PANEL FOR A FEDERAL BUILDING



HOUSE OF STEDMAN BUTTRICK, ESQ., CONCORD, MASS.

MR. JAMES PURDON, ARCHITECT

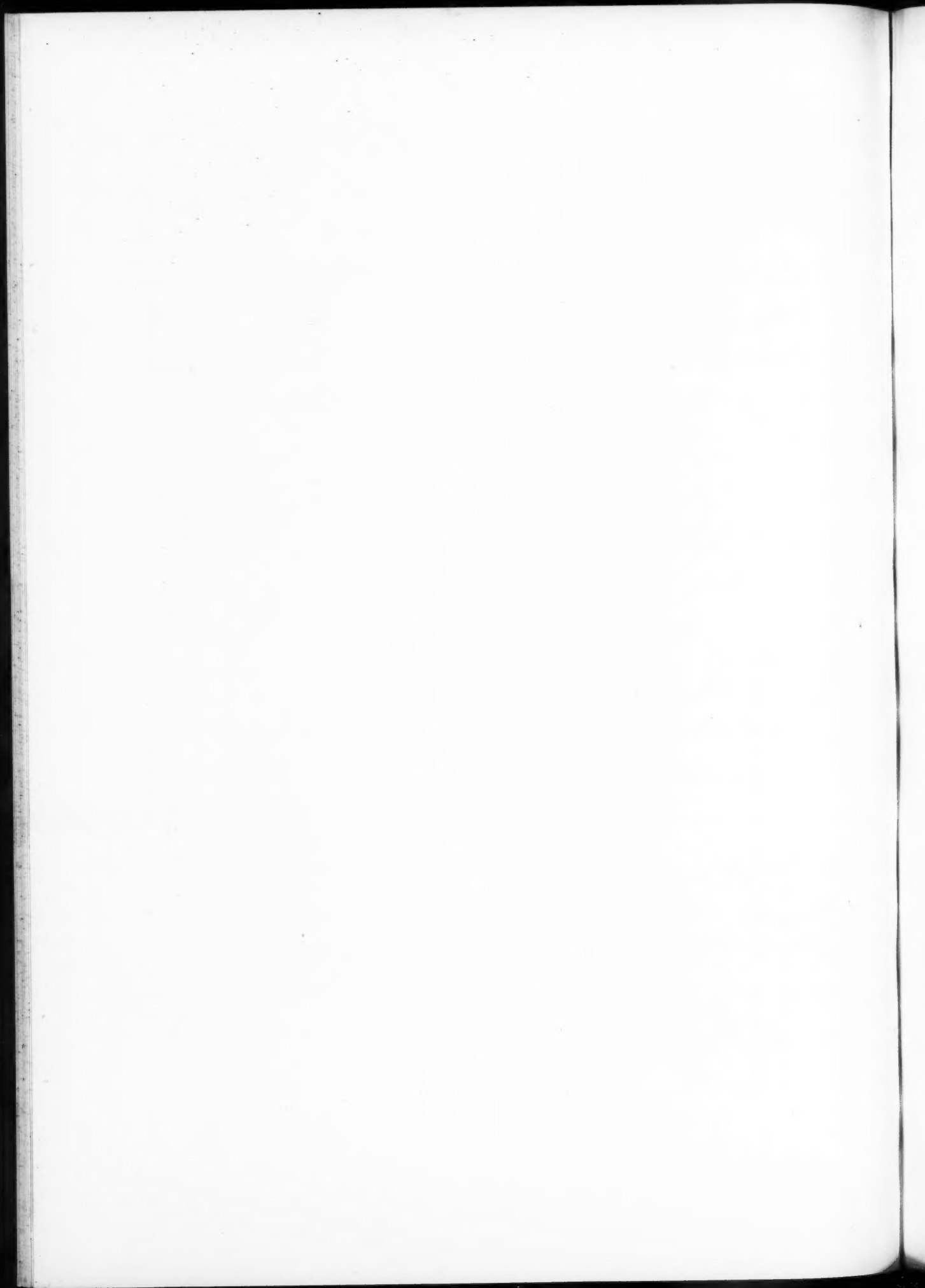




ENTRANCE FRONT

HOUSE OF STEDMAN BUTTRICK, ESQ., CONCORD, MASS.

MR. JAMES PURDON, ARCHITECT





HOUSE OF STEDMAN BUTTRICK, ESQ., CONCORD, MASS.

MR. JAMES PURDON, ARCHITECT

ABOVE is a detail of the living room loggia. On the banks of the Concord River, at extreme right of the picture the Battle of Concord was fought.

At right, Detail of main entrance porch. Columns, balustrade, etc., are of buff Indiana limestone. Floor, red tile. Brickwork, dark red water-struck. Roof, green slate.





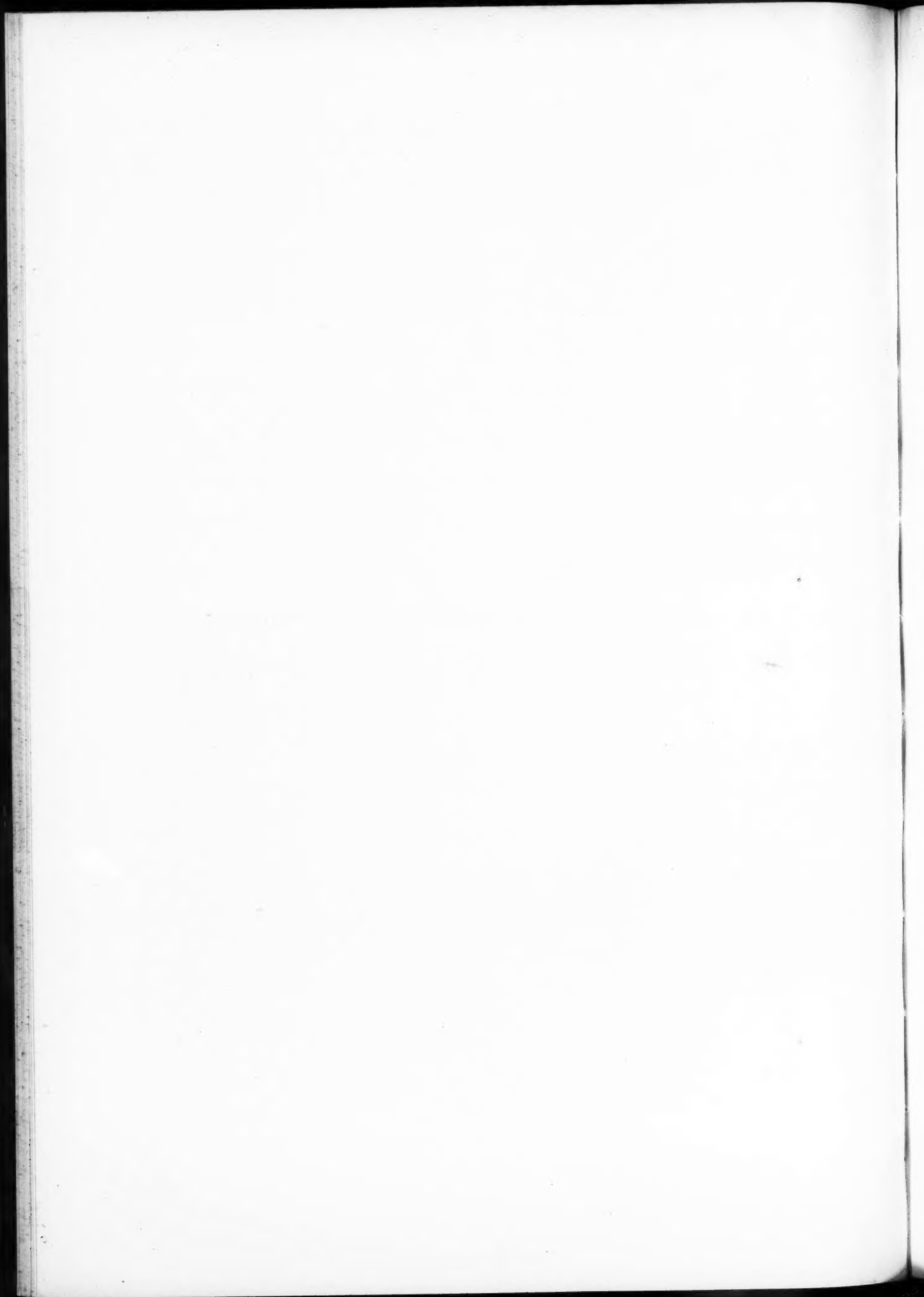
HOUSE OF STEDMAN BUTTRICK, ESQ., CONCORD, MASS.

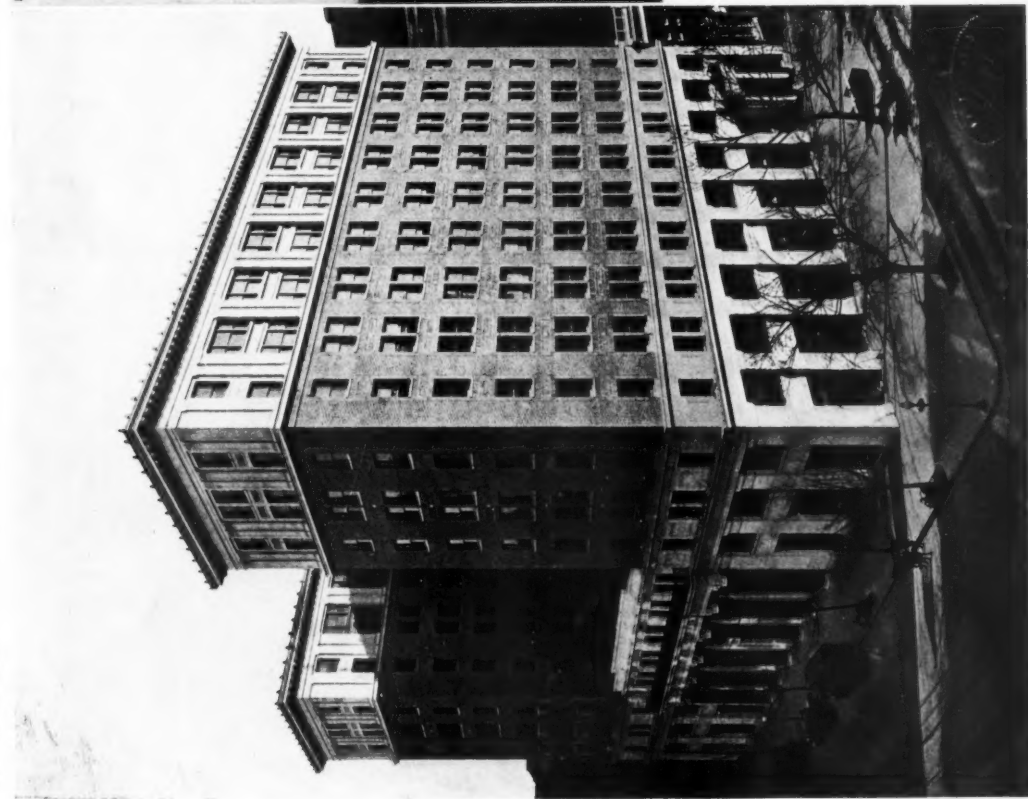
MR. JAMES PURDON, ARCHITECT

ABOVE, at left, the Library. Woodwork of straight slashed weathered oak. Fireplace, buff Indiana limestone.

Above, at right, the Dining Room. Woodwork, natural finish San Domingo mahogany; furniture mahogany, fixtures silver. Walls, soft green and silver grass cloth. Floor, quartered oak on hollow terra cotta tile and reinforced concrete (long span construction). Fireplace, dark green marble.

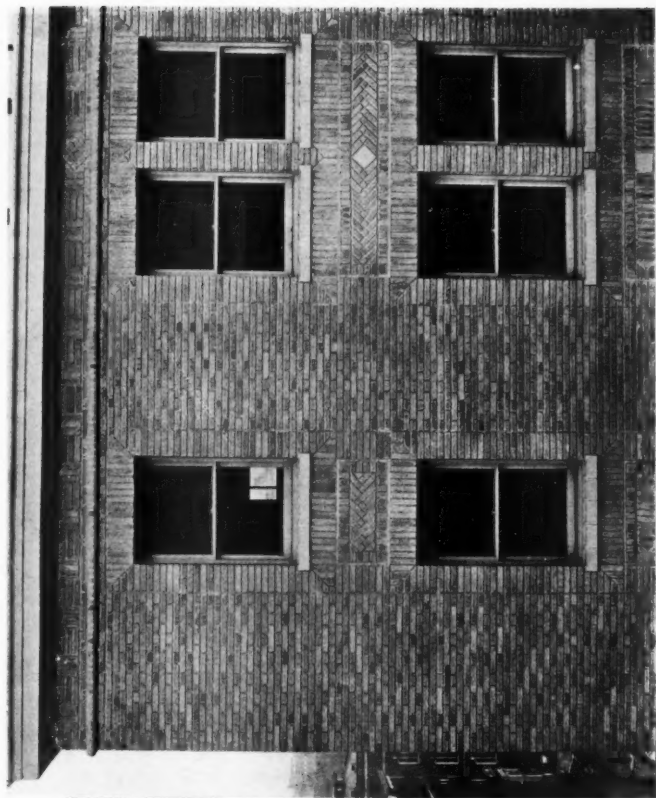
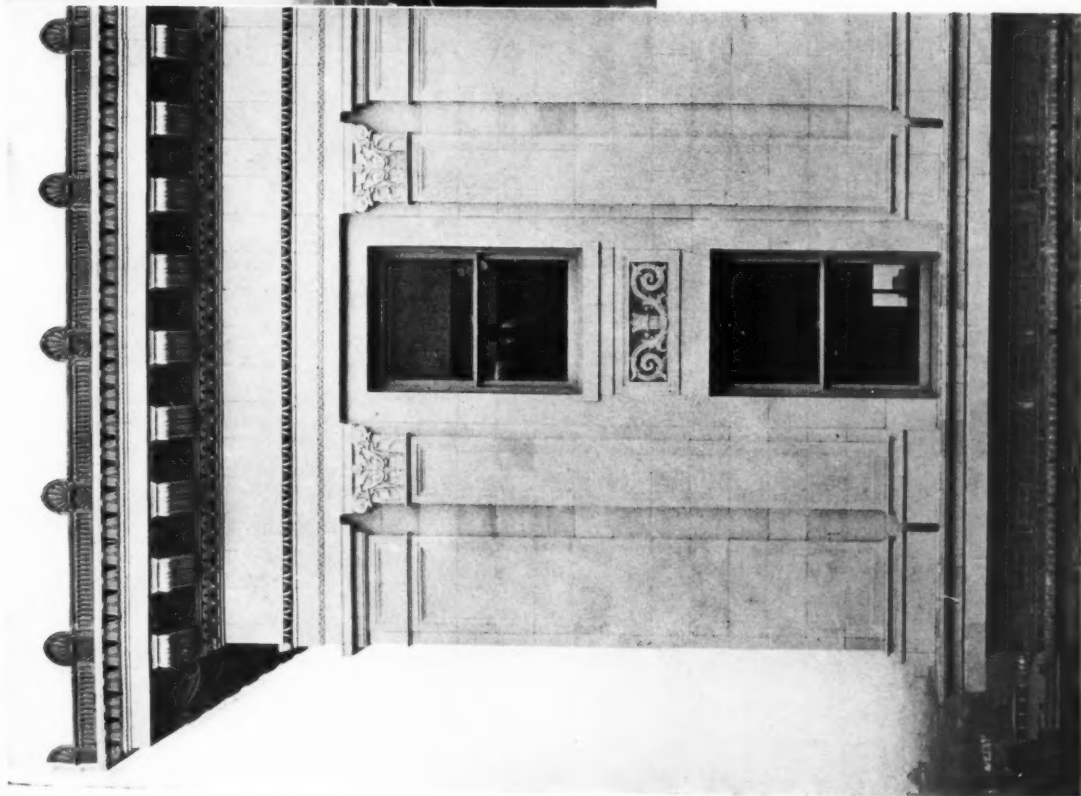
Below, at left, main entrance staircase hall. White wood, painted, mahogany rail.





THE WOODWARD OFFICE BUILDING,
WASHINGTON, D. C.

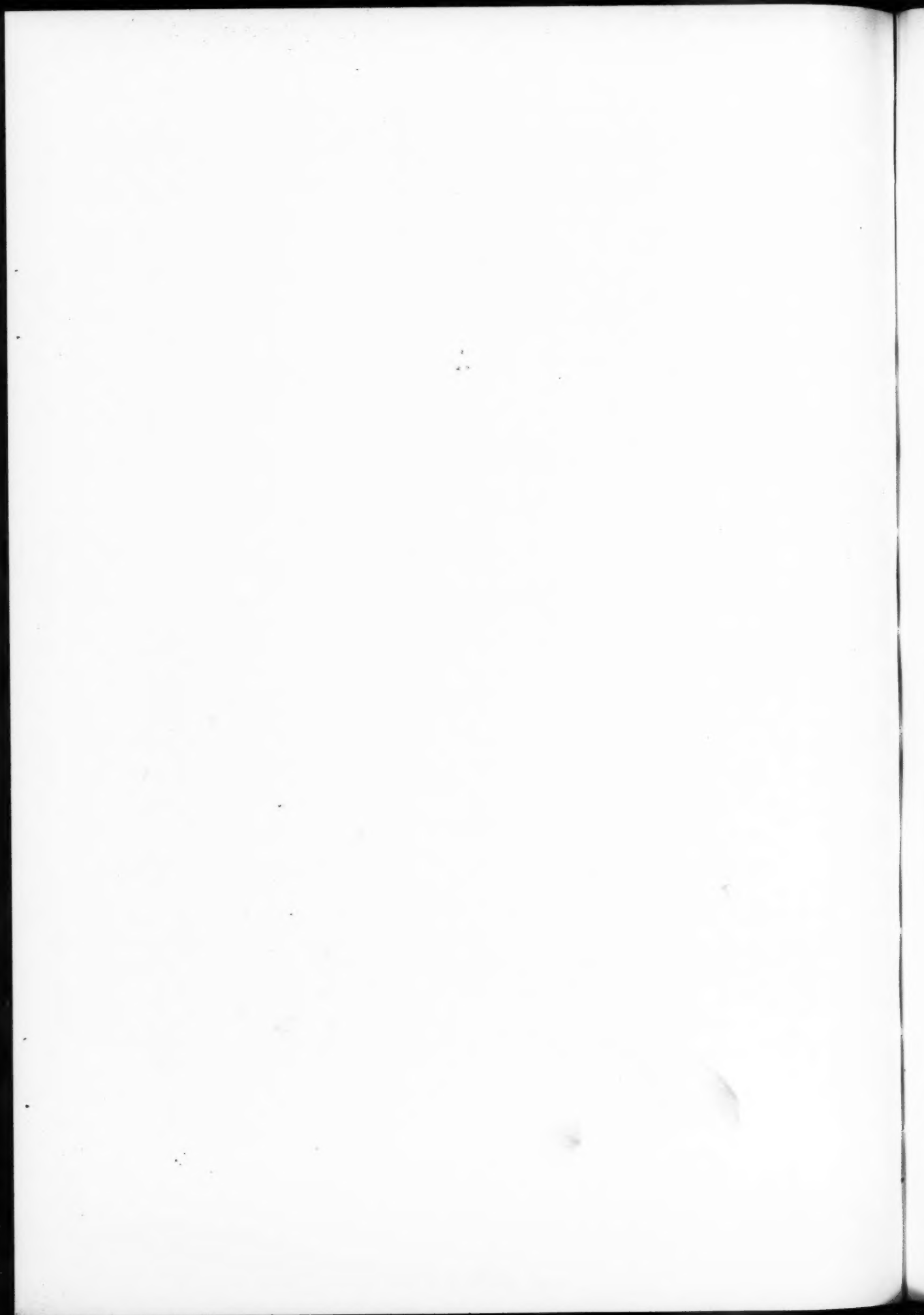
MESSRS. HARDING & UPMAN, ARCHITECTS

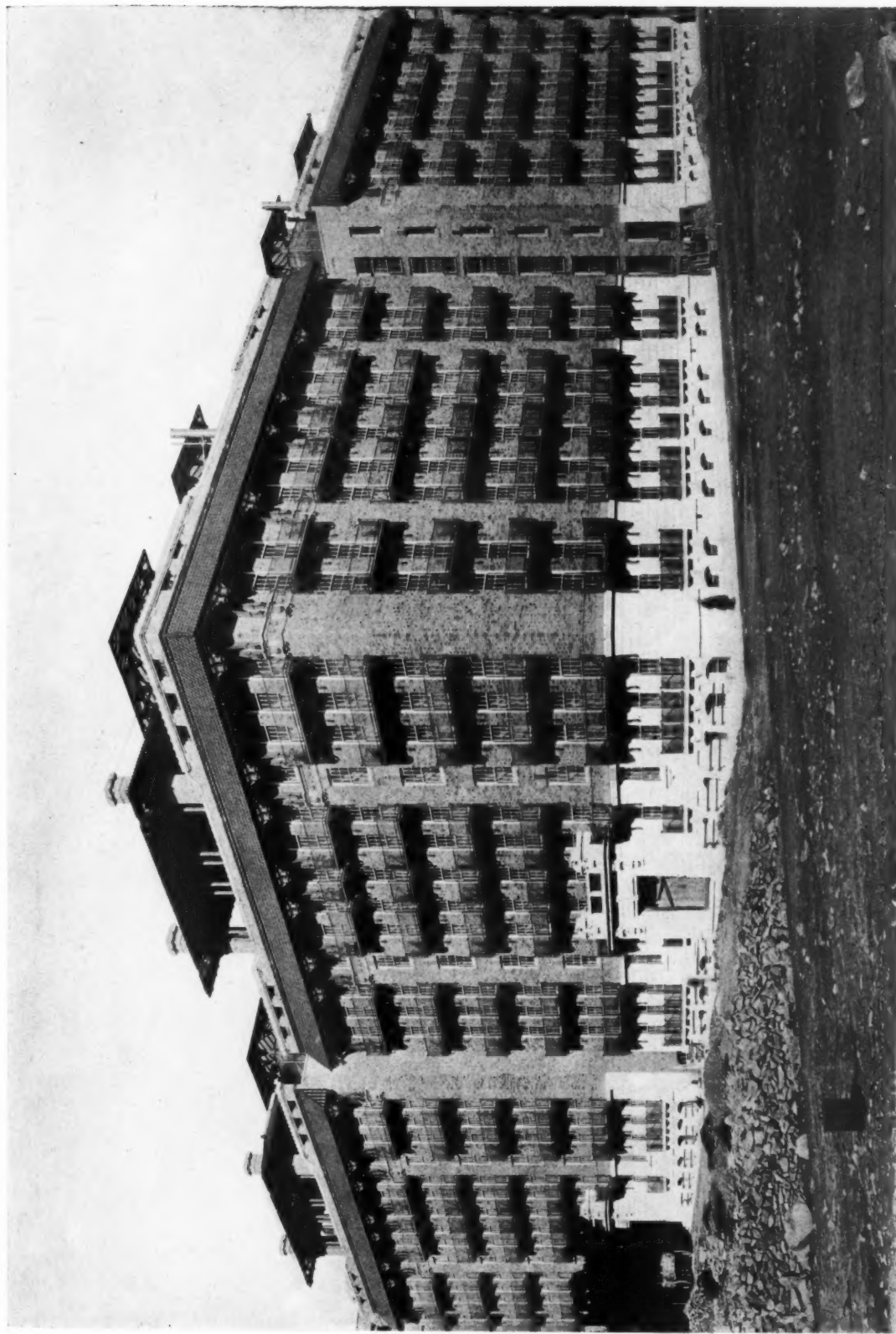


*At left, terra cotta details of upper stories.
Above, brick detail of intermediate stories.*

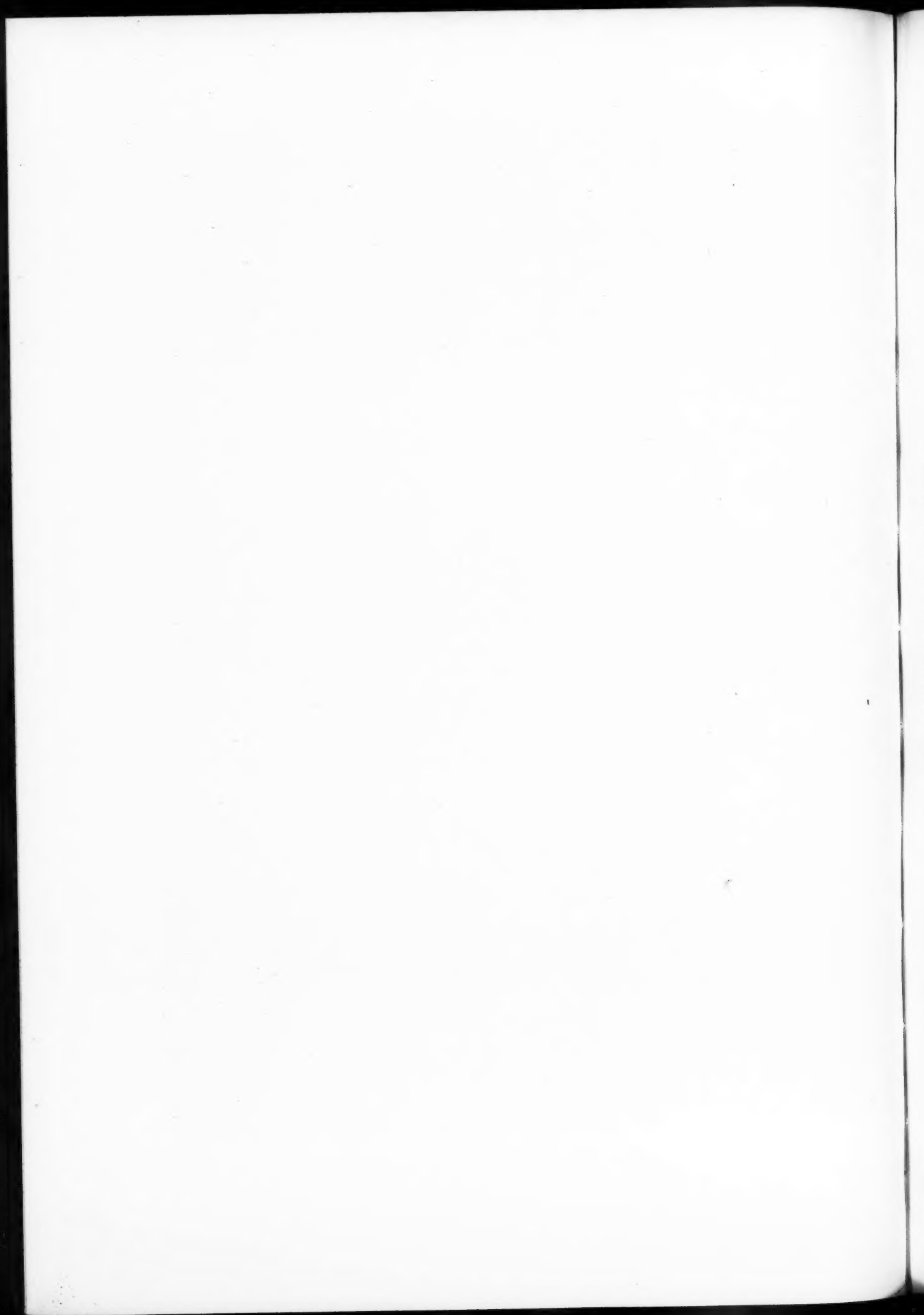
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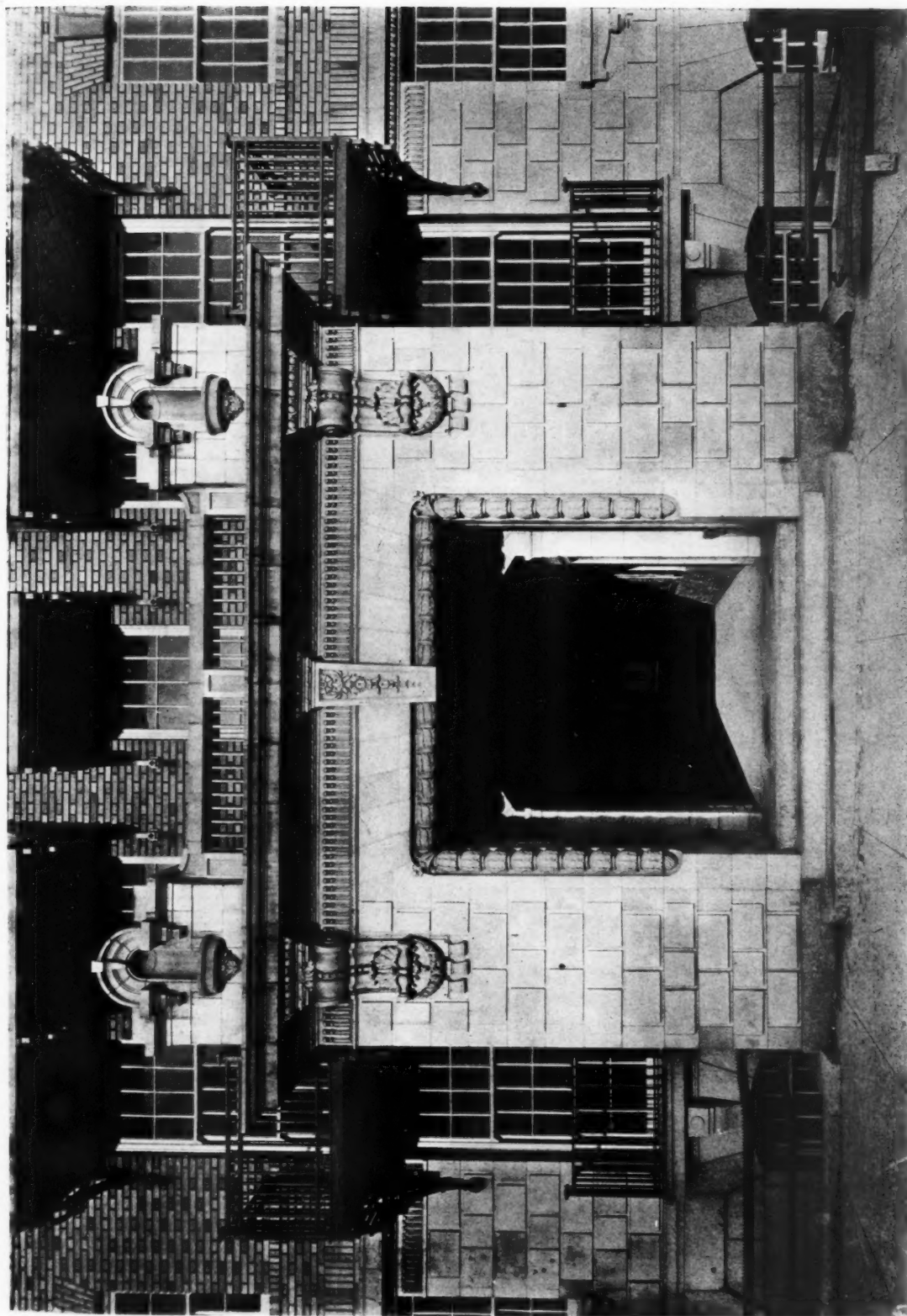
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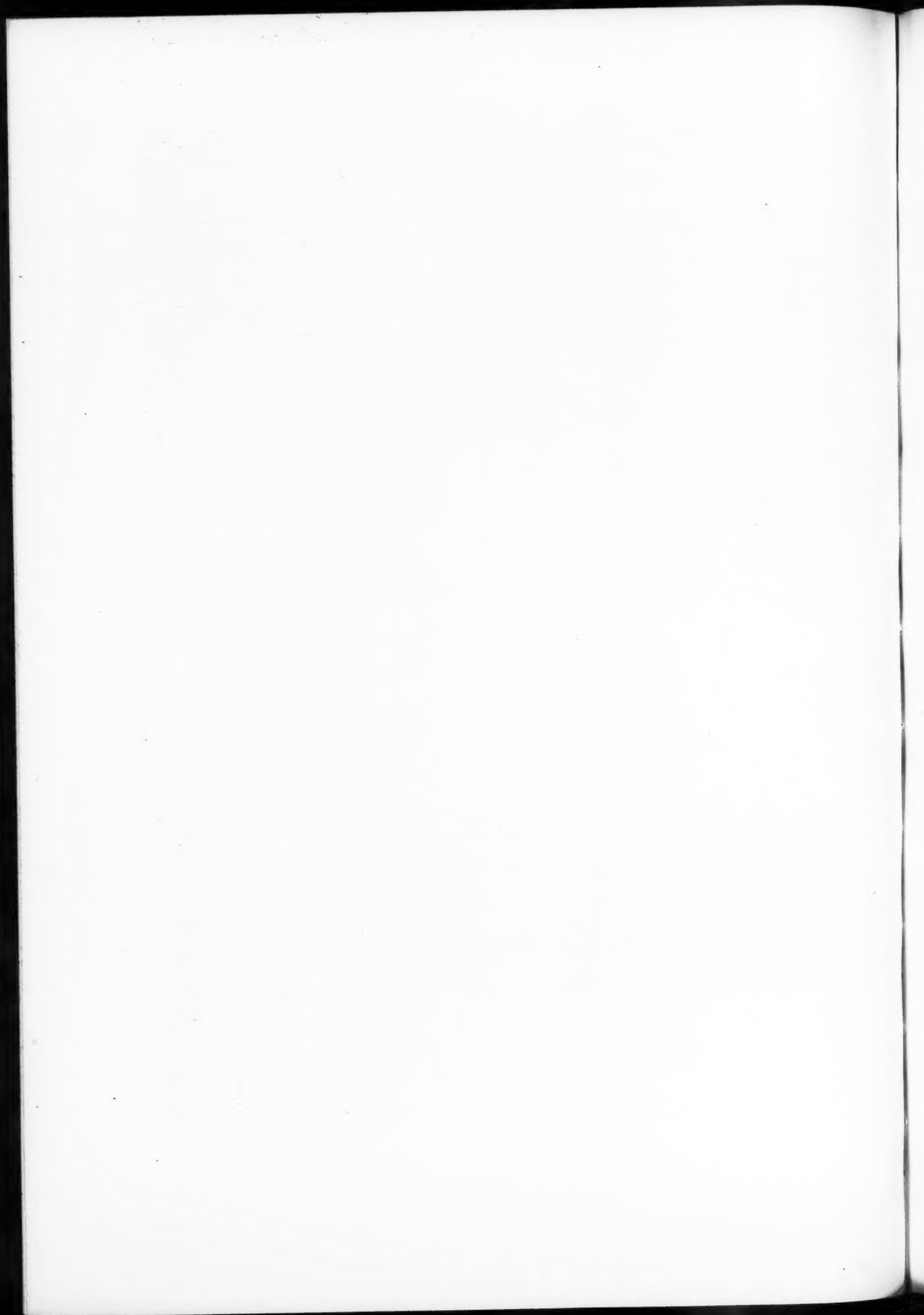
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MR. HENRY ATTERBURY SMITH, ARCHITECT

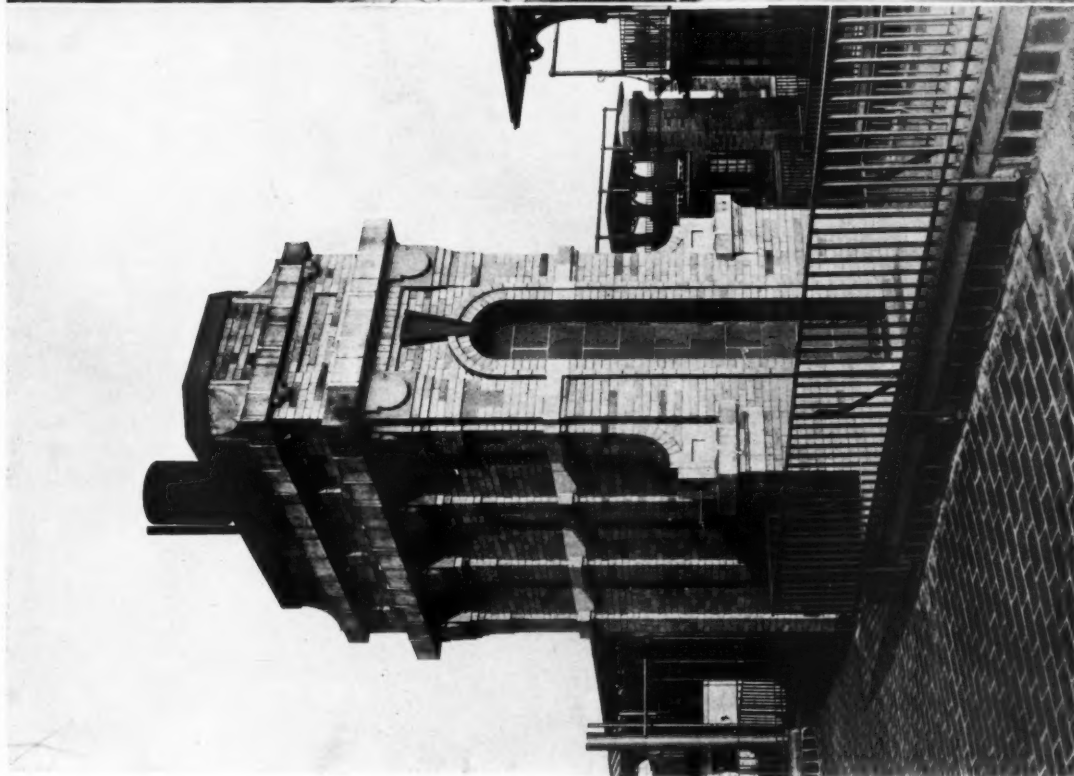




DETAIL OF MAIN ENTRANCE

THE SHIVELEY SANITARY TENEMENTS, NEW YORK
MR. HENRY ATTERBURY SMITH, ARCHITECT

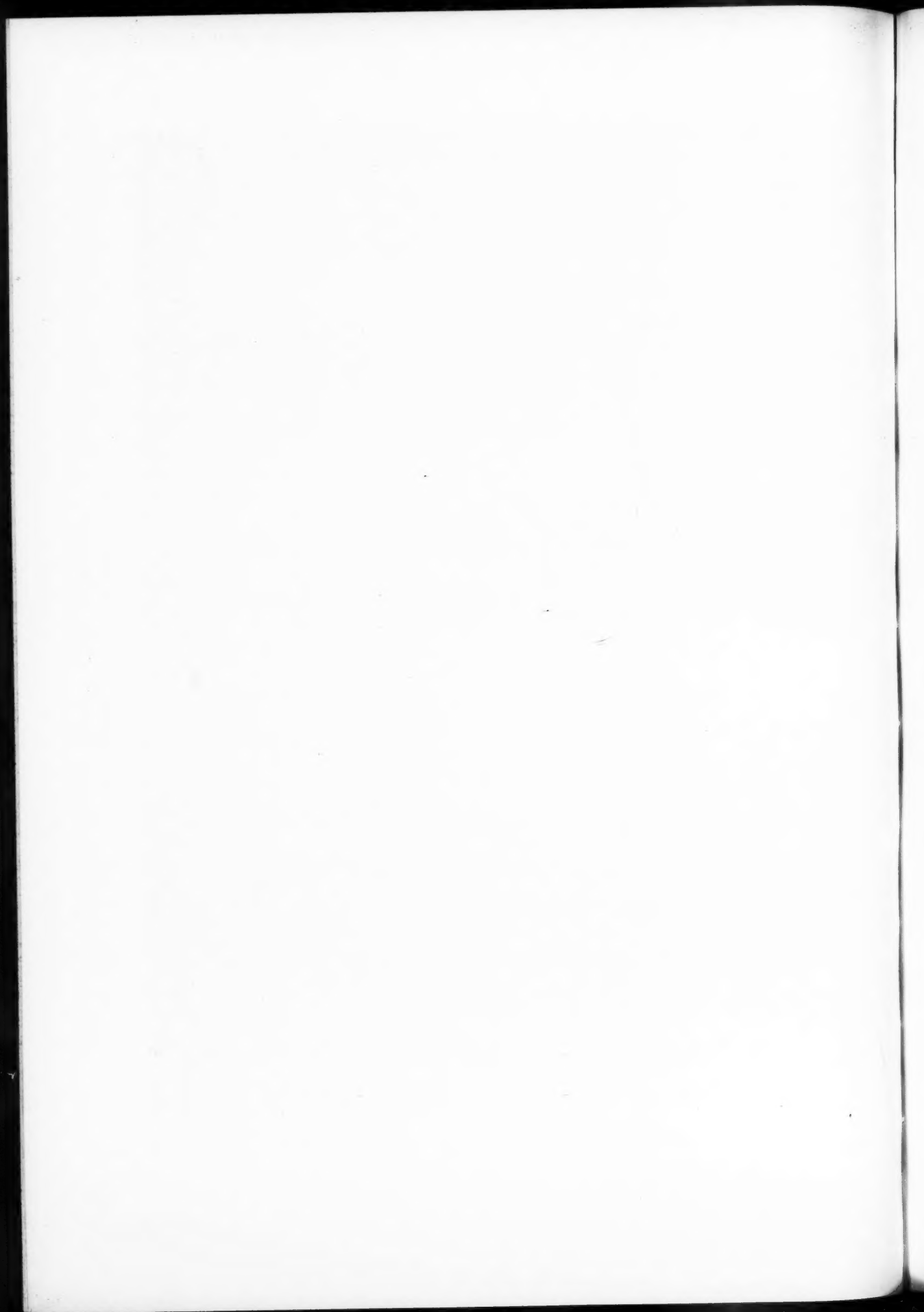


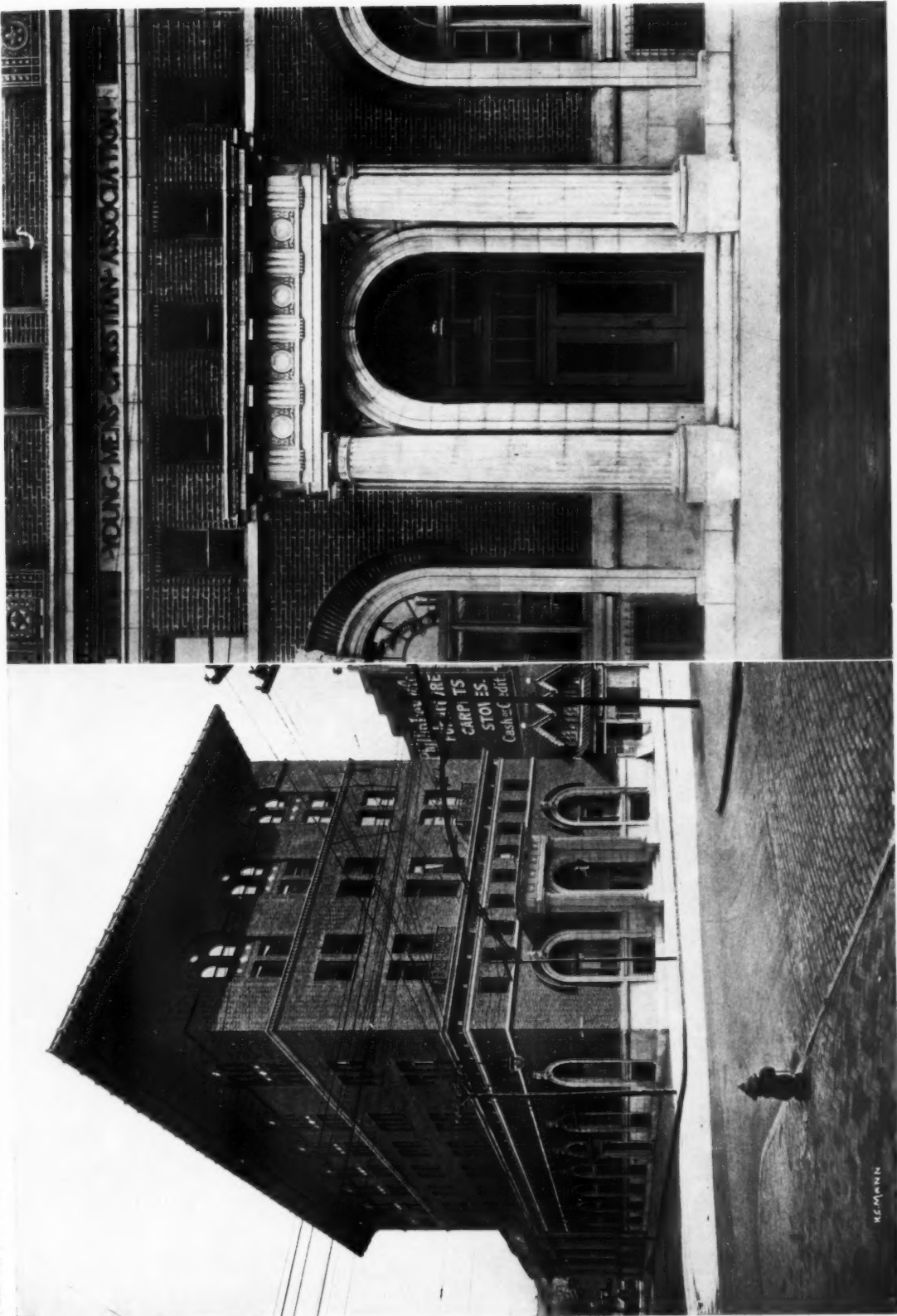


BRICK AND TERRA-COTTA DETAILS—DOORWAY IS IN BRONZE, GREEN GLAZED TERRA-COTTA

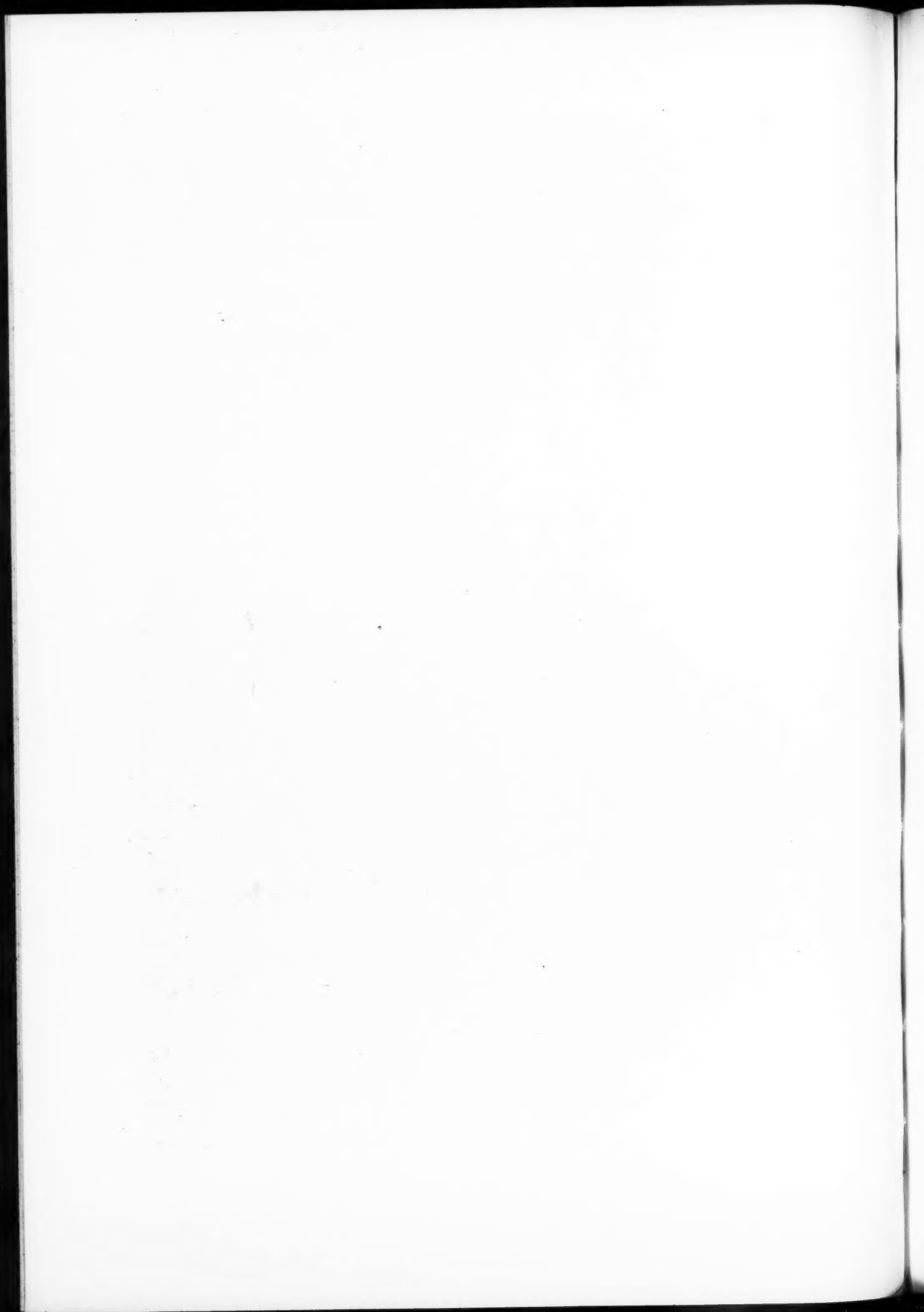
THE SHIVELY SANITARY TENEMENTS, NEW YORK

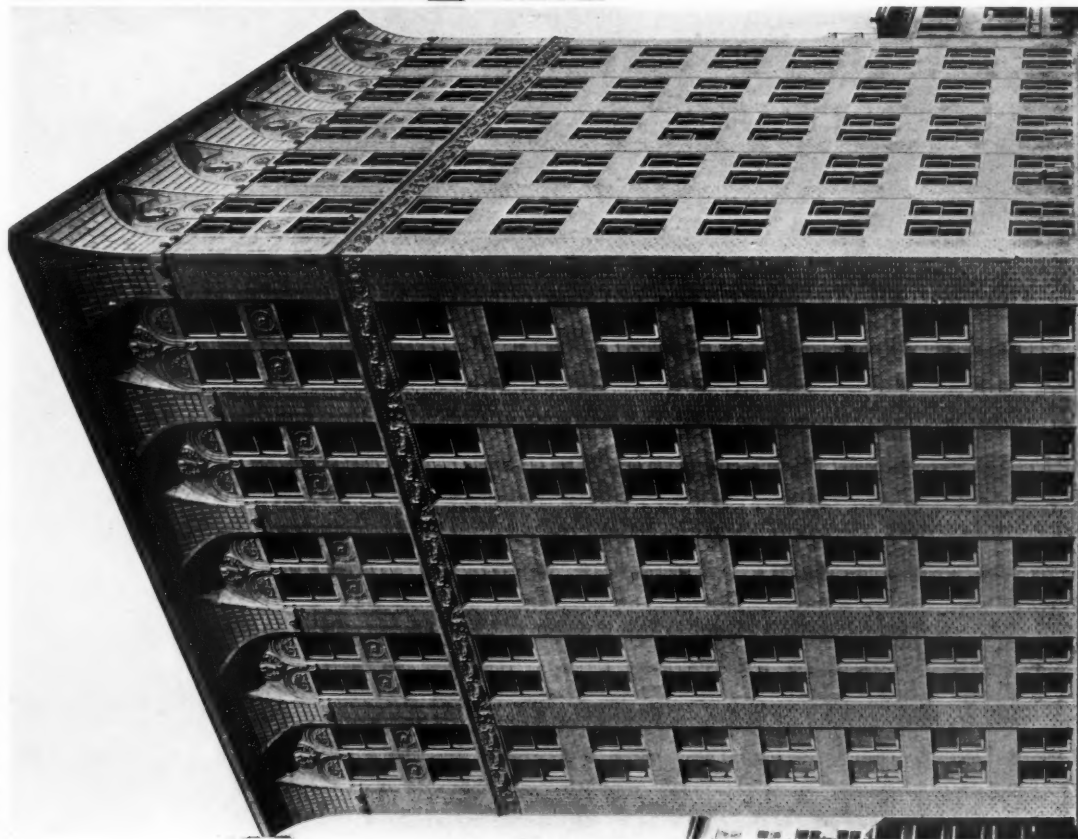
MR. HENRY ATTERBURY SMITH, ARCHITECT





Y. M. C. A. BUILDING, NORFOLK, VA.
MR. R. E. MITCHELL, ARCHITECT





AT LEFT, A LOFT BUILDING ON SEVENTH AVENUE,
NEW YORK

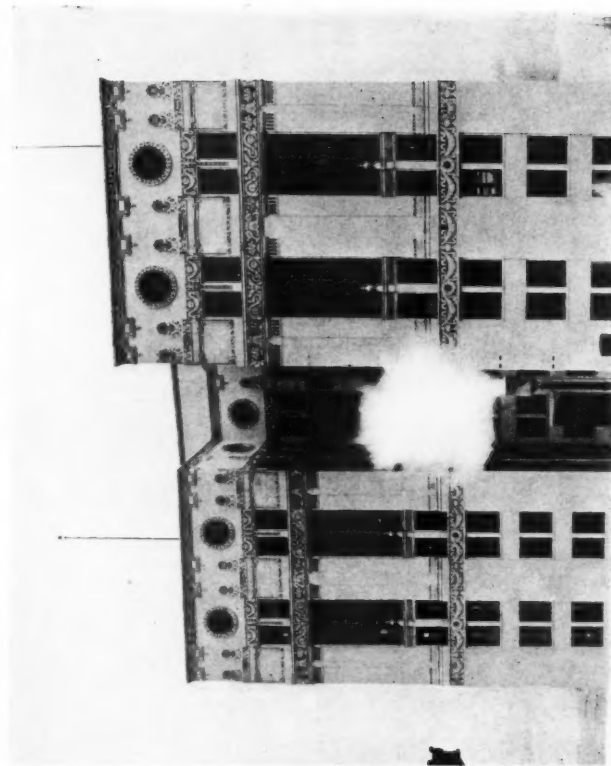
MESSRS. SQUIRES & WYNKOOP
ARCHITECTS

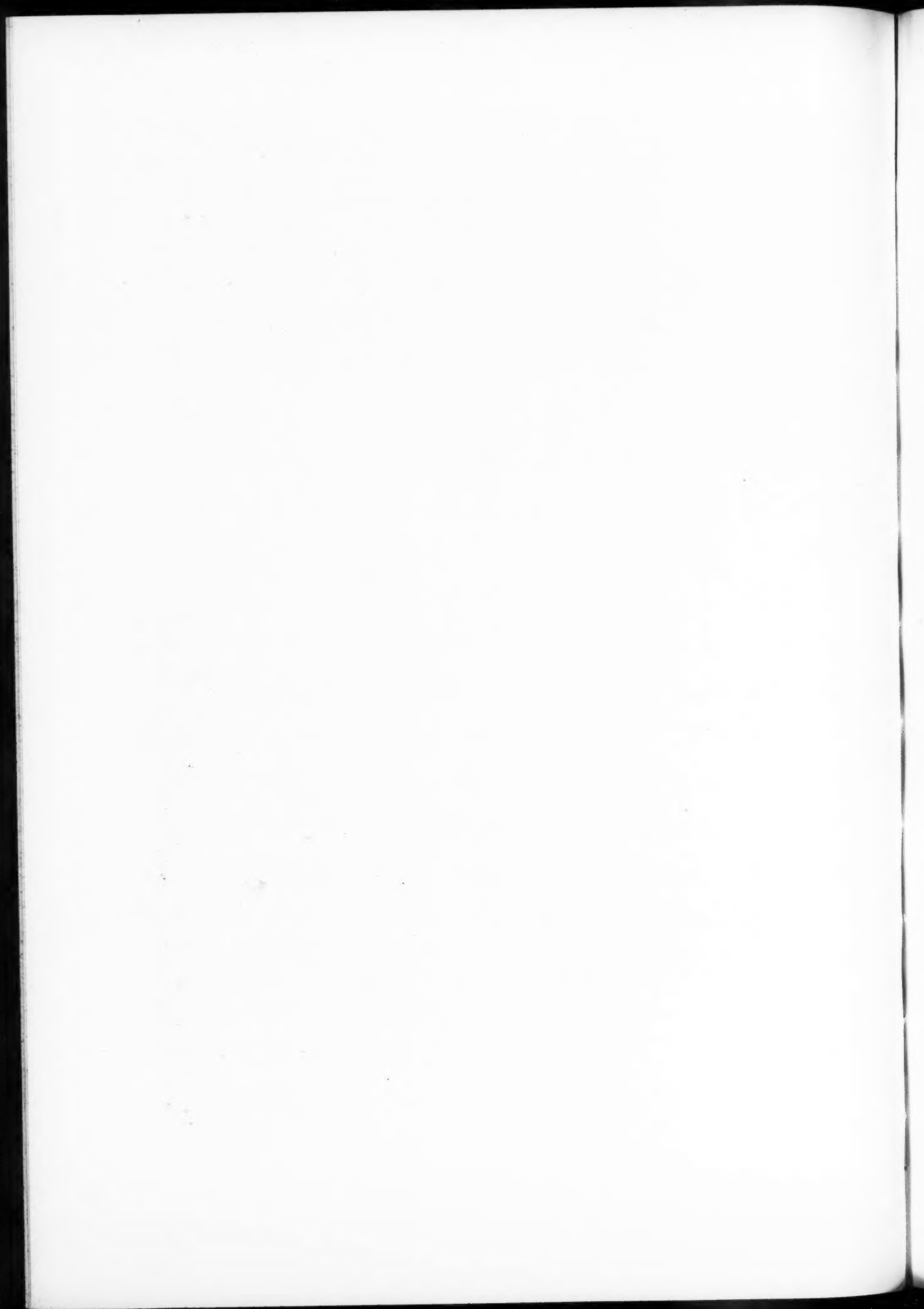
Note the introduction of terra cotta in the cornice.

ABOVE, BUILDING, NO. 80 MAIDEN LANE, NEW YORK

MESSRS. D. H. BURNHAM & CO.,
ARCHITECTS

The panels introduced in upper stories between lintels and sills
are of bronze green terra cotta.





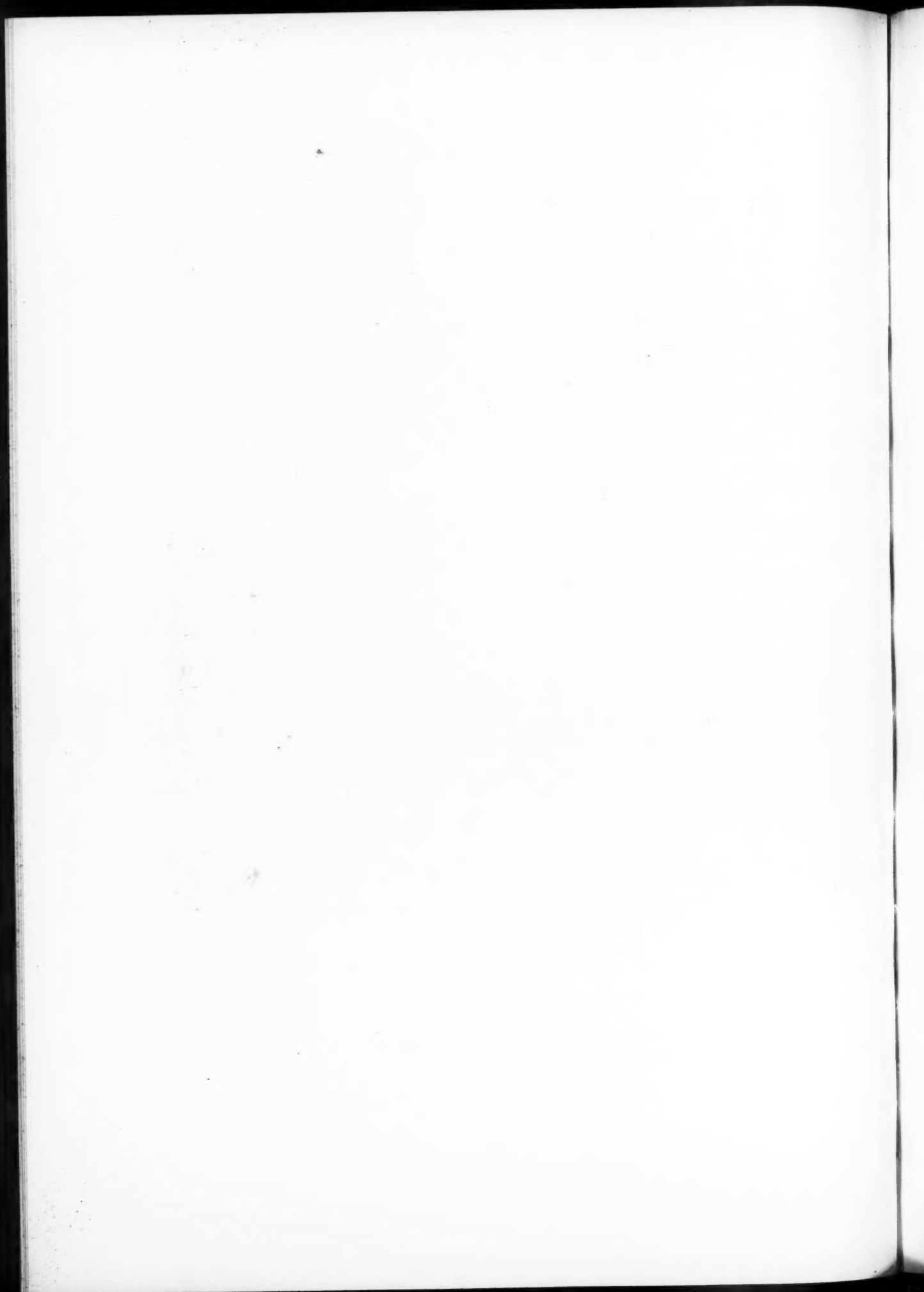


CHURCH, PAROCHIAL SCHOOL AND CONVENT, BROOKLYN, N. Y.
MR. GEORGE H. STREETON, ARCHITECT



INTERIOR, CHURCH OF S. FRANCIS DE SALES, PHILADELPHIA, PA.

MR. HENRY D. DAGIT, ARCHITECT





AT LEFT, THE HAMILTON NATIONAL BANK, CHATTANOOGA, TENN.

MR. R. H. HUNT, ARCHITECT

AT RIGHT, THE MAHONING NATIONAL BANK, YOUNGSTOWN, OHIO

MR. ALBERT KAHN AND MR. A. S. WADE, ASSOCIATED ARCHITECTS

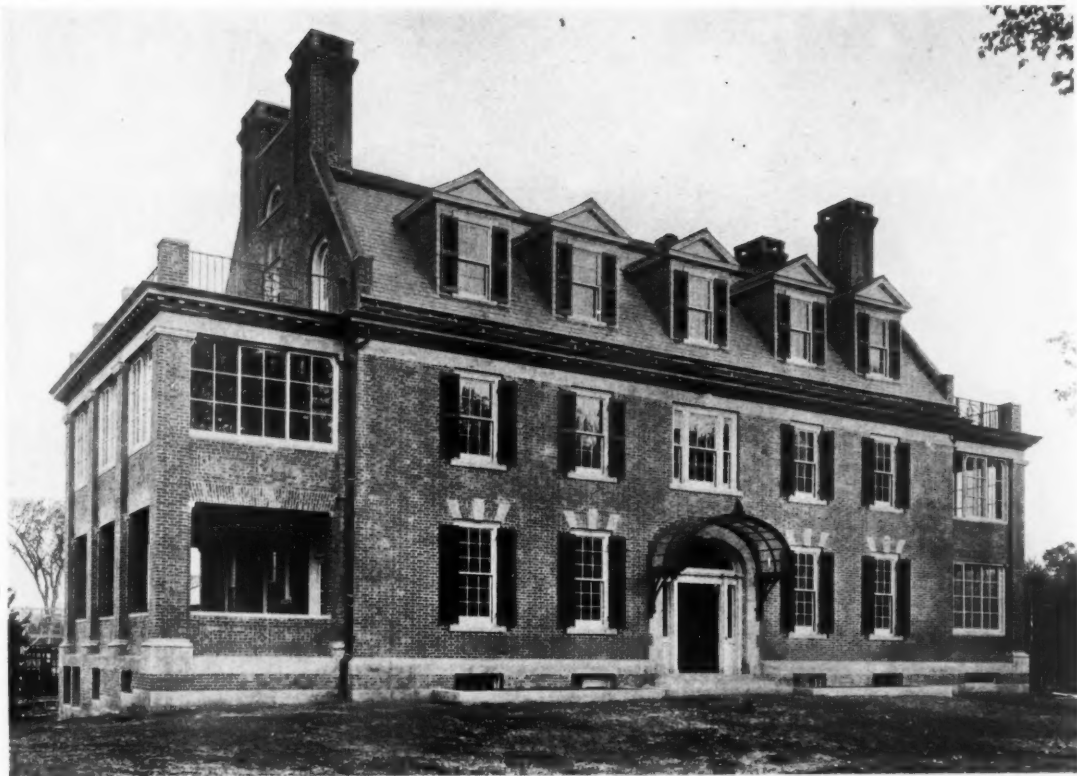




THE WILLIAMS SCHOOL, CHELSEA, MASS.
MESSRS. KILHAM & HOPKINS, ARCHITECTS



THE MICHAEL DRISCOLL SCHOOL, BROOKLINE, MASS.
MESSRS. KILHAM & HOPKINS, ARCHITECTS



THE WILLIAMS COLLEGE INFIRMARY, WILLIAMSTOWN, MASS.

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BALCONY, PALAZZO FRANCHINI, VERONA, ITALY