THROVGH THE AGES

APRIL, 1924

"Styles in any degree dependent upon purity of line must be practiced altogether in hard and undecomposing materials, ... crystalline marbles."

—*Lamp of Memory:* RUSKIN.

THROVGH THE AGES

VOL. 1 APRIL, 1924 NO. 12

CONTENTS

	PAGE
STRAUS BUILDING . . . . . *Frontispiece*	
CHICAGO'S NEW THIRTY-TWO-STORY STRUCTURE . . .	3
UNTERMYER GARDENS, NEW YORK	5
GOTHIC ARCHITECTURE IN ITALY	7
A GEORGIAN SKYSCRAPER	15
A LIST OF THE WORLD'S MARBLES	19
THE MISSOURI CAPITOL	27
TEMPLE OF JUSTICE, OLYMPIA, WASHINGTON	33
ROCKEFELLER TEA HOUSE, NEW YORK	37
A HANDBOOK ON MARBLE	38

Published Monthly by the
NATIONAL ASSOCIATION OF MARBLE DEALERS
GAY AND WATER STREETS, BALTIMORE, MD.
Subscription Price $3.00 per year Single Copies 35 cents
Executive Offices: 242 ROCKEFELLER BUILDING, CLEVELAND OHIO.
Application, for Second-Class Mailing Privilege has been filed at Baltimore, Md.

Straus Building, Chicago's latest structure.

THROVGH THE AGES

A Monthly Magazine devoted to the uses of Marble - its universal adaptability, beauty, permanency and economy.

VOL. 1 APRIL, 1924 NO. 12

CHICAGO'S NEW THIRTY-TWO STORY STRUCTURE

By ERNEST R. GRAHAM

Member of the firm of Graham, Anderson, Probst and White, Architects, Chicago.

CHICAGO Beautiful has been made possible only through the desire of its citizens to build the city with the highest ideas of service and refinement. From civic pride has developed the Chicago Plan, with such great possibilities as the Lake Front Development, including the Field Museum, the Art Institute, the Stadium, the proposed Aquarium, and the downtown campus of Northwestern University. That same desire has made possible the thirty-two story Straus Building, now nearing completion on Michigan Avenue at Jackson Boulevard.

Mindful of its place in the development of cities through the financing of large building projects, and remembering that forty-two years ago the house of S. W. Straus & Co. was founded in the city of Chicago, the officers of this organization in planning for their new Chicago home planned well. The building, they determined, must be the finest that architects and builders could produce.

The fruition of this desire is now apparent in the towering structure that pierces Chicago's scenic skyline. It is the magnificent Straus Bank and Office Building, which will be ready for occupancy on May 1 of this year. The building, together with its site, represents an investment of approximately $18,000,000 and contains approximately 440,000 square feet of rentable area.

This massive structure takes the form of a hollow square, built around the perimeter of the lot with an inside light court entirely surrounded by offices. The best examples of Florentine architecture are being followed. The exterior is Indiana limestone; the interior is finished in the finest marble and native black American Walnut. On the Michigan Avenue side the center section, about 80 feet across, will be set back 2 or 3 feet from the line of the corner sections and carried up into the great tower.

The set-back develops an interesting treatment which carries vertical lines into the tower and breaks the Michigan Avenue front, adding a note of distinction quite unlike anything now existing in Chicago.

That other cities are certain to benefit from the precedents set in the construction of this skyscraper is the opinion of architects

and builders. Perhaps never in the erection of a modern office structure has more care been used in the planning for both beauty and efficiency. The same careful planning has made for the close co-operation of architects, contractor and owner, and the consequent completion of the building in record time. Ground was broken late in March of 1923 and the closing of the winter finds the main shaft of the building complete and available for occupancy.

On the street floor there will be two entrances, one on Jackson Boulevard and the other on Michigan Avenue, in addition to the great arch entrance on Michigan Avenue, leading to the bank floor, which together with the third, fourth, fifth and sixth floors will be occupied by S. W. Straus & Co., for their investment bond business. The entrance arch will be one of the outstanding architectural features of the new building.

The banking room, which will be one of the largest and most beautiful in Chicago, will be 166 by 132 feet, with a height of 42 feet. The room, which will have heavy marble treatment with a bronze coffered ceiling, will have two mezzanine floors, the lower exposed to the banking room and the upper enclosed. Private elevators will serve the zone of the building occupied by S. W. Straus & Co.

Above the sixth floor the building will be occupied by office tenants. Each office unit has been efficiently laid out with what has been determined by the most practical dimensions. The typical unit will be 26 feet from the windows to the corridor line and approximately 17 feet in width. This unity, experience has demonstrated, constitutes an ideal office size, allowing for adequate reception room off the corridor with two private offices extending to the windows, forming a T-shaped subdivision.

The Straus Building will take its place among the homes of notable financial institutions which have made such a large contribution to the architectural beauty of Chicago. Such buildings as the Federal Reserve Bank Building, the Continental and Commercial Bank Building, the Illinois Merchants Bank Building and the First National Bank Building, will embody the ideal of a greater Chicago. To this imposing group, built by the city's largest financial institutions, is now being added the Straus Building, whose architecture, strategic location and most modern equipment, place it in the front rank of office buildings in America.

EDITOR'S NOTE

GROUND was broken for the Straus Building on March 21, 1923. The caissions for the foundation were completed June 23, 1923.

The first office in the Straus Building was opened on the seventh floor several days ago. The building will be ready for occupancy prior to May 1, 1924.

The remarkable record made in the completion of the Straus Building was largely possible through the foresight of the owners and contractors in obtaining the steel for the building. Last spring it was found that no one fabrication plant would promise the steel until late in the fall. Not being satisfied with such a prospect, the contractors immediately divided the contracts for fabrication among seven fabrication plants in five states, with the result that fabricated steel began to arrive on the site early in July, coming from the different plants tier by tier according to schedule. The stone and brick work of the main twenty-two-story shaft was completed February 8th.

Illustration courtesy *The American Architect-The Architectural Review.*

White Marble was used in the Greek Theater in the Gardens of Samuel Untermyer, Greystone, N.Y., overlooking the Hudson River and the Palisades. Welles Bosworth, Architect.

Milan Cathedral, founded in 1386, and finished in the sixteenth century. The workmanship is German; the Flamboyant detail French, modified by Germans. Fine marble was used throughout.

GOTHIC ARCHITECTURE IN ITALY

The Fundamentals were Completely Disregarded, but the Style Produced Monuments of Great Charm

ROME in the Middle Ages was the capital of western Christianity. Even the bishops from far distant dioceses had to journey there for their palls, and usually each was accompanied by chaplains. These officials were quite likely to be architects, and in the early period Rome was looked to for models. Some of England's earliest buildings, after the departure of the Romans, were built in the Roman manner, and there is no doubt that the Gothic style, much as it differed, eventually, from the Roman type, was gradually developed from it.

The architecture of the various provinces of Italy differs quite as much as in France. The Gothic style there never became naturalized, and the fundamentals of the system were almost entirely disregarded, although there were many monuments of singular charm; Italian Gothic was an exotic and was purely adventitious. The country was the home of the classical Roman style and when Romanesque made its appearance it was steeped in a flavor of classic art. There was always a tendency towards classic revival, and the country was ripe for the Renaissance even in the tenth and eleventh centuries. It was in fact, too, much influenced by its traditions to accept the true spirit of this new style. Gothic arrived by way of the Cistercian monks, and spread from Fassanova in Latium, where it was introduced in 1187, to Casamari near Rome, San Galgano in Tuscany, and other sites. The pointed style of these churches quickly caught the fancy of the Italian architects, and was as quickly modified by Italian taste.

"The Italian architects had little sense of logical structure, and thus produced buildings which included meager buttress systems, tied vaults, and lacked all that the French considered most important in the Gothic style." (Kimball-Edgell: A History of Architecture.) We find, for instance, in such cathedrals as those of Siena and Orvieto, built in the middle and end of the thirteenth century, respectively, the high gables, the pointed arches and the pinnacle finials of the Gothic style, combined with the round arches, the timber roofs and the

Interior of St. Francis, at Assisi.

NOTE: Except where otherwise specified, the illustrations for this article are through the courtesy of Thomas Machen, Architect, Baltimore, Maryland.

View of St. Francis, at Assisi, from the south.

cylindrical piers that are much more characteristic of Basilican forms, the whole effect having as much classic as Gothic feeling. Classical details were abandoned, but classical methods persisted.

The Italians preferred flat soffits and the parti-colored effect, resulting from the mixture of brick and marble, to the Gothic mouldings. Wall spaces were broad and openings small, a treatment that was the natural result of a climate that offered numerous sunny days. Stained glass was supplanted by mosaic and water-color painting on wet plaster. This predilection for parti-colored walling was often carried to unpleasant extremes, as exemplified in the interiors of Orvieto and Siena. The timber roof often took the place of the vault, and even with quadripartite vaulting of Gothic character the transverse arch was emphasized in a way that was the direct legacy of the Latin and Romanesque styles.

The spacing between columns was made wider and a loss of scale resulted. Exteriorly, the dominant lines are horizontal, and there is frequently an elaborate revetment, a treatment absolutely foreign to the whole spirit of Gothic architecture. The façades were usually very gorgeous, those in central Italy, in particular, being richly decorated screens behind which the church was hidden.

The early Gothic of the thirteenth century is best typified by such churches as those built by the Cistercians at Viterbo and Assisi, where the old Latin basilican plan was used, in spite of the pointed arcade and four-part vault. St. Francis, at Assisi, though small, is a fine vaulted church of distinctly Gothic character, but it depends upon colored decoration for its interior effect. At Verona, St. Anastasia (1260) had an arcade of unmoulded arches, with parti-colored voussoirs, and cylindrical columns. The arches were tied with iron tie-rods at the springing, obviating the necessity of balancing the pressure by such systems of heavy buttresses as are found in French and English Gothic. Later in the century were built many Gothic structures, among them the interesting cathedral of Siena. It had its screen-like façades ex-

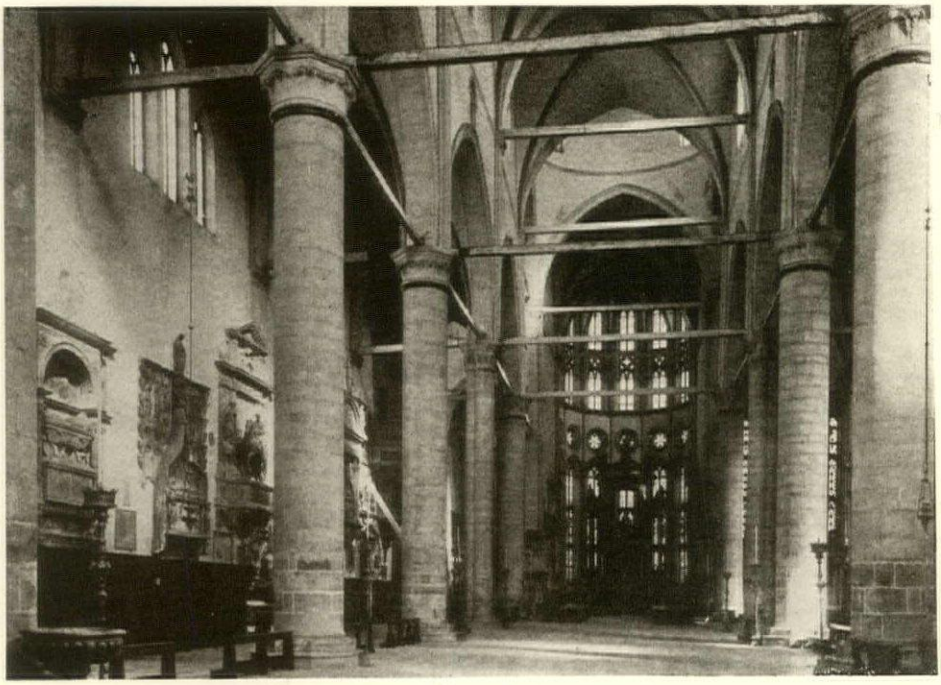
uberantly decorated in marble, with elaborately carved statues placed at innumerable points. The striped marble exterior treatment, that is characteristic of Tuscan architecture, is repeated in the interior. Polychromy is abundant. The whole building is almost startling in its riotous treatment.

The Church of St. Francis (1236–1240) reveals a real buttress system typical of that more organic feeling which found expression, in the north, in the many minor churches constructed in imitation of the cathedrals. In contrast to this are the hybrid churches of the south, where the Latin and Byzantine ideas mixed with the Cistercian.

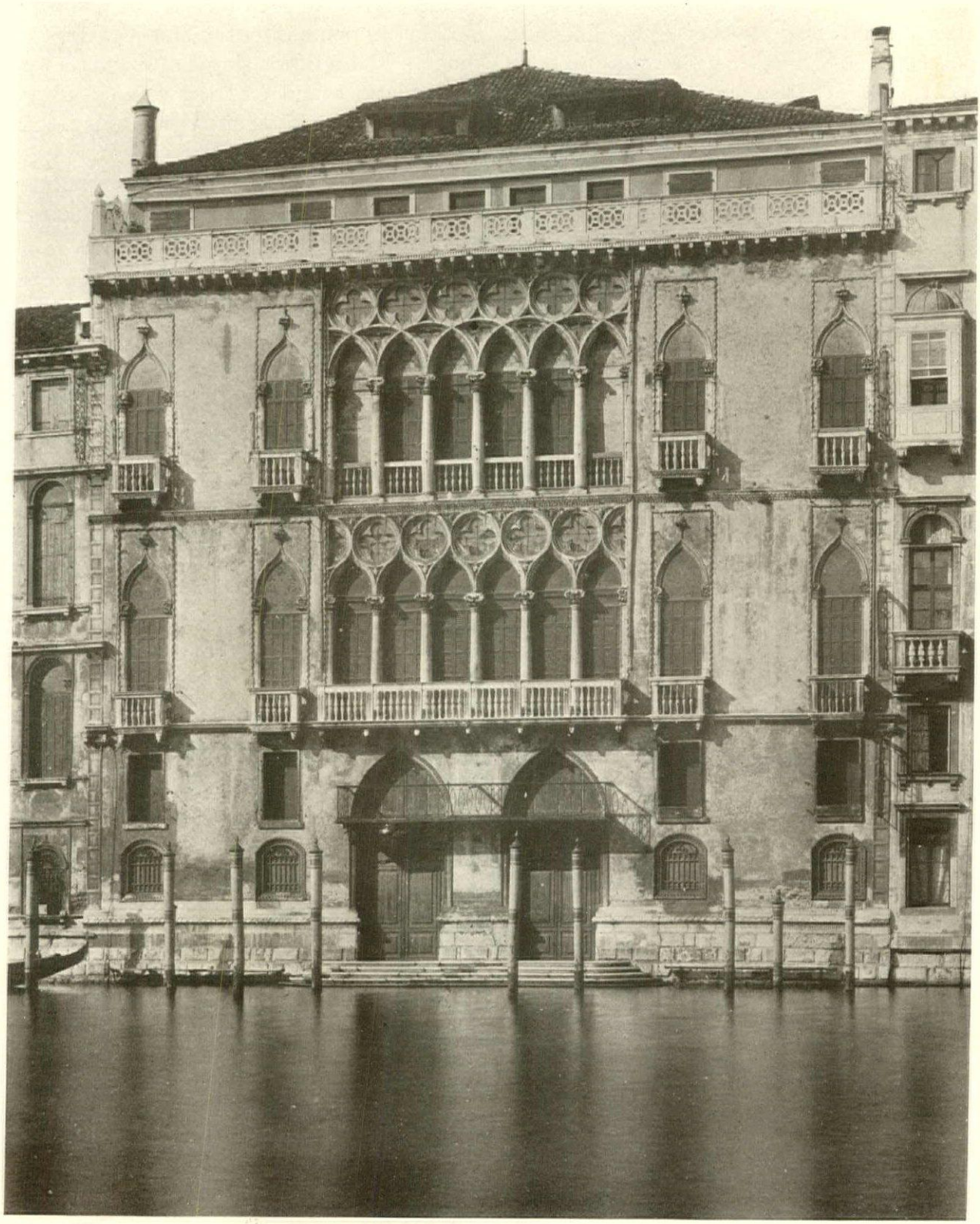
The great Italian monument of fourteenth century Gothic is the cathedral at Florence (1296–1367). The plan of Sta. Maria dei Fiore is that developed from the local architecture of the thirteenth century. There are three large polygonal apses, a plan that reveals German influence; and a dome built by Brunelleschi in 1434, that, while at first glance seems to belong to the Renaissance period of Italian architecture, in reality is Gothic in pointed outline and octagonal shape. The interior shows the wide intercolumniations and bareness peculiar to the Italian of this period; and the exterior, that constructional polychromy seldom if ever seen in Gothic of the more northern countries. There is no triforium, and the clerestory was omitted, while the openings were greatly reduced in size. The bell or clock tower, "The Lily Campanile" of Giotto, is unfinished, the intention having been, originally, to give it a spire. For this reason it seems top-heavy, though otherwise graceful.

Among other structures of the fourteenth century worth consideration is the cathedral of Orvieto in Umbria, which has already been mentioned. The façade is partly Romanesque, with the arcaded gallery across the whole front, but the rose window and four pointed spires, as well as the numerous figures in the niches high above the ground, are reminders of French Gothic.

In Venice we find a distinctly local style,



Interior of Sts. John and Paul, at Venice.



Pisani Palace at Venice, a Gothic structure built
in the fourteenth century.

Campanile of Giotto, part of the Cathedral at Florence.

a school of its own, due no doubt to the close contact with the Orient. While difcult to describe, there is never any doubt as to the origin of the treatment that was given, for instance, to the upper arcade of the Ducal Palace. There is an indefinable reminder of the East in the fronts of the late Gothic palaces along the Grand Canal. Such a church is that of Sts. John and Paul reveals traces of the same influence.

Venice contained the most famous and, at the same time, the most charming secular buildings of the Middle Ages. The fashion set by the Ducal Palace was followed by many other structures. The Flamboyant period saw the construction of large numbers of these buildings. As a general thing, the first floor had an arcade that was left open, whereas the upper stories were less broken. The openings were of a pointed trefoil form, in graceful and sinuous curves. The arches were interlaced, with the quatrefoils between them cusped, and given either round or pointed forms. Polished marble was used for exterior veneering, though sometimes we find terra cotta or small stones of several colors. The flat roof had no cornice. Its place was taken by a kind of lance-like battlement of wood or stone, whose conventional lacework appearance gave an added charm to the façade.

The fifteenth century is marked by an increasing German influence. The most important work of this period, though it was begun in the late fourteenth century, is the

Marble column in the doorway of the Orvieto Cathedral.

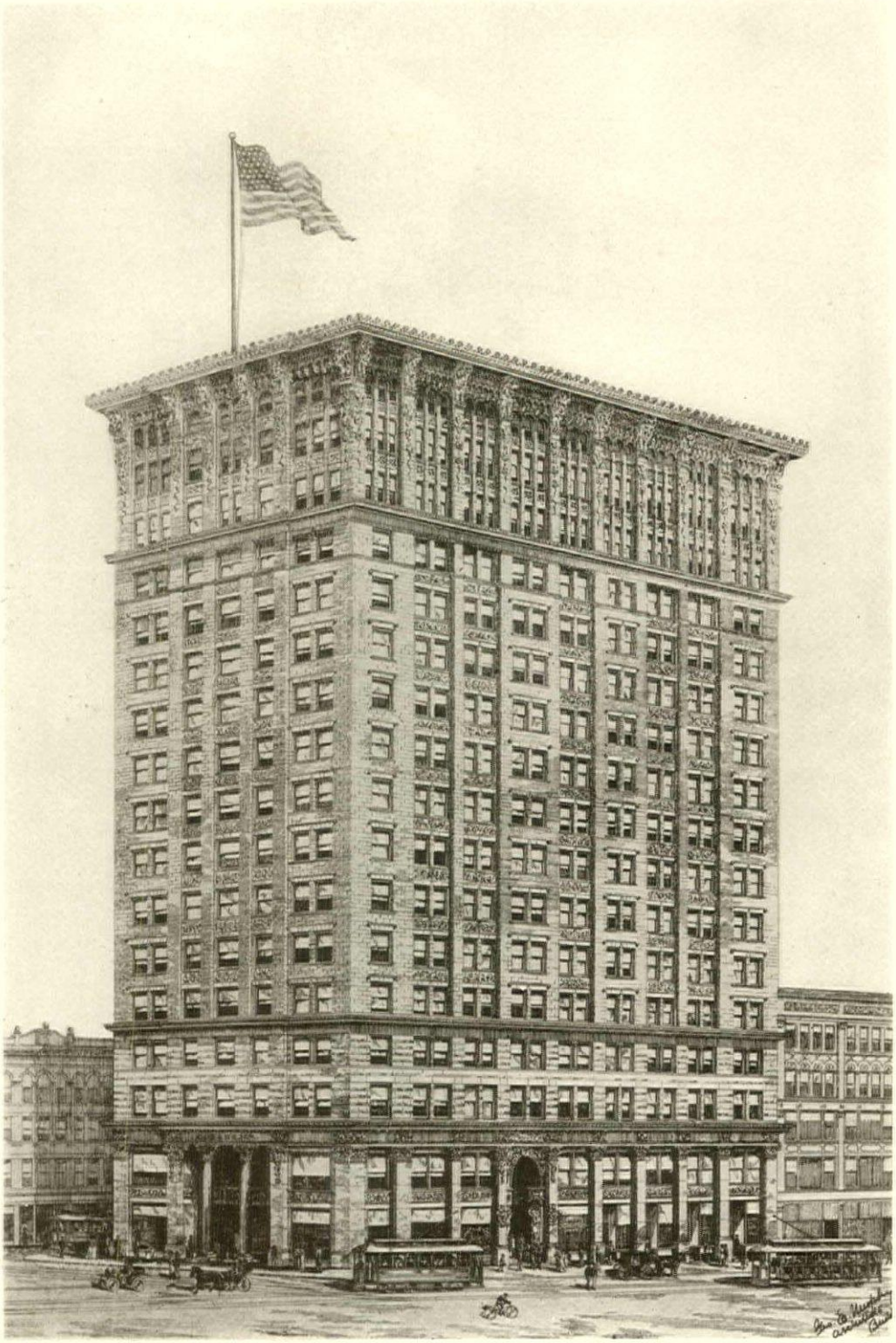
View of the Cathedral at Florence from the cupola of St. Lorenzo, showing Brunelleschi's dome.

Cathedral of Milan, the only great church in Italy that is truly Gothic in spirit. There is the unsparing emphasis on vertical lines in its soaring character, such as we saw in English Perpendicular; and there are also the Gothic elements of multiplicity of parts even though the detail is very bad. This latter is due to its German workmanship. The high Italian ground story was retained as well as the increased inter-columniation, but the triforium disappeared and the clerestory was diminished. The windows were small and the vaults were held in by tie-rods. Flat roofs were substituted for pitched ones, but a large number of pinnacles were used to camouflage the horizontality. A lacelike effect was obtained by a profuse use of delicate carving, especially figure work, and as the material employed throughout was fine marble, the whole structure is very imposing. The interior is a remarkable illustration of the noble effect it is possible to achieve by great height and general richness of decoration, even though the detail itself is very poor.

So mixed is the architecture of Italy, and so uncertain in its aims, that it is often impossible to classify, as to style, many of the buildings of this period. This is particularly true of the secular architecture, which offers some charming and picturesque structures. Each city assumed to itself its own peculiar type of building, a fact that held true even when they were not widely separated. All Italian mansions of the Middle Ages, of course, bore a certain resemblance, but they differed in detailed treatment and general expression. For example, we find in the Palazzo Publico of Siena a certain grace and slenderness that contrasted strongly with the almost repellant appearance of the heavy and dungeon-like Palazzo Vecchio. The former made use of much brick and the materials used were finished in a finer way, while the latter used a dark stone with rough rustication. The Siena structure had three-

light windows of very pointed design, encompassed by a highly pointed arch, whereas the Florentine building had windows with two lights, separated by a mullion, within a pointed arch with non-concentric intrades and extrades. This variance in the window openings is especially characteristic of the period.

Late Gothic Palace of Mascarello, built in the fourteenth century.



The Candler Building in Atlanta, Georgia

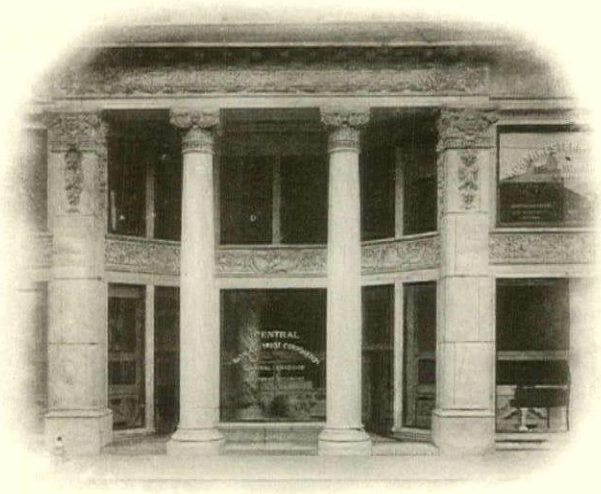
A GEORGIAN SKYSCRAPER

The Candler Building in Atlanta is an Immense Structure of White Georgia Marble

LESS than a century ago the Cherokee warrior reared his tepee on the hillsides in the grateful shades of the pathless forests that covered the State of Georgia. Today there stands a modern city of over a hundred thousand inhabitants—the city of Atlanta. It is typical of the inspiring drama that has been in the acting all over America, a story of ceaseless energy, untiring industry and unconquerable determination.

Of all American cities that have sprung into being, grown and prospered, none is associated with more commercial interest than Atlanta. It is recorded that in 1825 there was made a formal grant of two hundred and two acres of what was then Land Lot No. 78, of the Fourteenth District of Henry County, to one Jane Doss. The original grantee, not being blessed with prophetic foresight, sold this tract to a certain Matthew Henry for fifty dollars. Ten years later Mr. Henry sold it to Reuben Cone for three hundred dollars, an increase in value even in that remote day of five hundred per cent.

In 1845, two years before the city of Atlanta obtained a charter, Mr. Cone sold an undivided half-interest in the property to Ammi Williams, who sold a triangle out of the tract to the trustees of the First Methodist Church. The price paid for this fraction of the original fifty-dollar lot was one hundred and fifty dollars. The trustees sold most of this land in small lots, retaining only a parcel on Peachtree Street, upon which was built a log chapel, afterwards replaced by a brick and stone church. In 1903 this was bought by the Candler Investment Company for one hundred and sixty thousand dollars.



Entrance to Bank on North Front

Upon this site was erected the modern office building known as the Candler Building, one of the largest and finest structures in the south and second to none in beauty and embellishment. The building stands facing north on Houston Street, with its sides extending considerable distances on Peachtree and Pryor Streets, which converge to form with Houston Street, a flat-iron shape. The construction was unusual in the respect that the work was not let by general contract. The architect, Mr. George E. Murphy, having worked out the technical details, contracts for each specific phase of the undertaking were separately let, the steel work to one firm, the marble to another, and so on. Erection was begun on the steel skeleton about July 1, 1904, and the public was admitted by the first of January, 1906.

The exterior, seventeen stories high, was built entirely of Amicalola marble from the quarries in Cherokee County, Georgia. An interesting feature is the immense monoliths that adorn the Houston Street entrance. Each pillar is four and a half feet across at the base, tapering gracefully to four feet at the capital; each is twenty-six feet high and weighs more than forty tons. Over this same entrance are two immense plate girders each weighing several tons. These had to be delivered on the street car company's trolley trucks after their weight had broken several vehicles in attempting their transportation.

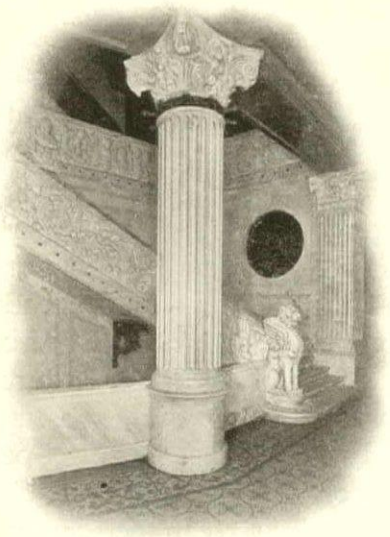
On the façade, between the first and second stories, are numerous elaborately carved panels illustrating the liberal arts and sciences. The artist and designer, Mr. F. B. Miles, secured sculptors from France, Italy and Scotland to execute the decorative work.

Beginning at the southeast corner of the building, on North Pryor Street, and moving north toward Houston Street, these panels represent Architecture, posed by Mr. H. C. Hunt, of New York, one of

America's celebrated architects. Sculpture, from a bust of Michaelangelo. Art, from a bust of Raphael. Literature and Drama, from a bust of Shakespeare. Music, from a bust of Wagner and ornate panels representing Natural History and Agriculture. The panel on the Houston Street corner represents Military Glory, and was posed by Admiral George Dewey, the hero of Manila Bay.

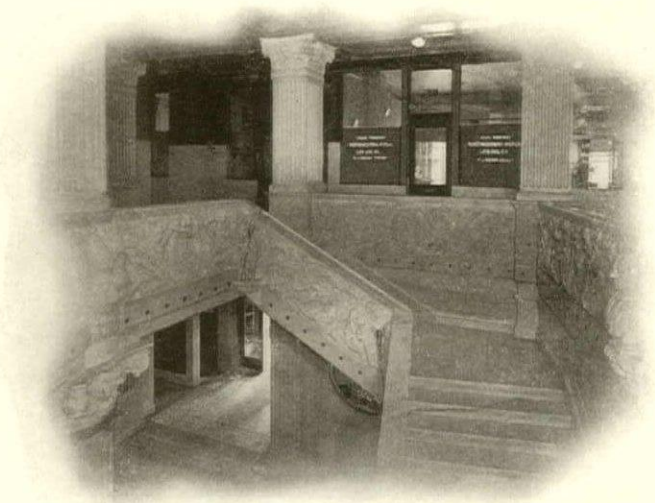
On the Houston Street façade, the panels number but two and represent the pioneer life of the early settlers. From one peers the face of Father Marquette, the intrepid priest-explorer, and from the other the well-known features of Col. William F. Cody, known the world over as "Buffalo Bill."

On the Peachtree façade, beginning at Houston Street, are represented Statesmanship and Philosophy, from a bust of Benjamin Franklin. The power of Steam, from a bust of Ericsson. Agriculture, from a bust of Cyrus McCormick, the inventor of the self-binding reaper. Music, from a bust of Beethoven. Art, from a bust of Abby. Literature, from a bust of Scott. Sculpture, from a bust of Ward, and Astronomy, from a bust of Herschel.



On the interior at appropriate intervals, in suitable niches in the ornate frieze are busts of Samuel C. Candler and Martha B. Candler, the father and mother of the man who conceived and carried to a successful climax the founding and construction of this magnificent building, together with many other famous and celebrated sons of Georgia.

The north end of the first floor contains a spacious room of nearly four thousand square feet area, occupied by the Central Bank and



Grand Staircase in Candler Building

Trust Corporation. The fixtures, installed and owned by the Candler Company, are entirely of Georgia marble of exquisite color and grain. Throughout the rest of the building marble has been used wherever practical. Each floor has its distinct dado or wainscoting of finely grained marble, each piece so matched with its neighbor that the lines flow together, and grain meets grain in one unbroken surface of polished beauty.

At the foot of the grand staircase that leads from the foyer to the first basement is an exquisitely carved marble newel post representing a dolphin. In the basement is a plunge pool, twenty by sixteen feet, and more than six feet deep, with sides and steps of white marble. Nearby is an electric light plunge consisting of a marble cabinet some ten feet high and five feet square, in which have been placed many incandescent lights. This is used by sufferers from lumbago or rheumatism, and seems to be quite popular.

The huge building is equipped with a refrigerating and cold storage plant, and all water used is filtered before it reaches the drinking fountains, which are placed conveniently for every tenant on each floor. The fourth, sixth and eighth floors of the building are especially equipped for the accommodation of physicians and dentists, having special waste pipes in direct connection with the street sewers and extra electrical connections, besides direct connection with air compressors located in the basement.

The Candler Building is a monument to southern enterprise, and the people of that section have every right to be proud of this fine structure. At night, with its maze of lights shedding mellow radiance from its scores of windows, it is one of the beautiful sights of the city of Atlanta.

The power machinery whereby the conveniences and comforts of the modern, twentieth-century office and commercial structure are made available for use must of necessity be gigantic as well as dependable. The equipment in the Candler Building consists of two sets of immense cross-compound heavy-duty type Corliss engines, three in each set. In putting in such a plant in duplicate, the management has provided against accidents and eliminated the possibility of confusion or vexatious delays. Some thirty-five miles of copper wire running through steel conduits supply current for the seven thousand electric lights used and the whole system is controlled from the basement.

A LIST OF THE WORLD'S MARBLES

By J. J. McCLYMONT

Note—In a past issue, Mr. McClymont proposed, for the sake of convenience, to divide the different marbles into four groups. These arbitrary groupings were as follows:

GROUP A — Any marble or stone sold to the trade in fair-sized slabs or blocks of commercial size, rectangular shape and guaranteed by the seller to be sound, free from natural defects, that can be finished at a minimum cost, and sold to the consumer as sound marble.

GROUP B — Any marble or stone sold to the trade in slabs or blocks of fair or medium size, generally rectangular shape, guaranteed to be sound and free from natural defects, the finishing of which, because of texture, the size of slabs, the shape and size of blocks, is somewhat more expensive than those in Group A.

GROUP C — Any marble or stone that cannot be sold as sound but contains a minimum amount of natural defects, such as dry seams, old fractures, partially or completely healed surface voids, etc., to be treated by the manufacturer in the most approved manner, reinforced where necessary by liners on back or metal inlays and sold to the consumer as semi-sound marble.

GROUP D—All marble, stone and so-called serpentine marbles, and Onyx, which, by their peculiar formation are known to be fragile, such as Breccias and nearly all highly colored marbles and serpentines, and that are sold to the trade in irregular shaped blocks or slabs without a guarantee as to their soundness, treated by the manufacturer in the most approved manner, reinforced where necessary by liners on back or metal inlays and sold to the consumer as unsound marble.

D'Alep Breche—See Breche D'Alet.

Dalton-in-Furness—See Dapple Limestone, and White Limestone.

Damascus Oynx—Same as Egyptian Onyx.

Danby or Mountain White—Group B.
Imperial Quarry, Danby, Rutland County, Vermont.
Faintly cream-tinted, somewhat translucent, with yellow, greenish-gray irregular streaks or mottlings. (Vermont State Geological Survey)
Takes medium polish.

Daniel Quarries
Located at Nehden, Westphalia, Germany.
Produce Alma and Goldedar Marbles.

Dapple Limestone—Group A.
Newton Quarries near Dalton-in-Furness, Lancashire, England.
Buff, containing small fossils and dappled with dark brownish feathery patches.
Takes fair polish.
Locally it is sometimes known as New England Marble. (Watson)
This is probably the same as the dark variety of New England described by Blagrove, although the descriptions differ materially.

Dark Ashburton—Group B.
Quarries near Ashburton, Devonshire, England.
Dark gray with bright red and white patches and markings. (Watson)

Dark Blue Columbia—Group B.
Quarries located at Columbia, Tuolumne County, California.
Dark blue gray.
Takes high polish.

Dark Blue Rutland—Group B.
Vermont Marble Company's Quarry, West Rutland, Vermont.
Dark bluish gray, mottled with white.
Takes high polish.

Dark Cedar—Group A.
Andres Quarry, Kizer, Blount County, Tennessee.
Dark pink slightly variegated.
Takes high polish.
Supply limited.

Dark Cedar—Group A.
Gray Knox Quarry, near Knoxville, Blount County, Tennessee.
Dark reddish brown background mottled with small white and light colored dots.
Takes high polish.

Dark Cedar—Group A.
Island Home Pike Quarry, near Knoxville, Tennessee.
Dark brown with veins of darker shade, few white dots.
Takes high polish.

Dark Cedar—Group A.
Victoria Quarries, near Knoxville, Tennessee.
Dark chocolate colored with fine white dots.
Takes good polish.
Not available.

Dark Chocolate—Group A.
Tennessee Producers Quarry, near Knoxville, Tennessee.
Dark color with slight markings.
Takes high polish.

Dark Cipolline—See Cipolline (Eastman Dark American).

Dark Cloud (*Clarendon*) or Clarendon Dark Cloud—Group B.
Clarendon Quarry, near West Rutland, Vermont.
Pure white with numerous dark almost black bands and clouds.
Takes medium polish.

Dark Columbia—Group B.
Columbia Quarries, Tuolumne County, California.
Light clouded gray, with an abundance of dark thread-like veins.
Takes high polish.

Dark Edelfels—See Edelfels Dark.

Dark Florence—Same as Pittsford Valley.

Dark Gray Kapunda—Same as Kapunda Dark Gray.

Dark Ivory Green—Group B.
Eastman's Quarries, West Rutland, Vermont.
Light gray to ivory white, with waving veins of green and others of yellowish or olive green.
Takes fair polish.

Dark Lepanto or French Gray—Group B.
Quarried at Bluff Point, south of Plattsburg, New York.
"Fossil fragments, of red and pink with few dark fragments enclosed in a gray ground moss." (Extract, N.Y. State Museum Bulletin.)
Takes good polish.

Dark Red Ogwell—See Red Ogwell (Dark).

Dark Republic—Group A.
Ross Republic Quarry, near Knoxville, Tennessee.
Dark chocolate, with small white markings.
Takes high polish.

Dark Roman Marble (Fossiliferous)—Group C.
Nebresina Quarries, Istria, Italy.
Light brown to brownish cream, with shell fragments of light color.
Takes medium polish.

Dark Tennessee—See Chocolate, Dark Cedar, Dark Chocolate, Dark Republic.

Dark Vein True Blue—Group B.
Vermont Marble Company's Quarries at West Rutland, Vermont.
Dark bluish gray with winding veins of darker shades, some of which are black, and large and small spots of white.
Takes medium polish.

Dash Kesen—See Maragha.

Dauphin
Quarry near Baune, Cote d'Or, France.
Pale red, melting into white and violet. (Blagrove)
Takes high polish.

Dead Man's Bay
Dead Man's Bay Quarry located at Cattedown, Devonshire, England.
Mentioned by Watson.
No description.

Deb Mori—See Steatite (Soap Stone)

Deer Isle (Serpentine)
Quarried on Deer Isle, Penobscot Bay, off the coast of Maine.
Dark green, almost black, sometimes streaked and spotted by veins of amianthus and diallage crystals.
This quarry has not been in operation for more than fifty years.

Dehkharegan—See Tabriz.

Delaware Marble
No marbles available from this state, although a white dolomite occurs near Hockessin, New Castle County.

Delaware Serpentine
Mention has been made of serpentine deposits in this state, but we have no record of any development.

Delta—See Port Shepstone.

De Nimes Blanc (Limestone)—Group C.
Quarry located near Nimes, France.
Very light, nearly white.
Takes low polish.

Dent Black
Quarry located near Dent Head, Yorkshire, England.
Deep black, with occasional shells and corals. (Watson)
Takes medium polish.

Dent Fossil (similar to Derby Fossil).
Quarry near Dent, Yorkshire, England.
Brownish gray, with white markings.
Takes high polish.

Dent Head—See Dent Black.

Derby Black or Black Derbyshire.
Ashford Dale Quarries, near Ashford, Derbyshire, England.
Black.
Blocks run from six inches to ten inches thick. (Watson)
Quarries not in operation in 1923. (Elsden & Howe)

Derby Fossil or Monyash Marble.
Monyash Quarries, Bakewell, Derbyshire, England.
Medium gray with white markings. (Watson)
Quarry not operated in 1923. (Elsden & Howe)

Derby Gray Fossil—Same as Derby Fossil.

Derbyshire Alabaster—See Alabaster, English.

Derbyshire Fluor Spar—Same as White Fluor Spar.

Derbyshire Marbles
"With the exception of the Hopton Wood Quarries, the Derbyshire Marble Industry is almost extinct." (Elsden & Howe —The Stones of London.)

Derbyshire Spar—Same as Alabaster, English.

Desamparo—One of the discontinued Mexican Onyx Quarries.

Desert—See Le Desert.

Devil
Signifies mourning.
Is applied to marbles quarried at or near Moulis, Ariege, France.
See Grand Devil and Petit Devil.

Devil's Den Quarry

In Newbury, two and a half miles south of Newbury Port, Massachusetts, there is an abandoned quarry. Small masses of Noble Serpentine can be obtained here, that, according to Merrill, compare with any in the world for beauty.

Devonshire Marbles

According to Watson all Devonshire Marbles are almost without exception fossilized.

Bradley Woods, Dark Ashburton, Dead Man's Bay, Fossil Clouded Petitor, Gray Clouded Petitor, Gray Ipplepen, Gray Ogwell, Hooe Lake, Plymouth Black, Pomphlett, Prince Rock, Radford, Red Ipplepen, Red Ogwell (Dark), Red Ogwell (Light), Red Petitor, Stoney Combe.

In addition to the marbles listed above, many quarries are operated. Those at Babbacombe and Newton Bushell are red, or gray with white and yellow veins. A rose-colored spar is found at Kitley Park.

Black and White marbles are quarried at Bridestown, South Tawton and Drewsteigton.

Black, with large white veins, are quarried at Staverton and Berry Pomeroy.

Devon Black—Same as Plymouth Black.

Devon Siena

Quarried near Plymouth, Devonshire, England.

Deep yellow with rose pink and occasional deep red markings.

Available in small blocks only.

Devon Spar

Quarried near Plymouth, Devonshire, England.

Delicate red to cream with a pinkish tinge.

Available in small blocks only.

Diabase

A compact heavy igneous rock; dark gray, dark green or black.

Not used for interior work, although used for inlays, etc., by ancients.

The Antique Porphyry or Marmor Lacedaemonium Viride was a Diabase, which according to Hull was taken from between Sparate and Marathon, Greece.

Dibunophyllum—Name given to certain fossils.

Di Calcina—Calcareous.

Diamond C Pink—Group A.

Craig Quarries, near Knoxville, Blount County, Tennessee.

Dark reddish pink.

Takes high polish.

Dihkergan—Near this village in Persia, Tobiz Marble is quarried.

Dihant Marbles—See Rouge Fleuri, Rouge Griotte, Rouge Imperial, Rouge Royal and Rouge Vif.

Dinorben (Black)

Quarried near Dinorben, Anglesey, Wales.

Deep blue-black, with small white fossils.

Takes high polish.

Dinorben (Brown)

Quarried near Dinorben, Anglesey, Wales.

Light brown, with spots and veins of darker shades.

Takes high polish.

Dionysos, Pentelic Marble—See Pentelic White Statuary.

Diorite

A granular crystalline igneous rock, commonly of soda, lime, feldspar and hornblende.

Diphyphyllum—Name of certain fossils.

Disaspre—See Benou Jaspe.

Disaspre Oriental—See Numidian Yellow

Diaspro della Rochetta
Quarried at Rochetta, near Siena, Italy. Is a mixture of a great variety of colors.

Djebel-er-Roos or Mountain of the Capes.
Near Kleber, Oran Province, Algeria.
On this mountain are located quarries that produce Algerian Serpentine, Antique Dove, Breche Sanquin, Jaspe Rouge, Jaune, Jaune Chiaro Ondate, Jaune Rose, Pavonazzo Rosso and Rose Clair.
None of these quarries were in operation in 1923.

Dog's Tooth or Mussel
Name of one of the fossil marbles of Derbyshire, England.
Not available.

Dole
Quarried near Dole, Jura, France.
Purplish red.

Dolerite—See Black Dolerite.

Dolly Varden Marble—See Knox Pink.

Dolomite
According to Merrill, "This mineral closely resembles Calcite, but can be readily distinguished by its greater hardness and from its being acted upon but little, if at all, by a dilute of acid. Like calcite, it frequently occurs in compact crystalline massive forms. Many of our marbles are dolomites."

Dolomite Alps—See Tegernsee Dark and Light Reds and the Ruhpoldings.

Donaghcumper—See Irish Black.

Donegal—See Dunlewy.

Donzio—Name of one of the Italian Quarries.

D'or—Means golden.

Dore—Means gilt over.

Dorer—Means to gilt over, to make yellow.

Dornington
Quarry at Dornington, Herefordshire, England.
Variegated greenish-gray, whitish yellow spots.

D'oro—Means golden.

Dorset (building stone)—Group A.
Valley Quarry (Norcross), near South Dorset, Vermont.
Cream tinted to very light faintly-greenish smoke color. (Vermont State Geological Survey)
Takes medium polish.

Dorset B (building stone)—Group B
Plateau Quarry, near South Dorset, Vermont.
Light cream-color, clouded with light gray to smoke tint. (Vermont State Geological Survey)

Dorset Green Bed—Group B.
Valley Quarry (Norcross), near South Dorset, Vermont.
Faintly greenish to pale cream, with very dark to light greenish-gray streaks. (Vermont State Geological Survey)
Takes fair polish.

Dorset Italian—Group B.
Quarried at Dorset, Vermont.
White ground mass, through which are scattered clear grayish-green and dark-green crystals.
Takes fair polish.

Dorset Mountain—Group B.
Blue Ledge Quarry, near East Dorset, Vermont.
Faintly bluish-white tint, irregularly mottled with very light gray. (Vermont State Geological Survey)
Takes medium polish.
This quarry was opened in 1825 and was known as the Holley, Fields & Kent, or Kent; and later as the Blue Quarry. (Hitchcock)

Dorsetshire—See Purbeck.

Dorset White—See Dorset A.

Doue
Quarry near Doue, Cote d'Or, France.
Varied shades of purple with white spots.
Takes high polish.

Dougliska Quarries—See Galway Black.

Doulers (Breccia)
Quarry near Doulers, Nord, France.
White, gray, red and reddish spots.
Takes high polish.

Dove Blue
This name is used to designate certain marbles and has become so general in its application that it may be applied to any of the following marbles:

Bardiglio
Bardiglio Fiorito
Bardilla
Bleu Turquin
Blue Pentelic
Dark Blue Columbia
Dark Blue Rutland
Dark Vein True Blue
Dove Blue Rutland
Dove Happaway
Eastman's Blue
Electric Blue
Esperanza
Extra Dark Royal Blue
Extra Dark True Blue
Florentine Blue
Highland Blue
Holland Blue
Irish Dove
Livido
Manchester Blue
Regal Blue
Royal Blue
Skye (Blue)
Standard Blue
Swanton Blue
True Blue
Veined Blue

Dove Blue Rutland—Group B.
Vermont Marble Company's Quarries, West Rutland, Vermont.
Gray-blue of fairly uniform color.
Takes medium polish.

Dove Happaway
Happaway Quarries, near St. Mary's Church, Devonshire, England.
Dove color with white and pink markings. (Watson)
Takes medium polish.

Dove Marble (Irish) or Irish Dove.
Johnstown Quarries, near Formay County, Cork, Ireland.
Blue-gray, with slender white veins and markings. (Watson)
Takes medium polish.

Dover Marbles—See Dover White, Dutchess, Kallithos.

Dover White or White Dover—Group A.
Dover White Marble Company's Quarry, near South Dover, Dutchess County, New York.
White, slightly clouded.
Takes medium polish.

Dove Skye—See Skye (Dove)

Drap Mortuaire
Quarry near Angre, Belgium.
Black, with occasional white fossils.
Takes medium polish.

Draycot (Brecciated)
Draycot, near Weston-super-Mare, Somersetshire, England.
Brownish-red, with large and small spots of gray and varied colored brown.
Takes medium polish.

Drewsteigton—See Devonshire Marbles.

Droit—Means straight.

Dukes Red
Alport Quarry, near Rowsley, Derbyshire, England.
Deep blood-red color. (Watson)
Not available. (Elsden & Howe)
Takes high polish.

Duna Almas—See Almas Marble.

Dunbar
Quarried near Dunbar, Haddingtonshire, Scotland.

Dark grayish-brown, with lighter colored fossils. (Watson)
Takes medium polish.

Dunkelbau—See Gray Kunzendorfer.

Dunkerron
Quarried on the Islands of the Kenmare River, near Dunkerron, Ireland.
Variegated black and white, and white, yellow and purple; also, purple veined with green.

Dunlewy—Group A.
Quarried on the banks of Lough Dunlewy, about 30 miles west of Londonderry, County Donegal, Ireland.
Clear white but coarsely grained, hardly suitable for interior work, although it takes a fair polish.

Dunville Stone (Freestone)
Quarry at Dunville, Wisconsin.
Buff colored, fine grain.
Takes no polish.

Durham—See Fosterley.

Dutchess or Dutchess County
South Dover Marble Company's Quarry, near South Dover, Dutchess County, New York.

Dyer Breccia
Dyer Quarry, near Sutherland Station, Manchester, Vermont.
Was found in three varieties:
No. 1—Brick-red ground mass, with fragments pinkish-white to cream.
No. 2—Brick-red ground mass, with fragments of bluish-gray.
No. 3—Brick-red ground mass, with fragments of deep red.
This stone is not available.

Eakle's Mills—See Venato.

East Dorset Italian—Group B.
East Dorset Quarry, near East Dorset, Bennington County, Vermont.
Light bluish-gray, with little plicated dark-gray graphitic beds. (Vermont State Geological Survey)
Takes medium polish.

East Grinstead Quarries—See Sussex.
Are also known as the Gorlinger Quarries.

Eastman Blue or Oxford Fleuri—Group B.
Quarry at West Rutland, Vermont.
Medium bluish-gray.
Takes medium polish.

Eastman Marbles

B. C. Cipollino	Green Vein Cream
Blanc Clair	Heidleberg Green
Cipollino Dark	Kiel's Green
Cipollino Light	Oxford Fleuri
Cream Green Vein	Pavonazzo
Cream Light	Siena
Cream Statuary	Vert Campan

White and Green

Easton Marbles—See Pennsylvania Green, Sylvan Green and American Green.

Ebony Black Marble—Swanton Black is sometimes called Ebony Black.

Echaillon—Group C.
The chief quarries are at L'Echaillon, a small town in the Commune of St. Quentin, Isere, France.
The best known varieties are:
Echaillon Blanc, also known as Light or White Echaillon.
Light cream-colored ground mass crowded with small fragments of encrinite stems and other fossils.
Echaillon Jaune or Yellow Eschaillon.
Yellowish buff, crowded with large fossil shells, some of which are two inches long.
Eschaillon Rose or Eschaillon Fleuri.
Brownish-pink ground mass containing an abundance of fragments of shells and corals.
All of the Echaillons take good polish and are available in large blocks.

View of the House of Representatives, Missouri State Capitol.
It is 70 by 78 feet and provides for 150 members.

THE MISSOURI CAPITOL

The Exterior of the Jefferson City Structure was Built Entirely of Missouri Marble

THE State of Missouri was first admitted into the Union in 1820, and since that time it has had six capitols. The first was the Mansion House on the northeast corner of Third and Vine Streets, in St. Louis. The Missouri Hotel, on Main and Morgan Streets, in the same city, was the next. The seat of government was temporarily shifted to St. Charles in 1821, in a two-story brick building with a saddle-back roof.

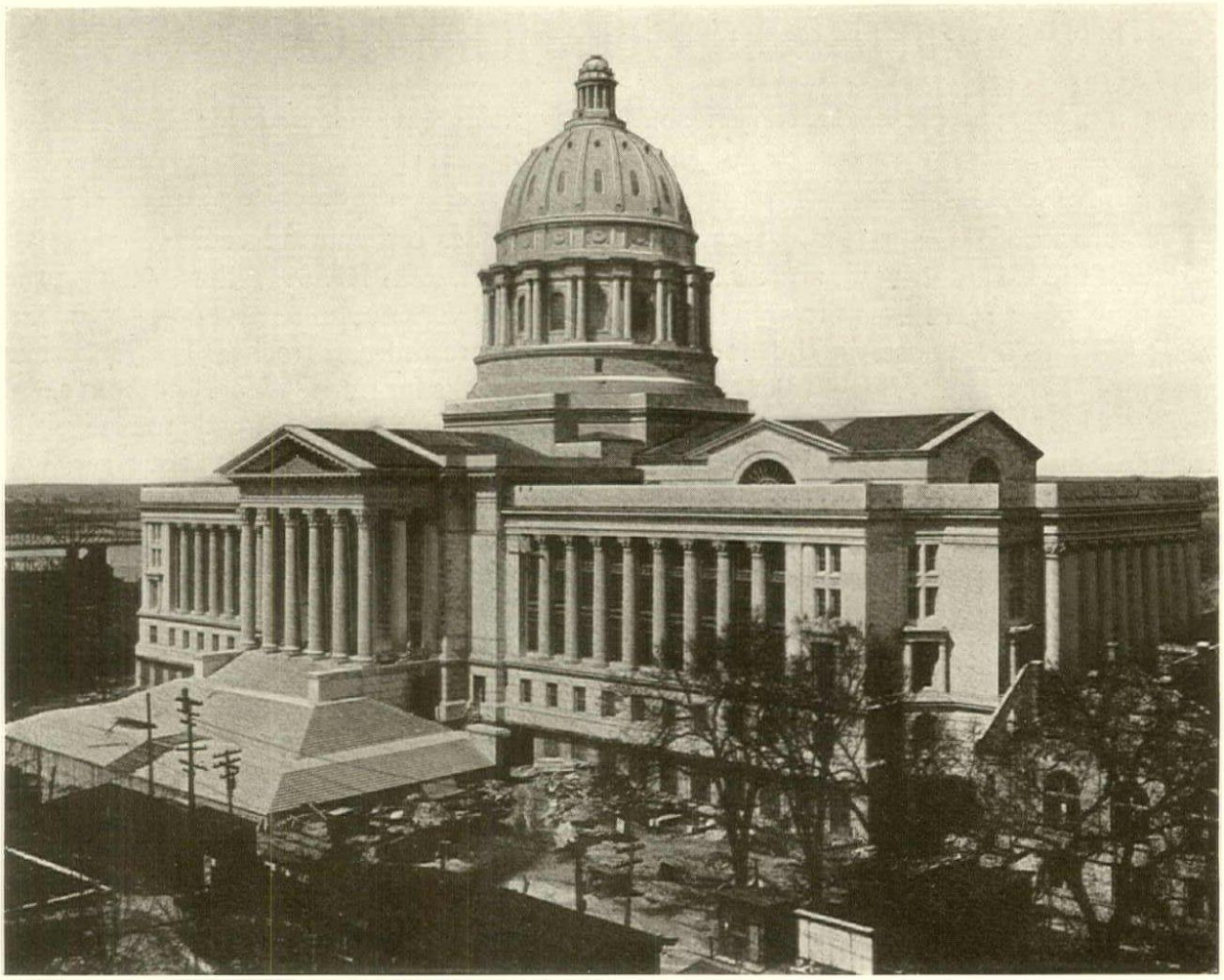
1826 saw the fourth capitol located at Jefferson City, at a cost of $18,573. This burned in 1837. The fifth was finished in 1840 at a cost of $350,000 and had two stories and basement, with a dome 130 feet high. It was one of the three handsomest buildings in the United States at that time. In 1888 it was enlarged by the addition of two wings, costing $220,000, and had a floor space of 50,000 square feet. This in turn was destroyed by fire in 1911, after which was erected the present capitol.

The sixth and present capitol has a floor space in its five stories of 500,000 square feet, and cost $3,600,000, or about 40 cents per cubic foot, not including the grounds and furnishings. From the laying of the cornerstone on June 24, 1915, until it was practically finished on July 1, 1917, a period of slightly over two years was required to complete the work, a remarkable record when compared to the time consumed in the construction of other state capitols. The building at Albany required thirty-three years; that in Illinois, twenty-one; while those of other nearby states were from nine years upward in their erection.

The site is commanding, overlooking many miles of beautiful country traversed by the Missouri River. Below, skirting the river, but far enough removed not to be annoying, are railroad tracks. The landscape scheme calls for ramps extending from these to the building, with an arcade to bridge the tracks, connecting by steps to the river. The grounds cover seventeen acres and are susceptible of striking treatment.

The building is an imposing symmetrical structure of the Roman Renaissance style of architecture, surmounted by a dome of unusual beauty. It has practically four fronts, the northern front being upon the Missouri River and the southern or main front upon High Street. It stands opposite the Supreme Court Building, its north and south axis running through the center of that structure. The façade effect from all sides is strikingly beautiful.

It is constructed upon the exterior of Carthage Missouri stone, a pure crystallized limestone marble of hard and enduring texture. Engaged fluted columns constitute the exterior of its walls, while noble free-standing fluted columns surmount its north and south porticos and its eastern and western fronts. It is surrounded by a concrete terrace 12 feet wide and extending almost entirely around the building. The fine esplanade is enclosed with a handsome balustrade and is finely lighted. The walls of the terrace are bush-hammered in fine imitation of stone. The building has four stories besides the basement and covers approximately three acres. It is 437 feet long by 200 feet wide in the wings and 300 feet through the center. It is 88 feet from the



Exterior of Missouri State Capitol, at Jefferson City. It is now surrounded with gardens, driveways and boulevard electric lights.

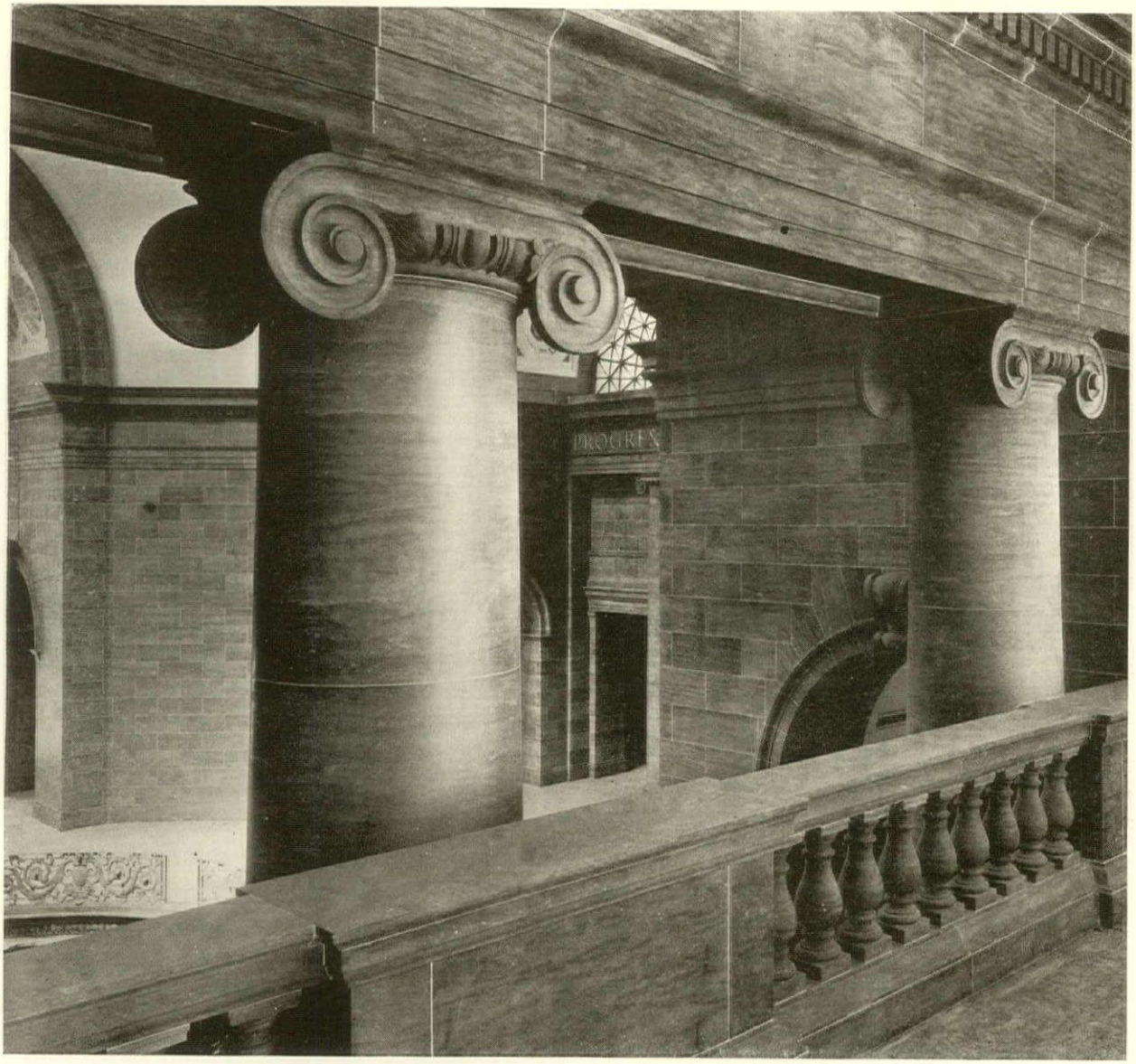
floor of the basement to the top of the exterior wall and 262 feet from the basement floor and 400 feet from the Missouri River level to the apex of the dome.

The outlines are symmetrical to a high degree, the fluted columns that entirely surround the structure giving it the appearance of an ancient temple of Greece. There are 134 columns in the entire building, the 14 on the front and rear porticos being 48 feet high. These are exactly similar in size and character to the columns of the Temple of Jupiter Stator in Rome.

The dome, with its 32 columns about its drum, is of exceptional beauty, especially when, at night, it is outlined by the system of searchlights that are thrown upon it.

The walls of the rotunda and the corridors and vestibules of the first, second and third floors, and of the grand stairway, are lined with Carthage Napoleon Gray marble. The floors of all the corridors, rotundas and all the treads of the stairway are of solid Carthage marble, which makes as attractive an interior as it does an exterior finish.

The heavy overhanging arches in and around the rotundas and the numerous piers encased in marble give an appearance of massiveness and strength in contrast with the columns usually found in similar places



Columns and capitals of the Main Rotunda. Carthage and Phenix marbles were used extensively for the interior.

in public buildings. A merit of the building that must not be overlooked is that it is fireproof, and is built with a strength and solidity that will render it impregnable to injury or destruction by any natural cause short of an earthquake.

Between the rotundas and the museums described elsewhere are eight large columns from Graniteville, Mo. All the other columns except those in the House and Senate are either Phenix or Carthage Marble. The columns in the Senate chamber are Royal Antique marble, with white Vermont marble bases and caps.

Throughout the building there is an abundance of carving in the handsome stone work, especially in the capitals of the exterior columns, and on the walls near the grand stairway. This carving cost the State $75,000, and the contractor at the time

claimed it cost him $48,000 more than this.

In planning for a state capitol, certain fundamental requirements must be met. There must be quarters provided for both Legislative and Executive departments, as well as, frequently, the Judicial department. Since these function in practically the same way in every state, there is apt to be a certain similarity of general interior design. The Legislative department, for instance, must contain two large halls, one for the Senate, and one for the House; there must be extra chambers for committees, lobbies, etc.; while for the Executive department a large number of adjacent offices. This necessitates the placing of the Legislative department on an upper floor, resulting most always in a large central unlighted space on the lower floors, that is either used for storerooms, cupboards, vaults and the like, or wasted entirely.

The State Capitol at Jefferson City is distinctive in that this space was so arranged that it was possible to use it as the location of two well-lighted museums containing displays of the historical relics and the natural resources of the state. The architect,Egerton Swartwout, accomplished this by making one floor out of the two Executive floors at these points, and lighting the lofty rooms the dome from above and from the side corridors.

Nor is this the only distinctive feature of this very beautiful structure. The approach to the main rotunda is directly from the exterior, instead of by means of interior staircases as in most capitols. This rotunda is on the Legislative floor, two stories above the entrance of the ground level, and is about 140 feet high by some 65 feet across. The walls are lined with Missouri marble and the upper portion is richly decorated with mural paintings. A monumental flight of steps leads through an eight-column portico into a great stair hall, 30 feet wide, that leads directly to the rotunda. This hall is really a part of the rotunda itself, and is lighted by an immense skylight in which are richly colored pictures of the state's products.

There are other original treatments worthy of notice in this Jefferson City building, such as the lighting effect of the rotunda, the whispering gallery, and the lighting of the Legislative chambers. These are best described by the architect himself, as follows: "The windows in the upper portion of the dome as well as the great semi-circular over the entrances to the Senate and House of Representatives are filled with cathedral glass of a delicate purple shade, the color being so slight as to be indistinguishable in itself, the effect being merely of a soft subdued light. At the back of the rotunda, opposite the great staircase, is a semi-circular for the accommodation of the legislative library. The large skylight of this room is filled with brilliant golden cathedral glass and being so situated that it is itself invisible from the main rotunda, sheds a bright golden glow over the legislative library, and brings out in striking relief the screen of columns which separate the library from the rotunda, the effect of golden glow being intensified by the soft subdued light in the rotunda itself.

"Another feature of the rotunda is the whispering gallery, which is above the main cornice, about 65 feet from the floor. There have been instances of similar whispering galleries, notably the one in the Cathedral of St. Paul's in London, but these have been fortuitous accidents. The whispering gallery in the Missouri State Capitol was carefully, mathematically laid out by a celebrated expert on acoustics, and this is undoubtedly the first time on record that such a thing has been done successfully. A person standing in this gallery can hear the faintest whisper from directly across the rotunda, a distance

Stone carving on Grand Stairway.

of 65 feet, the sound following the curve of the gallery.

"The Senate and the House of Representatives are large, lofty rooms, well adapted for the seating of a large number of people, and are perfect acoustically. It is only within the last decade that acoustics have been elevated to the rank of an exact science. The mediaeval churches and in fact most modern churches are melancholy examples of the disregard of the underlying principles of this science. In the past, rooms intended for auditoriums have been constructed merely with the hope that through some happy chance the speaker would be heard by most of the audience. Almost any room, if the ceiling is low enough, and it is filled with people, will be good enough acoustically, but for a perfect room it is necessary to provide for those times when the room will be practically empty. The State Capitol Commission Board wisely sought the advice of the greatest acoustics expert in the world, and as a result of his skill the Legislative chambers in the Missouri State Capitol are acoustically perfect.

"Another distinctive feature of the Legislative chambers is the lighting. Practically all such rooms in other State Capitols are lighted merely by skylights, which is generally unsatisfactory. In the Missouri State Capitol the Legislative chambers extend a considerable distance above the roof, so that the opportunity is given to introduce large windows in the side walls, giving direct light and ventilation on three sides of each cham-

ber. The practical and artistic value of these windows cannot be overestimated. The chambers themselves are dignified in treatment. The Senate has a semi-circular colonnade of richly veined marble, resting upon a high marble base, and in the House of Representatives the walls are lined with marble and the galleries are screened from the room by a colonnade of polished granite columns."

Grand Stairway, Missouri State Capitol.

TEMPLE OF JUSTICE, OLYMPIA, WASHINGTON

THE State of Washington has never had a capitol building worthy of the name. It did have, up until 1899, a wooden building that was used for a capitol and for the state executive offices. This structure was built in about 1862. In 1893 the Legislature voted to build a State Capitol and Mr. Ernest Flagg was engaged as the architect. The plans were drawn and the contract for the foundation of a new State House was let, and the foundations built for the new building.

Before the money was appropriated to complete this building the hard times of 1893 came on and there was inaugurated a general policy of retrenchment that resulted in the complete stoppage of all public improvements. The newly laid foundations were boarded over and left in this way.

The old state house, however, was in such a very bad condition that some arrangement had to be made for a State Capitol building. The County of Thurston, in the State of Washington, in which the capitol is located, had just completed a new court house about this time. Being in need of funds, the

Marbles from Alaska are used in the corridors. The caps, trimmings and mouldings are made from the solid material, and not built up of thin slabs.

These walls, floors and stair-treads are all marble.

County determined to sell this building, and the State bought it for a state house. After purchasing this structure, the State was compelled almost to double its size and it is this building which has been used for a state house ever since.

These quarters became too small to house all the varied departments of the civic machinery, and the people of the State, through the Legislature, determined to build a group of buildings for the legislature and the different state offices. Competitive plans were asked for and Wilder and White, architects, of New York, were judged the winners, and were engaged to make the plans for an imposing group of buildings. These consisted of a main building located in the center of a square, with four smaller buildings, one on each side.

The Temple of Justice, an impressive building, whose large columns lend dignity to the entrance, was the first building to be erected. All of the buildings, including the Temple of Justice, were to be fireproof; and they naturally turned to marble, not only on account of its fire-resistant qualities, but on account of its beauty.

The walls and floors of the corridors are finished in Alaska marble; the caps, belt courses, trimming around the doors and all moulded work are made from solid marble, and not built up of thin marble, as is so often done. In the center of the floor of the corridor is a star patterned of Gravina marble in a field of Tokeen, and the effect is not unlike that in the Capitol at St. Paul, Minnesota.

The wall marble is made of very thick material. The large fluted Doric columns under the balcony in the entrance to the Law Library, as well as those under the balcony at the opposite side of the corridor leading to

the Supreme Court Room, are monolithic.

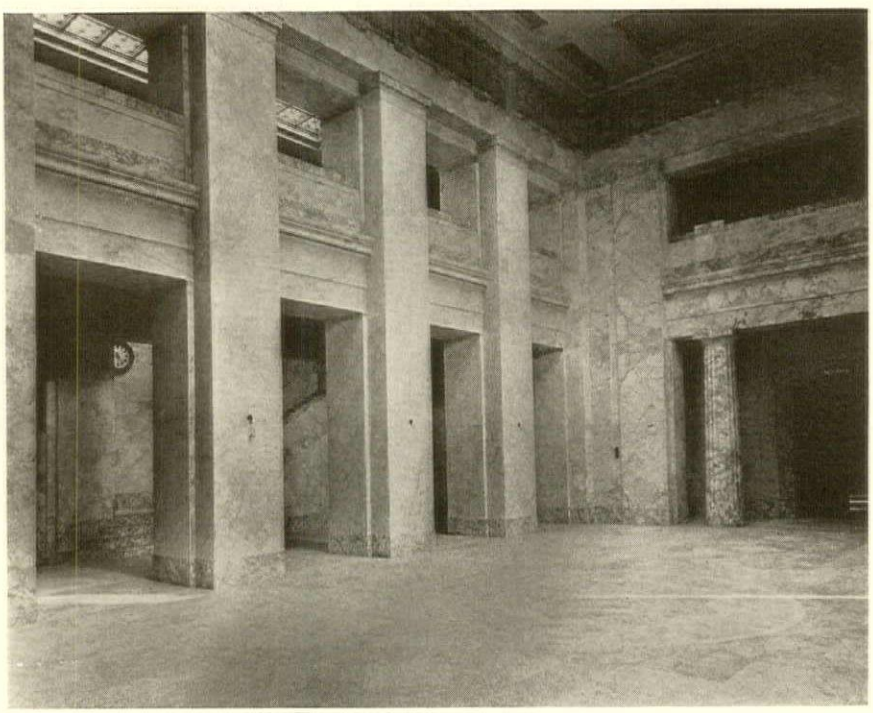
Marble was used for the floors, not only because it is durable, fireproof and a non-conductor of sound, but also because of its artistic effect. Indeed, of late years marble is coming into general use as a flooring material, not only in public edifices but in private buildings, general stores and elsewhere; if freely chosen, it is characterized by splendid wearing qualities, and in addition to this it is so much more noiseless than most other materials.

The stairs in this building leading from the entrance corridor to the second floor are of marble with a balustrade between the columns of especially heavy marble construction. In fact, all of the marble used is very thick and heavy to harmonize with the dignity of the plans. The sense of durability and stability most suitable to a building of this character is very happily emphasized by an exaggeration in the weight of the materials employed in the construction.

The door trim in the entrance to the Law Library and the Temple of Justice is made of solid marble heavily moulded. Inside of the entrance to each of these doors is a feature especially noteworthy. This is a finely carved marble trim with a carved cap and ornamental frame of great artistry surrounding the clock.

The architecture of the Supreme Court Room is unusually commanding and noble in style. The treatment of this room furnishes a very good illustration of how well marble works in with other material and how it lends beauty and dignity to the whole effect.

The question of price was not the main consideration in the selection of marble for this building. The chief desire of the architects was to give the structure an appearance in keeping with its purpose, and in this they have succeeded most admirably.



Another view of the Main Corridor.

Illustration courtesy *The American Architect-The Architectural Review.*

Marble was chosen to carry out the decorative scheme in the Tea House in the Gardens of John D. Rockefeller, Pocantico Hills, N.Y.
Welles Bosworth, Architect.

A HANDBOOK ON MARBLE

It is the purpose of the National Association of Marble Dealers, to publish as soon as possible, a handbook on marble. The material contained in this book will be contributed by those best qualified to speak in an authoritative manner on the various matters treated. This is the eighth installment and contains the final part of the second chapter, written by John Stephen Sewell, President of the Alabama Marble Company. These extracts will probably undergo some slight changes before appearing later in book form.

CHAPTER II—The Production of Marble (*Concluded*)

TILTED BEDS

In Alabama, a clear span of 80 feet with piers 20 feet square, has been adopted, and no falls have occurred.

The dip, in Vermont tunnels, varies from almost zero to 20° or 30°, at various places; in Alabama, from 20° to 36°, in tunnels so far developed. In Colorado, also, tunneling has been adopted where the marble dipped into the mountain at an angle of about 45°. In both Vermont and Alabama operations have progressed to a point where piers are left standing, free all around; sometimes they are vertical, sometimes standing at an angle more nearly perpendicular to the beds. In no case has a pier failed, even though it is often unsound, as a result of selective quarrying of the sounder materials.

In Alabama, the walls of the tunnels were laid out at right angles to one dominant system of cracks, which causes them to be diagonal with the strike and dip; but this apparently awkward arrangement has not sensibly added to the cost of quarrying. In any case, the layout of tunnels and piers should be made with a view not only of taking full advantage of the unsoundness so as to get rectangular sound blocks, but also of facilitating the transportation of the blocks from their place of origin to the mouth of the tunnel. To the extent that these requirements are conflicting, the first should prevail. There is no profit in unsalable blocks, no matter how easily and cheaply they may be quarried and handled.

Tunnel quarries are almost necessarily developed in units of convenient size, and all the marble made available is removed, before an adjacent unit or extension is developed. A very convenient size for a unit of working space is from 80 feet by 80 feet to 80 feet by 100 feet. The larger size fits well into conditions where the tunnels may be 80 feet wide in the clear, and the piers are made 20 feet by 20 feet.

So far as known, the first tunnel quarries in this country were developed in Vermont. The methods in use there are safe, and presumably as economical as any that can be devised. The tunnel is developed in the overlying material, which is not salable as marble. Channel cuts are made separating the overlying material from the marble, and subdividing the material to be removed, so that it may be blasted without shattering the marble. An explosive having the rending properties of black powder—not the shattering effect of dynamite—is used for the blasting. The nature and sequence of the various operations are well described in Bulletin 521 of the U. S. Geological Survey and in Bulletin 106 of the Bureau of Mines. The initial tunnel should be about 7½ feet in the clear, from floor to roof, to permit the introduction of channeling machines on the floor. As soon as it is developed, the roof should be examined with minute care, and every fragment of rock, however small, that is even partially detached, must be knocked down. Sometimes masses of considerable size require light charges of powder, to remove them. After quarrying operations begin, the

floor rapidly recedes from the roof; it is then difficult to reach the roof and pieces even as small as a walnut, falling 50 to 100 feet, may produce serious injury or even death.

DISPOSAL OF DEBRIS

A unit of space in a tunnel quarry always starts from a face, in which practically the entire thickness of the marble and of the 7½ feet of material to be wasted by tunneling is exposed. The marble from the area in front of the face has been removed. At each round of blasting, roughly from 4 to 6 feet of progress may be made. For the first few rounds, it is easy to dump all the debris over the face, and then remove it, if desired. But as the tunnel progresses inwards and, generally, down the dip, the cost of disposing of the blasted material rapidly increases. This consideration alone makes 100 feet a sort of economical limit to the distance a tunnel should be driven before quarrying begins.

The debris produced in blasting should be allowed to accumulate as a talus against the face, unless it is more than sufficient to reach the top, at its natural slope. Unless this is done, when quarrying is begun, one is faced with the problem of lifting blocks weighing from 10 to 40 tons from the edge of a cliff whose height is equal to the thickness of the workable marble—possibly as much as 100 feet—with very little headroom available. With the talus available, the blocks can be dragged off and down the slope, without risk or danger. As quarrying proceeds, the process of dragging the blocks down the slope and then into position to be lifted gradually drags the debris out also, and it can be removed from the tunnel or tunnels, a little at a time *pari passu* with quarrying operations.

It is manifest that, for continuous operation in tunnel quarries, there must be more than one tunnel, so that quarrying operations may proceed in one place while development is going on somewhere else. It should be remembered that, in a pinch, quarrying can be accelerated at the expense of increased unit costs; but if tunneling is accelerated, part of the price may be serious shattering of the underlying marble.

There is here a very serious problem to work out, in the way of a program of quarrying and development carried on together, so as to insure continuity of output without tying up an unreasonable amount of capital in development work. The thickness of the deposit; the average net yield of good marble, the number of different grades; the relative ease of quarrying, as compared with tunneling operations; all of these are factors in the problem. In the final solution, doubts should be solved in favor of extensive development.

SECURE SUFFICIENT DEVELOPMENT AREA

One marble-producing company which has attained to a stage of profitable operations after a long and costly struggle, was controlled, in its early days, by a group of capitalists, who knew nothing of the business. As is usual in such cases, they sought advice from every possible source, including the operating companies with whom they would inevitably compete. They accumulated a file of correspondence about six inches thick, including one or two meager reports for which they had paid. In the entire file, was just one letter, one-half page in length, which was worth the paper on which it was written and the time required to read it. That letter was worth many thousands of dollars, had its full significance been appreciated and made a basis of action. It was a very kindly and courteous letter from the late Senator Redfield Proctor, of Vermont, and was to the effect that the most important rule for success in the marble-producing

business was to have plenty of developed quarrying spaces, so that if one or more of them went bad, good stone could be obtained elsewhere, and so that development and quarrying operations could be carried on together, without interference.

It sounded simple and obvious—no one questioned its soundness—but it was a long time before anyone realized what was really involved in it. The company in question is still, after nearly twenty years of operation, extending its development work more rapidly than its quarrying operations, because those in charge do not consider that they have yet put Senator Proctor's wise advice fully into effect. The plan they are working on now, as the minimum necessary for permanent success, is, relatively speaking, at least five times as extensive as they first supposed to be necessary. It will involve permanently tying up in the one item of quarry development alone, from three to five dollars per cubic foot of probable annual production of merchantable stock.

The experience of the company during certain periods when the net yield of their quarries was very small indicates that a development program of the extent adopted is necessary to insure their business against the possibility of disastrous shortages of merchantable marble. Stripping an open quarry and quarrying operations can both be accelerated when money is available, but the development of tunnel quarries cannot safely be accelerated beyond a certain rate of progress. Hence, when tunnel quarries are inevitable, there is a serious problem to work out.

In any case, in any kind of quarry, the sequence of operations for several years in the future must be quite accurately visualized, if serious mistakes are to be avoided.

Recurring for a moment to known causes of unsoundness in marble deposits, one not so far mentioned because the circumstances of publication of this series of articles in an unexpected manner have made final revision and corrections impossible, is the occurrence of dikes of igneous rock traversing the marble deposit. This is not so common as other causes, but it is by no means infrequent. In every known case, the marble for many feet from the dike is hopelessly unsound. Where dikes are known or suspected, they should be searched for, completely located, then avoided, in locating quarries.

Two hundred feet is not too wide a berth to give to a dike, although sometimes some sound marble is found at less distances.

To hastily summarize the contents of this chapter, there is no known method of determining beforehand, in all cases, whether a quarry can be made profitable or not. By taking advantage of all that the geologist, the mining engineer, the quarryman, and the manufacturer can contribute, the least promising prospects can be avoided. This accomplished, a careful detailed study of the conditions in the proposed opening can be made to yield data which, properly used, will result in methods that will insure success, if success is possible at all. But in no case will success be assured until it is actually achieved, and until it is, the outcome must be highly speculative. By success is here meant the successful production of a reasonable percentage of merchantable marble at a reasonable cost. Financial success still involves successful marketing, which is, in many cases, a very complex and difficult question. This will be discussed in detail in a later chapter on Conditions in the Trade.

SOUND ADMONITIONS

In the meantime, this chapter will be closed with a few cautions and warnings already implied in what has gone before.

1. Where the weathered surface of a mar-

ble deposit, whether covered by overburden or not, is worn to smooth and rounded outlines, the prospect of a sound quarry is better than where the outcrop is ragged and jagged. But there are exceptions to this rule.

2. Technical men can give advice of great value, but no one can predict the outcome of operations with certainty.

3. A certain amount of core drilling should always be done, but the quarry should not be peppered with holes.

4. The location and structural characteristics of the marble within the limits of the property should be carefully determined.

The probable sequence of events for years ahead should be carefully studied in connection with the preliminary development work.

5. Electrical operation should always be considered as ultimately inevitable.

6. In all doubtful cases—current practice to the contrary notwithstanding—the marble should be quarried *with the beds*. It is a very rare case where this is not the best method, even if others are practicable.

7. Where nature has already subdivided the marble by joints into blocks no larger than commercial sizes, do not spoil them with channel cuts and drill holes. Conform to the unsoundness.

8. There is no real shortage in the market of any kind of marble. The trade will not be found standing ready to shower riches upon a new producer. Even after his production problem is solved, he must still sell his product; he must finally assume the risk of its defects and the cost of creating a market. No one else is going to do that for him without taking all or the greater part of his profits. The failure to appreciate the fact that this condition is both inevitable and just, has brought disaster to many new and inexperienced producers.

Large marble blocks in a quarry yard.

LIST OF QUARRIES AND MARBLE MANUFACTURERS

REPRESENTED IN THE MEMBERSHIP OF THE NATIONAL ASSOCIATION OF MARBLE DEALERS

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Akron, Ohio.	Flower Marble and Tile Company	Jas. T. Flower
Atlanta, Ga.	Reeves Marble Company	Alex. Reeves
Baltimore, Md.	Hilgartner Marble Company	A. H. Hilgartner
Baltimore, Md.	Jos. B. Dunn & Sons, Inc.	Chas. Scheidt
Baltimore, Md.	P. B. and W. Marble and Tile Co., Inc.	Richard T. Salter
Birmingham, Ala.	Alabama Marble Company	John S. Sewell
Boston, Mass.	Troy Bros. & Company	M. W. O'Brien
Buffalo, N.Y.	Geo. W. Maltby & Son Company	Wm. C. Maltby
Buffalo, N.Y.	Lautz Marble Corporation	R. K. Glass
Carthage, Mo.	Arnosti Marble Co.	A. Arnosti
Carthage, Mo.	Carthage Marble and White Lime Co.	Geo. S. Beimdiek
Carthage, Mo.	Consolidated Marble and Stone Co.	Millard Bryan
Carthage, Mo.	Ozark Quarries Co.	T. R. Givens
Carthage, Mo.	F. W. Steadley & Company, Inc.	K. D. Steadley
Carthage, Mo.	Lautz Missouri Marble Company	F. J. Lautz
Carthage, Mo.	Spring River Stone Company	John E. O'Keefe
Chicago, Ill.	American Marble Mill Company	T. J. Murphy
Chicago, Ill.	Black & Gold Marble Company	J. J. Bauer
Chicago, Ill.	C. N. Marthens Marble Company	C. N. Marthens
Chicago, Ill.	Corley-Meservey Marble Company	B. F. Meservey
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Chicago, Ill.	Frank P. Bauer Marble Company	Frank P. Bauer
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Chicago, Ill.	Naughton Marble Company	Thos. Naughton
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Cicero, Ill.	National Mosaic Tile Company	George Wilde
Cincinnati, Ohio	Cincinnati Marble Company	H. L. Pike
Cleveland, Ohio	Allen Marble Company	R. M. Allen
Cleveland, Ohio	Empire Marble Company	Frank C. Smith
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Cleveland, Ohio	Interior Marble and Stone Co.	E. M. Fritz
Cleveland, Ohio	Prospect Mantel and Tile Company	S. J. Weingarten
Cleveland, Ohio	Roy-Cliff Marble Company	L. G. Yeau
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Dallas, Texas		J. C. Bruggen
Dallas, Texas	J. Desco & Son	J. Desco
Dallas, Texas	Southwest Marble Company	William Jessop
Denver, Col.	McElhinney Tile and Marble Co.	D. C. McElhinney
Denver, Col.	Denver Mantel and Tile Company	W. D. Watson
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Kansas City, Mo.	Kansas City Marble and Tile Co.	G. F. Keller
Kansas City, Mo.	Phenix Marble Company	Mastin Simpson
Kansas City, Mo.	Sutermeister Stone Company	C. O. Sutermeister
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Knoxville, Tenn.	Salomone-O'Brien Marble Company	Walter O'Brien
Knoxville, Tenn.	Tennessee Producers Marble Co.	B. L. Pease
Little Rock, Ark.	Southwestern Tile Company	R. E. Overman
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Louisville, Ky.	Peter & Burghard Stone Co.	Jos. E. Burghard
Memphis, Tenn.	Central Mosaic and Tile Co.	Louis B. Marus
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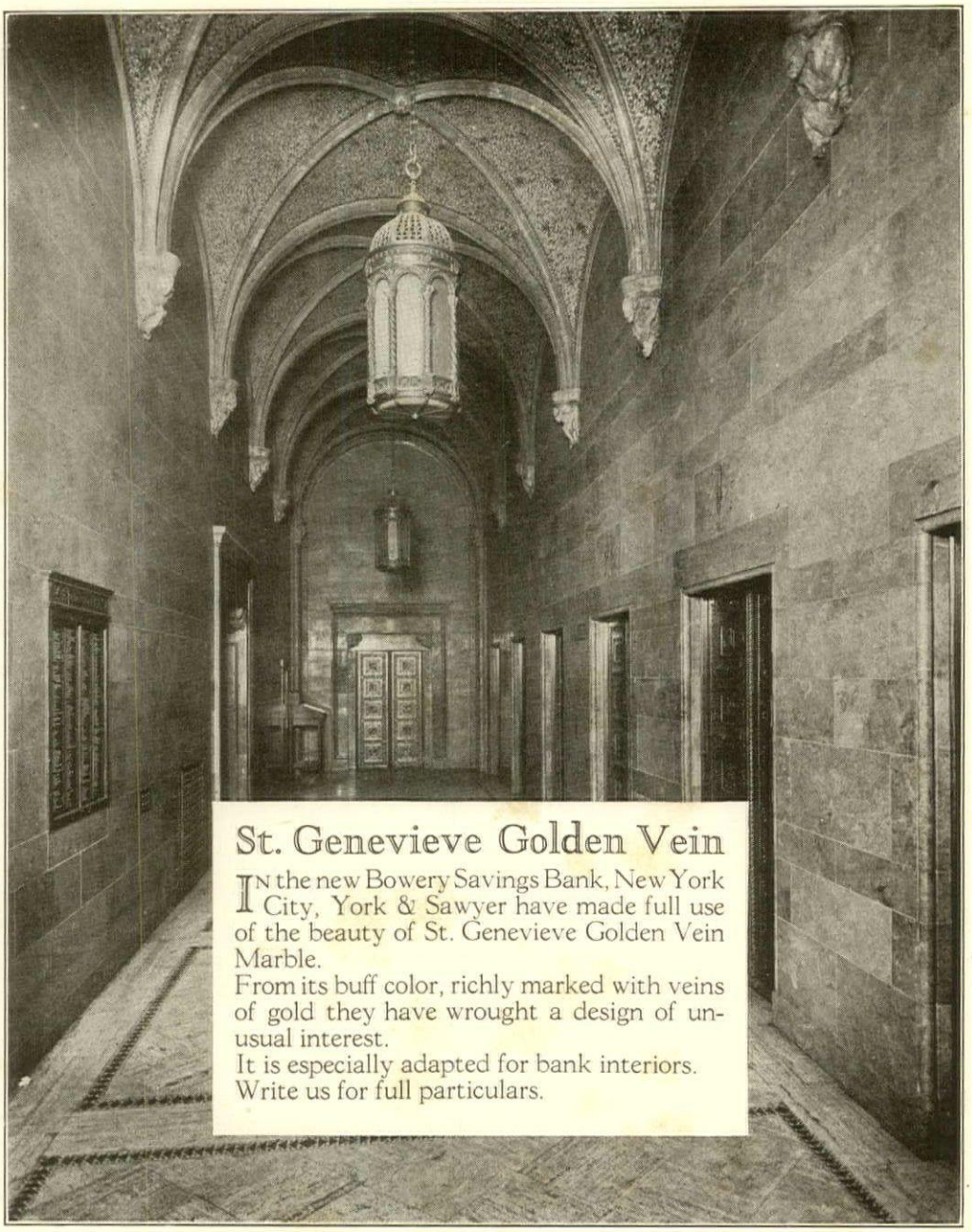

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