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·TWO·THIRTY·NINE·WEST·THIRTY·NINTH·STREET·

VIEW OF MADISON SQUARE, NEW YORK, LOOKING SOUTH, SHOWING THE METROPOLITAN TOWER, AND THE FLATIRON BUILDING AT JUNCTION OF FIFTH AVENUE AND BROADWAY

THE AMERICAN ARCHITECT

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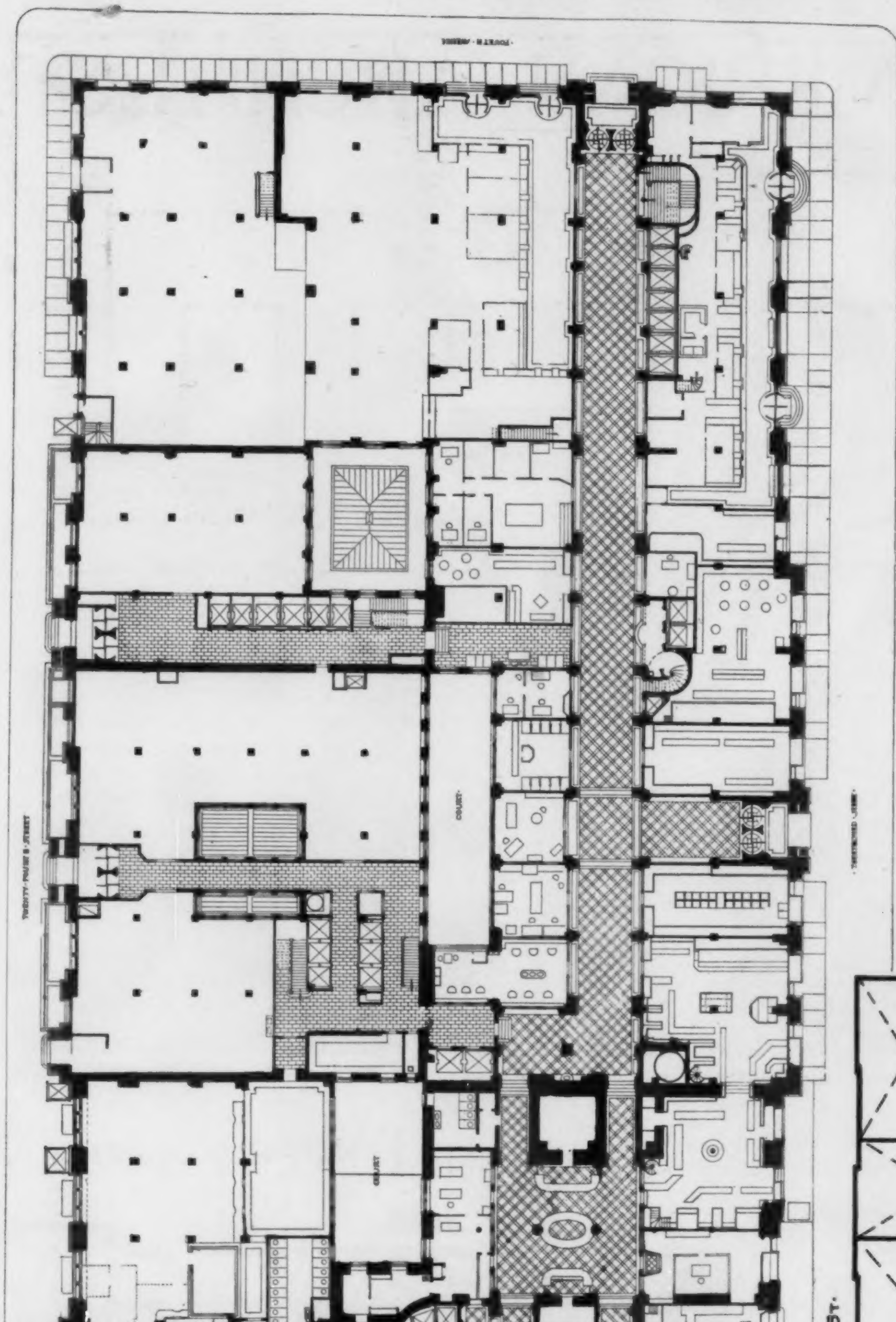
THE METROPOLITAN TOWER

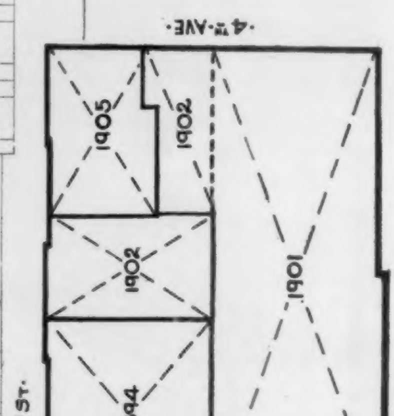
THE Metropolitan Tower, located on the southeast corner of Madison Avenue and Twenty-fourth Street, and forming the northwest corner of the building of the Metropolitan Life Insurance Company, is now about completed. This tower is the highest masonry and steel structure in the world. It is 700 feet 3 inches above the curb, has a frontage of 75 feet on Madison Avenue and 85 feet on Twenty-fourth Street. The tower entrance is on Twenty-fourth Street. Messrs. N. LeBrun & Sons are the architects. The completion of this edifice marks the consummation of this firm's efforts on the Metropolitan Life Building, which now covers the entire block bounded by Twenty-third Street and Twenty-fourth Street, Madison and Fourth Avenues.

Before proceeding to a general description of the structural features of the Metropolitan Tower, its planning and architectural detail, it may be pertinent to refer to the inception and growth of this important office building.

In May, 1890, the first building operations of the Metropolitan Life Insurance Company commenced. The residence on the corner of Twenty-third Street and Madison Avenue was razed, the excavation made, and the building started. In the summer of 1893, this initial part of the building, which had a frontage of 125 feet on Madison Avenue and 143 feet on Twenty-third Street, was completed and the owners took possession.

Additions were made in 1895 and in 1898. The possibility of acquiring the entire block for the expansion of the building, while at that time remote, was not so impossible as to prevent the architects from evolving a scheme that would comprehend the entire area, and



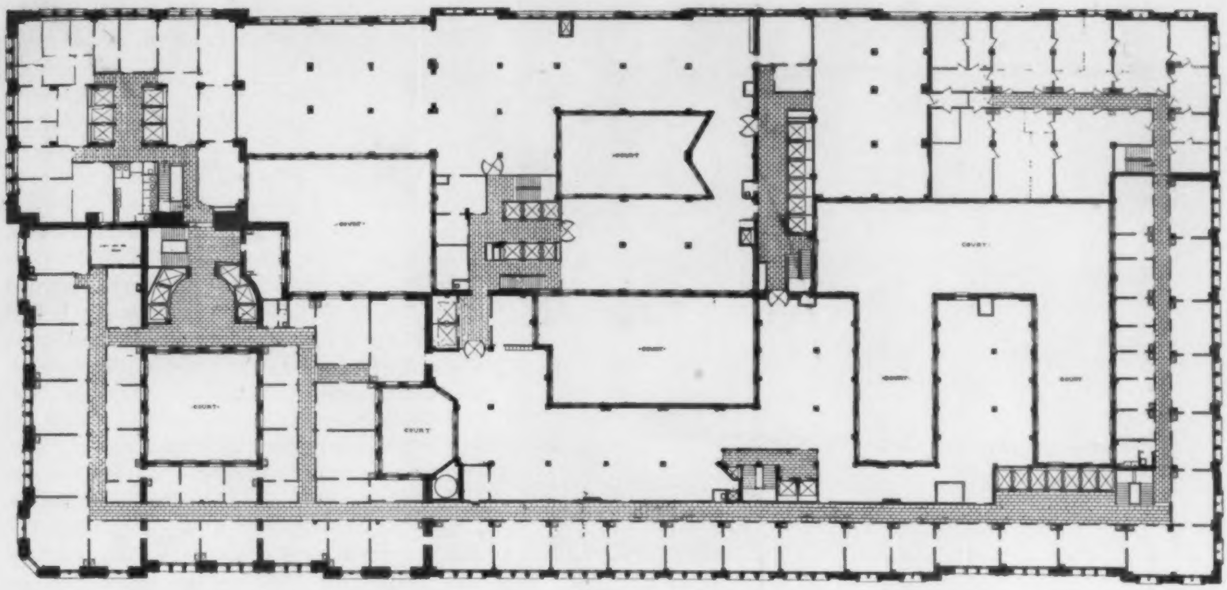


MESSRS. N. LE BRUN & SONS
ARCHITECTS

FIRST FLOOR PLAN

METROPOLITAN LIFE INSURANCE CO.'S BUILDING
NEW YORK

(Small plan at left shows dates of commencement of original building, and the successive additions)

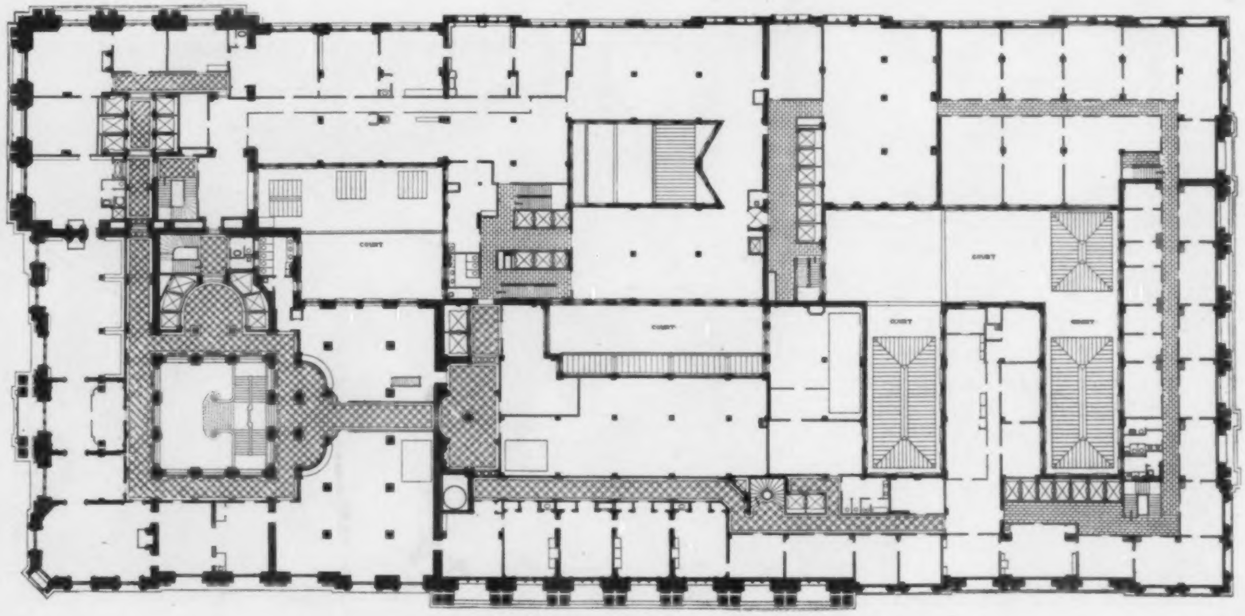


TYPICAL FLOOR PLAN

while none of the final details as to height, etc., were considered, it was part of the original plan to erect at the corner where the tower now stands, provided the ground could be obtained, a tower or campanile that should raise its height above the rest of the building. It would be interesting to follow in detail just how this scheme of planning was worked out, to learn with what difficulty such important buildings and the land they occupied as the Venetian-like Gallery of the National Academy of Design, and the Church of the Madison Square Presbyterian congregation, better known as "Dr. Parkhurst's," were acquired and razed to make way for this building. The tower stands on the site of the original Dr. Parkhurst's church—the new edifice having been erected directly opposite the tower on Twenty-fourth Street.

To comprehend the successive stages from the inception of the building to the completion of the tower, the accompanying plan of the ground floor will be of assistance. The various parts are marked distinctly with the initial dates of their erection.

As to the architectural style of the building the illustrations shown explain in detail. The tower, treated as a composite, conforms in its design to the rest of the building, with such variation of scale in its component parts and in its details of moulding and ornament as would appear to be necessary in so tall a structure. The small dome which surmounts the whole is gilded, and



SECOND FLOOR PLAN

VIEW SHOWING STRUCTURAL MEMBERS ENCASED IN CONCRETE

with the white marble used in construction, forms a bright landmark easily distinguished at great distances. When viewed from the decks of incoming ships, or from the mountains along the Orange Valley or the Palisades of the Hudson, either in the bright sunlight or the diffused light of a cloudy day, the effect is one that impresses the spectator.

Three hundred and forty-six feet above the curb, at the twenty-fifth, twenty-sixth and twenty-seventh stories, is the great clock with its well atuned chimes and the deep-toned resonant bell, 7,000 pounds in weight, that strikes the hours.

Constructionally, the Metropolitan Tower is of course fireproof. The main details of the engineering problems of the steel work are set forth in Mr. Hall's article which appears in this issue.

The solid rock required for the support of this massive structure, weighing more than eighty-five million pounds, was reached at depths varying from 28 to 46 feet below the curb level, many preliminary borings having been made to ascertain the character of the substratum.

As the stability and substantial durability of these composite constructions of metal and masonry are in large measure dependent upon the thoroughness with which their structural steel members are protected from the destructive action of rust and fire, particular attention was given to the matter of the painting and the concrete casing of the steel work. Any defects in or damage to the "shipping coat" of paint were corrected on delivery at the building and after erection, and the finishing coats were laid on by "day's work" under strict and special supervision.

In addition to this protection all the columns, girths, girders and wind braces were encased in a manner claimed to be unusually thorough with *reinforced concrete,* composed of a one to two mixture of Portland cement and sand carefully packed and consolidated within wooden "hoardings" or boxing *so as to eliminate all air spaces or pockets between the concrete and the metal.* The interior of the lower tiers of columns, and the foundation grillages were likewise filled with concrete. The "hoardings" used were framed in detachable sections ingeniously bolted together and were removable and continuously used as the erection progressed. This concrete protection, which the San Francisco conflagration proved to be so efficacious against the action of fire, acts also as a most excellent rust preventive. It completely encased the steel in no place less than two inches, and along the soffits of the girths and girders the thickness was increased to three inches. Wherever the exterior marble facing and the brick backing adjoined the steel work the same care was taken to avoid air spaces, and the steel was first parged a full half inch with rich cement mortar and the masonry work was thoroughly grouted.

The marble and brick work was firmly tied and anchored throughout to the structural steel work by specially formed anchors, straps, eye bars and dowells. At every story at least one course of the marble work extends through the entire thickness of the wall, and the steel frame was so designed, in connection with this binding and anchoring, as to sustain the weight of the marble work to its extreme outer face.

The floor arching is of armored cinder concrete, filled in solid at the haunches, the lower flanges of the beams and girders being first protected by two inches of concrete as before described. The finished flooring laid

VIEW SHOWING FLOOR SYSTEM AND STRUCTURAL ARRANGEMENT solidly over these arches is of well laid Terrazo mosaic.

This system of solid arching and flooring, and the very thorough manner in which the concrete and masonry work was made to closely encase the structural framework which was so admirably contrived in the designing of the steel frame, having contributed, in a measure, to the stiffness of this lofty tower under extreme wind pressure. On the fiftieth story (660 feet above sidewalk) during the highest winds thus far experienced there was no perceptible sway or vibration.

The ceilings throughout were hung to permit the running of electric conduits below the beam protection, and throughout the building the precaution was taken in all cases to run all pipes and conduits *outside* the concrete and masonry casing of the steel work, thus eliminating one source of danger in prolonged conflagrations.

The very complete illustration of details which we are enabled, through the courtesy of the architects, to present to our readers, show more clearly and technically the salient features of the plan and methods of construction and fireproofing than any amount of descriptive text.

Suppressing the tendency that is ever present when referring to any achievement which marks a record in a field of endeavor, we cannot refrain from a word of congratulation to the architects, whose constant supervisory care, together with the various departments under their direction, have completed a structure which will stand, we feel sure, for some time at least, as one of the most successful buildings of this period.

A RECENT LEGAL DECISION

Effect of Architects' Certificate—Honest Mistake

A building contract provided that "the architects' and superintendents' opinion, certificate, report and decision on all matters to be binding and conclusive on the party of the second part." The words "on all matters," it was held, referred to all the matters about which the architect under the contract was authorized to make a certificate, and in the absence of a provision in the contract making the architect the arbiter of all matters of difference between the parties on final settlement after the completion of the work the architect had no power to certify as to what was due from the owner to the contractor according to his opinion and statement of the account between them.

On the other hand, as to all matters coming within the purview of the architect's powers and duties, as specified in the various provisions of the contract his "opinion, certificate, report and decision" are as binding upon the owner as upon the contractor, notwithstanding that the contract expressly specifies that they are "binding and conclusive on the party of the second part (the contractor)." The owner cannot escape the binding force and effect of the decision of one whom he expressly appointed and authorized to make decisions for him.

Although the certificate, report, opinion and decision of the architect are made conclusive by the contract, the law writes into this provision that the conduct of the architect must be free from fraud. If he fails, therefore, to exercise his honest judgment, or makes such gross mistakes as necessarily imply bad faith, his decision, report, certificate and opinion are not binding upon the parties. But an honest mistake on the part of the architect will not have this effect, and where, as in this case, the contract stipulates for liquidated damages for delay in completing the work, the penalty will be enforced though the delay is caused by the honest mistake of the architect in directing something to be done although the act directed was unnecessary.

The question whether delay in completing the contract was or was not caused by fraud or bad faith on the part of the architect was held to be one for the jury.—Boston Store v. Schleuter (Supreme Court of Arkansas), 114 South Western Reporter, 242.

VIEW FROM SOUTHWEST DURING CONSTRUCTION

DESCRIPTION OF THE STRUCTURAL STEEL FRAMEWORK FOR THE TOWER OF THE METROPOLITAN LIFE INSURANCE BUILDING, NEW YORK CITY

Any adequate conception of this great tower presents to the mind three dominant characteristics, namely: strength, beauty and utility; one satisfying the requirement of safety, another appealing to the æsthetic nature of man, and the last justifying an expenditure of money and labor requisite to give the idea form and substance, projecting the thing conceived from an ideal into a material realm.

With the first named characteristic, only, is the structural engineer concerned, and it is obvious that the engineering features involved in the structural steel framework of the composite construction of such a monument must be designed in strictest subordination to and in conformity with the architectural requirements of its design and plan.

The writer, therefore, leaving to others the consideration of the artistic attributes of the tower will confine his attention strictly to the description of that hidden steel skeleton or framework which, now concealed from sight within that charming architectural envelope of marble, brick and concrete masonry, has yet the all important function of giving support and adequate strength to this tallest of human habitations.

How to resist the forces of wind and gravity constitutes the specific engineering problem in every tall building. That problem on a large scale has been solved in this structure by methods most of which had become already familiar. The adequacy of the usual forms of skeleton construction and the absence of experimental methods in such a structure are reassuring. The forces here encountered, however, are of such magnitude as to require members of unusual proportions, the design of which demanded careful analysis and much attention to details.

Practically speaking, the tower may be regarded as a many storied office building. It is a rectangle 75 x 85 feet in plan, the arrangement of which is best subserved by a spacing of interior columns wide enough to require the use of 12 inch floor beams and girder of greater depth. The wall columns, being spaced to suit the fenestration, divide each of the four enclosing walls into three panels. The weight of the tower is thus distributed over twenty columns, of which the twelve wall columns bear 75 per cent. of the total load.

The largest column, carrying a load of 7,500,000 pounds, rests upon a cast steel base 3 feet high and 7 feet square, supported by steel grillage composed of four courses of 24-inch I-beams. In this manner the load is spread over the rock at a unit pressure of 50,000 pounds per square foot.

The column arrangement is well suited to the structural requirements. The heavy loads upon the exterior columns are conducive to great stability; and the huge columns necessary to carry these loads form part of a very rigid system of wind bracing. The shapes of the column sections used in the walls were dictated by the wind bracing requirements. The bracing is of a familiar type, consisting of riveted plate girders with channel knee braces at corner columns where the wide piers permit, and gussets in the narrower piers at intermediate columns (Fig. 3).

In the lower stories where the wind stresses are greatest, a twin system of bracing is used—one girder with its braces on the outside of column center line, and one on the inside—the corner columns being of special design to afford easy connection for the double system (Figs. 4 and 5). At the twelfth floor and above, the inner girder and bracing give place to a simple I-beam carrying the floor, while the outer bracing system continues to the top of the columns, the sections and connections being gradually reduced in harmony with the reduced wind stresses.

The exterior columns are respaced at the twenty-ninth floor and terminated at the thirty-first floor, excepting the corner columns, which end at the thirty-fifth floor. From the thirty-first to the thirty-fifth floors the large tower is telescoped by a smaller one of similar shape and similarly braced which runs straight up to the thirty-ninth floor. Here the vertical walls are capped with a marble cornice from which rises a sloping marble roof in form of a truncated pyramidal spire to the soffit of

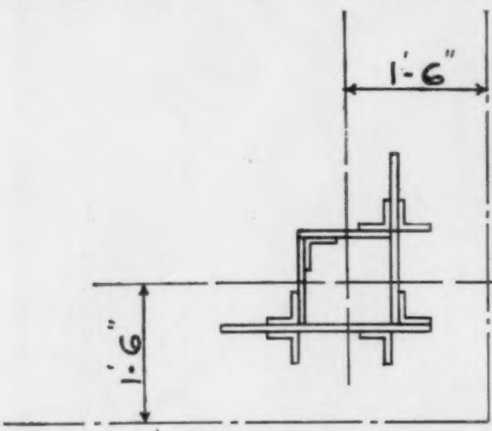


FIG. 1

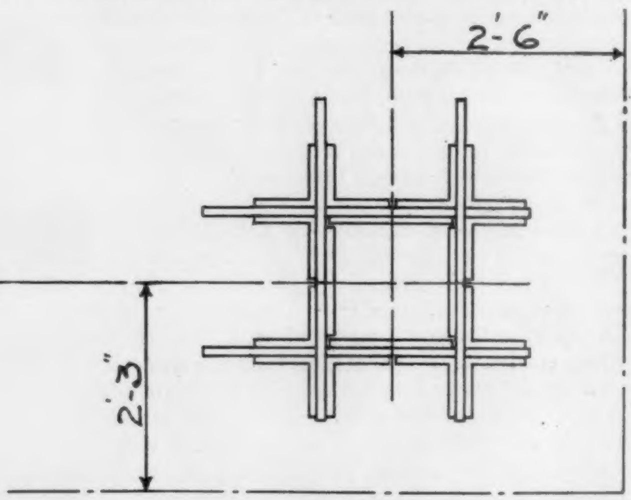


FIG. 2

lookout balconies at the forty-fifth floor. The eight interior columns maintain their vertical alignment from the foundations to their intersection with the rafters of the spire-shaped roof just described.

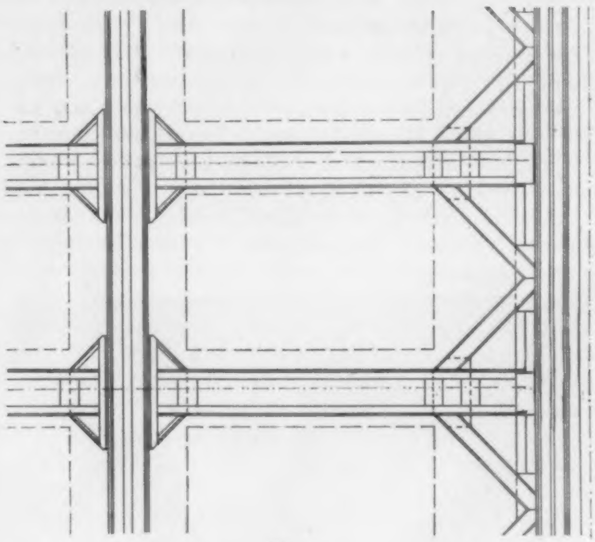


FIG. 3

Above the forty-fifth floor a braced frame for the observation turret, and the lantern framing complete the steel construction, at an elevation of 700 feet above the sidewalk, or 40 feet above the bottom of lowest grillage foundation.

The marble ashlar facing of the tower bears upon the flanges of the wind bracing girders, which afford a very firm and satisfactory support. The slightly projecting corner piers are carried on shelf angles, which are riveted to the columns and to stiffeners on the girders (Fig. 6). Generally the extreme outer edge of supporting steel is kept 4 inches back from the outer face of wall or pier, so that the steel is well protected from the action of the elements.

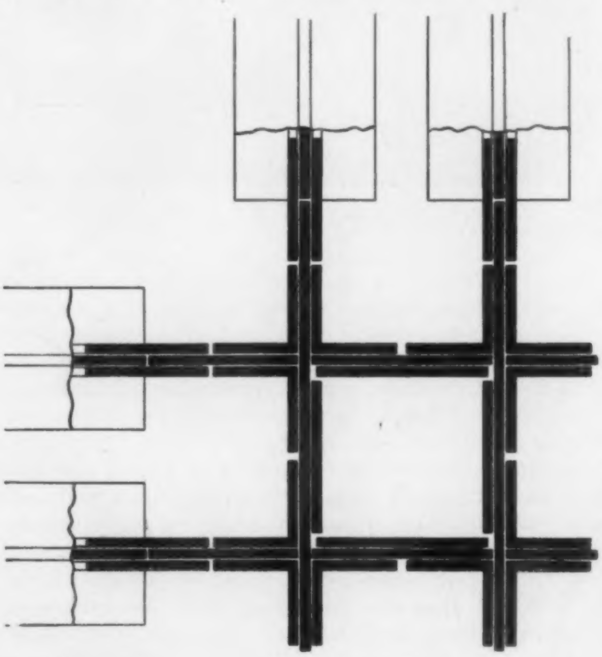


FIG. 4

The shaft of tower having an entasis of 1 foot 6 inches in its short axis and 2 feet in its long axis, the outside faces of walls gradually approach the column centers as they rise. The extreme positions are shown in Figs.

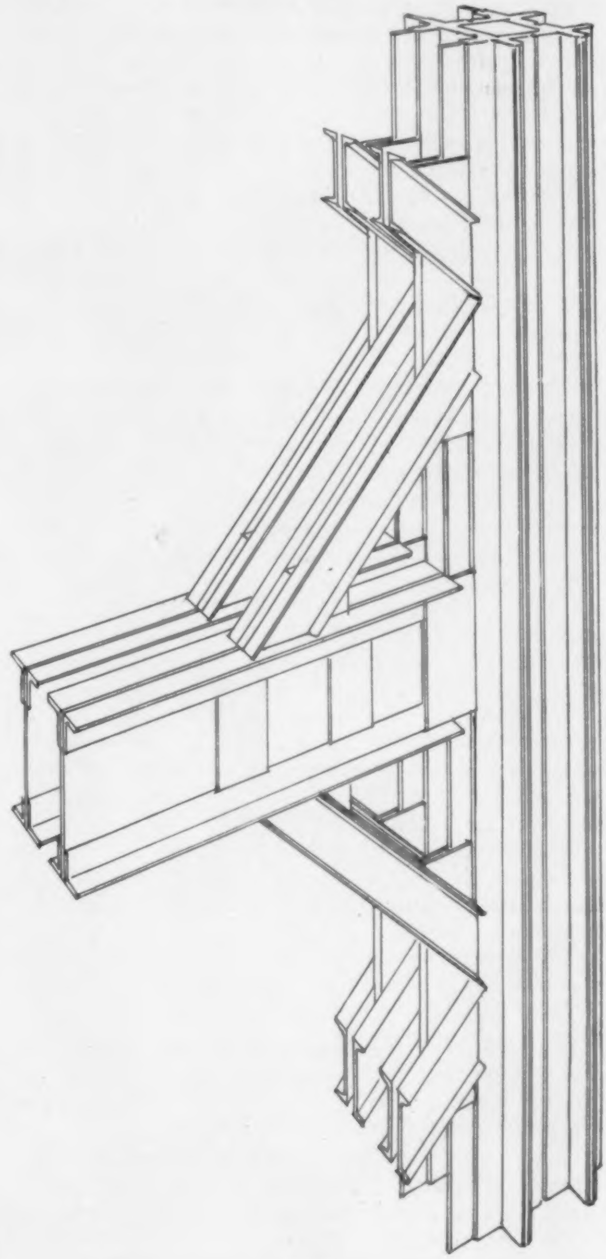


FIG. 5

1 and 2, both axes of the columns being vertical. The gradual reduction in size of successive sections in the ascending column keeps the metal a safe distance within the enclosing walls.

There are certain exterior features requiring special means of support. The projecting architectural orders in the first three stories are carried at the sidewalk level upon a platform of beams framed on top of auxiliary columns which stand on the outer portion of main column foundations. The projecting balconies at eleventh floor level in line with cornice of main building are supported by riveted cantilevers, so arranged that the marble slabs forming the floors rest on the bottom flanges of cantilevers. The ornamented marble torus surrounding the clock dial in twenty-fifth, twenty-sixth and twenty-seventh stories is a thorough arch ring anchored to the penetrating steel columns and girders.

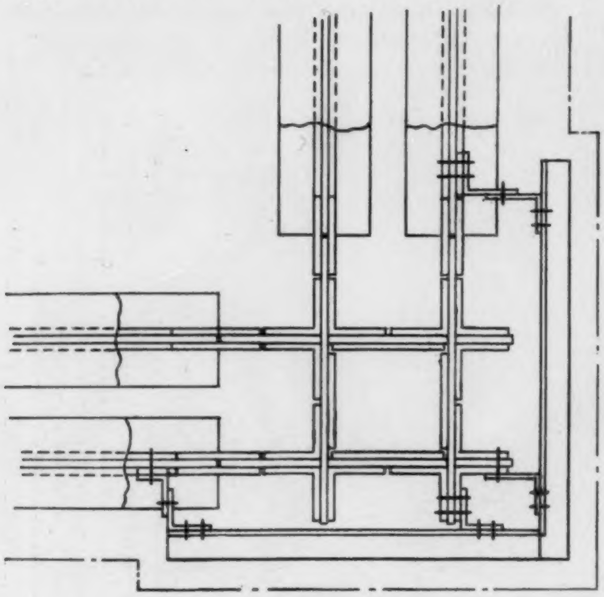


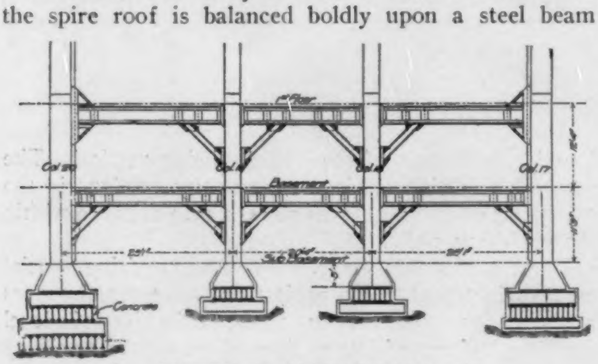
FIG. 6

The marble corbels in twenty-ninth story, extending entirely through the wall, are built in between vertical channels to which they are anchored, and the floor of the balcony is carried by concealed cantilever beams, one over each corbel.

The three-story marble columns and surmounting arches, which form a screen in front of the logia above thirty-first floor, are carried at that floor but are otherwise self-supporting.

The wall above these arches is carried on a girder spanning the entire front at the thirty-fourth floor. This girder is latticed to a similar one at the thirty-fifth floor, forming an imperfect truss, that is, a truss whose webs do not intersect at the center line of chords. The top chord of truss supports the cantilever brackets carrying the main cornice of the tower.

The cornice at thirty-ninth floor under the eaves of the spire roof is balanced boldly upon a steel beam coupled with a girder which carries the foot of rafters. Between the 8-inch I-beam rafters of the spire is built a brick wall into which the marble ashlar is bonded and anchored. The balcony supports at forty-fifth floor are similar in principle to those at thirtieth floor.



FOOTINGS FOR TOWER COLUMNS

The forty-sixth story marble columns of the octagonal lantern are bored for a star-shaped steel core which is attached to the steel frame above and below for additional strength and to guard against possible displacement by shock or other causes; and a light frame is carried up inside of the lantern roof to furnish support and anchorage for the concrete cover.

In every part of the steel structure it has been the aim to provide, not only the required strength, but also an unusual degree of stiffness. Provision is made in the steel bracing against a wind pressure of 30 pounds per square foot over the entire area of the tower. The strength of this tower as a whole, as well as in its parts, lies, without question, in its steel frame, and its stiffness or rigidity is provided here also in a far larger measure than in any ordinary building.

VIEW OF WIND BRACING TAKEN MARCH, 1908

There are in addition powerful elements of strength and more especially of stiffness in the floors and masonry walls. The mason work was designed by the architects with great care and equally well constructed under their supervision. The marble is bonded with the brick backing, and thoroughly anchored to the steel work by steel anchors. It is worthy of note that the marble is practically all supported on top of the steel, the expedient of suspending the stone having been avoided wherever possible.

The floor framing is adapted to either concrete or tile arches of ordinary spans. The floor system used consists of segmental cinder concrete arches on wire mesh supported by light arching metal ribs which spring from the bottom flanges of beams. At every fourth floor, flat bars placed diagonally across the floors were bolted to the top of beams to square up the steel frame during erection. These were removed after concreting as it was feared their presence might cause cracks in the finished Terrazza mosaic floor surfaces. Concrete is the fireproofing material used throughout the structure, and completely envelops all structural members.

I have now given a general description of the steel work, which, together with the accompanying illustrations, will present a clear notion of the construction. Anything further that might be added would necessarily relate to detailed calculations and details of connections which are deemed to be beyond the scope of the present article.

The steel work and foundations were designed for Messrs. N. LeBrun & Sons, the architects of the building, by Purdy & Henderson (Inc.), Civil Engineers, New York. The writer was the engineer in charge.

JOHN L. HALL.

GENERAL NOTES ON SPECIFICATIONS AND CONTRACTS

BY WM. BROKAW BAMFORD, A.M. Am. Soc. C.E.

PART IV.

It would, of course, be infinitely better to definitely specify what is required and avoid wherever possible the use of the words "best" or "best quality." They are at times very troublesome for their size and inoffensive appearance.

A case in point might be cited where it was used in specifications for a medium, if not cheap, class of work, which stated that "all hardware shall be of the best obtainable quality and similar to Smith & Co.'s (a local concern), to whose catalogue the following numbers refer, etc." The owner had decided to spend a limited amount of money, but wanted to commit the not unusual folly of building a $20,000 house for "not to exceed $5000." The architect tried to satisfy his client in quantity if not in quality. The result developed considerable friction between all parties during construction, and by the time the hardware was reached the owner had become thoroughly convinced that he was a much abused man. The samples of hardware submitted did not suit him, and he had seen some manufactured by a noted hardware concern that he liked and would actually cost over $200 more than that specified, but as he was a lawyer he insisted that the "best obtainable quality" covered the case and he would have no other. Affairs had reached the state of court proceedings when the author, who happened to be a friend of the owner, was consulted about the technical details of the case preparatory to trial. A short examination was sufficient to see that both the architect and the contractor had done more than their duty under an equitable interpretation of the contract. The contractor was "poor but honest," and desired to retain as long as possible the good will of the owner, a wealthy land owner, and was already out of pocket a goodly sum, with more in view, although he had done his best to handle the work in a satisfactory manner. He now found that in his zeal to help the architect and satisfy the owner, in his estimate, he had let his zeal run away with his judgment to his financial loss and the prospective loss of the good will of

VIEW LOOKING UP BROADWAY, SHOWING SHELTERED POSITION OF SINGER TOWER. COMPARE WITH EXPOSED LOCATION OF METROPOLITAN TOWER

TELEPHOTO VIEW OF TOP OF TOWER DURING CONSTRUCTION

the owner. The architect had badly erred in preparing a set of drawings, showing quantity but not quality, which convinced the owner he was going to get a great deal for a little money and was unaware that the specifications had sacrificed quality to quantity. The specifications were very general and the owner claimed he noticed that the "best quality" was freely mentioned and did not know that it contemplated work which should not have been designated by such a broad term. The author, by good luck and a personal reputation for fairness with the owner, succeeded in straightening out the snarl and the work was finally completed with reasonable satisfaction to all. The owner, however, would not forgive the architect, because he said that the architect had placed him in a position where he was making a dunce of himself under the logical assumption that he was in the right, and had not carefully explained to him about the quality of the work contemplated.

The foregoing illustration would also apply to other words or expressions used mechanically without weighing their full significance and which might be as likely to cause serious trouble if exception was taken to them. The following illustrations might be noted: "Concrete shall not be dropped from a height," "all stones must be as nearly cubical as possible and of uniform size," "the timber to be free from all knots." These expressions are all misleading and exaggerated and demand what is almost impossible to obtain. Why not specify only what is required and can be reasonably obtained and then insist that it be furnished?

Brevity—It is astonishing how much a specification can be condensed by simply rewriting, omitting unnecessary words and duplicate expressions. In a well known published building specification the author condenses it by nearly one-third its original size by these means and reduced it nearly one-half by a rearrangement and elimination of superfluous or irrelevant matters.

The imperative tense is suggested for specifications for the sake of brevity, and sentences written so that the important part is placed near the beginning to gain emphasis, with the details following. The consistent use of the imperative tense is a great help in writing short, terse sentences, and does not necessarily imply arrogance on the architect's part, as the specification is an explanation of the work the contractor agrees to do.

Brevity, like accuracy, is the result of repeated efforts. Brevity, while not kin to clearness, will be found to greatly help the latter if the two work hand in hand.

A specification is read for facts, which should be briefly stated, and not obscured by descriptive form of expression. This will more readily insure their being seen and comprehended and therefore observed.

A good plan is to begin with general statements covering all work under that particular division. Thus, under carpenter's work, there are the general conditions and general work covering all carpenter's work, then the general statements under articles like interior woodwork or painting and finishing, then general statements under the section like trim or hardwood finish. This obviates the necessity of repeating these various requirements throughout the specification under the different articles, etc.

The drawings and specifications should be interdependent and not describe in the latter what is clearly shown on the former, and the specifications should refer to the drawings by "as shown on drawings," or "as per detail," where they do not completely describe the work. This will eliminate needless repetition and long descriptions of work clearly shown on drawings and prevent errors in not having the two strictly in accord in matters of detail. Such conflict often leads to serious trouble, especially if both are perfectly clear and the wrong one is followed.

Arrangement—In its final and most complete form this might be called a refinement—desirable but not essential. In the primary arrangement it is, however, extremely important, and this importance increases with the size of the specification.

As the ultimate object of a contract is to obtain a definite finished product of a certain kind, for a particular cost and in a given time, and the object of a specification is to give the contractor a part of the information necessary for him to satisfy the contract, it would seem that the arrangement used should be one giving the most practical help to the contractor to accomplish these objects and so satisfy the owner.

Modern conditions have developed among both contractors and workmen a series of independent trades who confine themselves to a special branch of construction work and the author's experience has demonstrated the advisability of having the specification conform to these trade conditions as far as possible to secure the best results. A specification is simply a means to an end—the completed building—and any purely theoretical consideration should give way where practise and experience has found them faulty.

These contractors are all independent and are rarely the same on any two buildings. It is a difficult task to bring these various interests together so that the building can be erected with the least amount of friction. The independent trades will remain the same and actually do the work, whether they contract direct with the owner or become sub-contractors, sub-sub-contractors, sub-sub-sub-contractors to a general contractor for the entire work.

Each sub-contractor in taking off his quantities is solely interested in his own branch of the work, and if his requirements were scattered through the specification in such a way as to make it impossible for him to tell accurately what is required, his bid should be proportionately higher, and if, when the work is being done, it is found that he has overlooked some items which he should have included, there is apt to be some unpleasantness or an allowance for extras. The time allotted to contractors in which to submit proposals on large work is usually none too long to obtain carefully prepared estimates for each sub-division of the work. The architect usually feels that by awarding the work to a general contractor he has done his full duty, as a general contractor must see that his various sub-contractors properly estimate the work or become responsible for everything they may omit, and these various sub-contractors, as such are not recognized by the architect. While it is legally true that the general contractor may be responsible for all work, it is in practise unwise for architects to attempt to ignore trade conditions. While they need not legally recognize sub-contractors, they should recognize the trade conditions and endeavor to make it as simple for the sub-contractor to properly estimate the work as possible, for by so doing they are also benefitting themselves and the owner. The specification should be divided into the most usual trade units as far as possible, but these divisions must be modified to some extent by conditions of the particular piece of work.

Whether or not we eliminate the general contractor, or some of the main sub-contractors, and try and deal directly with the "man who does the work," the principle here advocated holds true, namely, to try to arrange the specifications so that the work to be done by each trade is grouped together. These trade groups can be readily grouped under broader heads and awarded to one contractor, as the particular case in hand may require, but it is very difficult for a general contractor to properly sub-divide a specification where the items of work of the various trades are not grouped.

In a specification all carpenter work need not be under carpenter's work; such as forms under reinforced concrete work, or centers under mason's work, or enclosing building, fences (temporary), floors (temporary), sidewalks, etc. (temporary), under general work. Nor need all the work of a particular kind, like iron, electrical, plumbing, etc., be found under the division for the contractors for such kind of work. Thus the distinction is drawn that the work under a heading is not all the carpenter work, but all the work to be done by the carpenter, a most important distinction. In the actual writing of the specification this difference will not be as great as it may appear, as most carpenter work will naturally fall under the carpenter's work, etc. It will be found that there is certain work which it would be better to have installed under the direction of one contractor than of others, this decision is largely a matter of experience and no hard and fast rule can be laid down. To illustrate, the author has found it expedient to put the complete installation of the house pump for water or drainage under the plumber's work, and if it is an electrical pump, to have the contractor installing the pump do all electric work and make the connection to it of the feed wires. This method concentrates the responsibility as much as possible and obviates the question of who was at fault for defects should the plumbing system not operate properly.

It is immaterial whether the electrical contractor on the work actually is employed by the plumber to wire the pump. The point is to try and concentrate responsibility among the trades for the completed finished product. The claim will be made that this is a part of a general contractor's work; in one sense it is—but to practically work it out is not so easy. The present method of general contracting has been severely criticised by architects, the American Institute of Architects being almost convinced that general contractors should be eliminated. If they are eliminated or retained the principle advocated, of dividing the specification into trade divisions, is essential to putting the business of building contracting on a better basis for practical results, unless there is a contingent fund large enough to protect contractors from omissions or mistakes in specifications.

The arrangement for dividing a specification should be to put the generally recognized main trades under so-called chapters; these can be divided into so-called articles, usually covering the complete work of a trade. The grouping of the articles into chapters should follow the grouping of trades desirable to best facilitate executing the work. The sequence of the articles would be more or less arbitrary, but should follow in general the order in which the work will be performed. There are numerous articles which are more or less independent and their assignment to chapters, and sequence in the chapters is often a matter of personal experience.

While articles would generally remain the same for buildings of the same general class, they would change for the different classes. For illustration, roofs and sheet metal work might be under mason's work in a fireproof building, but be under carpenter's work in a frame building. For small specifications most of the work can be grouped under general heading of articles and the order of the sections, clauses and paragraphs become of less importance.

After the separation by trades the object of arrangement should be to divide the work into so-called sections, completely describing the work governed by the sectional heading. The sections can be further divided, where desired, into clauses. The heading for sections and clauses should be selected with extreme care and be as comprehensive as possible, and only matter placed under them which it would be reasonable to expect to find there, form its title, and they should exclusively determine the amount of work which they cover with any necessary cross reference. This may not be legally necessary, but practice has amply demonstrated its great benefit. The justice of this will be most strongly felt by anyone who will read a specification not prepared by himself and try and decide what is required or intended. The architect will find that the careful selection of titles and placing of matter under them is one of the primary and most successful features toward the writing of an intelligent specification.

Poorly arranged specifications are as harmful to the contractor as poorly arranged building laws, building department rulings, etc., are to the architect. Legally, "ignorance of the law excuses no one," but those who try to conform to such laws are rudely shocked when some unexpected "joker" is discovered in an out of the way place or requirements are found where least expected. It is not intended that the various divisions should be considered any more a legal part of the specifications than the present marginal notes or headings. Of course, whatever is stated anywhere in the specification is binding on a general contractor just as the building laws, etc., are binding on the architect, but the trouble will come when the independent trade contractor, who must do the work, finds he did not include such work in his estimate and demands extra compensation. The general contractor did not include the work except under his contingent item, because it was the work of a special trade and the trade contractor did not include it, because it was not evident when making his estimate. The work must be done; who pays the bill? Is it to be wondered at that if the contingent item of the general contractor is small and demands for extras like the above are numerous, that the work does not progress smoothly.

The majority of the sections and clauses are not directly related to those adjoining them, for that reason placing them in alphabetical order under each article facilitates locating them, especially in long specifications, and establishes a desirable uniformity. To accentuate the difference between sections and clauses the headings of the former can be placed beyond the reading matter while the headings of the latter can be kept within the reading matter.

A marginal note in fine type to divide the clauses still further into paragraphs could be added. These notes are additional helps if they are reference notes only and not used as headings to divide the work, as is often done; in such a case uncertainty and confusion is very likely to result, and their usefulness becomes very doubtful in practise though apparently desirable in theory. Where the specification is long and the headlines embrace a lot of matter that might not be easily found, the marginal notes are a great help but for the majority of work the clauses can be made sufficiently numerous to fulfill all purposes of marginal notes.

There are numerous clauses of a general nature which refer to broad divisions of the work; such clauses should preferably be grouped together and can generally be arranged to proceed all work to which they refer. Thus we have the general conditions which govern all work under the contract, clauses which govern all carpenter's work, clauses which govern all exterior woodwork, all interior woodwork, all painting, etc., etc.

For special classes of work, the arrangement might be modified with advantage; for instance, where the work involved a great variety of changes in the interior finish of the different rooms. In such a case general clauses might be written describing the construction on the lines proposed above, and then grouping together a set of clauses with headings for each particular room and describing in detail the material and finish to be used for the several parts.

Solely from the architects' and owners' point of view it might be an advantage to specify all matter necessary to complete a piece of work under one heading instead of following the method of dividing the work by trades. This would permit determining at a glance what the finished work would be like. Thus under doors would be (a) construction and materials, (b) the finish, (c) the hardware, (d) the glazing, (e) the saddles, (f) the jambs whether of wood or iron, etc., but such a method if analyzed will be found to be of only limited application and falls far short of the ideal under present conditions.

Such an arrangement makes it difficult for the mechanics of a particular trade to tell from a specification what work they are to do, as their requirements would be scattered throughout the specification. Then there are the general conditions applicable to all work of a trade which cannot be made as clear and comprehensive if the work is scattered rather than brought together in one place. It certainly aids the proper execution of the work if the specification is made as easy for ready reference as possible, so that the mechanics on the job can find their work specified in a manner intelligent to them. Otherwise they may say, "Oh, help," and use the specification as little as possible to the detriment of the work and the generating of friction among the men most responsible for the character of the finished product. This is a very practical and important consideration in these days of rapid work and close competition.

Numbering the various sections and clauses of a specification is a great help in referring to particular parts of the work. The decimal system is an excellent one for a model specification, because it provides an easy means for expansion and making changes, but a straight numerical arrangement would probably be used for a working specification.

If many provisional amounts are inserted in a specification, it would be an advantage to group them for each chapter at the beginning and then if desired refer to them under the particular clause.

Miscellaneous Information and the Use of Forms

A good index is a most desirable addition to a specification especially if no particular attention is paid to the arrangement of sections and clauses. If, however, they can be readily located without an index its omission will save that much additional matter and labor.

At times it is not very easy to locate a piece of work by a short description in the specification; in such cases numbers might be placed in circles where desired on the drawings, for easy reference in the specification.

If the work for the various trades is awarded to separate contractors and not as a unit to a general contractor, great care should be exercised to see that all essential general requirements are contained in the separate contracts and that all the work is included under some contract and none omitted. It should be remembered that while under a general contract the broad clauses contemplating a complete structure "according to the true intent and meaning of the drawings and specifications" might be evoked to cover the completion of the work not distinctly specified, such clauses may not be applicable under the separate contract arrangement, as each contractor there undertakes to perform certain work according to drawings and specifications and not to erect a completed structure.

The author cannot too strongly warn architects against using any set of forms without carefully reading and modifying them to suit the particular conditions of their buildings, and any indiscriminate use of the forms is to be discouraged. The adoption of a single clause without the careful consideration of the particular case in hand would probably result in loosely adopted and carelessly prepared contracts. No two buildings are exactly alike, and while general methods may be the same, the details are most certain to vary. No forms can be used automatically and special features may only require changing a few words, but those words may completely modify other parts and alter the construction desired.

The architect should make a study of the sources of local materials, their suitability for the work, and their unit cost delivered and erected, so that specifications may be drawn that can be followed without requiring the use of materials or methods for doing work that are wastefully extravagant.

Extensive experimenting by the author has demonstrated that an ideal set of workable forms would be a combination of the loose-leaf file and card index. The work of no two practitioners is alike in the class of buildings handled and the forms must be carefully modified to suit each individual or the local conditions. To write into the form every contingency that might be likely to ever occur in any practice or to incorporate alternate methods or conditions would make them too bulky and cumbersome for practical use and would detract from its clearness. But by combining the two systems the specification and cards can be enlarged, reduced or modified as desired with the least possible difficulty. The cards and loose-leaf form are both required for a proper working tool and neither type alone can be made as satisfactorily useful.

The cards should be used to contain requirements not often needed by the individual user, also alternate sections, etc., for different methods, etc., and should be always numbered and referred to in the forms to act as a check and reminder. When requirements contained on cards are desired the card can be inserted in the forms in the proper place and fastened to the binders. Articles like reinforced concrete or drinking water system which might be seldom used by some could be removed and filed separately and the forms kept on a personal working basis.

The clauses as written in the loose-leaf form would cover the more usual conditions of the general types of buildings with parts subject to change so written that they will be noted and alterations be inserted should they be required.

There are special requirements applicable only to special types of buildings, and as only a few of them would be used by any one practitioner they should not be placed in the loose-leaf form. As occasion requires any of these special types could be developed on the proper series of cards and noted in their proper place in the forms.

The forms could be used in the writing of contracts and specifications in either of three ways:

1. Make changes or modifications in ink directly on the forms. Add lengthy new matter by writing on strips of paper and binding in forms in proper place. When completed give forms to stenographer, who writes the specification with modifications noted. After the specification has been completed and finally approved, the forms are filed with the notes, etc., of the building and becomes a matter of permanent record.

This is by far the best method, as notes, changes or directions given by the owner can be made at once on the forms and dated so that they will not be lost or forgotten when the specification is written. They thus serve to check responsibility for matters in the finished specification should any question arise as to who decided that such a finish, etc., was to be used.

2. Make changes with a soft pencil and use as in No. 1. After the specification has been completed and finally approved, clean the forms with a soft rubber and they are then ready for further use.

3. Using the forms as guides and models and dictating the specifications directly to a stenographer. This method is very rapid and convenient for small buildings, but is not to be recommended for large work.

After the specification has been written it should be carefully checked up with the drawings and with the forms to see that nothing has been omitted or improperly written.

The use of forms as a guide in writing specifications is far superior to using old specifications; first, because no two specifications are alike, and therefore requirements desired for new work may be scattered through an endless and confusing number of old specifications, and it may become a difficult matter to tell which requirement previously used are really the best. Second, using old specifications has a tendency to cause the reading of requirements mechanically under the impression that as they were once prepared by the architect for presumably similar conditions, they are applicable for the new work. Such use often leads to absurd and unintentional errors which the author admits to having made by following such a method, and when traced to the old specification it was found that the two cases were not similar, or that more recent experience had shown the old requirements to be unsatisfactory and that he had been unnecessarily overtaxing his memory to make the proper corrections before again using the old requirements.

It is assumed that each practitioner would keep his forms correct and up to date from his own experience, by noting ideas for future work as they occur to him and not trusting to remember them when wanted in a hurry, possibly several years later. He will then always have a convenient and reliable guide to follow and will be relieved of much unnecessary mental anxiety in the actual preparation of his specifications.

THE ANCIENT NORMAN FOUNDATIONS OF WINCHESTER CATHEDRAL*

By ARTHUR G. BEIN

To an architect familiar only with elaborate systems of concrete piling and steel caissons it was a rare opportunity to get down under Winchester Cathedral recently when the ancient Norman foundations were being repaired. Several of the piers of the nave had been gradually settling toward the north aisle—the distant one in the illustration shows it plainly—and an engineer had been called in to discover the cause. It was after the sunken pier had been supported by an oak grillage and the pavement in the immediate vicinity removed that the opportunity came for examining the foundations laid for Bishop Walkelyn's church in 1079.

These might still be doing their work satisfactorily after nearly a thousand years had not the original Norman piers they supported been later burdened by the extra weight of the triforium gallery and at the same time encased and disfigured by Gothic columns of the poorest period. It was just such continual additions as these, by the way, that have caused Winchester to be known as a whole "School of English Architecture" in itself.

The ground on which the cathedral is built is wet and boggy and has always been a source of trouble to its builders both ancient and modern. It was undoubtedly this condition which caused the collapse of Bishop Walkelyn's newly completed tower over the crossing of the nave and transepts in 1107; although the pious said it was due to the "cankering wickedness" of the Red King's bones buried beneath it.

The excavation showed that the bottom of the footings extended thirty-one feet below the pavement of the nave and were immersed in six to eight feet of water, which is not surprising considering the nature of the ground. At the bottom of the excavation and extending considerably beyond the dimensions of the pier was a layer of peat bog three feet thick which rested directly on a stratum of clay. Laid tight together on the bog was a six-inch thickness of beech timbering, which in its turn supported an oak grillage. The grillage consisted of two twelve-inch layers of oak timbers, the first layer running in opposite direction to the beech underneath and the second at right angles to the first. On this as a foundation the Norman builders commenced the great stone superstructure, the first several courses of which were huge slabs that spread the weight over the entire grillage below and insured a perfectly uniform vertical compression. Above these huge slabs the stone work was carried in the ordinary way to the level of the pavement, where the original Norman piers were embellished with simple Norman base mouldings. Thus they remained until the beginning of the fifteenth century, when William of Wykeham, Bishop of Winchester, set about the remarkable conversion of the Norman nave into the perpendicular.

What had happened to the various materials of the foundation during all these centuries was interesting to note. The peat had petrified into a great monolithic mass, so dense as to offer considerable resistance to the pick; in fact it had become such an ideal foundation substance that it seemed a pity to discard it in favor of the deeper concrete; but as the new footings were to be carried below it, its removal was unavoidable. The beechwood had remained perfectly intact and seemed still willing to do its share of the work. But the oak in some places had completely rotted away, allowing the stone work to crack and become dislodged, and this was the cause of the settling noticed in the piers. The engineer in charge of the repairs would not discuss the failure of the oak to withstand the compression, but it was probably because it had lain partly under and partly out of water.

To form the new foundation, concrete in bags was lowered into the excavation, where it speedily was swallowed up by the greedy water. The oak grillage (one can hardly call it the older method since concrete foundations were used by the Romans) would have been impossible of repetition owing to the cramped space opened up for the workmen, and into which it would have been impossible to lower and turn the big timbers. Naturally the concrete was carried only to a few feet above the water level, and from there up stone was used. Whether this combination of stone and concrete will last as long as did its oak and beechwood predecessor must be left for future ages to decide.

*See American Architect, No. 1689, issue May 6, 1908, for detailed description of method employed in restoring these foundations.

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CONTENTS

THE Metropolitan Tower, intended, as we understand, to represent at once the culminating and final effort of a successful career in the practice of architecture, apparently also represents, in many respects, the culmination of skyscraper construction. The highest structure of a commercial character yet erected, it can, in addition, lay claim to exceptional methods and materials of construction that promise unusual efficiency. Probably in no building that has been planned with the primary object of producing revenue has cost been a smaller factor. Stability and permanence were the governing—in fact, almost the only—considerations given weight when methods and materials were determined. With this fact in mind, a study of the building from the constructor's viewpoint becomes of more than ordinary value and interest, although the architectural designer will find profitable a careful consideration of the solution adopted for a most unusual and difficult problem. Much speculation as to the form which the ultimate skyscraper will take has been indulged in during the past few years. Perhaps it is idle to attempt to forecast the future in this regard, but as far as indications of the present can be interpreted it would seem that the Campanile type, of which the Metropolitan Tower is perhaps the most striking example, bids fair to find increasing favor with architects who have regard, not only for the client of the moment, but also for the broad rights of others requiring light and air sufficient to insure some measure of health and comfort.

THE decreasing use of inflammable materials of construction and finish in city buildings is probably one of the strongest indications to be noted of an undoubted movement looking to better more permanent building. It is, in itself, quite gratifying, and to a certain degree satisfactory, but to anyone who has gleaned his knowledge of the situation entirely from published statements calling attention to this or that "absolutely fireproof" structure, a tour of inspection through a few of the most prominent and apparently expensive fireproof buildings in course of construction in some of the larger cities would prove a disappointing revelation. It is quite probable the walls and partitions proper will, in most instances, be found constructed of fireproof materials. But the chances are all in favor of finding the openings in these partitions framed with rough wood frames and then finished with wood jambs and trim, and supplied with a door of especially well-seasoned wood that has not been rendered any more fireproof by the application of paint and varnish. The windows furnish only a little less fuel, and the base, wainscot, cornices and ceiling beams of many rooms furnish enough material to feed a conflagration for hours. The floors, as constructed in some of the buildings referred to, contain an inexcusable amount of lumber. They consist of wood sleepers, a rough floor and a finished floor aggregating with the sleepers more than two inches thickness of wood over the entire floor area. Altogether, does it seem remarkable that fires appear to be capable of doing considerable injury to so-called fireproof structures? When, for example, wood ceiling beams are supported on wood forming and brackets, supplying altogether thousands of feet of lumber, we have not done as much as we can toward rendering our large buildings fireproof. The advance in the manufacture and use of metal and other incombustible trim and finish would seem to render unnecessary the misuse of wood in connection with alleged fireproof buildings as indicated above. The oft reiterated excuse based on considerations of cost and expediency appears insufficient.

PERHAPS the perspicacity and inherent wisdom of the ordinary city council member is brought more strongly in evidence by the consideration of a building code than any other duty devolving upon him. Or possibly he exercises the same shrewd intelligence in the discharge of his other functions, but they happen to be such as to attract less attention and study. In any event, we trust that his intellectuals are not often agitated to the degree that very apparently followed a prolonged consideration of the subject of a new or revised building code in one of the Western cities. At last, in a state of comparative mental exhaustion, the council formally expressed the opinion that it would be impossible to draft a code that would meet the complex and unusual requirements of the city in question. The problem was too hard; too many interests were to be considered; the responsibility too great. The only safe plan to avoid doing injustice to some one was to do nothing. And after much consideration, junketing to neighboring cities and general expense, that was precisely what happened. Is there recorded a more frank, even if unconscious, confession of incapacity? But, after all, perhaps the city is to be congratulated. It is at least no worse off than before, and we doubt not there are cities where it is fervently hoped the committees of councilmen now at work on this same problem will be moved to as complete a realization of their limitations.

PLACE DE LA CONCORDE PARIS

A LETTER FROM MR. CHARLES MORRIS, ARCHITECT

A short time ago I suggested to the editor of the AMERICAN ARCHITECT that it might be interesting to the profession if in every occasional issue of the paper a practising architect would write an appreciation of an ensemble, plan, elevation or detail of some architectural monument or modern work, which appealed to him, illustrated by a small photograph. We hear much adverse crticism of past and present work, but I believe it would be refreshing to all of us if such a series of articles as I suggest could appear regularly. It might give an insight into the work now being done, also it would help many of us to appreciate certain works to which perhaps heretofore we have been indifferent. While it may not have an educational value it may increase our interest. Again, there is of necessity in architecture so much that we do not like let us occasionally take the positive side and state frankly what we do like and why.

An Appreciation

The Garde Meuble on the Place de la Concorde in Paris (called "les Grands Batimens" in "Monumens eriges en France a la gloire de Louis XV," by Patte, 1765) has always made a strong appeal to me, and has been a source of pleasure and inspiration. I know of few buildings whose proportions are so satisfying and where one can see such dignity so simply expressed.

I admire the proportion between the height of the basement and the colonnade. The basement is two-thirds the height of the columns and balustrade above. The free standing columns at the ends of colonnade give a sense of spaciousness and completeness, and below stops the arcade with adequate piers.

For the filling in between the pilasters on the second and third stories, the relationship between the widths and heights of the window openings is particularly happy; the detail of the architraves of these windows is worthy of study. I might add that, in my opinion, this arrangement of two openings, instead of three or more, in the column height has never been improved, no matter how carefully treated or cleverly disguised.

Framing the center portion are the end motives with their sculptured pediments relieved by wall surfaces without openings and crowned with effective ornament. The niches, too, add to the feeling of strength. It will be noticed that the roof is not a feature of the elevation and merely serves as a background to the balustrade. The whole gives a sense of restfulness and proper balance. One cannot help feeling, in studying this building, that the architect did not tell all he knew —a contrast to some modern buildings. "The artist may be known rather by what he omits" is well said.

I also think in the matter of scale the Garde Meuble has a lesson for us now, not only as to the scale of the building proper, but the actual sizes of the stones themselves, which, to a large extent, tend to fix the scale. By actual measurement the largest courses are not over 18 inches high and most of them less. On some of our narrow streets in New York we find stone courses nearly double the sizes referred to above, the result being lack of scale and giving an impression of exaggeration. These buildings face on one of the finest squares in the world, and take their place with dignity, flanking the entrance to the Rue Royale with its splendid vista.

CHARLES MORRIS.

VIEW LOOKING EAST

THE METROPOLITAN TOWER
MADISON SQUARE, NEW YORK

MESSRS. N. LE BRUN & SONS
ARCHITECTS

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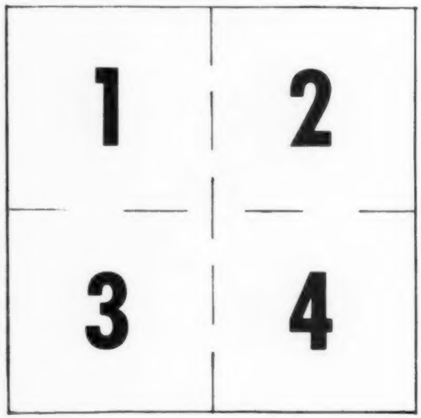

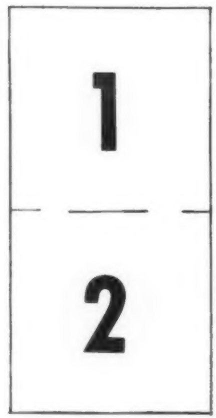

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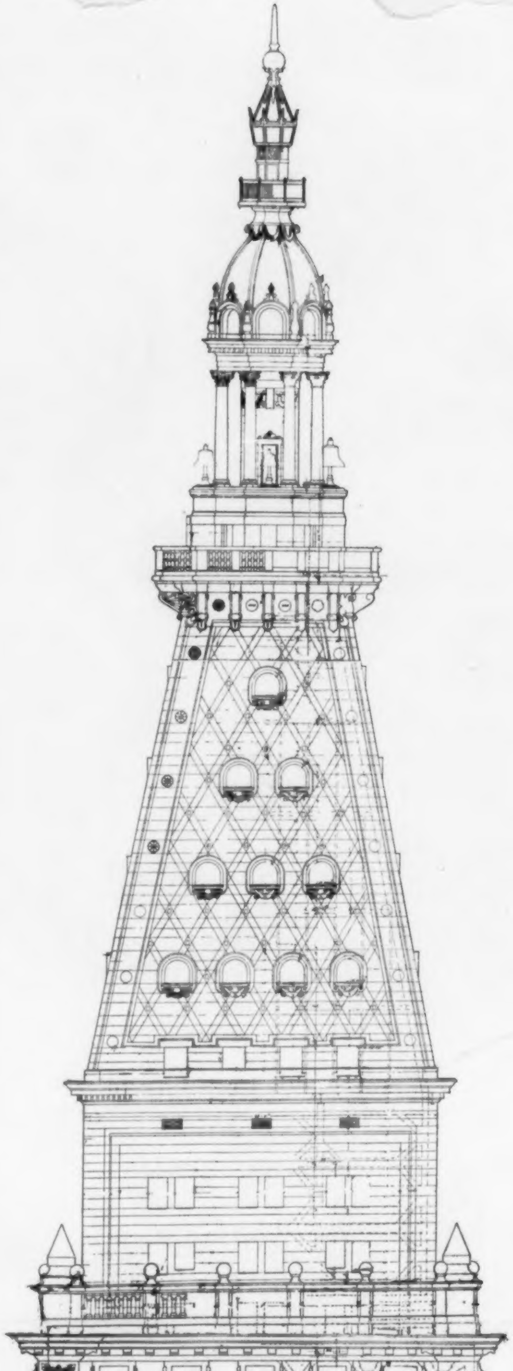

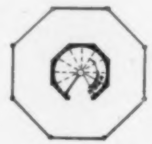

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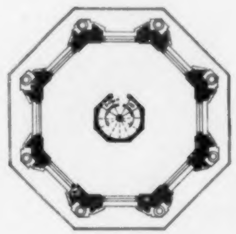

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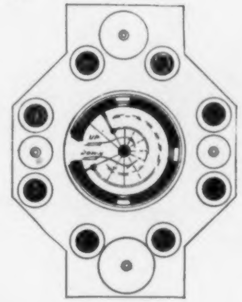

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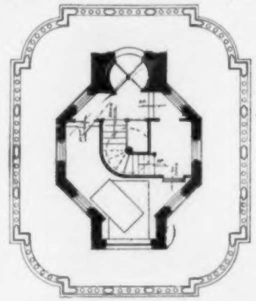

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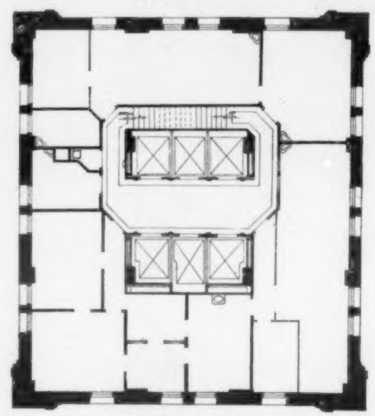

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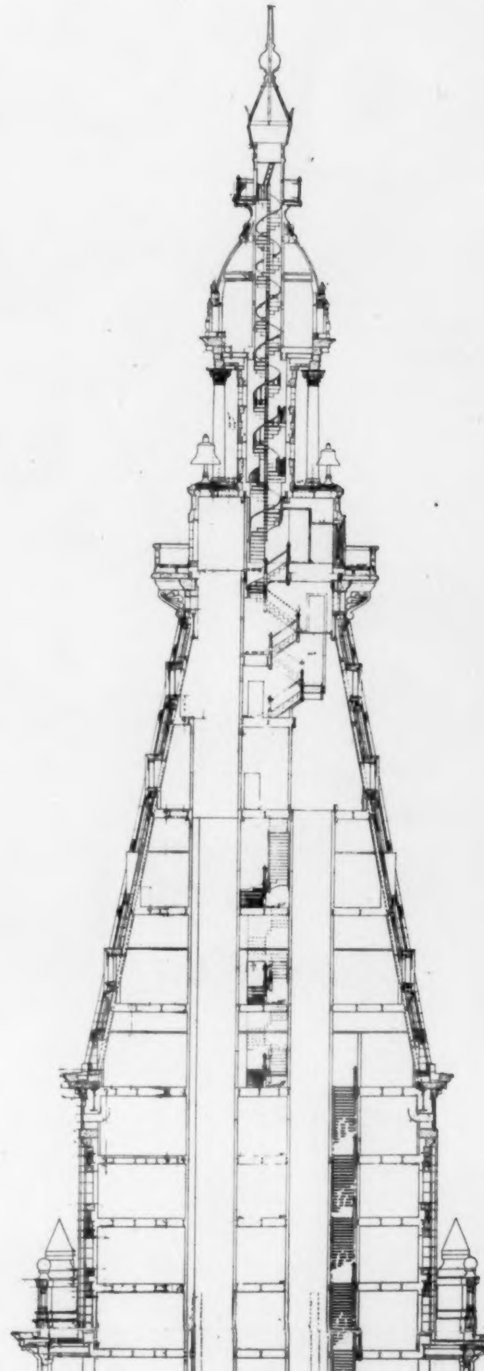

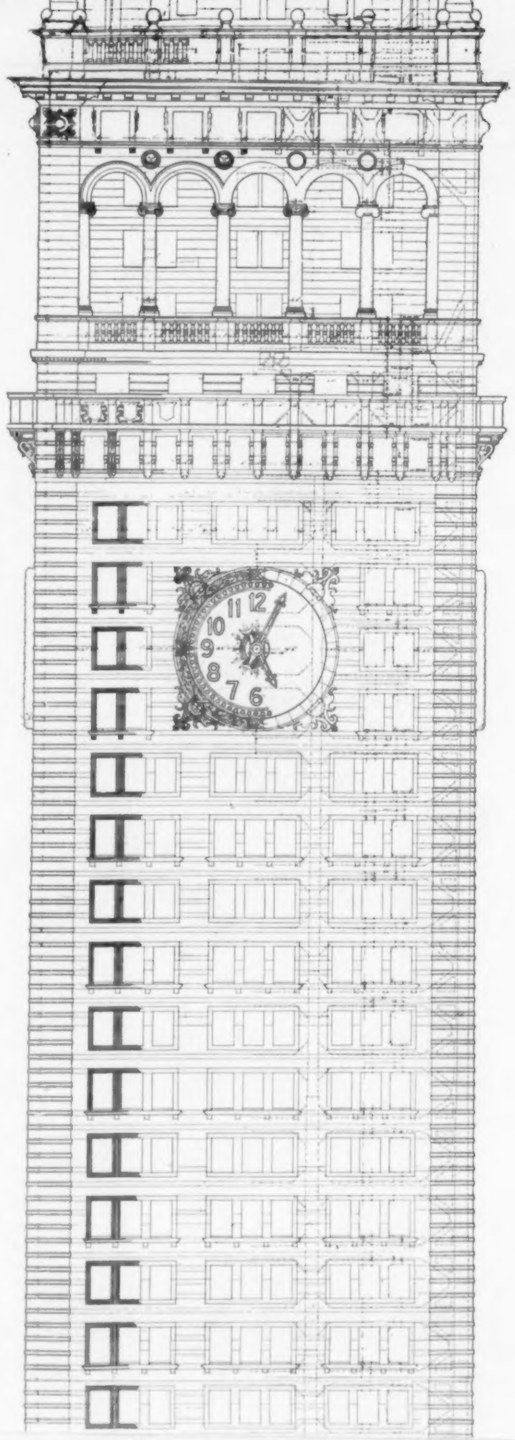

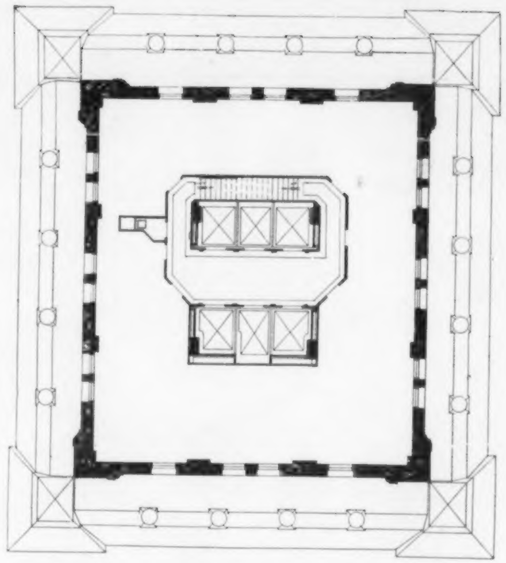

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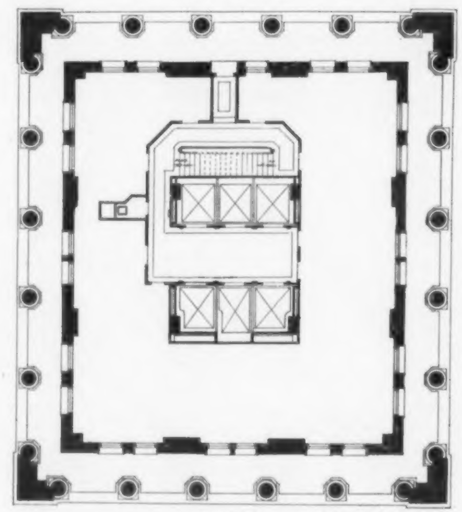

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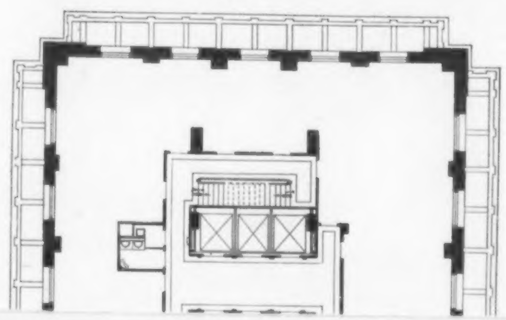
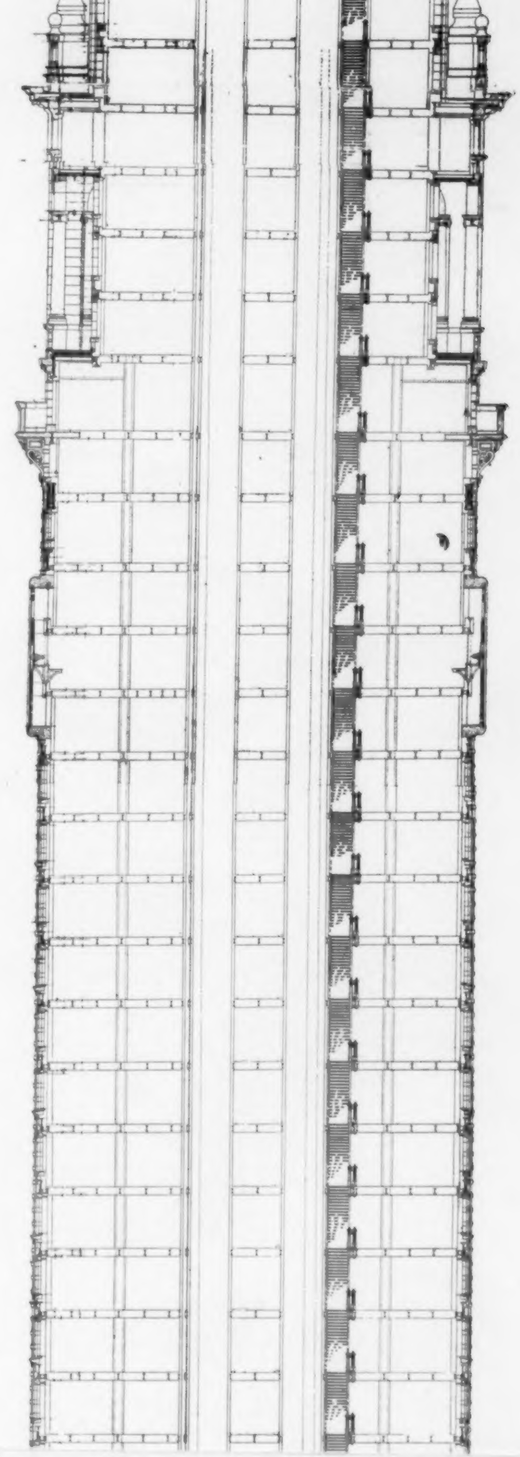
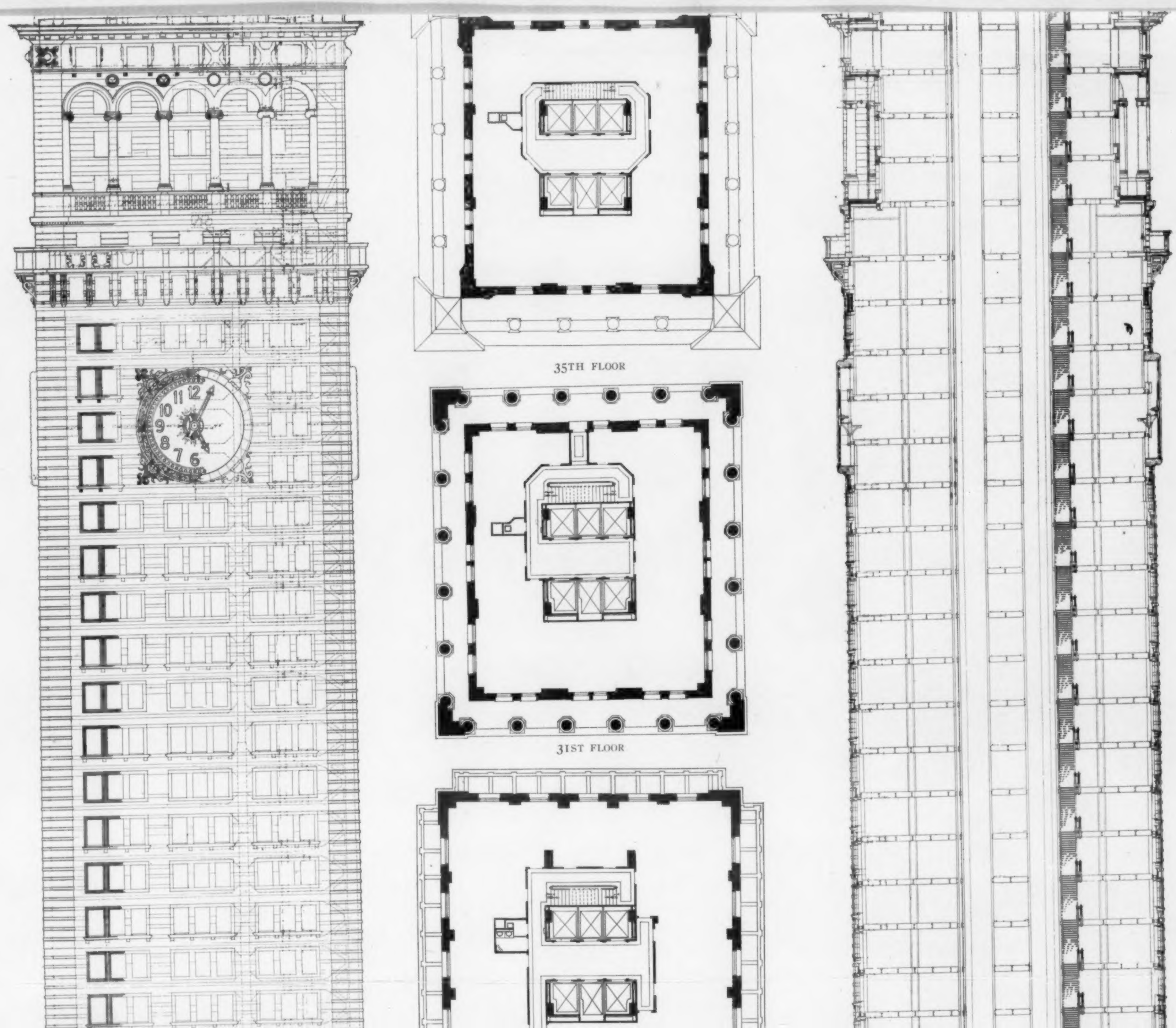
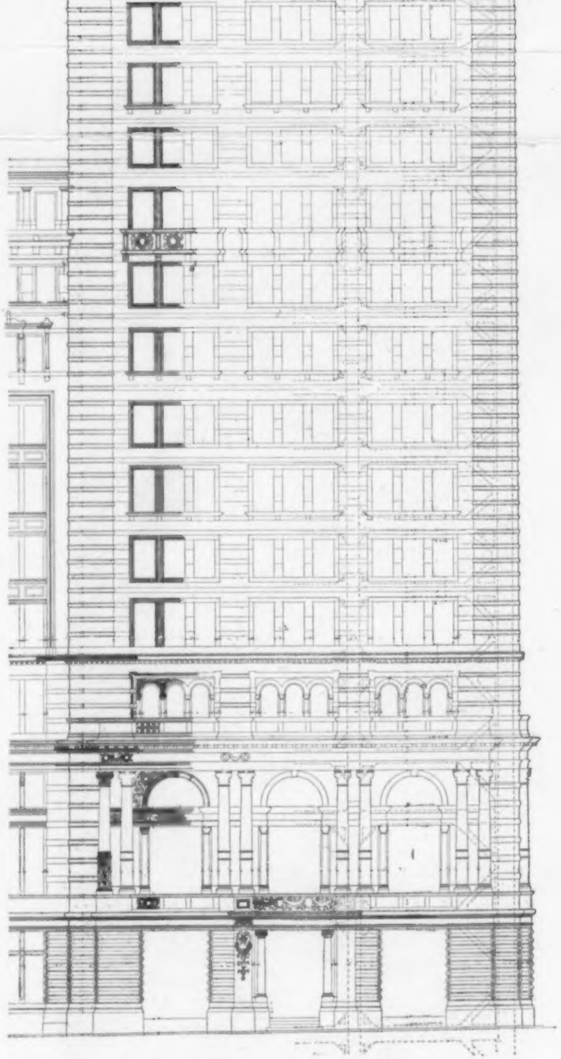


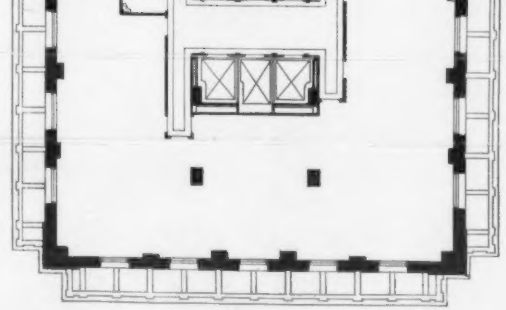



35TH FLOOR
31ST FLOOR

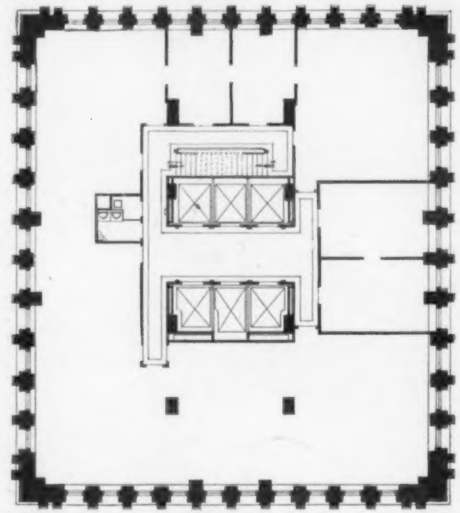


ELEVATION ON 24TH STREET

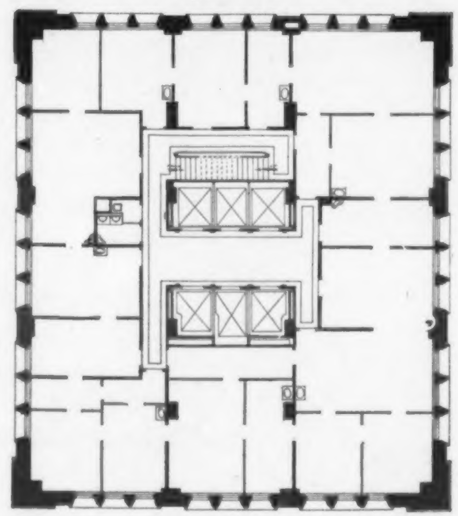
THE METROPOLITAN TOWER
MADISON SQUARE, NEW YORK



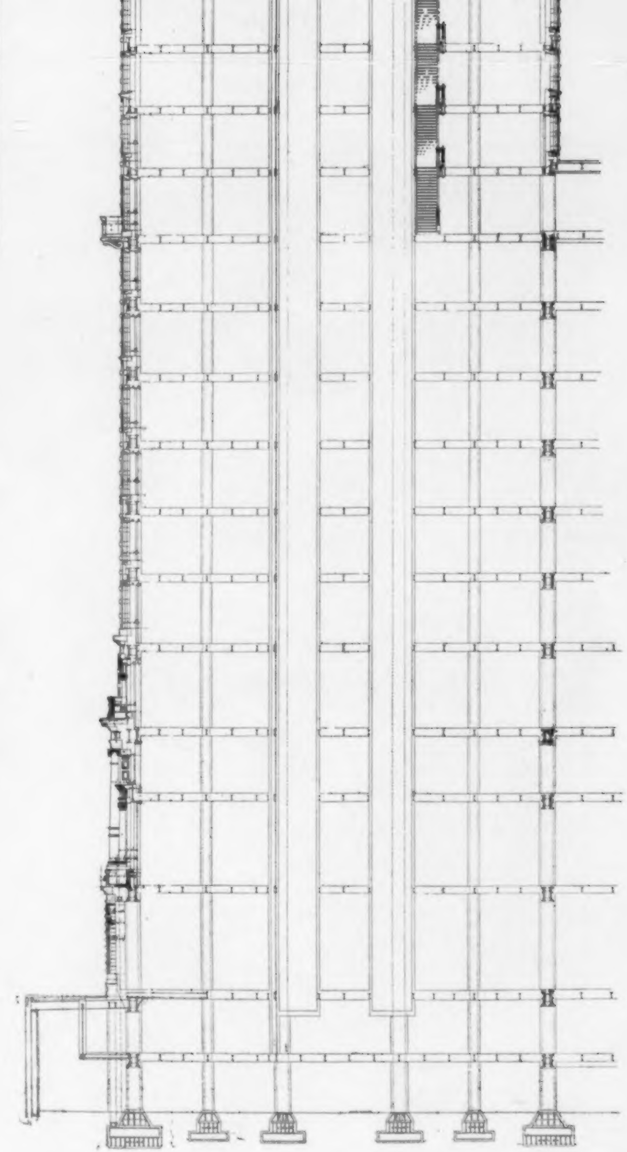
30TH FLOOR



29TH FLOOR



21ST FLOOR



SECTION

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VIEW LOOKING SOUTHWEST, SHOWING METROPOLITAN BUILDING, ANNEX AND TOWER, WITH CAMPANILE OF MADISON SQUARE GARDEN AND FLATIRON BUILDING AT EXTREME RIGHT

THE METROPOLITAN TOWER
MADISON SQUARE, NEW YORK

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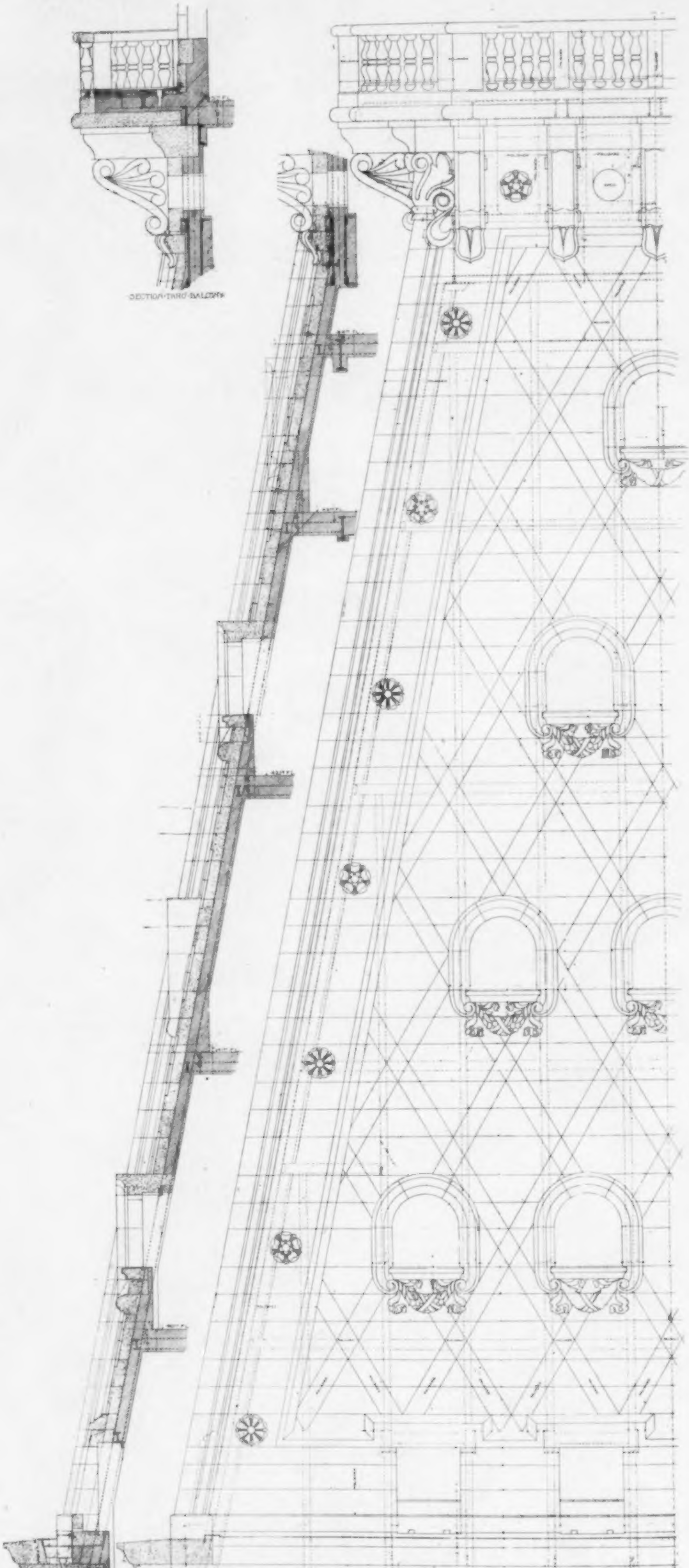

THE
METROPOLITAN
TOWER
MADISON SQUARE
NEW YORK

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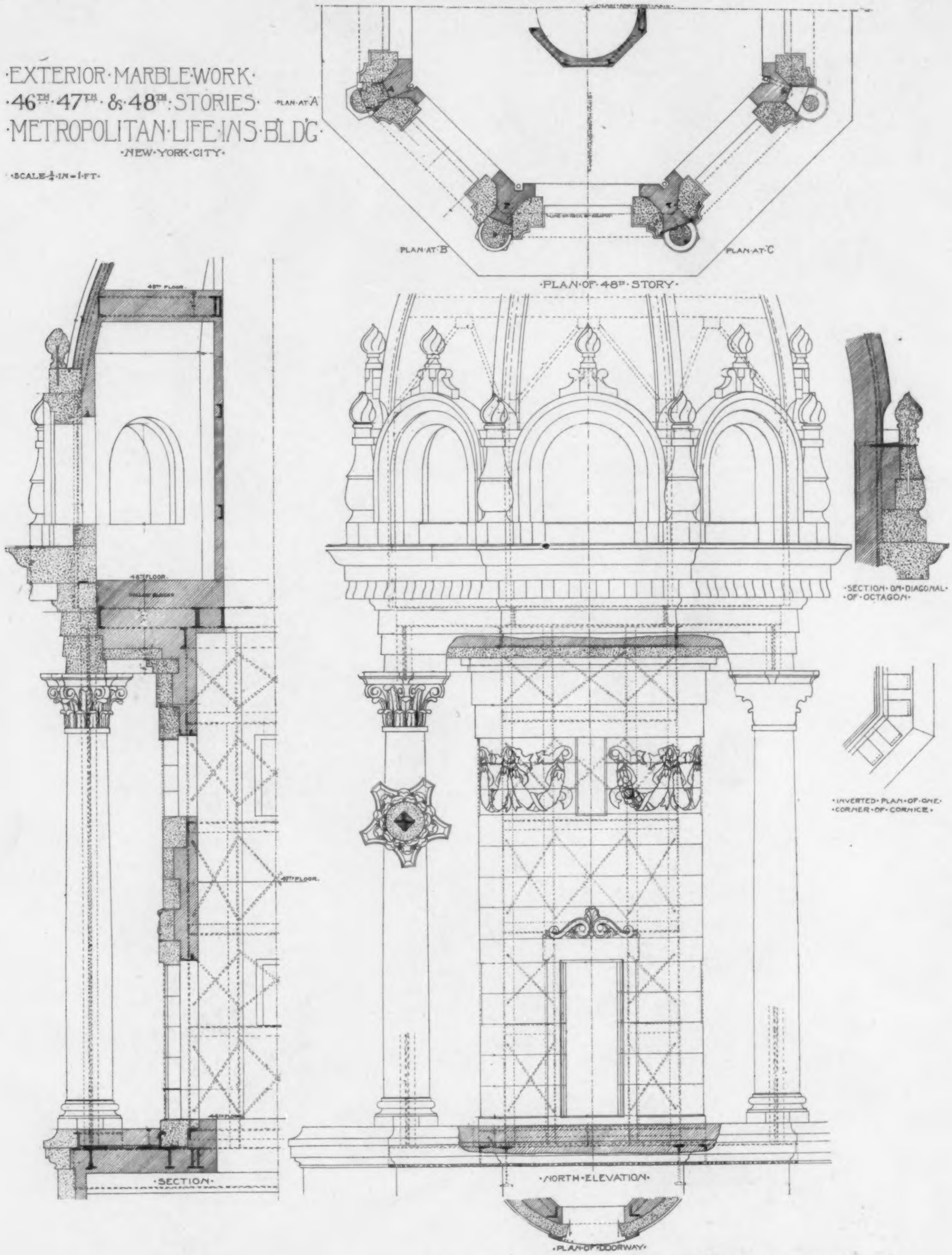

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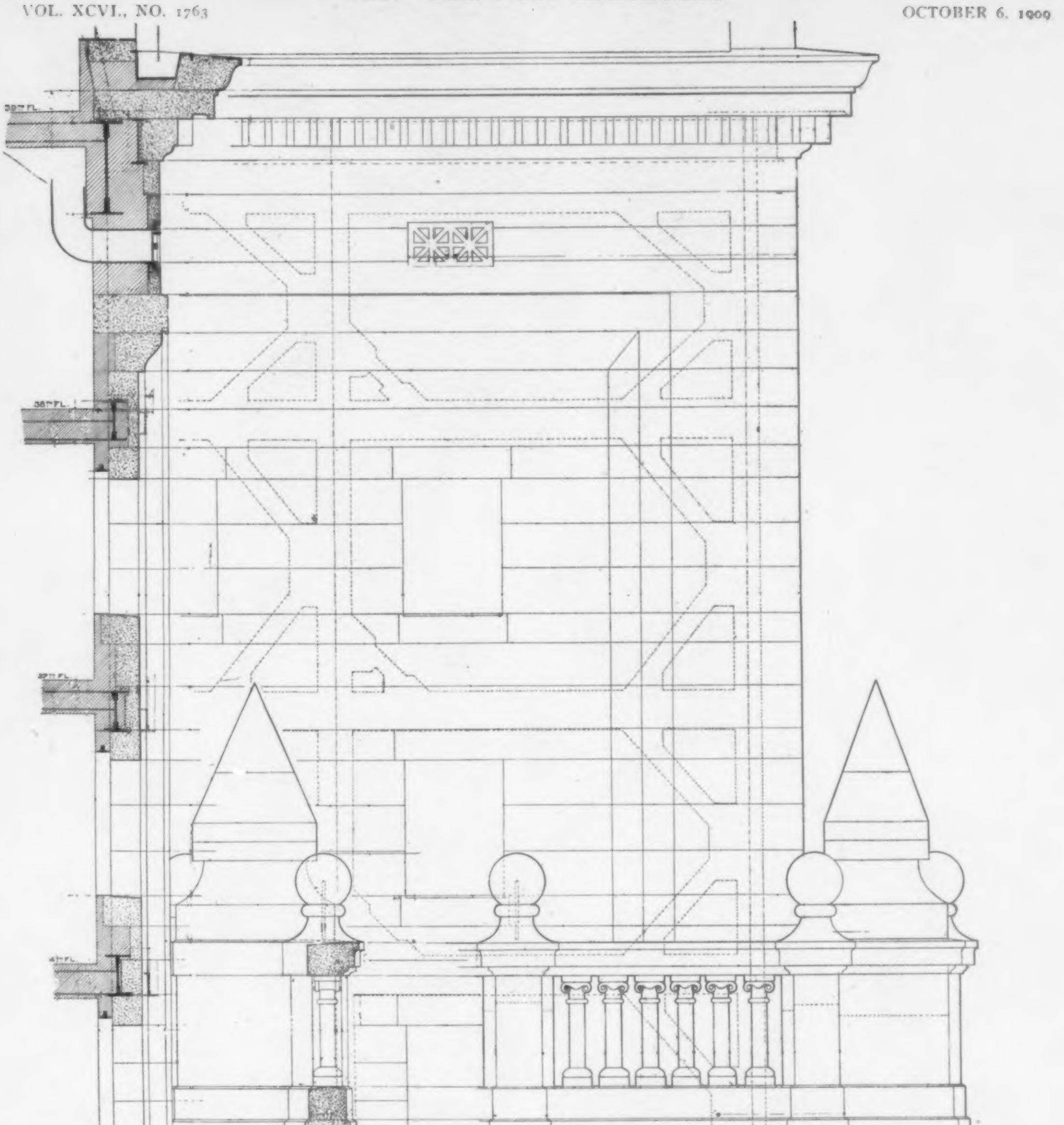

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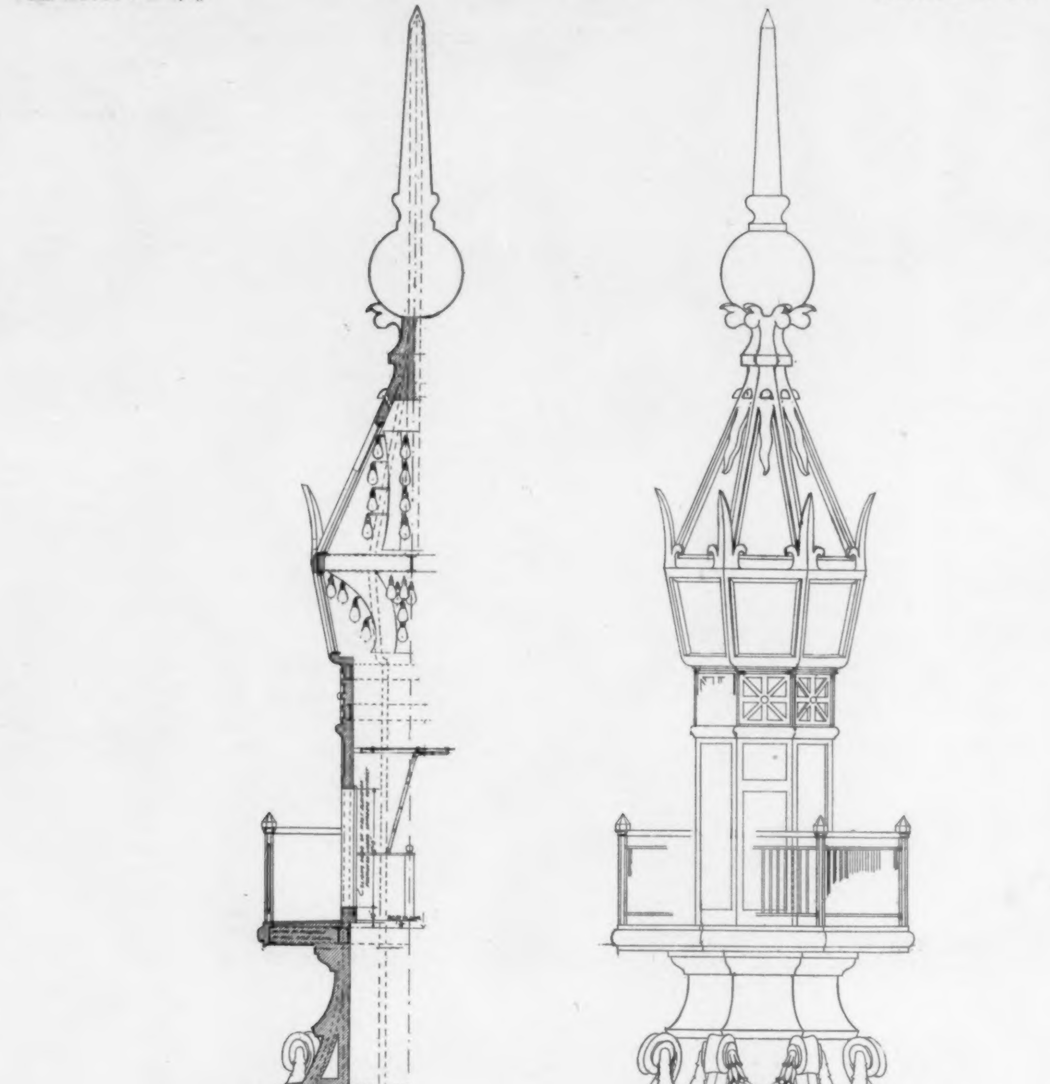

THE METROPOLITAN TOWER
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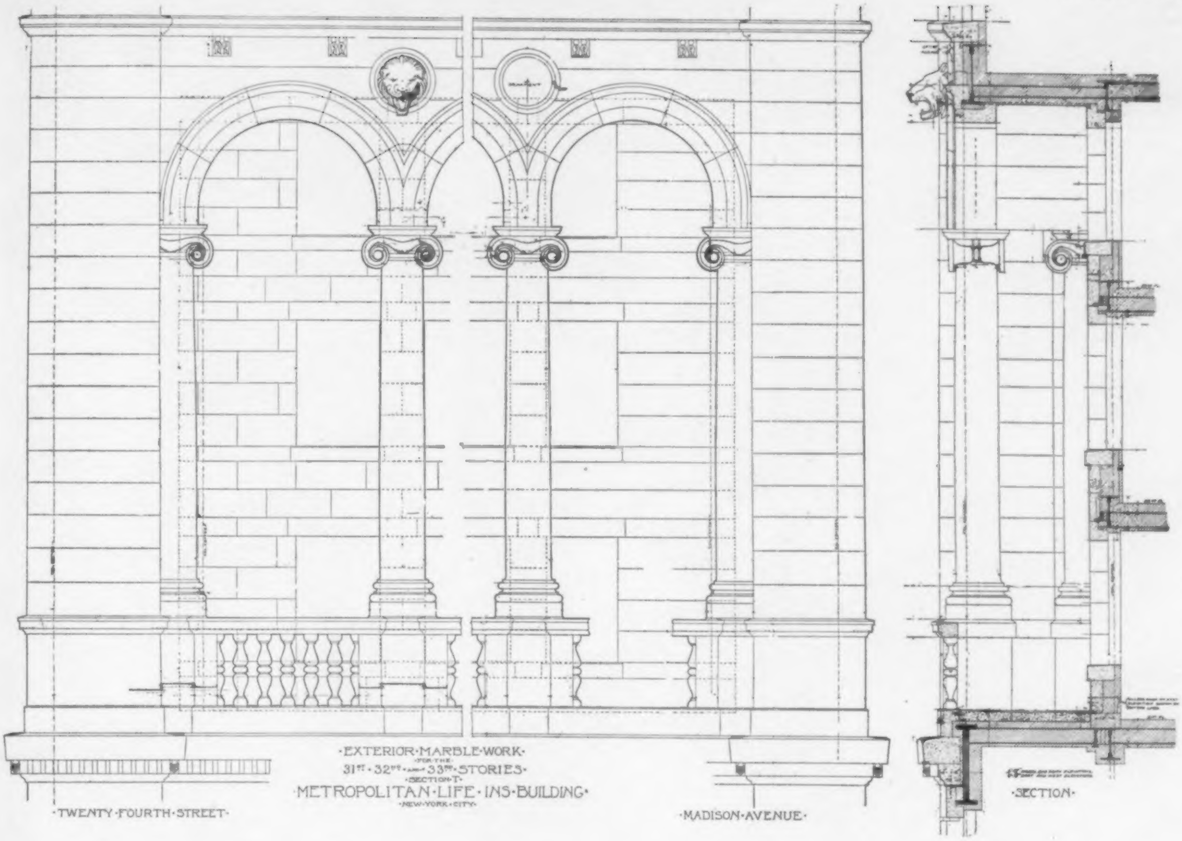

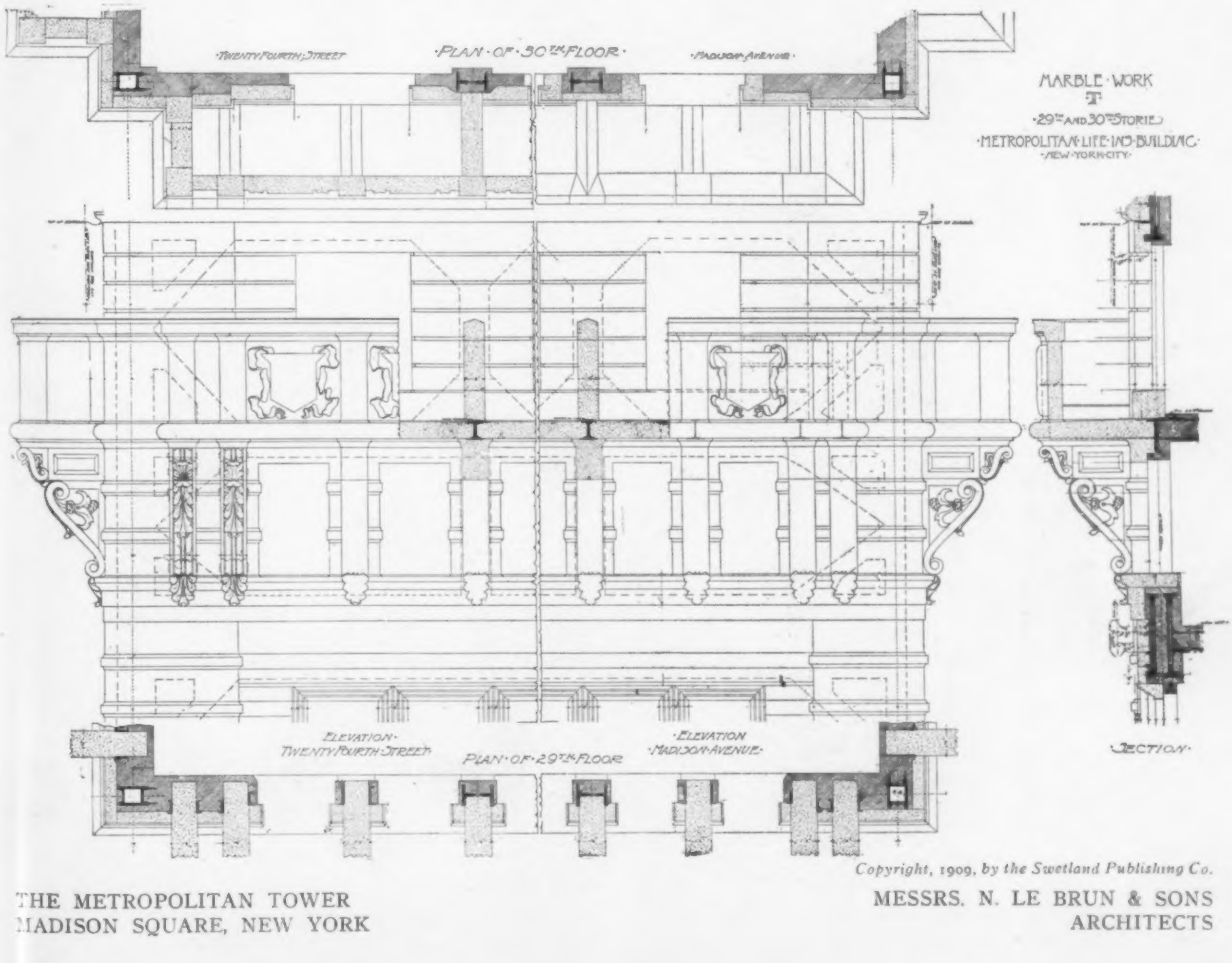

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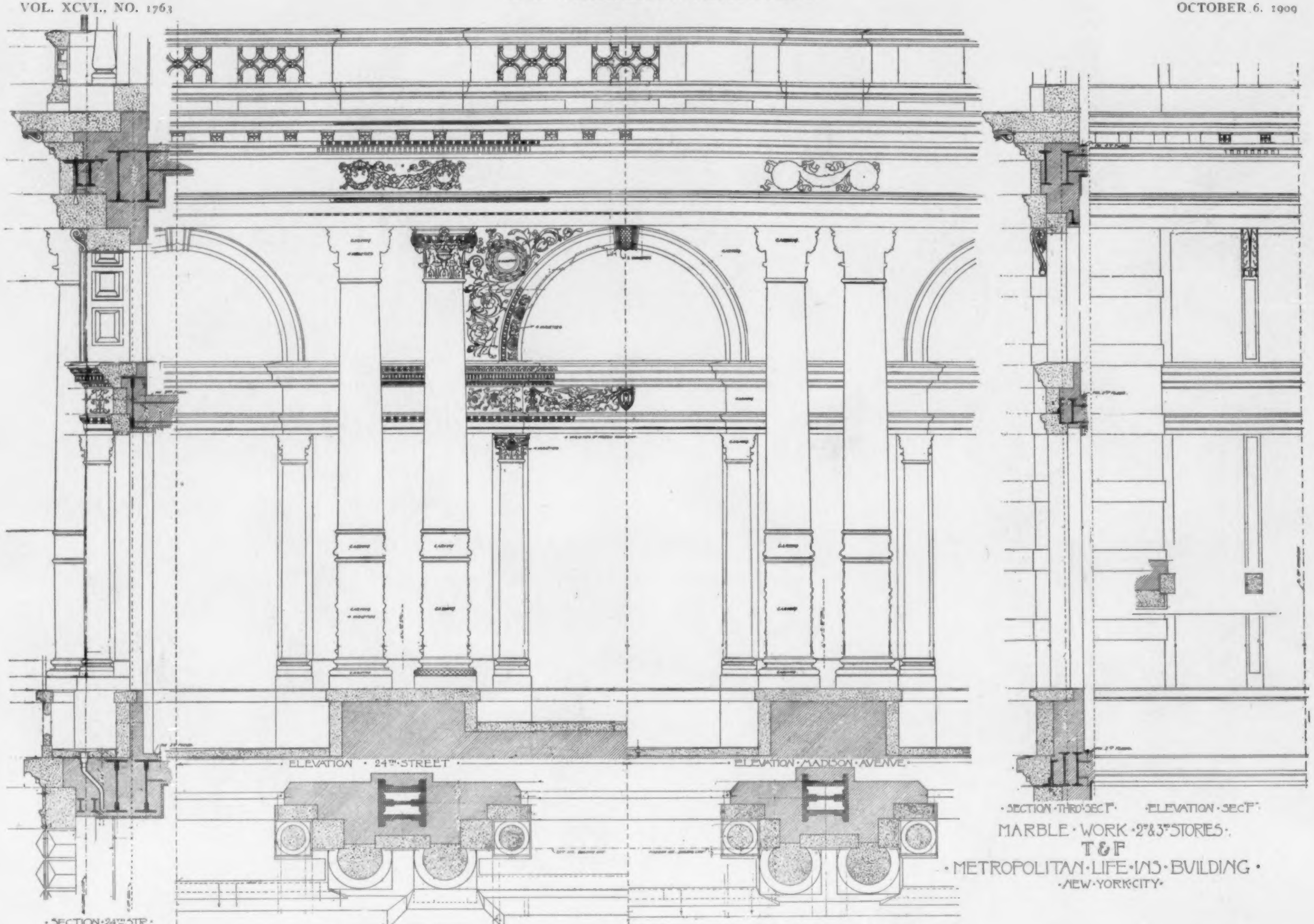

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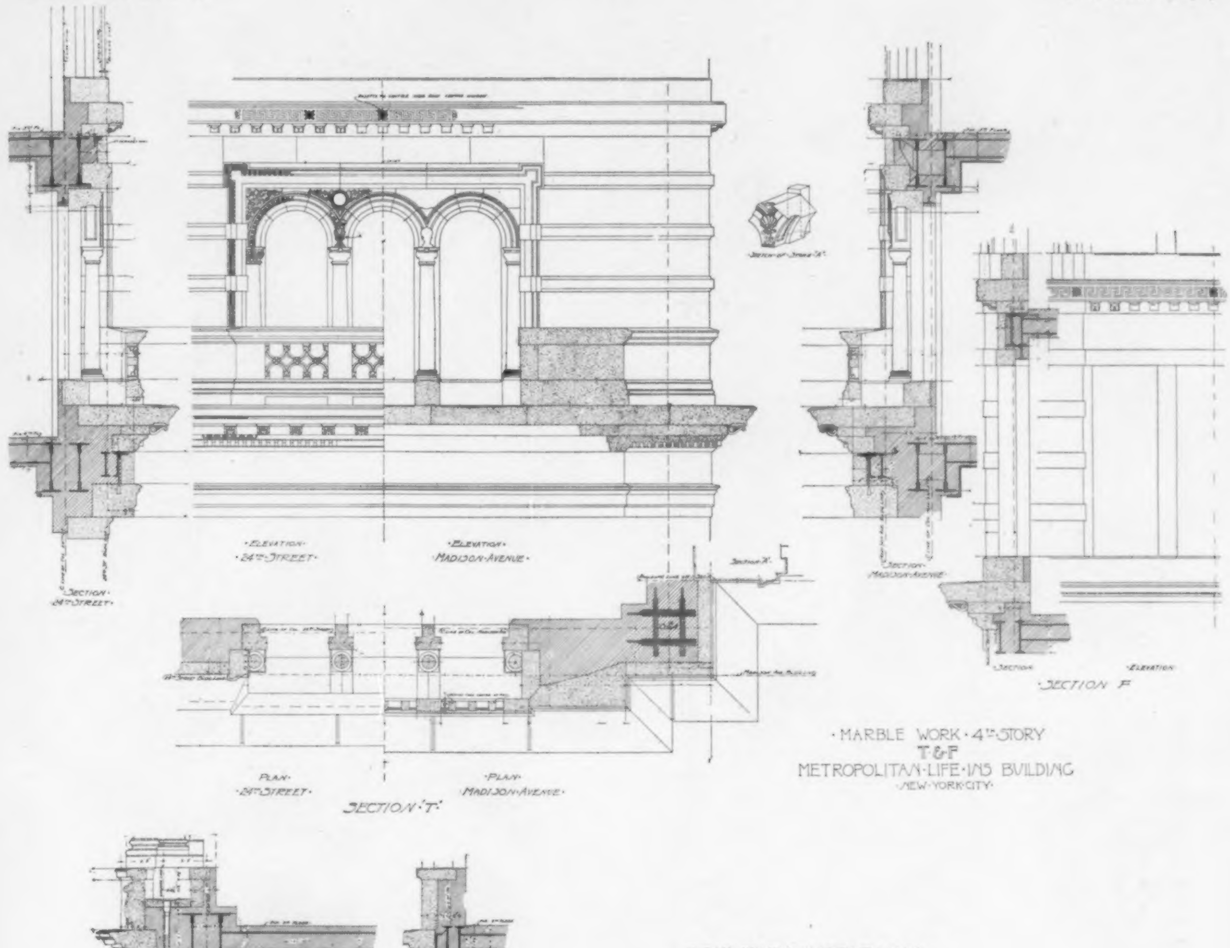

THE METROPOLITAN TOWER
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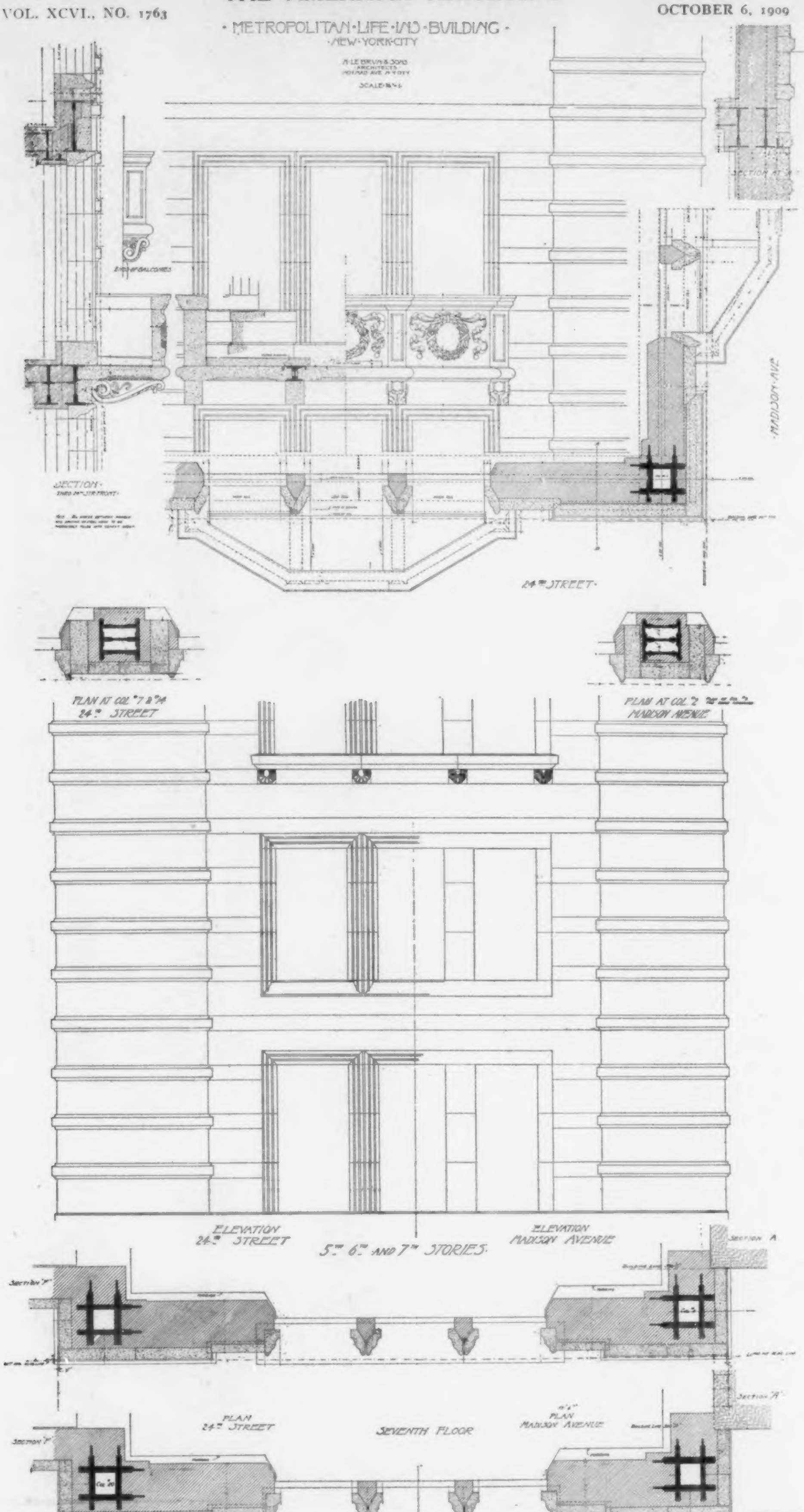

THE METROPOLITAN TOWER
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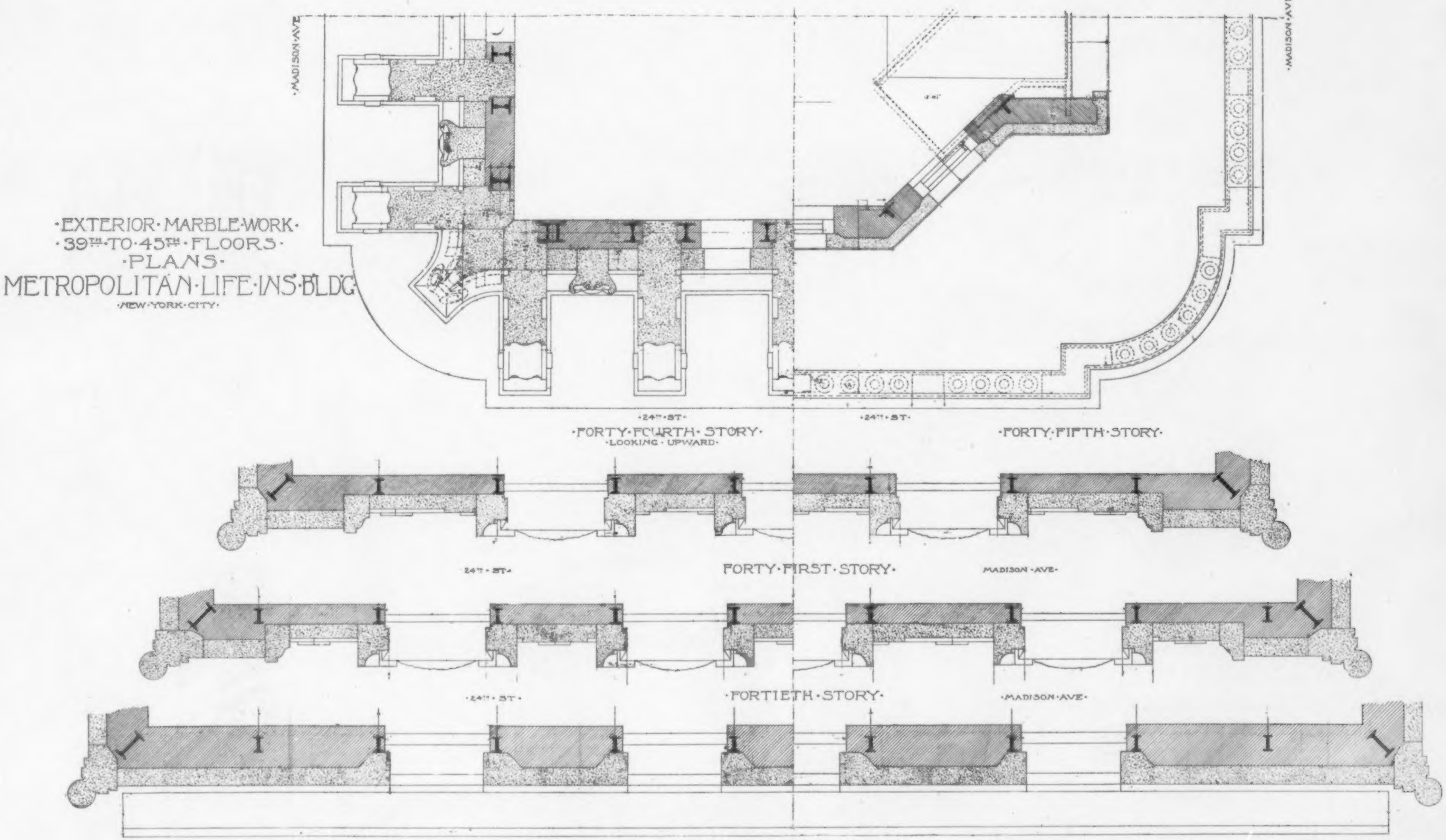

THE METROPOLITAN TOWER
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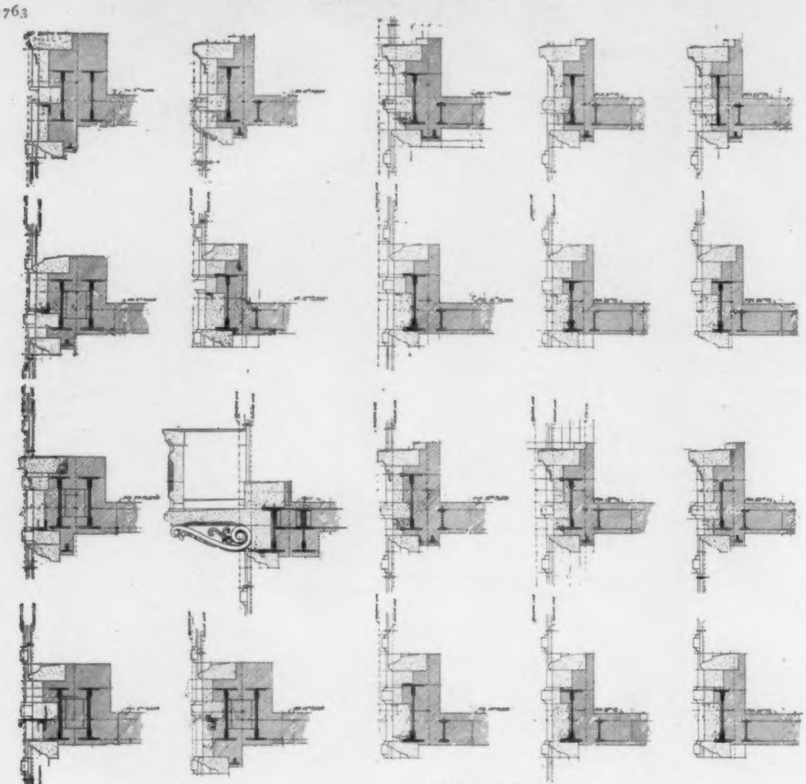
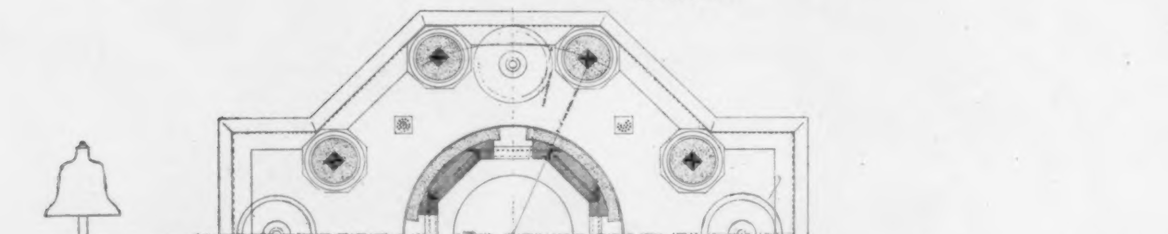


·WALL SECTIONS·
·MADISON AVE.· BET COLS. 1-4·
·SEC. "T"·
·METROPOLITAN·LIFE·INS·BLDG·
NEW·YORK·CITY·



·EXTERIOR·MARBLE·WORK·
·FORTY·FIFTH·STORY·
·METROPOLITAN·LIFE·INS·BLDG·
NEW·YORK·CITY·

THE METROPOLITAN TOWER
MADISON SQUARE, NEW YORK

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