THROVGH THE AGES

SEPTEMBER, 1923

Oh! classic marble ages old—
  Beauty and grace thou jointly hold,
Inspiring artist and builder too;
  Rare child of nature with strength to do.

J. G. D.

THROUGH THE AGES

VOL. 1 SEPTEMBER, 1923 NO. 5

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Wire sawing a large block of Carrara white statuary marble into smaller blocks.

THROUGH THE AGES

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

VOL. 1 SEPTEMBER, 1923 NO. 5

QUARRY METHODS IN EUROPE

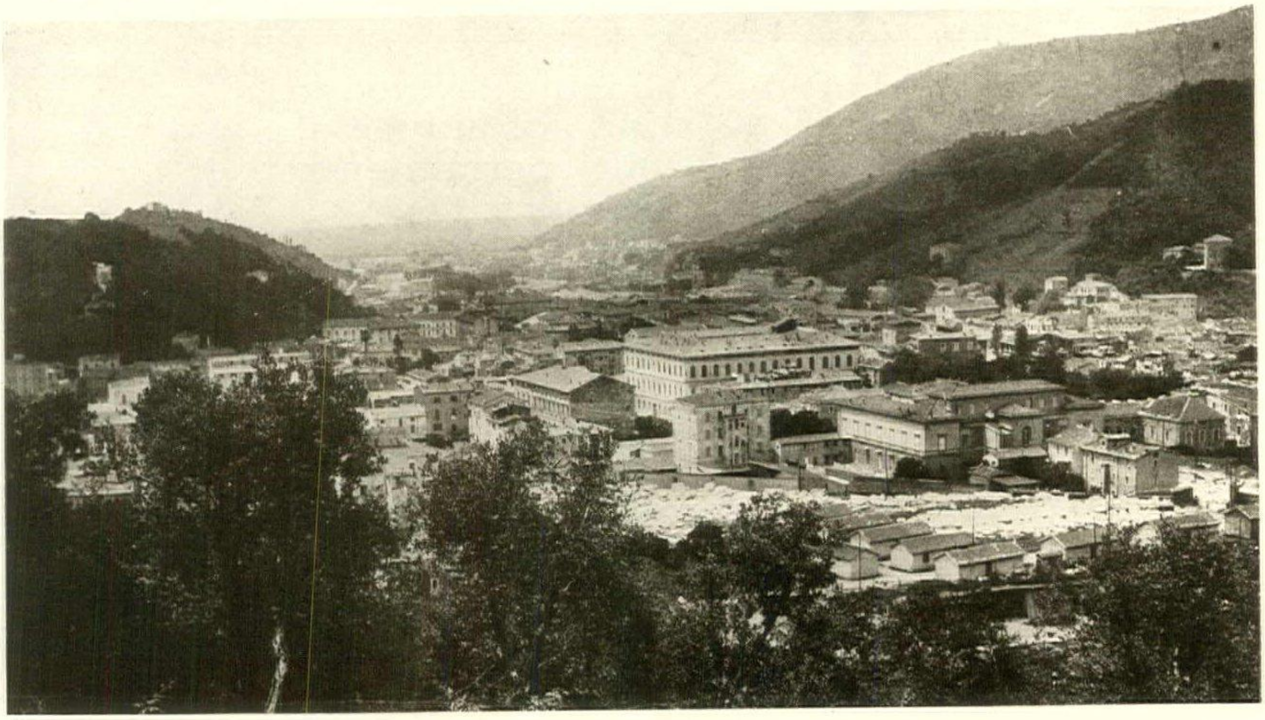
BEFORE beginning a description of the modern methods in use on the Continent, it is interesting to review briefly the manner of removing marble as practiced by the ancients. We can trace these from old workings, and additional light is thrown upon the subject by various writers whose accounts, while not always authentic, are at least illuminating.

On Mt. Pentelicus, several of the ancient quarries show that the blocks were removed by wedging in a horizontal plane after there had first been chiselled a perpendicular face. This was despite the fact that the dip of the quarry inclined inwards from the working face. Blocks of marble already extracted have been found in certain workings in Algeria. Other blocks have been seen in the same locality with wedge holes and grooves cut in them all ready to be raised. Near Larissa, in Thessaly, evidences are still to be seen of a curious method occasionally employed. This consisted of cutting away the rock from around a column, leaving it standing free. Niches were cut to provide room for the workmen as they toiled at their task. After the column was shaped according to the demands, it was severed at the base and lowered to the ground by ropes.

When wedges were employed, they were usually of wood, moistened. The method used to extract granite today in India was also known to these old quarry workers. This consists of lighting fires along a line and then drenching them with water. The sudden contraction caused by the swift cooling of the rock causes rifts to occur in the stone along the line of the fires.

Modern methods in force in the quarries of Europe vary to a great extent. Some are very primitive. Explosives are used in certain districts, but this method is very wasteful and uneconomical. The blocks when cut up into smaller pieces often break up and as for sawing them into slabs, it is found that the shattering caused by the explosives is such as to render them unfit for such purposes. Renwick, in his book on Marble and Marble Working, written in 1909, speaks of a Devonshire marble of good appearance that is used mostly for road metal and which is taken out by explosives. When a large block comes through, as it frequently does, and is sent out to the trade, the dealers are afraid of it on account of its reputation for unsoundness. Renwick suggests that explosives should not be used except for black marble.

The variations in quarrying methods are sometimes due to the formation of the rock; but it more frequently happens that it is due to the manager's knowledge of the differ-

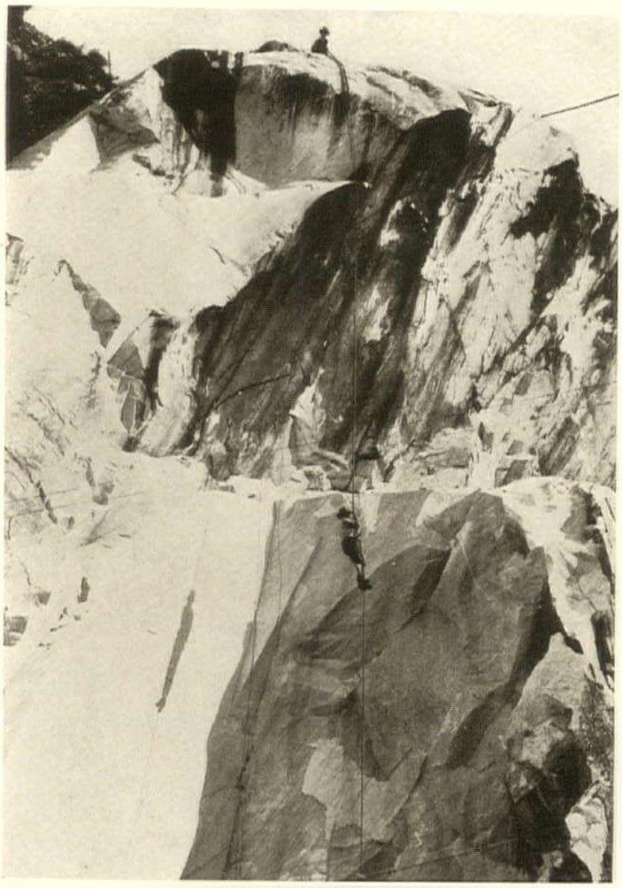


Carrara, the city of marble, in the neighborhood of which are very rich quarries. Carrara lives on the marble industry.

ent appliances in use. As a general thing, Europeans are very conservative, and it not infrequently happens that the best methods are not always employed.

The extraction of marble in Europe is usually accomplished in one of three ways—by wedging, sawing or channelling. Of these, the oldest and simplest is wedging. No machinery is employed. The marble is forced from its bed by the action of steel wedges driven between veins or in rifts. Since the vein and the bed of the stone is very irregular, it follows that the blocks are of various shapes. Naturally, there is a great deal of waste. These blocks must be broken up again in order to secure the proper shapes in smaller blocks. Moreover, the waste chokes up the quarry and renders good beds inaccessible. This percentage of waste is usually very high. Wedging is customary in quarries that are erected along communal lines or situated in isolated positions. These quarries usually lack capital, which is another reason for their unprogressive methods. Wedging is, broadly speaking, only suitable where deposits lie on or near the surface.

Sometimes, a combination of drill and wedge work is adopted. This usually is done by two men with a hand-drill, one of whom holds the drill, or jumper, in position while the other one strikes the end with a heavy hammer, turning the drill with each blow. These holes vary from the full depth of the block required to two-thirds of this depth. After the holes are drilled, long metal wedges or plugs are inserted, which upon being tightened break the marble from the bed. Sometimes, short holes alternate with deep ones. When the marble is in a shallow bed, shorter holes suffice, the blocks being broken out by driving steel wedges between soft iron slips placed on the lip of each hole. This is called "plug and feather" work.



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Brave miners prepare the point of approach for the cutting with the helicoidal wire.

Lately, machine drills have come into extensive use. These drills are propelled by compressed air or steam which is conveyed to them through flexible tubes from the generating station. The drill consists of a valve motion with a piston attachment against which the drilling bar is clamped. The piston acts as a hammer, making from 300 to 600 strokes a minute. The drilling bar is automatically turned at the same time. For ledges and open ground, these machines are fastened on tripods; for work in crevices or underground galleries, the machine is mounted on a column or shaft bar. A great many of these rock drills are of American manufacture. In connection with these drills there is used also a quarry bar, which is a steel bar 6 to 10 feet long, supported on four legs. The underside has a rack and pinion adjustment, by means of which an even line of holes of equal distance apart may be drilled. Such methods have been in use only for the past few years. The quarry bar is sometimes used for channelling work. When so used, a special bit of steel known as a "broacher" is employed to break out the marble between the drill holes. Many attempts have been made to induce quarry owners to adopt electricity, but with scant success.

The sawing method has been in use for a little over thirty years. An endless wire rope, made of three strands of twisted steel, is passed around a driving wheel on pulleys from a power house, and thence around the quarries at a speed of from twelve to four-

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The wire in place, the large mass of white statuary marble is being cut.

© Underwood & Underwood, N.Y.

The helicoidal wire in operation in a Carrara quarry. Here are produced about 300,000 tons of special white marble for statuary and construction each year.

teen miles an hour. Necessary tautness is obtained by means of a sliding carriage at convenient points. The driving wheel is usually about 4 feet in diameter, this particular size having been found most efficient. It is guided by means of pulleys erected on suitable movable standards. This wire is used both for cutting marble from the bed and for sawing marble into blocks.

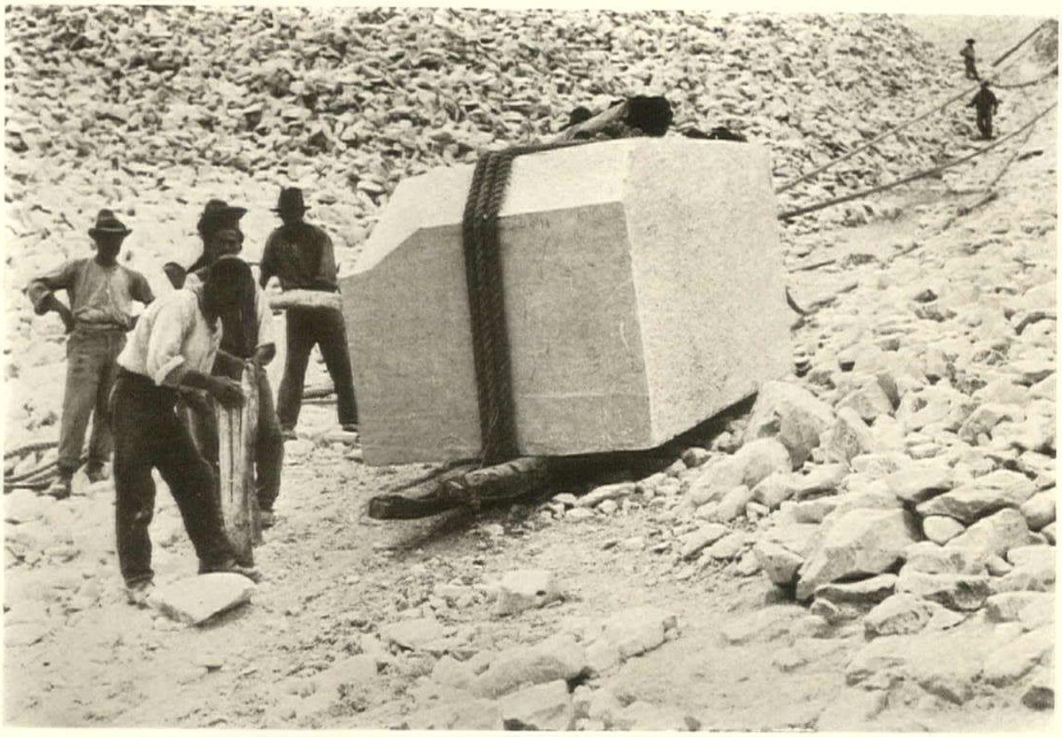
In Belgium and in the North of France, they sink holes from 2 to 3 feet in diameter by means of a revolving cylinder with a serrated bottom. Sometimes, this cylinder is set with "bort" or black diamonds. The core is extracted from the holes and standards erected. The marble is then cut from the rock by the wire saw. The core itself is often suitable for column work.

On April 8, 1854, M. Eugene Chevallier got out a patent for the first wire saw. For twenty-five years, however, it remained unused, but was finally revived by M. Paul Gay in 1880. In 1884, M. Michel Thonar, of Belgium, invented the pulley with universal joints, which enabled the wire to be turned in all directions.

Previous to 1898, the use of the wire saw was restricted through the inability to guide it slantingly. By means of the penetrating pulley, its field of usefulness has been greatly increased. The penetrating pulley has three parts—first, the pulley, which is a steel disc 20 inches in diameter and about ¼ inch thick. This disc has its edging grooved to receive the wire. There is an axle on each side supported by a boss. Second, a fork, which is a hollow steel bar, 2½ inches in diameter with grooves at the lower end to receive the pulley. This fork can be lengthened by a series of tubes of equal diameter. Third, the carriage, which is a standard carrying a screw and drum attachment by means of which an automatic progressive motion is given to the fork through the rotation of an exterior pulley on which the helicoidal wire runs. In using it, they first sink two holes about 2½ inches in diameter. In these holes are placed the standards carrying the wire and the wire is then set in motion and the penetrating pulley is brought close to the rock. Since the diameter of the wire is larger than the thickness of the pulley, it wears and bites into the rock, forming a groove into which the pulley may enter. Sand and water are fed to the descending wire and the fork supporting the pulley follows the hole made to receive it. The wire is thus carried through the ground from one standard to the other, making the cut as required. By altering the positions of the standards, cross cuts may be obtained.

The penetrating pulley was first put in use at the Campanile Quarry at Carrara in March, 1898. Since then the wire saw has been largely used in France, Italy, Belgium and Greece. It is not used to any extent in either Great Britain or America.

Channelling is not known to any great extent in Europe. It is interesting to note that Renwick said in 1909 that the demand for colored marble was of comparatively small extent, with the exception of Belgian "Granite" and Rouge, and that in his opinion, there was hardly a quarry of colored marble in Europe that could profitably employ an entire American equipment. Methods have not changed greatly since then.



The *lizzatura* of a large block of marble from the quarries on the mountain summit to the valley below where the finishing operations are conducted.

A LIST OF THE WORLD'S MARBLES

By J. J. McClymont

Note—In our May 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.

Alabaster (Welsh)
Quarried at Sea Cliffs near Penarth, Glamorganshire, Wales.
Light pink background with mottles of darker shade.
Supply limited.

Alabaster Onyx
(Also Nile Onyx.) See Algerian Onyx.

Alabaster Oriental—See Algerian Onyx.

Alabaster Siena—See Alabaster Agatato.

Alabaster Agatato—Group D
Quarried at Siena, Italy.
Yellow color with shadings running to light brown.
Takes high polish.
This is a variety of Galena Siena.
Available in fair-sized blocks, supply fair.

Alabastrino or Alabastro
See Alabaster Italian.

Alabastron or Alabastrites
See Algerian Onyx.

Alamogordo—Same as Alamora.

Alamora—Group C
Quarried at Alamogordo, New Mexico.
Gray with golden or greenish gray veins.
Takes high polish.
Available supply limited. Can supply any sized blocks needed.
Trade-Mark—A. M. Co.

Alaska Marbles
For detailed statement of the marble dedeposits in Alaska see U. S. Geological Survey Bulletin 542, 1912, page 52, and Bulletin 682, 1920, both by Ernest F. Burchard.
For Alaska marbles on the market at present, see Gravina and Tokeen.

Albare—See French Alabaster.

Albatre—See Alabastrino or Alabastro.

Alberese—Lime Stone.

Alberia—White

Albertson Extra Dark—Group B
(Also known as Esperanza.)
Quarried at West Rutland, Vermont.
Bluish gray, criss-crossed with darker

veins of various widths, some black or nearly so.

Alementejo Marbles
See Borba Red and Borba White.

Algeria Marbles
See Numidians and Tazout.

Algerian Onyx—Group D
(Also known as African Alabaster, Onyx Marble, Oriental Alabaster and Nile Onyx.)
Quarried at Thebes Oran, Algeria, Egypt.
Variegated from light bluish cream to various shades of pink, yellow tan, reddish brown and brown.
Takes high polish.
Can be obtained in fair-sized blocks.

Algerian Serpentine—Group D
Quarried at Kleber Quarry, Oran, Algeria.
Green background mottled with black.
Takes high polish.

Alicante Marbles
See Mola and Rouge Clair.

Allagen Marbles
See Green Poppenberg.

Alma—Group D
Daniel Quarry, Nehden, Westphalia, Germany.
Grayish pink with wide white veins and fine purple and golden markings.
Takes high polish.

Almas—Group C
Duna Ahnas Quarry, Hungary.
Light brown.
Takes high polish.

Almeria Marbles
See Chercos Blanco, Chercos Teteado, Cabdar Blanco, Macael Blanco and Macael Cres.

Almiscado Amerello—Group D
Maceiro Quarry, Pero Pinheiro, Portugal.
Yellow with light gray markings.
Takes high polish.

Almiscado Escuro
Maceiro Quarry, Pero Pinheiro, Portugal.
Light gray and violet with yellowish veins.

Almond Verona—Group C
Quarried near Verona, Venetin, Italy.
Pink background with various slightly colored mottles.

Alport Mines—See Dukes Red.

Alpes Maritimes—See Marbre de Turbie.

Alps Green (Serpentine)—Group D
(Also known as Polcevera Green.)
Polcevera Quarry, Italy.
Dark green, with mottles and waves of light green and white.
Takes high polish.

Alps Green (Serpentine)—Group D
(Also known as Verte Muran and Verte des Alpes.)
Quarried at St. Paul, Bosses Alps, France.
Color similar to Alps Green listed above.
Takes high polish.

Alps Red—Group D
(Also known as Rouge des Alpes.)
Polcevera Quarry, Italy.
Dark green background, with dark reddish brown spots with white veins and markings.
Takes high polish.

Alps Red (French)—See Egyptian Red

Alquants Bigio—Grayish

Alson
Quarried at Alston, Cumberland, England.
Deep black.
Not available.

Altissimo (Statuary)—Group A
Quarried at Monte Altissimo, Seravezza, Italy.
Pure creamy white.
Takes high polish.
Small blocks only obtainable.

Alwalton—Group C
Quarried at Alwalton, near Peterborough, England.
Hard bluish green.
Takes high polish.

Amaranthe D'Osserain (Brechi)—Group D
Quarried near Sauveterre, France.
Dark violet with dark green and brown mottles.
Takes a high polish.

Amazonite (a variety of feldspar)
Quarried at Pike's Peak, Colorado.
Light green, slightly variegated.
Used only for ornaments, etc.

Amazon Stone—Same as Amazonite

Ambre Jaune—See Yellow Amber

American Cipollino
Quarried at West Rutland, Vermont.
From pale to dark green wavy bands.
Supply limited.

American Cream White Lens—Group A
(Also known as American Caen Stone)
Quarried at Leander, Texas.
Cream white.
Takes no polish.
Available in large quantities, any sized blocks.

American Black
See Glen Falls Black, Swanton Black and Virginia Black.

American Gold Quartzite
See Kingswood Stone.

American Green
See Cardiff Green, Georgia Green, Jersey Green, Michigan Verde-Antique, Sylvan Green, Vermont Verde-Antique and Westfield Green.

American Pavonazzo
See Alabama and Vermont Pavonazzo.

American Ricolite—See Ricolite

American Siena—Group B
Quarried at West Rutland, Vermont.
Light lemon yellow, with veins of irregular width of a slightly darker shade, sometimes running to a decided brownish shade.
Takes fair polish.
Available supply limited. Extreme size of blocks fair.

American Tavernelle—Group A
Asbury Quarries, Knoxville, Tennessee.
Slightly mottled brownish pink.
Takes good polish.
Available in long and wide blocks, thickness limited. Supply is good.

American Travertine
See Biesanz Travertine.

American Yellow Pavonazzo—Group B
Quarried at West Rutland, Vermont.
Light yellow to yellow salmon, irregular veins or long clouded bands of green.
Takes fair polish.
Supply available is not large. Slabs of any usual size can be obtained. Sold to the trade in slabs only.

Amicalola
Quarried at Ballground, Pickens County, Georgia.
Clear white or very slightly shaded.
Takes high polish.

Amygdaloidal Marbles
Name which may be applied to any marble composed of oblong or almond-shaped fragments, such as appear in the Campan Marbles.

Ancy le Franc
A village in Yonne, France, where marbles bearing this name are quarried.

Ancy le Franc (Blanc)—Group C
Quarried at Ancy le Franc, Yonne, France.
Light cream.
Takes high polish.
Fair-sized blocks available in reasonable quantities.

Ancy le Franc (Bleu)—Group C
Quarried at Ancy le Franc, Yonne, France.
Bluish gray.
Takes high polish.
Large supply of any reasonable size available.

Ancy le Franc (Jaune)—Group C
Quarried at Ancy le Franc, Yonne, France.
Light yellow.
Takes high polish.

Ancy le Franc (Jaune Dove)—Group C
Quarried at Ancy le Franc, Yonne, France.
Bright yellow.
Takes high polish.

Angaston
Name of village in Southern Australia where many varieties of coarse-grained marbles are found. The two following are the best known:

Angaston (Pink) (or Pink Angaston)—Group B
Quarried at Angaston, South Australia.
Light salmon, slightly mottled.
Takes high polish.
Available in fair-sized blocks. Not being exported at present.

Angaston (White) (or White Angaston)—Group B
Quarried at Angaston, South Australia.
Light salmon, with faint gray markings.
Takes high polish.
Available in fair-sized blocks. Not being exported at present.

Anglesey
Near Anglesey, Wales, are quarries which produce Anglesey Serpentine, Dinorben and Penmon.

Anglesey Serpentine (Brecciated) (or Mono Stone)—Group D
Rhoscolyn, Quarry, Hollyhead Island, Anglesey, Wales.
Dark green, with spots and patches of white.
Takes high polish.
Not always available.

Anhraconite—See Encrinital

Antico Cipolino—See Cipollino Greek

Antico Pavonazzo (or Pavonazzo Antico)
See Numidian Pavonazzo.

Antico Rosso—See Rosso Antico

Antique Fance—Group D
Furuli Quarry, Nordland, Norway.
Cream-colored white, with greenish gray veining and occasional patches of light pink.
Takes medium polish.

Antwerp Black—See Virginia Black

Apuan Alps
Range of mountains from which nearly all Italian Marbles are quarried.

Apuan Onyx—Group D
Quarried at Seravezza, Italy.
This stone is not what is commercially known as Onyx, or Onyx marble, but is a brecciated semi-translucent marble.

Arabescatto—Group A
Quarried at Seravezza, Tuscany, Italy.
An English vein of the lighter cast.
White with few clouded veins.
Takes high polish.

Arancia—Signifies orange color

Arancio—Group A
Quarried at Knoxville, Tennessee.
Cream tone with faint indications of yellowish-brown veins.
Takes high polish.

Arcadia
An island of Ancient Greece referred to by the Romans as Achhia and now called Moresa. It is mentioned by some writers as being the source of dark marbles used by the ancients. This reference may apply to Rosso Antico.

Argyllshire Marbles
See Ballachulish and Iona.

Arena—Signifies sand.

Argent
Signifies silver (also Argent Blanc, and Argento)

Argent Vert—Group C
Signifies silver or white green or light green.
Quarried in Canada.
Bluish background with dark flat markings.
Takes fair polish.

Argentina Marbles—See Calera

Ariege Marbles
See Casabet, Escallette, Grand Antique, Rose de Pyrenees, Rose Vif and Tarteing.

Arizona Marbles
No quarries are now operating in Arizona. A white marble, strongly veined, which took a good polish, was produced in limited quantities for a short time but was discontinued about 1914. This quarry was located in Cochise County, fourteen miles from the S.P.R.R. siding at Olga, which is eight miles east of Bowie.
Another deposit which has not been developed is located in Yavapai County. This marble is a variegated white and violet colored rock.

Arkansas Marbles
The quarry at Batesville, producing marble by that name, is the only active marble quarry in the state. For years it has been known that this state possesses many deposits of different kinds of marble, including white, red, gray, yellow and variegated. Some Onyx is also reported. See Batesville Gray Light, Batesville Buff and Batesville Gray Dark.

Armagh Red or Red Armagh—Group C
Quarry at Armagh, Ireland.
Purplish, brown mottled.
Takes high polish.
Not available at present.

Arni Alto—See Arni Vein

Arni Vein—Group A
(Also Arnie Alto or Vert Bella)
Arni Quarry, Carrara, Italy.
White with yellowish gray veins.
Takes high polish.
Large quantities available.

Argentina Onyx—See Brazilian Onyx.

Arrabida Marble—Group D
Arrabida Quarry, near Setubal, Estremadura, Portugal.
Variegated, with fine irregular fragments of gray, pink, purple, white and black, all cemented with a yellow filler.
Takes a high polish.

Arudy Quarry
For marbles produced by this quarry, see Gris Panache, St. Anne Grand Dessin, and St. Ann Rubane.

Asbury Pink—Group A
Quarried at Knoxville, Tennessee.
Light pink with random veins of dark bluish gray.
Takes high polish.

Ashford Quarry
Located at Bakewell, Derbyshire, England.
Produces Bird's Eye, Derby Black and Rosewood marbles.

Ashford Black—See Derby Black

Ashover Quarry
Located at Derbyshire, England.
See White Fluor Spar and Yellow Ashover Spar.

Asia Minor Marbles
See Africano and Red Cipollino, Chian, Marmora, Marmora Statuary and Rose D'Orient.
Africano is one of the marbles used by the ancient builders and is supposed to have been quarried in Asia Minor, but the quarry has not been relocated.
Writers have mentioned White Marble from Ephesus, Herakleia or Heraclea, and Mylasa or Milassa, but none of these marbles are available.

Asiatic Turkey Marbles
See Chian (Porta Santa), Marmora Statuary (or Proconnesus) and Rose D'Orient.

Aspersion or Asperione—Signifies sprinkling.

Assiut—See Egyptian Onyx

Aste—See Breche D'Aste

Athens Stone—Group A
A misleading name given to a fine grade of Joliet Limestone from the old Washington Ledge Quarry at Joliet, Illinois. This quarry has been abandoned and must not be confused with the Joliet stone now available.
Dark gray even tone.

Athlone—See Irish Gray

Atrax—See Verde Antico

Attica—See Pentelikon

Attunga—Group D
Quarried at Attunga, Tamworth, N.S.W., Australia.
Reddish background with angular fragments of tan and violet.
Takes high polish.

Aubert
See Grand Antique and Rose De Pyrenees.

Aude
See Griotte, D'Italia, Languedoc, and Vert Moulin de Counes.

Aurora Brecciate or *Brecia Aurora*–Group C
Paitone Quarry, Brescia Province, Lombardy, Italy.
Light tan fragments with reddish brown filler.
Takes high polish.

Aurora Rossa—Group C
Paitone Quarry, Brescia Province, Lombardy, Italy.
Pink background, with white patches and fine brown markings.
Takes high polish.

Ausseer—Group D
Quarried at Aussee, Styria, Austria.
Various sized irregular shaped fragments of tan or buff, cemented with dark red filler.
Takes high polish.

Australian Marbles
See Angaston Pink, Angaston White, Attunga, Borenore Blue, Buchan Fawn, Buchan Gray and Fawn, Caleula Dark, Caleula Light, Fernbrook, Fernbrook Jasper, Kapunda Dark, Kapunda Light Gray, Kapunda White, Limestone River, Macclesfield Cream, Macclesfield Dark Gray, Macclesfield Gray, Macclesfield

Pink, Macclesfield Red, Orbost, Queensland, Rockley, Rylstone; and Toongabbie, Warialda and Windellama.

Austria-Hungary Marbles
See Adneter Licht Urbano, Adneter Grau Schnoll, Adneter Rosa Urbano, Adneter Rotgron, Adneter Rot Lienbacher, Adneter Rot Scheck, Almas Marble, Ausseer, Breche de Kiefer, Crastaler, Dark Roman, Engelsberger, Giallo di Mori, Girolomo, Gr. Kunzendorfer Passiflora, Grun Tropf, Kainachthaler, Laaser, Licht Roman, Lindewiese, Marbacher, Orsera, Piszko Sutto Rot, Repen Zola, Rosso di Mori, Rot Tropf, Ruszikaer, San Guisto, Sterzinger, Ugarisch Grau, Untersberger Neubruch, Untersberger Veitelbruch, Untersberger Hofbruch, Vigauner.

Austrian Tyrol Marbles
See Breche de Kiefer, Giallo di Mori, Laaser and Sterzinger.

Avenatto—Group B
Quarried at Florence, Vermont.
White, with brown veining which almost covers the white. Some of the veins are so faint that they are almost lost in the white.
Takes fair polish.

Ayrshire (a serpentine)
Quarried at Ayrshire, Scotland.

Azcoitia—See Rouge St. Isidro

Azur—Blue

Azzure Lumiere—Light blue

Azzure Obscurite—Dark blue

Azzurro—Blueness

Azzurrino—Bluish

Lobby approach to the registration desk, Hotel Caswell, Baltimore, showing a rich and impressive marble treatment. Floors are of Alabama, with border of Dark Tennessee, and the panelling is Escalotte (Italian) with bases of Verde Antique.

This cable road in the Danby quarries is about one mile long and rises about 900 feet above the level of the railway in the valley below. A double track system is used, with a carload of ballast to offset the weight of the car of marble.

THE DANBY CLIFF-WORKERS

Reprinted through courtesy The Stone Publishing Co., N.Y.

THE Pueblo Indians, who built their dwelling places in the canyons of the great Southwest, would have been well satisfied with the outlook at Danby Mountain. They could have asked for only one change. As it is now, the marble workers spend their days on the mountain side, coming down to their homes at night. The Indian cliff dwellers would have used the lofty stone tunnels for a sleeping place and the lower country for a playground.

If one would get a connected picture of the cliffs and the lower country, he must climb half way up the mountain on the other side of the valley. An unkept wood road leads to the summit. The way, at first, is half hidden by foliage, but on approaching a higher level the trail swings out into the open, over land where the forest fires have left nothing but blackened tree trunks.

At a certain point in the course, the path swerves around the side of a ragged ledge. Let this be the stopping place. It would only be wasting time to look for a better view. Across the valleys, hundreds of feet away, lies the cable road, trailing down from the upper quarry like the tail of a mammoth kite. The track is over a mile in length and every foot of it is in sight. At the base of each opening is a whitened pile of waste set about by Nature's wonderful green background. And to the north, as far as the eye can trace, is the gorgeous color harmony of valley, mountain and sky.

Not everyone who looks at this picture would think of going back to the beginning for a review of the early days of the marble industry. Few people, in fact, could tell what state produced the first American marble and yet the story has the interest of a romance. Away back in 1785, soon after

Lord Cornwallis lowered his colors on the plains of Yorktown, someone discovered that a certain mountain in Vermont was made up largely of white stone. It was found, moreover, that this stone was exceedingly useful. In those days, the fireplace was an essential part of every dwelling. Large slabs were needed for the hearths and chimney backs—something that would stand the heat without cracking or crumbling. Someone tried the Danby stone and people were surprised to see that the fire had no effect on it. Even then, news had a way of getting into circulation. It was not long before buyers were coming from distant towns in search of the mysterious fireplace stones. Ox-carts began to creep over the mountains loaded with white fire jambs and lintels.

* * * *

Then came the entry of this new product into the building world. As the country grew more prosperous, plans were laid for a long period of expansion. There were calls for a stone that would give to New World structures something of the beauty and impressiveness of the lands across the sea. And so Vermont marble went forward to meet a new demand. Its record, since that time, is well known to all who have been in any way connected with building operations. It would be no small task to name all the varied structures which have come from these mountain quarries. The output has been given a far-reaching distribution. It is already quite generally known that the two latest of the nation's great memorials—the Arlington Amphitheater and the Red Cross Building—are of Danby marble.

* * * *

The Red Cross Building has already been dedicated to the memory of the women of the Civil War and to the service of the National Red Cross Society. The commission in charge of its construction had a fund of $800,000 on which to draw. In design, the structure is in accord with the simplicity of the White House, which stands just across the corner of the Mall. For a setting it has a terraced parkway, surmounted by broad marble steps. Its entrance is marked by twelve massive Corinthian columns. Within the building a spacious marble stairway opens the way to the upper floor. On the landing of this stairway are placed three marble figures, the emblems of Faith, Hope and Charity. Both of these splendid monuments are planned in a large way and together they called for nearly 700 carloads of material.

There was a time when every block of marble that came off the mountain had to be loaded on a wagon and sent down over a treacherous, winding road. In the rainy seasons, the way was often blocked by the mud. The winters were turned into periods of waiting. As it is now, a block is hardly out of the quarry before it is set down in the valley. The cable road is sure. It runs in all kinds of weather—mud and snow are no longer a menace. To say that this track is a mile long gives no hint of the problems that attended its construction. It should be explained that the upper quarry is 900 feet above the railway level. At one point, the cable line is laid out at a grade of 55 feet to the hundred. This is far from being an easy slope and yet a block of marble weighing 90,000 pounds is not too great a load for the Danby cable system.

The plan appears to be simple enough. There is a long stretch of wire rope with a car attached to either end. Then there is the power house with its mammoth drum, around which the rope is wound. And when the operator turns on the power, the car at the top of the line starts to go down and the car at the bottom starts to go up. A stretch of

A fifty-ton marble block which was quarried for the bow of the Scott Memorial Fountain, in Detroit, Michigan. This fountain was designed by Cass Gilbert, and has already been erected in Belle Isle, one of Detroit's parks. The quarrying of this block called for special equipment, and for a special car to transport it to its destination.

double track provides them with a meeting place. All the operator has to do is to watch the indicator, and stop the wheels when the cars come to the end of the track. So far as theory goes, there is nothing complex about it. In the beginning, though, when someone was called on to sit down at the foot of the mountain and estimate the power that would be needed and specify the form and size of the machinery that must be installed, the undertaking was anything but insignificant. The indicator is so adjusted that it shows each car actually moving over the track and stopping points along the way. Like many other things about the system, it is easy to comprehend after it has once been explained. Yet it must have taken more or less experimenting to bring it up to the point of accuracy.

The results of experimental work stand forth very prominently in the modern marble plant. When the visitor at Danby comes in sight of the quarries, he will first catch the sound of the waste conveyors — the suspended carriers which dump the refuse marble down the mountain side. In the distance, they give the impression that someone is rattling the bones of a giant skeleton. By means of them, the mouth of the quarry is kept free from obstruction. Machinery is made to do away with a substantial amount of common labor. Within one of the openings an overhead railway has been built. Supported by brackets, it stretches out under the roof of the quarry like an overgrown cash carrier system. Over its track the car travels for hundreds of feet out into the tunnels, removing the waste from corners which could never be reached by a conveyor. Before this road was installed, all the refuse had to be handled two or three times. Now it is simply loaded on the cars. This is another case where an experiment led to a saving.

Similar conditions prevail in the world of marble machinery. The electric channeller and the electric drill, which take the place of the old hand tools, are the result of a striving for something new. If the American producers had been satisfied with the old way, we might still be blasting out marble, following the method that is still operative in certain sections of Europe. But invention has followed invention, changing handworker into machine-runner, until the standard of productive efficiency has been raised

The Danby cable road. Before this line was built, the blocks had to be hauled out by team. In winter, marble could not be moved at all.

to its present level. It is due largely to these improvements that the Danby quarries are able to meet the demands of today. When a number of large structures are all calling for the same kind of marble, there must be no uncertainty as to the volume of the output. If the blocks are slow in coming from the quarry or if there is delay in getting them to the mills, the progress of the work is retarded and innumerable plans have to be worked out to overcome such "slow-ups." Danby has an equipment that insures her against these dangers, and, what is more, she has an inexhaustible deposit of marble.

Danby Mountain, known also as Dorset Mountain and Mount Æolus, is in reality a collossal block of stone, over which Nature has sprinkled a little soil. It thrusts itself up into the sky to a height of nearly 1,800 feet. In many places the sides are almost perpendicular, and although oftentimes these cliffs are exposed, there are no evidences of disintegration or falling away. All the changes have been brought about by men. Considering the mountain as a whole, these changes appear rather trivial. One must see the inside of the vast machine-made caverns in order to rightly judge of their extent. Some of them have been broadened and deepened until their dimensions aggregate hundreds of feet, while others are only beginning to grow. Three of the larger openings are on the main cable track; several more are within reach of a branch line. No one can say how many quarries may be developed from what are now known as prospects.

It is apparent, therefore, that the Danby cliff workers may look ahead to continued years of labor. They have already produced the marble for many structures, but they will be called on to provide for many more. Each day the gangs of men will file up the mountain side to give the wheels a new start; each evening they will retreat again into the valley. And in the meantime the cable road will be handing down to us the fruits of their toil.

The Mt. Vernon Place M.E. Church South, in Washington, D.C., at Ninth Street and Massachusetts Avenue is built of Georgia marble. Its gleaming whiteness, set amid the green foliage of the surrounding trees, attracts the eye of the passerby to its Doric lines of architectural beauty.

Main banking floor, Guaranty Trust Company's central office at 140 Broadway, New York.
View from officers' platform, looking toward Broadway entrance.

NEW YORK BANK CONTAINS FINE MARBLES

Guaranty Trust Company Buildings Use both Domestic and Imported Stones Effectively

THERE are few bank buildings in the country that contain finer marbles than three of the four structures occupied by the Guaranty Trust Company of New York. Though these were built at different times, in each the same care and skill was shown in the selection of the various stones employed. The result is a fine example of the success that may be obtained with marble even though the treatment is confined to the plane of the commercial.

The Main Office was completed in 1913. It is located at 140 Broadway. The architects were York and Sawyer, of New York. No better description of the treatment could be given than that published in the *Architectural Review:*

"The main banking floor itself has

Another view of the Main Banking Floor of the Guaranty Trust Company's central office at 140 Broadway, New York City. The interior is built almost entirely of dull finished marble, sand colored. The floors are square blocks of Knoxville, with black and gray marble inlays.

The Broadway entrance to the Main Office of the Guaranty Trust Company on Broadway. This view shows the combined use of marble and bronze. The ceilings and capitals of the huge columns are carved in deep relief.

Officers' platform at right of the Fifth Avenue entrance of the Guaranty Trust Company of New York. The Doric columns and the low balustrades between them are of sand-colored Hauteville marble.

View of Women's Banking Department, from Forty-fourth Street entrance in the Fifth Avenue office. The floors are of pink Tennessee, while the railings, square engaged columns and gallery railing and columns are of Hauteville marble.

View of the entrance lobby of the Madison Avenue office of the Guaranty Trust Company of New York, showing tellers' cages and check table. Note the black and white Vermont marbles in the floor, cages and railing.

floors of silver-gray Knoxville, with an inlay of narrow bands of mosaic in black, and other variegated dark marbles. The walls, columns, counter-screens, etc., are of Hauteville marble, with the frieze above a particularly successful imitation of the same material. The ceiling is plastered, with the main body-color matching the marble in general tone, but of a lighter shade, combining to make a particularly dignified, reserved, and satisfactory treatment, in the general style of Roman precedent, lightened with much Italian Renaissance ornament and modeling—the refinement and restraint of which, with its low yet delicate relief, remains its distinctive characteristic.

* * *

"Above the main banking floor are two other important banking rooms — the Foreign Exchange and Trust Departments, on the second and third floors respectively; with counters, and wainscotes of Hauteville, and the floors of Knoxville marble, and of Cork inside the grilles. The directors' room has wainscote and beam ceiling of Italian walnut, with Siena marble architraves, mantels, and floors—the latter inlaid with a border of black mosaic. The walls are covered with a rich stuff harmonizing with the walnut in tone. A similar treatment is used in the president's room, and smaller committee rooms; while the vice-president's office is finished in Mexican oak. In the offices, the floors are of cement, with marble base and metal trimmings; while the basement, the toilet-rooms, minor corridors, halls, etc., have wainscotes of the gray Knoxville."

The Fifth Avenue office, at Fifth Avenue and Forty-fourth Street, was originally the Sherry Building. The reconstruction plans added a twenty-five-foot section on Fifth Avenue and a fifty-foot section on Forty-fourth Street, each running up to the height of the original building. The work was done in 1919 and 1920. The banking room is 90 feet wide and 225 feet long. The ceiling of this room is 17 feet high for the most part, although the middle portion is 32 feet high. Beneath this part of the building is a two-storied vault, reputed to be the largest bank vault in the world.

The design of the interior is in the Italian Renaissance style. The floor is laid in pink Tennessee marble with a design in mosaic of different colored marbles in the center. The walls are covered with Euville, a French marble; balustrades, pilasters, columns and carved door trims are of Hauteville marble.

The Madison Avenue office, at Madison Avenue and Sixtieth Street, was built in 1916. Because of the difficulty of obtaining steel during the time of the war, a reinforced concrete skeleton construction was used. The architects for both of these two branch offices were Cross and Cross, of New York.

The style of the Madison Avenue branch is the late Georgian or Adams. The exterior is of pink Tennessee marble; the interior has a balustrade, counter-screen and wainscote of black Vermont marble with a gunmetal bank screen. The wall pilasters are of white Vermont marble, while the floor is composed of alternate squares of white and black Vermont. The banking room is about 45 feet square, with a ceiling height of 22 feet. The sense of spaciousness, combined with the opulence of the marble treatment, gives an effect of grandeur unusual in a building of this character.

Photograph from Thos. G. Machen, Architect, Balto., Md.

Details of the central doorway of the Pisa Cathedral. This structure is entirely of marble. The plan is that of a Latin cross with deep transepts, with aisles on both sides of them.

ROMANESQUE ARCHITECTURE IN ITALY

THE year 799 A.D. marks the passing of the Roman Empire as such, for it is the date of the election of the first Frankish king, Charlemagne. The fifteen years that followed were filled with a revival of building and it is to the credit of Charlemagne that in a great measure he restored the arts and civilization to western Europe.

The year 1000 A.D. was popularly supposed to mark the end of the world and little building was done during the half-century that preceded it. After the passing of the millennium, buildings sprang up in all parts of Europe, each country transforming the accepted forms in general design and detail, and adding new features. A ready use of the material at hand characterizes the style in each country.

The Christian Church was both the civilizing and educating agency of the period and made a constant effort to extend its powers in northern Europe. Charlemagne encouraged the growth of monastic communities and the erection of a church was often the foundation of a city. The Papacy rose to great power and controlled all civic government.

East and West drifted apart and their architecture progressed along different lines. The various European countries looked to Rome until each developed its own style. Science and art were monopolized by religious bodies. Monasteries, with schools attached, functioned as universities and the bishops and abbots were military chiefs. Until the formation of Gothic art about 1200 A.D., the history of architecture in Europe is the history of religion.

The term Romanesque includes all those phases of western European architecture based on Roman art from the time of the departure of the Romans up to the introduction of the pointed arch, or roughly from 500 A.D. to 1200 A.D. The name Romanesque itself is apt to prove confusing unless we remember that each school of architecture of

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The old Roman "Ponte Pietra" and castle of St. Pietro, Verona, Italy.

Photograph from Thos. G. Machen, Architect, Balto., Md.

The Basilica of St. Pietro at Toscanella. The exterior has been altered since its erection about 739 A.D. The architect was Rodpert. The two side doors are Romanesque, but the central door and the two two-light windows were probably inserted in the thirteenth century. The rose window looks like the work of early Renaissance set in an earlier framework.

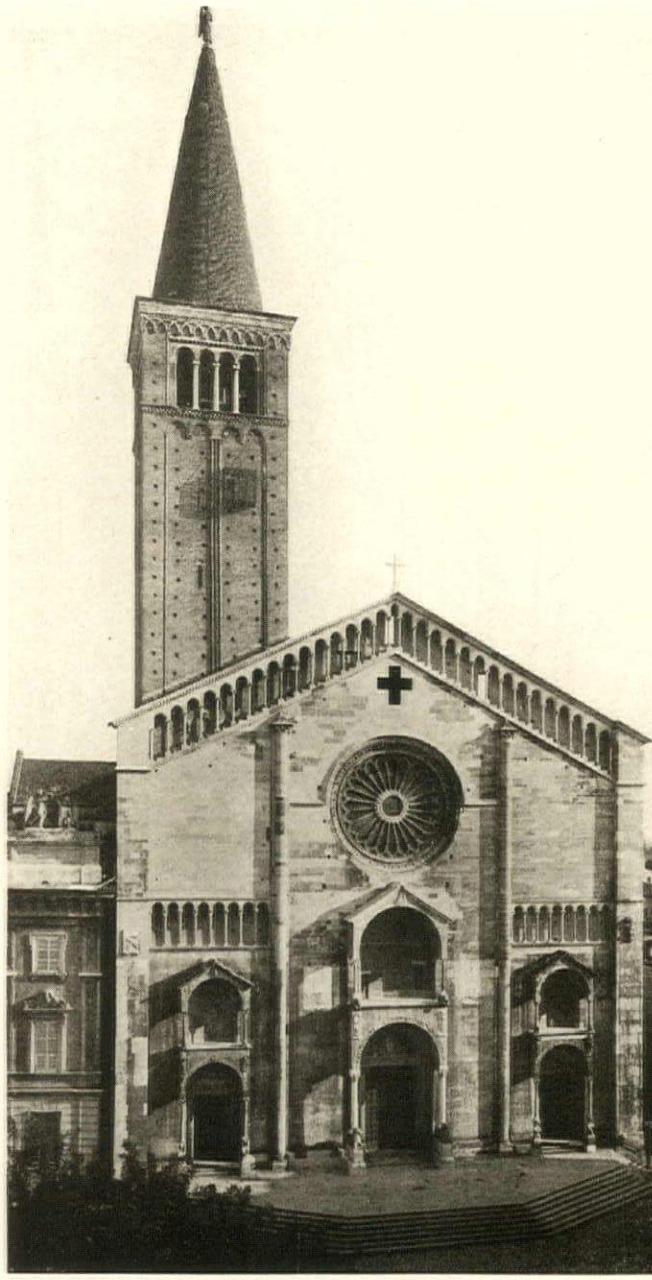
this period, although expressive of the peculiar genius that produced it, is bound by a common root, namely, the architecture of the Romans.

Romanesque architecture is confined, more so than any other style, to ecclesiastical structures. It expresses not only the natural and religious feelings of the people, but the common ideals of the whole people. It is invested with a freshness too often lacking in many modern works. The variations in plan, in heights of columns and arches, may be attributed to inaccuracies of measurement or deliberate design. In either case, the result is an animate quality, a sense of motion and picturesqueness, that enlivens and banishes monotony.

After the churches of Rome and Byzantium split upon differences over the ritual and creed, the divergence between the architecture of the western and eastern church became greater still. The eastern Orthodox church never departed from the Byzantine models. We see it today in Greece, Asia Minor and Russia. The western church has always looked to Rome for her earliest inspirations.

In Rome, where the basilicas were on hand to serve as models and where on all sides were to be found classic temples, with their profusion of choice columns and marble wall-linings, the basilican churches were the natural outcome. Outside of Rome, where materials were scarcer and greater architectural originality was required, other conditions prevailed. The low wooden roof of the basilica had to be replaced by a more enduring form of vaulted construction.

There developed in Italy then, three distinct styles of Romanesque architecture: the Early Christian, The Lombard and the Tuscan, or Pisan. Some authorities, such as Dr. Hamlin, of Columbia, recognize in addition two others: the Italo-Byzantine and the Sicilo-Arabic, in Sicily.

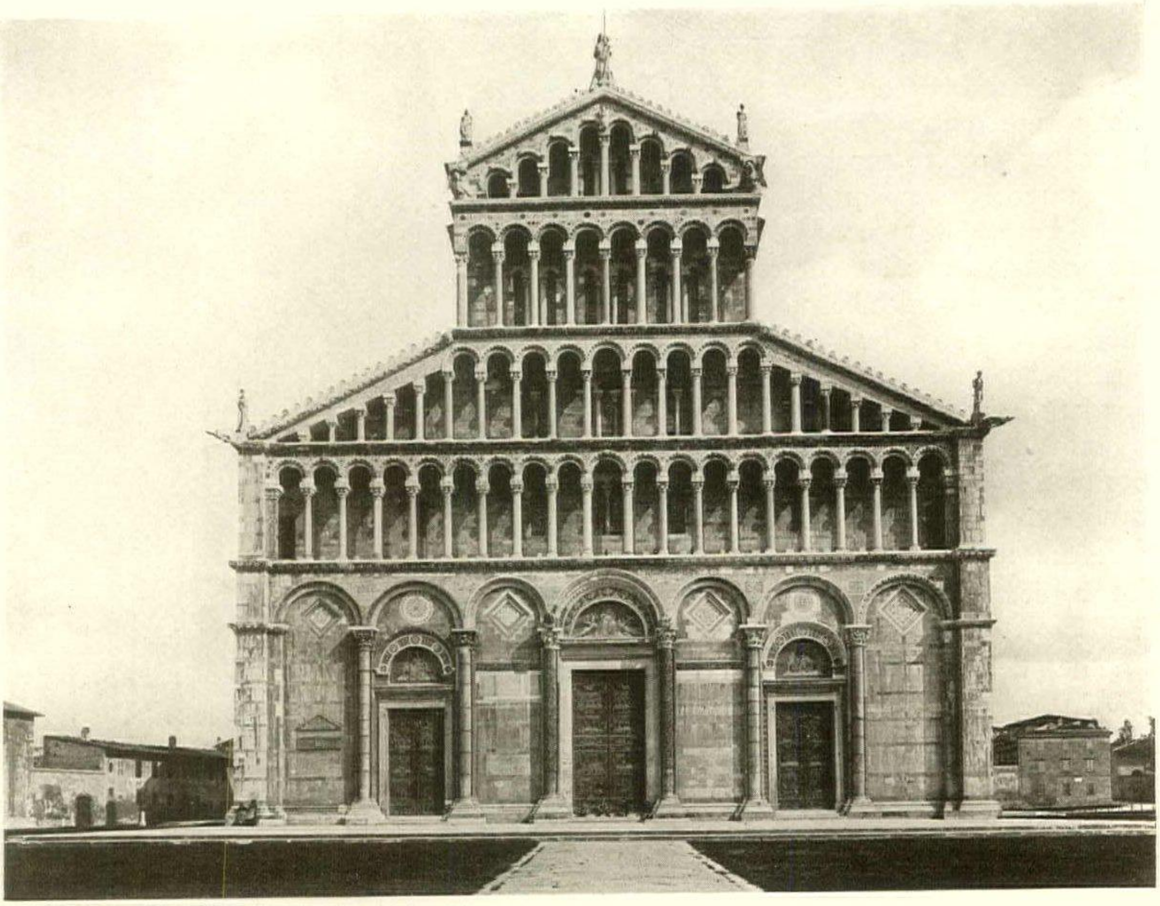


Photograph from Thos. G. Machen, Architect, Balto., Md.

The Cathedral at Piacenza, in Lombardy, is an example of late Romanesque or early Gothic. The nave is majestic with columns of enormous height. Although it has lofty arcades, the upper stories are not starved. The triforium stage is well developed. The plan is both parallel and transverse triapsidal.

The Lombardy style, as implied by the name, flourished chiefly in the cities of the Lombardy Plain, in the north of Italy. Good examples are found in the cities of Milan, Bologna, Piacenza, Verona and Pavia. The façade was simple in composition, with a wide expanse of plain surface, broken at intervals by a series of arcades filled in with slendor arches and columns. Colonnettes or long pilasters, blind arcades and open arcaded galleries under the eaves were effective in giving lights and shadows to these exteriors. The front was often divided into three parts, suggesting the basilican interior nave-and-aisle, by narrow flat or round pilasters. The basilican form otherwise disappeared, as far as the exterior was concerned; the vaulted roof was concealed by a simple low-pitched gable. A projecting porch adorned the doorway, and the columns of the portico rested upon the backs of crouching lions. The carving was often of an elaborate and grotesque nature. The façades were always solemn and dignified. Tennyson, after visiting the old cities of Lombardy during cloudy weather, wrote:

"Stern and sad (so rare the smiles
Of sunlight) look'd the Lombard piles;
Porch-pillars on the lion resting,
And sombre, old, colonnaded aisles."



Photograph from Thos. G. Machen, Architect, Balto., Md.

Front of the Pisa Cathedral. The architect was Boschetto, a Greek of Delichium. Sixty-eight columns of the nave are said to be Greek and Roman antiques, spoils of war. Some of the capitals are Corinthian, others Composite. Inlays of dark green marble are conspicuous.

There was often a square campanile, or bell-tower, connected with the church. This was often treated with some variety of form and decoration. It was often adorned with long, narrow pilaster strips and an arcaded cornice, as at Piacenza. The plan was sometimes octagonal, with openings at the top three or four in number on each face. Nearly every important town of northern Italy possesses one or more examples of these structures dating from the eleventh, twelfth or thirteenth centuries.

Within, the basilican plan was changed by the introduction of the massive vaulted roof, requiring the width of the nave to be narrowed, and the substitution of sturdy piers carrying the pier arches for the rows of graceful columns. These piers were often of clustered section. A crypt, or shrine, was sometimes placed beneath the choir, and the choir floor raised a few steps above the general floor level.

The introduction of logic for tradition in planning the structural members is found for the first time. In these Lombard piers and vaults it is frankly applied. The vaulting was in square divisions or bays, made up of two pier arches meeting upon an intermediate lighter pier. The interior became changed entirely in appearance, and took on a severe and massive dignity that the future developed through centuries of progress. Ex-

Photograph from Thos. G. Machen, Architect, Balto., Md.

Another view of the Cathedral at Pisa. This shows the Baptistery in the left background. A third member of the famous Pisan group is the Leaning Tower. The Baptistery was begun in 1153, the architect being Diotisalvi. The main walls are banded with Verde di Prato, like the Duomo.

amples of this style are seen in St. Ambroglio at Milan, St. Michele at Pavia, The Cathedral of Piacenza and St. Zeno at Verona.

The Tuscan style was lighter and more elegant than the Lombard. The ceilings were timber as in the basilican form, and the use of columns persisted. The façades were almost entirely covered with a lavish arrangement of wall-arcades and galleries, carried on flat pilasters, or sometimes in tiers of small arches on slendor columns standing free of the wall, as in the celebrated group of buildings at Pisa. Occasionally, as at St. Miniato in Florence, the façades were divided into panels of dark and white marbles. The arcading was prevented from becoming monotonous by varied treatment of the different tiers. The Leaning Tower at Pisa was an exception, for here the bands of arcades were of equal height from base to summit. Ruskin claimed for this strange monument the distinction that it was the ugliest building in the world. Certainly it is architecture's most famous freak. The question as to whether the lean was caused by settling or was included in the original design has never been satisfactorily settled, although that latter view seems borne out by the fact that there is a deviation towards the vertical in the upper stories compared with the slant of the lower stages. It has always served as a watch-tower rather than as a bell-tower,

Photograph from Thos. G. Machen, Architect, Balto., Md.

Interior of the Cathedral at Monreale, in Sicily, showing the central aisle, side aisles, and apse. This building was begun about 1174 A.D. It is 315 feet long and shows a mixture of Greek and Saracenic feeling. The central aisle is divided from the side aisles by monolithic pillars with capitals of great beauty. All the architectural features are evidently subordinate to the mosaic decorations which cover every part of the interior and are the glory and pride of the edifice.

of the baptistery is due to a unique system of doming. The building was covered with a cone of masonry and then there was sprung a segment of an annular vault over the aisle from the cornice, or upper string-piece, to a point about two-thirds the way up the masonry cone. The resultant effect is superficially that of a dome. This building, indeed, belongs partly to the Gothic period.

Since Pisa maintained an extensive trade with Byzantium, the eastern methods of building and decoration influenced the Tuscan, and probably accounts for the use of the marble panelling the usual purpose of a campanile.

The cathedral at Pisa is five-aisled. Its exterior arcades vary in height and spacing. The roof is of wood and over the crossing is an egg-shaped dome curiously small for so large a nave. While the effect of the coloring and design of the exterior is pleasing, the interior is decorated with the typical bands of light and dark marble of such striking contrast as to shock the eye rather than please it. The peculiar shape of the roof

Photograph from Thos. G. Machen, Architect, Balto., Md.

Another view of the interior of the Cathedral at Monreale. The windows, though pointed, are undivided and not meant for painted glass. The plan is that of a Roman basilica.

so characteristic of Florentine architecture. Good examples of the Pisan style are found in Lucca in the churches of St. Martino and St. Michele; and in Pistoia, not far from Florence; in other parts of Italy also we meet with churches in which are blended the style of the Byzantine, the Lombard and the Tuscan.

The church of St. Miniato (1013-60), near Florence, shows a departure from the Pisan. The plan is that of a basilica with the nave divided by two transverse arches into three parts. The timber roof is richly painted and marbles decorate the walls. The exterior shows, instead of the horizontal bands of marble as used in the Pisan group, panelled veneering of black and white marbles, a combination of Pisan and Italo-Byzantine.

The rule of the Mohammedans in Sicily, which began in A.D. 827, affected the island's architecture, and we find a mixture of Byzantine, Romanesque and Arabian. For instance, the beautiful cathedrals of Monreale (1175) and Palermo (1185) have the nave columns topped by finely carved Byzantine capitals and dosserets, and the roofs richly treated with color decoration after the manner of the Mohammedan interiors.

Photograph from Thos. G. Machen, Architect, Balto., Md.

The Palermo Cathedral in Sicily, although possessing no dignity of outline or grace of form, is more richly ornamented with intersecting arches and mosaic decorations externally than almost any other church of its class. The decorations, moreover, follow its construction. The effect is pretty, however, rather than grand.

DENVER BOASTS OF FINE BANK

Its Classic Lines are Accentuated by Gleaming Marble

DENVER, with a population of 213-000 in 1910, jumped to well over 260,000 in 1923. This increase was due to several things. The high altitude and clean air are beneficial to those semi-invalids seeking healthy climates. The ore shipments from the rich regions round about find an outlet through Denver. The system of irrigation extensively employed of late years has been conducive to increased agricultural energy and success. The people themselves are progressives. New industries have located there and attracted labor from other sections.

The city officials have not fallen behind during this era of growth and prosperity. Witness, for instance, the planning and partial completion of the Denver Civic Center, where in land and buildings included in or adjacent to the site, exclusive of the Capitol grounds, the sum of ten million dollars has been spent. Witness the extension of Broadway, the great north and south thoroughfare, in the culmination of which it was necessary to condemn thirteen blocks of property.

The business men of the city have also kept apace with the march of progress. New buildings have sprung up rapidly and many of these have been on a par with the best structures to be found in our largest municipalities. Marble has been used in large quantities both for exteriors and interiors, and a fine example of such treatment is

Corner of interior, showing officers' enclosure and part of main banking floor.

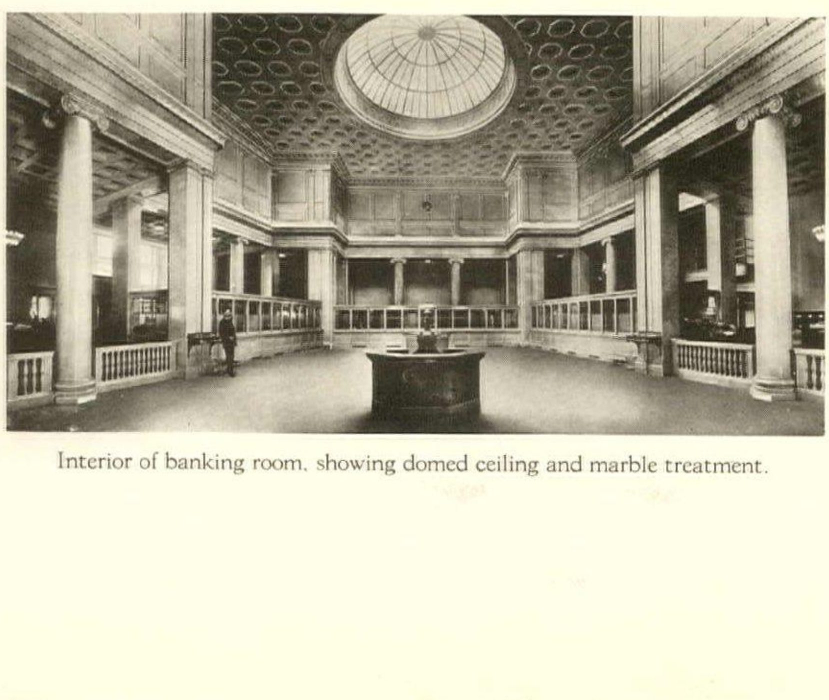
found in the Colorado National Bank, one of the handsomest banking houses in the West.

The building is on the city's main financial street, Seventeenth, at the corner of Champa, and cost $500,000. It has a frontage of 125 feet, with 100 feet on Champa Street. Although at present only four stories in height, the foundations are capable of carrying thirteen, the additional nine to be added sometime as future needs demand.

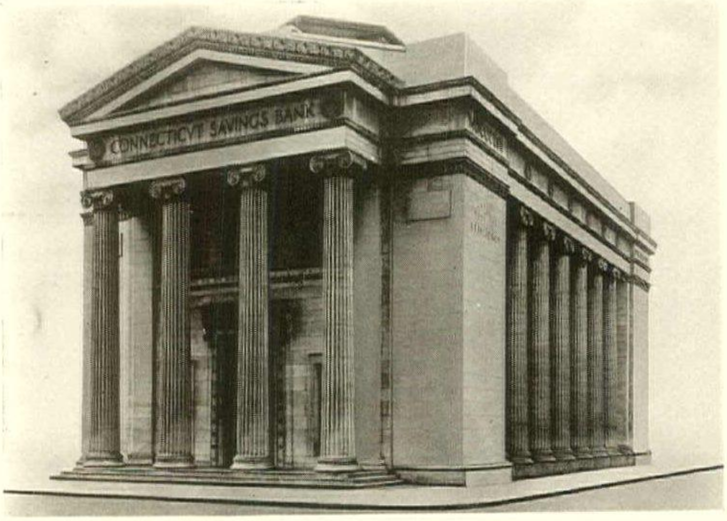
The exterior is a modification of the Greek Ionic style, and is built entirely of Colorado Yule marble from the quarries at Marble above Glenwood Springs. The material was cut and finished at the quarry and shipped to Denver ready to set in place. The carving was done by Baristow, of Washington, D.C., who carved part of the Lincoln Memorial at Washington, which was built of the same material.

The exterior columns, fourteen in number, are 42 inches in diameter at the base and 28 feet high. They are fluted, and capped by the characteristic Ionic volutes. Antefixæ of Greek floral motive adorn the cornices and relieve somewhat the severity of the lines. The building is placed upon a slight podium, broken, at the entrance, to the street level.

Within, the entire first floor is occupied by the banking room, the height of two ordinary stories. This is modeled after the Pantheon and is finished in Hauteville marble from France. The floor is gray marble from Knoxville, Tennessee. Above the ground floor are two stories divided up for offices and occupied by bond firms and lawyers. Here the stairs, floors, wainscotes and toilet-rooms are finished with Colorado Yule Golden Vein marble. Since all of the doors and windows are of steel or bronze, the building is absolutely fireproof and enjoys the Class A insurance rate. The building was occupied on September 6, 1915.



Interior of banking room, showing domed ceiling and marble treatment.



IT PAID TO BUILD OF MARBLE

New England Bank Discovers that the Beauty of their New Building brings Increased Business

PREVIOUS to 1908, the Connecticut Savings Bank of New Haven was housed in a rather unpretentious building. From the time of its organization in 1857 until that year, the officers and trustees had been content to go along in the usual conservative banking fashion, watching the business grow steadily—but slowly. The deposits had reached nine millions of dollars and some of the directors felt that a banking business of this volume deserved a home more worthy of such an impressive total.

New York architects were consulted, materials and costs were figured out, and plans were made for a new building. This new structure, it was decided, should be of marble as being more in keeping with the dignity that a large banking house should have. It was begun in 1907, and was finished and occupied by the bank in June of 1908.

The psychology of a mutual savings bank having for its home an individual and striking building is evidenced by the rapid increase of business which has come to the institution. In fifteen years its deposits increased from nine millions to twenty-two millions of dollars. No small part of this healthy development is due to the effect produced in the minds of the customers by the bank building itself. The solidity of the structure suggests the stanchness of the bank; both seem destined to last for many years to come.

The exterior is of Greek design, and is entirely of Alabama marble. Across the front are four Ionic columns, while six similar columns are ranged along either side. The pediment is almost severely plain, but the lack of ornamentation is offset by the carving of the cornice, of the egg and dart pattern. The interior pilasters, counters and floors are of marble quarried in Vermont.

The bank cost approximately $350,000. It stands at the corner of Church and Crown streets. It was designed by Tracy and Swartwout, of New York City. Its roll of officers and trustees carries the names of many prominent New Haveners.

AN OLD SOUTHERN SKYSCRAPER

Birmingham Boasts of the Brown-Marx Building

SEVENTEEN years ago a group of men were considering the erection of an office building on First Avenue and Twentieth Street, in Birmingham, Alabama. Because these men were both forward-lookers as well as interested in the development of their own state, they planned a modern up-to-date fireproof skyscraper, the first in Birmingham, if not in Alabama; and wherever possible, the contracts for materials were given to local firms. The owners of the building decided to award the contract for the interior marble to a state concern. As a result, Alabama marbles were used exclusively in the building—the first large job, indeed, in which they were used.

The Brown-Marx Building was built in two sections. While the marble in the first section of the building is of good quality, well finished and well installed, at the same time it must be admitted that it shows evidences of inexperience in the selection and matching. It contains really several grades of Alabama. However, the building as a whole, to one who knows its history, is an interesting example of the higher standard that comes with experience in the marble business.

The second section of the building and the entire first floor will compare favorably in every way with the highest grade of interior marble work found anywhere. The first floor is finished in marble carefully selected for a minimum of clouding. As a matter of fact, it is almost free of clouding; and the warm creamy tone of the marble gives a very pleasing effect.

The building occupies seventeen thousand square feet of ground, and is sixteen stories high. While comparatively old, it has been kept up to date in every way, as far as possible, and enjoys today the best clientele of any building in the South. The original cost of the structure in 1906 and 1908–9 was about one million dollars. It has 150 feet frontage on First Avenue and 100 feet on Twentieth Street. It contains nine passenger and one freight elevator. It furnishes a splendid example of the fact that in the long run a marble finish for interiors of high-grade commercial buildings is the most economical as well as the most attractive.

The Brown-Marx Building

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 fifth installment and contains 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 (*Continued*)

CORES can be taken out with drills in which the cutting bit is a piece of hardened pipe, and the cutting material sand or steel shot; but the best results are obtained with a diamond drill. Cores should be at least two inches in diameter, and need never exceed three inches.

Cores will inevitably break into pieces of moderate length to a greater or less extent. With an ordinary diamond drill, the pieces of core will turn on one another and often completely grind off the fractured surface. It is highly important that this should be avoided, for two reasons:

(1) When it occurs, the true length of the core cannot be determined.

(2) If the fractured surface is preserved intact, it will always show whether the break occurred in a natural crack, or was due to the vibration of the machine, thus giving valuable indications as to unsoundness.

For these reasons, it is strongly recommended that prospecting for marble be always done with a diamond drill with a double core barrel, such as is used in prospecting for coal. In this type of machine, the core is received into an inner tube mounted on ball bearings within an outer one, which carries the cutting head. The inner tube or core barrel tightly grips the unbroken stump of the core and thus remains stationary, while the outer tube revolves. Cores taken out in this manner will cost from three dollars per linear foot, up, depending on location, length of core taken at each set-up, total amount of drilling, etc.

If the surface of the marble or the overlying stone is accessible where the drill enters it, the beginning of the core should be scored with a line whose direction is known.

Normally, the cores should be vertical. As marble deposits always have a grain, and nearly always veins of color, more or less parallel with the beds — all of which are easily visible in the core if it is wet; or certainly, if it is polished—a vertical core gives valuable indications as to the Dip, at every point. If it has been possible to properly mark the upper end of it, it will indicate, not only the amount, but the direction of the Dip, which is important. It will give the angle of the Dip in any case; it will give the direction, if it has been marked as recommended, and if the fractures are so preserved that the pieces of core can be accurately fitted together, so that each piece may be "oriented" from the one preceding it; they will indicate variations in the Dip, even if they do not give the direction. A variable Dip is cause for suspicion and investigation; it means folding of some kind, and that often means unsoundness. An Anticline is more likely to be unsound than a Syncline, from the nature of the case. If the outcrop is due to the cutting off, or truncation, of the upper part of an Anticline, the trend of the marble in the ground is different, as a rule, from what it is if the outcrop is a truncated Syncline. A truncated Syncline may be an indication that there is no great amount of marble available, or it may not. In all of these matters, the services of a trained Geologist are highly desirable.

CORES DIFFICULT TO INTERPRET

In the case of the Quarry, previously referred to, in which drag folding produced such unfortunate results, the veins of Schist appearing at intervals in the cores indicated not merely a variation in the Dip, but an actual reversal of Dip, at frequent short intervals. If the Schist had been good tight "color" of an agreeable quality, this might have indicated a variegated marble, still marketable, instead of white marble. The deposit, in this case, was entirely covered with earth, but was exposed at a few places in small pits, that were dug in connection with the drilling. The frequent and sudden reversals of Dip in the same core, and the pattern in which the Schist appeared at the surface where the marble was uncovered, could be seen very plainly to be not only the result of the conditions in the Quarry, but plain indications of it; but no one interested in the development of the property was able to interpret the record.

Torsional movements, producing slight folding in a deposit after it is no longer subjected to pressure enough to enable it to flow, are pretty sure to produce systems of cracks oblique to the axis of the stress. Contrary to what might be expected, in practice, the marble at the apex of the fold is often sound, and the unsoundness is encountered on the flanks of the fold, where locally, at least, the beds are plane and the Dip uniform. If the marble is very sharply folded, and not manifestly shattered, it is probable that the folding occurred while the deposit was deeply buried, and it may be quite sound. Gentle folding, then, with moderate variations of Dip, is to be regarded with suspicion, whether the cores encounter unsoundness or not. Sharp folding, without manifest unsoundness, is less suspicious. Uniformity of Dip clear across the strike, for some distance along it, to a depth of a hundred feet or more, in each core, is a good indication, even if an occasional natural crack shows up in a core. It is certain that there will be joints at intervals, no matter what the conditions; but uniformity of Dip is at least good evidence that certain stresses known to cause much unsoundness have not been present. However, no amount of core drilling can ever finally settle the question of soundness. Where the directions of the prevailing unsoundness have been determined in Quarries actually developed, attempts have been made to test the soundness in the direction of proposed extensions by taking out cores practically parallel with the beds and so directed as to intersect the dominant cracks. In at least one case where this work was very carefully carried out, there was no difficulty in recognizing the natural cracks where they cut through the cores; but the most troublesome of the cracks were discontinuous; a whole "school" of them would close up, then start again in a foot or so. This condition was so prevalent that, in a body of marble that was really too unsound to be worth quarrying, the drill went through many of the spots where the cracks had closed up, bringing out long sound cores which led to very optimistic expectations. The real and very sad state of affairs was discovered by the expensive method of quarrying.

DRILLING SOMETIMES MISLEADING

Generally speaking, the results of drilling must be discounted by a considerable margin; The indications taken at their face value almost always lead to conclusions which are too optimistic. As an example, one case is known where a deposit over a considerable area, adjacent to a quarry that was yielding fairly well, was broken up to a depth of about twenty-five feet, and eroded into huge boulders by the ground water. The boulders were generally egg shaped, large end up, and standing just as they had been when they were a part of the ledge; the water had surrounded them with mud as fast as the marble was dissolved. There was an overburden of about twelve feet over the marble. A drill hole put down in this area struck a large boulder, went through it, struck a small area, about one foot square, where the boulder still retained its original contact with the bed below, and then twenty feet or more into the uneroded beds below. This core, taken together with the indications of the quarry walls, caused the quarry to be extended in that direction, but not a foot of good marble was obtained until the entire mass of earth and boulders had been removed to an average depth of nearly forty feet below the original surface. The boulders themselves were very unsound, and absolutely worthless as marble.

Instances such as these could be multiplied indefinitely: too much cannot be inferred from cores. However, they do give absolute evidence of the presence of the marble and its thickness; as to its lithological character at different points; and as to variations of Dip; all of which are of sufficient importance to justify the use of the drill in, at least, a few well-chosen spots, even when the deposit is fairly well known. When it is not, a reasonable amount of core-drilling should never be omitted.

BEGIN QUARRYING ON OUTCROP

So far as known, marble quarries are always opened on the outcrop. The thickness of the workable beds varies from twenty feet, or so, to two hundred feet, in the deposits so far developed in the United States. The available area of the outcrop—or at least its width—depends upon the Dip of the marble itself and the slope of the surface along which the outcrop occurs. The minimum width is the thickness of the deposit, and it occurs when the surface of the outcrop is at right angles to the beds, *i.e.*, to the Dip of the marble.

When the outcrop is concealed, as when the marble lies below the floor of a valley, it is well to expose it in a few trenches at right angles to each other, before drill holes are located. Access to the stone itself enables the strike and Dip of the outcrop to be determined directly; but it should be pointed out that two parallel lines of drill holes covering the entire width of the outcrop and developing both the overlying and underlying rock will give a fair idea of the strike of the outcrop, whether the latter is exposed or not.

After trenching, drilling and samples have been made to yield all possible information, the next step is to determine the approximate location of the Quarry, and strip it, if necessary. Nothing should be done at this stage of the proceedings to prevent a subsequent shifting of the opening within reasonable limits, nor should the direction or location of Quarry walls be fixed. After the marble is exposed over a considerable area, its surface should be thoroughly cleaned off, washed and carefully examined. Now is the time to work out those "structural lines" above referred to, which have a vital bearing upon the success or failure of the enterprise. If sample blocks have not previously been taken out, they should be taken out now. Unless there are marble shops near by, a small saw-gang and a polishing machine should be set up; the sample blocks should be sawed and finished in every possible way.

This work should be done, of course, by men skilled in the trade.

The sample blocks should be marked so that when the slabs sawn from them are examined, it will be known exactly how they lay in the Quarry.

LOOK FOR CRACKS

The distribution of the color and the direction of any cracks, should be carefully noted, as well as the polishing, cutting and other qualities of the marble.

In the meantime, the clean surface of the marble in the Quarry should be carefully examined for cracks, open beds, layers of inferior stone, etc. The cracks are the most important feature at this time. More or less, they will always be found. As a rule, they are more numerous at the surface than they are at some depth in the marble. Some of them die out, others persist. A quarryman experienced in the same marble can tell, by looking at them, which are likely to die out, and which are likely to persist. He cannot ordinarily explain it in words; it is a power that comes by experience, and is like a "sixth sense"; but it is very real, and very important.

Some of the cracks will be plainly apparent and easily seen by anyone. Some will be difficult for the most experienced man to find. Often the very tight ones are marked on the weathered outcrop by hair lines of slightly siliceous material, standing out a little from the weathered surface of the stone. They do not look like cracks—but they ALWAYS ARE. However, these cracks rarely persist to any great depth. Sometimes the edges of the cracks have suffered a little from solution, in which case there is a very minute and very narrow depression in the weathered surface, following the line of the crack. These also often do not look like cracks—but they ALWAYS ARE.

If the edges of any of the layers present an angle from which pieces can be broken, all such edges should be so broken from one end of the Quarry to the other, drenched with water, and carefully examined while wet. If no edges are available, a few narrow strips should be "pointed off" and drenched. This will reveal many cracks not otherwise visible, even to the initiated. But, even then, some of the cracks will appear like thin lines, not quite as translucent as the marble itself. Such lines often occur in perfectly sound stone, but they should always be regarded with suspicion. Examination with a magnifying glass of reasonable power will almost always settle the question; for if the line is a crack, the glass will reveal the thin film of water penetrating the stone. Finally, the operation of sawing a block into slabs and polishing them, will reveal all the cracks there are. If the blocks and slabs have been properly marked, the Quarryman can then go back to the Quarry and mark the places where cracks must be, whether he has been able to find them or not.

The object of all this is to enable the Quarry to be laid out and operated so that the waste due to unsoundness shall be a minimum. It is probable that very few marble deposits, unless visibly shattered, are hopelessly unsound. But many a Quarry has been a failure because not enough sound blocks were produced from it. Many of them might have succeeded, if the unsoundness had been carefully studied and taken into account.

Enough has been said as to the origin of cracks, except those due to two specific causes:

(1) Proximity to the surface produces cracks in a variety of ways, not always clearly understood. "Slicks" have been defined and explained; irregular cracks—often curved—are often quite numerous to a mod-

erate depth. It is easy to imagine that there may be strains in a deposit that cannot develop into cracks at any great depth, due to the restraint of the overlying material; but, within varying distances from the outcrop, and especially within the reach of the effects of expansion and contraction due to the weather, these strains will develop into cracks, which will keep on developing as erosion proceeds. Earth stresses have produced the strains, but below a certain depth, they cannot develop into cracks.

(2) Where the marble has been thrust up over other materials, it may have slipped back a little after the thrust was over, due to elastic reaction, cooling and contraction, etc.; and in such cases there may be more unsoundness deep down in the deposit than there is at the surface.

In the majority of cases, unsoundness diminishes with depth. There are exceptions, but the only known way to discover them is to open and operate Quarries.

The question of practical interest is to minimize the waste due to unsoundness. Cracks have habits, they occur in certain ways, and those modes of occurrence depend somewhat upon their origin. As already indicated, some persist, no matter how deeply we go, within practicable limits. Some are sure to disappear. Sometimes new ones come in. There will always be at least two systems of cracks, making angles of from 60° to 90° with each other as a rule, which will persist. As soon as these persistent cracks can be recognized—but not before—the location and direction of the Quarry walls can be fixed.

If there is no other way to determine which are the dominant systems, a continuation of the practice of marking the blocks and sawing them into slabs, combined with a study of all unsoundness revealed, will soon yield the desired information.

CRACKS OCCUR IN SYSTEMS

The point of practical importance for the Quarryman is that the persistent cracks always occur in *systems*. If a crack is found to be persistent, there are sure to be others approximately parallel with it; and there are sure, also, to be others constituting another system, more or less nearly at right angles to the first. Earth stresses or expansion and contraction, or both together, have produced them. But no theory as to their origin is sufficient to forecast their actual numbers and arrangement at any given point. The structural Geologist can, by a study of the deposit, of the adjacent rocks and of local conditions, make a pretty fair guess as to locations where the conditions generally favor soundness or unsoundness; but the rest must be learned by experience, as above indicated. Nothing short of actual operation on at least a preliminary scale will tell the real story.

In this investigation the Quarryman must be prepared for surprises. Any one layer may be much more or less unsound than those above and below it. The cracks in any one system may be spaced with fair uniformity, or very irregularly; they may occur in schools, forming zones of unsound marble with cracks so close together that the entire zone is worthless; wide zones of sound marble may intervene, sometimes wide enough for a Quarry to be located in marble entirely free of the particular cracks concerned. Sometimes cracks persist for a while, close up, and then start again, usually with a slight offset. They may be offset from one layer to another. Sometimes a whole school of cracks is interrupted for many feet, only to begin again.

At least some of the cracks belonging to any system are easy to find, but there are often intermediate ones that are very tight and very hard to find.

Some authorities deny that a crack due to earth movements can ever close up, but every Quarryman knows that they do. Even little faults, involving a slip of as much as an inch, have been known to close up within eighteen inches; and cracks that undeniably belong to persistent systems can be seen open several inches on Quarry walls, at the outcrop, and closing up entirely within distances of from twenty to one hundred feet.

Sometimes the arrangement of the cracks suggests that the stresses tending to produce them and the resistance of the stone were nearly balanced, so that the stone yielded in some places, and either successfully resisted or yielded slightly, without fracture, in others. In such cases changes from sound to unsound and back again are often sudden and inexplicable.

Where sliding has occurred, the resulting unsoundness has sometimes been distributed throughout the thickness of the deposit, and sometimes it is concentrated in one or more layers—usually those of higher grade, unfortunately—whereby they become so unsound as to yield little or no good marble. The Quarryman often calls such a layer, a "Cushion Layer."

At the outcrop the cracks are usually both numerous and irregular. With increasing depth, they become more regular, and, as a rule, less numerous. But there are exceptions to all rules. Sometimes, for twenty-five feet, the cracks are so numerous that no good marble is obtained; then, within four or five feet, the stone becomes very sound.

Sometimes it gets worse for a time, and Quarries have been abandoned because of "unsoundness coming up from below." It is probable that if a Quarry is on "a main ledge," and if the body of the deposit is followed far enough, a high average degree of soundness would, in all cases, be realized. But sometimes this is too far for the patience and the financial resources of even a considerable number of successive owners.

There is just one safe rule to follow—and it is safe only in the sense that the Quarryman may feel, in the event of failure that he has not overlooked or spoiled any good chances: that is, to Quarry slowly and carefully, sawing the blocks and studying the unsoundness, until the persistent and systematic cracks are recognized; then, if they are at all numerous, or complicated in arrangement, make a plan of the Quarry, showing the cracks. Try different methods of cutting the marble into blocks until that one is found that will yield the maximum amount of rectangular, sound blocks; then fix the location and direction of Quarry walls so that channel cuts laid out to produce the best results shall be parallel to the walls, and proceed to quarry accordingly. Even then, the unsoundness must be closely followed, and the Quarryman must be prepared to change the locations of his cuts to accommodate himself to breaks and offsets in the cracks. But if he has done the preliminary work thoroughly, he will not have to change the general direction of his cuts to any material extent. He will also have the satisfaction of knowing that he will get all the sound marble there is, and no one can do better than that.

Along with the study of the cracks, the distribution of color should be studied, and, so far as the unsoundness will permit, that method of quarrying should be adopted which will enable the blocks to be sawed into slabs of the highest possible grade. This is a matter of very great importance, and one that is often neglected.

The question of soundness determines, in most cases, whether the block is salable as marble or not; the grade determines the price at which it can be sold, if salable at all.

LIST OF QUARRIES AND MARBLE MANUFACTURERS

REPRESENTED IN THE MEMBERSHIP OF THE

NATIONAL ASSOCIATION OF MARBLE DEALERS

City and State	*Company*	*Representative*
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
Brandon, Vt.	Middlebury Marble Company	Wm. T. Fleming
Buffalo, N.Y.	Geo. W. Maltby & Son Company	Wm. C. Maltby
Buffalo, N.Y.	Lautz Marble Corporation	R. K. Glass
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
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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
Chicago, Ill.	Peerling Marble Company	Frank J. Peerling
Chicago, Ill.	Standard Mosaic Tile Company	C. R. Borchardt
Chicago, Ill.	Taylor Marble Company	Geo. W. Bower
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
Cleveland, Ohio	Haworth Marble Company	W. J. Haworth
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
Columbus, Ohio	Wege Marble and Tile Company	C. F. Wege
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
Des Moines, Iowa	Des Moines Marble and Mantel Co.	J. R. Golden
Des Moines, Iowa	Holbrook Marble and Tile Company	H. F. McAdow
Detroit, Mich.	Christa-Batchelder Marble Co.	E. L. Leavenworth
Detroit, Mich.	Detroit Marble Company	B. L. Cummins

City and State	*Company*	*Representative*
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Fort Worth, Texas	Good Marble Company	H. G. Good
Houston, Texas	Salt Lake Marble and Supply Co.	Geo. E. Rieder
Indianapolis, Ind.	F. E. Gates Marble and Tile Co.	F. E. Gates
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
Kasota, Minn.	Babcock & Willcox	Tyrell S. Willcox
Kasota, Minn.	Breen Stone and Marble Co.	Tyrell S. Willcox
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Knoxville, Tenn.	Gray Eagle Marble Company	E. F. Klein
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Knoxville, Tenn.	Tennessee Producers Marble Co.	B. L. Pease
Little Rock, Ark.	Southwestern Tile Company	R. E. Overman
Long Island City, N.Y.	Clarendon Marble Company	Alexander Thomson
Louisville, Ky.	Peter & Burghard Stone Co.	Jos. E. Burghard
Memphis, Tenn.	Central Mosaic and Tile Co.	Louis B. Marus
Milwaukee, Wis.	Andres Stone and Marble Company	Edgar Andres
Milwaukee, Wis.	Breidster Marble Company	Fred. W. Breidster
Milwaukee, Wis.	McClymont Marble Company	J. J. McClymont
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Minneapolis, Minn.	Northwestern Marble and Tile Co.	Chas. N. Gramling
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Oklahoma City, Okla.	Taylor Marble and Tile Company	G. W. Taylor
Omaha, Neb.	Sunderland Bros., Company	J. P. Williams
Peoria, Ill.	Peoria Stone and Marble Works	H. A. Farley
Philadelphia, Pa.	John Hegarty Marble Company	John Hegarty
Pittsburgh, Pa.	American Marble Company	Max Weiner
Pittsburgh, Pa.	Iron City Marble Company	George L. Sibel
Pittsburgh, Pa.	Pennsylvania Marble and Mosaic Co.	John A. Fiore
Somerville, Mass.	Phil. H. Butler & Son Company	P. H. Butler
St. Louis, Mo.	Bradbury Marble Company	I. P. Morton
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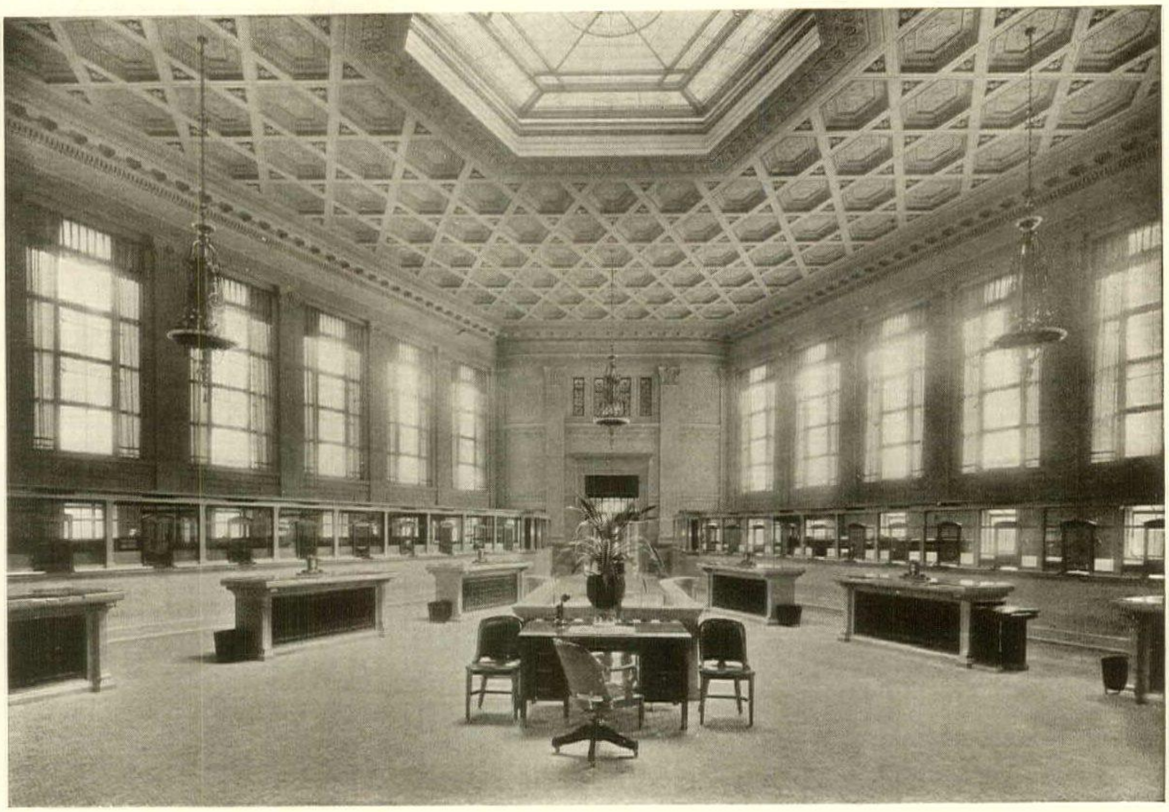

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