

“Cleaving Granite by Compressed Air”

By J. E. Schultz, Houston Building, Knoxville, Tennessee

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Sullivan Machinery Company, Chicago, Illinois

The article begins:

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This article, which begins on the next page,
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<http://quarriesandbeyond.org/>

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CLEAVING GRANITE BY COMPRESSED AIR

By J. E. SCHULTZ*

An industry which is rapidly growing in importance and is capable of great development in the South is the quarrying of granite for monumental, building and crushed stone purposes.

Of the states south of Mason and Dixon's line, Georgia, Maryland and North Carolina are credited with the heaviest production of granite, ranking in the order given. The last report of the United States Geological Survey gives the 1911 value for Georgia at \$847,000, and for Maryland \$845,936, while that of North Carolina was \$772,685.

Of all the producing quarries in the above territory one of the largest as well as most interesting is that of the North Carolina Granite Corporation at Mount Airy, North Carolina, from which the major portion of the stone quarried in that state is shipped.

The granite is exposed over a tract of nearly fifty acres and rises as a ridge-like hill to a height of 130 feet. At the base lie the switch tracks, connecting the quarry with the various finishing plants, as well as the spur track leading to the Southern Railway. The granite hill has a gentle slope, approximately 15 degrees, with an ample tract of level ground at its base, affording marked natural advantages for handling the blocks of stone in an expeditious and economical manner. The granite itself is widely and favorably known because of its attractive light gray

color, absence of veins, the ease with which it can be dressed and polished, and the readiness with which blocks of any dimensions may be secured.

The facility with which the North Carolina Granite Corporation is enabled to fulfill large orders on very short notice is unusual and is aptly illustrated by an order which came in recently for a thirty-ton block of granite, which was quarried, placed on the cars and on its way within 12 hours.

CREATING BED PLANES BY AIR

The following description of the unique method used in quarrying at this property is reprinted from the May (1906) *MINE AND QUARRY*.

The deposit at Mt. Airy consists of a perfectly solid, homogeneous mass of moderately hard granite, showing no ledges or bed planes whatever, but splitting readily in a straight line in almost any direction. In order to make quarrying economical, this feature is taken advantage of to create artificial beds, to which to work. Large sheets or laminations of granite are separated from the mass at a single operation, just as an onion is peeled, by the successive use of powder and compressed air. The stone is then split up into proper sizes for building stone, paving blocks, curbing, lintels, and stock for monumental purposes at very low cost.

*Houston Building, Knoxville, Tennessee.



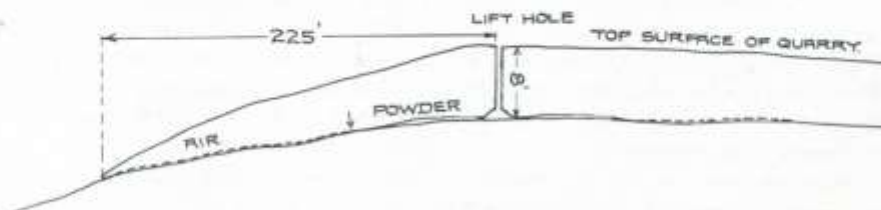
Starting a 400-foot ledge line with Sullivan Plug Drills

In the center of the sheet or area to be lifted, a drill hole three or four inches in diameter is sunk from five to eight feet in depth, depending on the greatest thickness of stone required. The bottom of the hole is enlarged into a pocket by exploding half a stick of dynamite, as indicated in the sectional sketch shown below. A small charge of powder, about a handful, is then exploded in the pocket, thus starting a horizontal crack or cleavage across its greater diameter. Charges increasing in size are now exploded in the cavity, the drill hole being plugged at each blast to confine the powder gases and thus exert a more or less constant force upon the stone.

After the cleavage has extended to a radius of 75 or 100 feet in all directions from the lift hole, a pipe is cemented into the hole with melted sulphur and connected by means of a globe valve to the

pipe line. Compressed air at 70 to 80 pounds pressure is gradually admitted and the cleavage rapidly extended until it comes out upon the hillside in a thin edge, as indicated by the cross sectional sketch referred to above. A sheet of several acres in extent may be raised in this manner, affording a bed plane approximately horizontal, to which the quarrymen can work, thus securing stone of any required thickness.

It will be observed from the accompanying sketch, that on the area, raised by this means only a portion of the cleavage extended to the surface, owing to the thickness of the ledge on the up-hill portion of the area. The bed plane thus formed is reached at these points by quarry bars and drills in the usual manner, the extent of the cleavage being determined by striking the surface of the stone with a sledge.



Sketch showing sectional view of granite splitting by air

(photo captions) "Starting a 400-foot ledge line with Sullivan Plug Drills." & "Sketch showing sectional view of granite splitting by air."



The paving block production is a large one

DRILLING EQUIPMENT

For drilling the lift holes, channeling the stone and other heavy work, Sullivan $3\frac{5}{8}$ -inch differential valve drills are employed, mounted on tripods or Sullivan "U-45" quarry bars, while upwards of 60 "DA-15" Sullivan plug drills are used for the plug and feather work.

AIR POWER PLANT

The compressed air for the drills and for the tools in the finishing plant is supplied by two Sullivan air compressors. One of these, located in the main finishing shed, is a class "WX" Corliss cross compound steam and two-stage air unit, operated condensing. Its principal dimensions are as follows: Steam cylinders, 16 and 28 inch by 42-inch stroke; air cylinders, 26 and 16 inch by 42-inch stroke. The displacement capacity is 1935 cubic feet of free air per minute at 75 revolutions. This compressor was installed in 1905 and has been operated as the main air unit ever since.

In the power house of the large crushing plant is installed a Sullivan class "WJ" two-stage belt-driven self-lubricat-

ing compressor, size 20— $12\frac{1}{2}$ x 16, having a displacement capacity of 960 cubic feet of free air per minute at 165 revolutions.

HANDLING THE GRANITE

The quarried granite, in its various forms, is delivered to cars at the foot of the hill by eight cableways, operated by independent steam hoists, with a maximum capacity of eight tons each, and two inclined tramways with a maximum capacity of 75 tons each. Owing to the difficulty and cost of procuring suitable mast timbers, the management conceived the idea of building up their masts out of one-inch boards. The boards are lapped one on the other and securely nailed together. Four pieces are nailed together first, these having a suitable taper, and upon this the other boards are nailed, as shown by the sectional sketch.

It is possible in this manner to build up a mast of any desired size and at about one-half the cost of a mast timber of similar size. This method has been in use a number of years with complete satisfaction. To guard against seepage of rain

(photo caption) "The paving block production is a large one."

water and consequent rotting, the masts are protected at the top with cone-shaped caps of sheet iron.

CUTTING PLANT

The main cutting plant is 65 feet by 420 feet, and an extension provides quarters for a well-equipped machine shop, which takes care of all repair work, and the tool sharpening shop, which has equipment for 12 fires. The equipment of the cutting plant includes 15 surfacing machines, one 14-foot column lathe, and a Jumbo polishing mill, as well as two 20-ton electric cranes of 50-foot span, having five-ton auxiliary hoists.

The power house adjacent to the main cutting plant has two boilers of 210 H. P. each and one 100 K. W. generator direct connected to a compound engine.

CRUSHED STONE OUTPUT

The waste stone from the quarry is crushed in two crushing plants having respectively capacities of 200 and 750 tons daily. The smaller plant is located at the west end of the quarry and the larger at the east end.

The latter is equipped with No. 5 and No. 7½ Gates Crushers, two sets of balanced rolls, screens, etc. The power plant consists of two 150 H. P. boilers and a 200 H. P. Corliss engine. The stone is conveyed to the crushing plants by small quarry cars and tracks of the usual type, provision being made for automatic dumping. The smaller plant has a No. 4 crusher, 50 H. P. simple slide valve engine and necessary screens, elevator, etc.



Feather edge of granite split by air

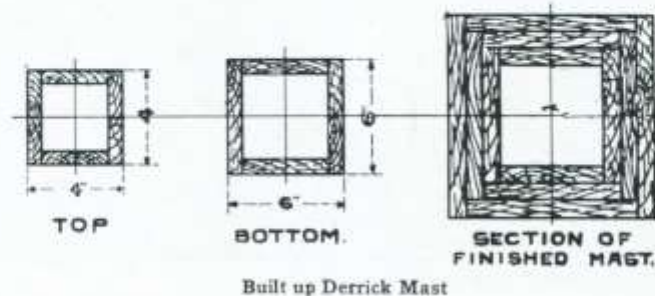
PRODUCTION AND LABOR

During the year 1912, the North Carolina Granite Corporation shipped 2,500 car loads of stone, consisting of dimension, curbing, paving blocks and crushed granite, totaling approximately 100,000 tons.

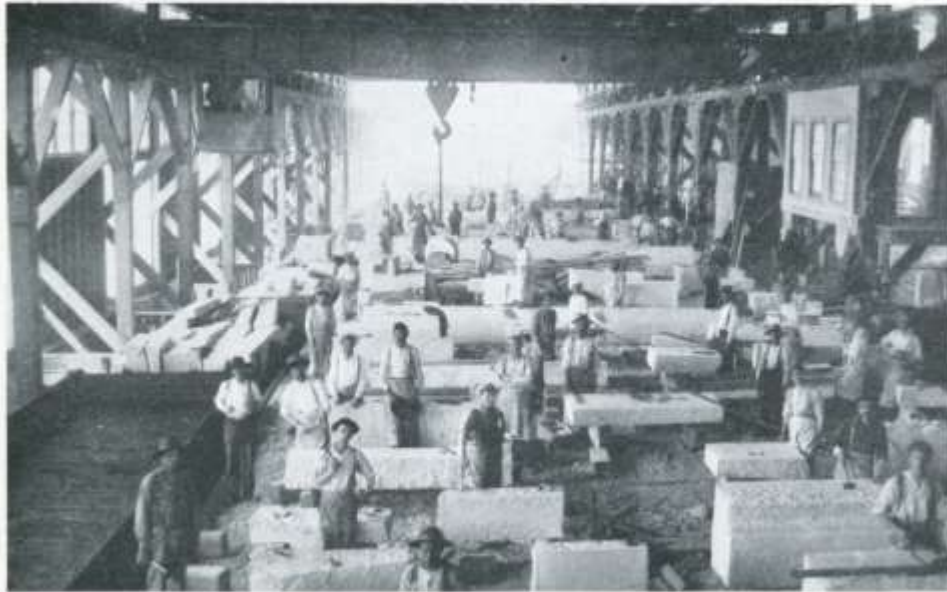
To quarry this tonnage and prepare it for market from 400 to 600 men are employed, ranging from the skilled stone cutters, who receive a minimum of \$3.30 for eight hours, and paving block cutters, paid 50 cents an hour, to the plug drill operators who are paid 16 cents per hour. Eight hours constitutes a day's work.

OTHER MOUNT AIRY FIRMS

In addition to the North Carolina Granite Corporation, there are several other finishing firms operating at Mt. Airy, and supplied with stone from the quarry described. One of these is the



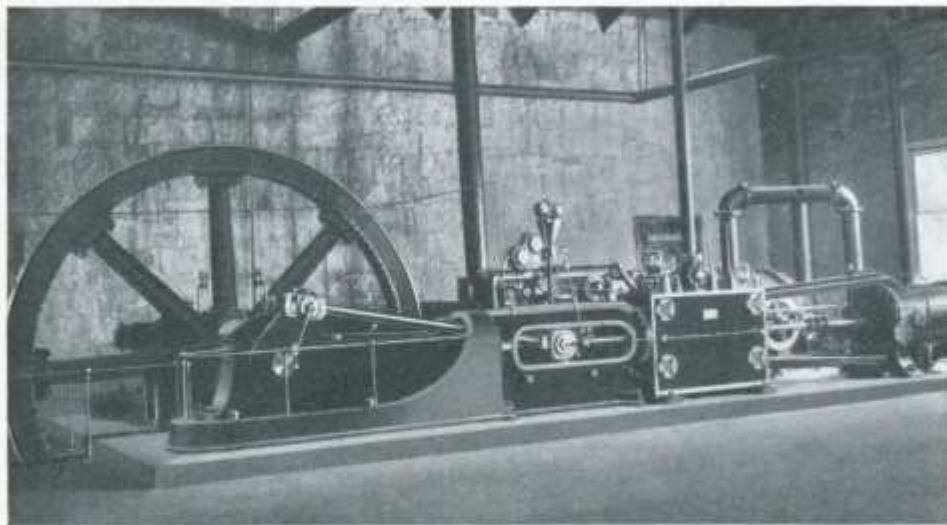
(photo captions) "Feather edge of granite split by air." & "Built up Derrick Mast."



In the finishing plant

Mt. Airy Granite Cutting Company, which operates one of the largest cutting plants in the South. This plant consists of a cutting shed, 225 x 75 feet, a well equipped tool sharpening shop, a compressor house in which is installed a Sul-

livan class "WJ" 16-10x14 two-stage belt driven air compressor, having a displacement of 537 cubic feet of free air per minute at 165 r. p. m., which serves five large surfacing machines, 100 one-inch cutting tools, and a number of Sullivan



Sullivan Corliss Cross Compound Two Stage Air Compressor, North Carolina Granite Corporation

(photo captions) "In the finishing plant." & "Sullivan Corliss Cross Compound Two Stage Air Compressor, North Carolina Granite Corporation."



A rush order for large stones; Sullivan Plug Drills at work

"DA-15" plug drills and $\frac{3}{4}$ -inch cutting tools. Mr. George A. Bailey is president and general manager of the above company.

The Sargent Granite Company, Mr. J. D. Sargent, general manager, operates a large force of stone cutters and specializes in finishing dimension stone for building purposes. They are equipped with eleven large surfacing machines, 40 one-inch tools and Sullivan "DA-15" plug drills.

The Lemmerman and Hoffman Granite Company, organized to finish Mt. Airy granite, have several notable bank buildings to their credit, in addition to having cut the stone for numerous post offices. Their cutting shed is equipped with Sullivan "DA-15" plug drills, three large surfacing machines and numerous small cutting tools. The fourth finishing firm

located at Mt. Airy is the Smith Granite Company, Mr. J. E. Smith manager. The last named firm has made a specialty of cutting stone for post office buildings, and recently completed a contract for the post office at Rapid City, S. D., which indicates the wide scope of their trade.

All the above firms are supplied, with the exception of the first named, with compressed air from the Sullivan compressor at the central power plant of the North Carolina Granite Corporation.

The officers of the North Carolina Granite Corporation are Thos. Woodroffe, president; Geo. Woodroffe, vice-president and assistant treasurer; C. B. Keesee, secretary and treasurer. The writer acknowledges his indebtedness to the officers of the companies named for the data obtained.



(photo caption) "A rush order for large stones; Sullivan Plug Drills at work."