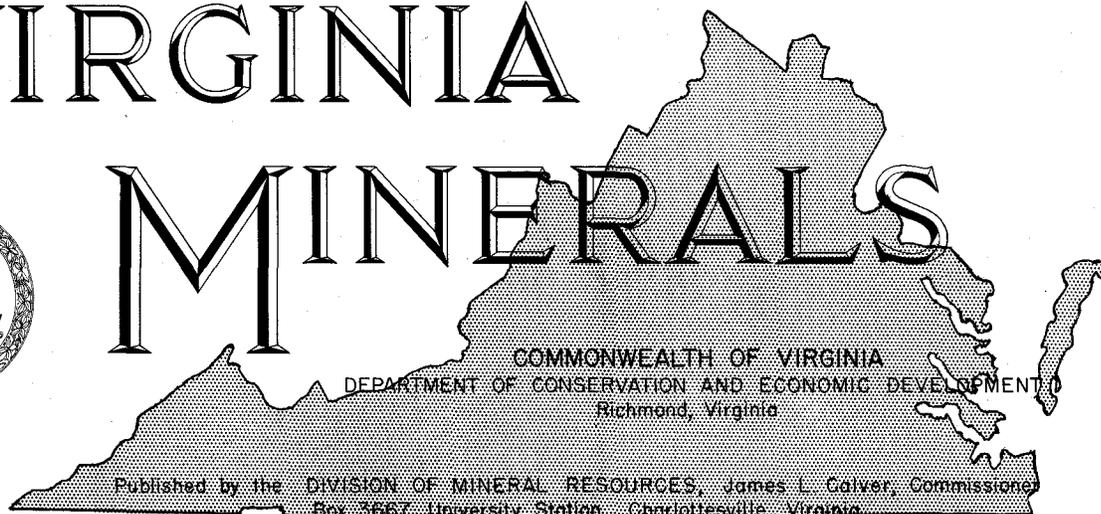


# VIRGINIA



# MINERALS



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No. 2

## Talc, Soapstone, and Related Stone Deposits of Virginia

JAMES WILLIAM SMITH

### Introduction

Dimension stone is produced from soapstone and serpentinite at Schuyler, dimension stone is quarried from rocks related to soapstone at Lynchburg, and ground soapstone is produced at Schuyler and Henry. Talc and soapstone have also been commercially produced from Fairfax, Orange, Fluvanna, Amelia, Campbell, Floyd, and Grayson counties.

Soapstone is a rock composed essentially of the mineral talc. Soapstone is commonly dark gray and contains various quantities of carbonate minerals, chlorite, amphibole, magnetite, and other minerals. Talc is a hydrous magnesium silicate mineral characterized by a pronounced soapy feel, platy cleavage, pearly luster, and softness, being easily scratched with one's fingernail. Usually talc is white, gray, or light green. Most talc, soapstone, and related rocks are formed as the result of metamorphism of ultrabasic igneous or carbonate sedimentary rocks.

Many small soapstone quarries developed by the Indians have been found in Virginia. Such quarries, located two miles northeast of Schuyler, are 10 to 30 feet in diameter and 2 to 4 feet deep. Many fragments of bowls carved by the Indians have been found in these quarries. Early white settlers quarried soapstone locally and used it for door jambs, hearths, and other chimney parts, and for foot warmers in carriages, sleighs and beds. The stone was shaped with axes, saws, and other wood working tools. Virginia has al-

ways dominated the dimension soapstone industry in the United States. Most of the Virginia material has come from Albemarle and Nelson counties (Figures 1 and 2). Production of commercial soapstone has been reported from Albemarle and Nelson counties since the early 1880's. The Alberene Stone Division of The Georgia Marble Company, located at Schuyler, Virginia, is the only producer of dimension soapstone in the United States.

At present dimension soapstone, that is soapstone cut to specific shapes and sizes, is used largely as chemical resistant furnishings in laboratories. Often associated with soapstone are serpentinite and amphibole schist which are used largely as architectural dimension stone. Milled blocks of talc are used for gas-burner tips, insulators for electrical appliances and marking crayons. A very pure form of block talc is used for tube spacers in vacuum power tubes. Ground talc and ground talcose rocks are used chiefly in the production of ceramics, insecticides, roofing, paints, asphalt filler, rubber and paper. Special

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New schedule:

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FIGURE 2

**EXPLANATION**

- SOAPSTONE, SERPENTINITE, AMPHIBOLE-CHLORITE SCHIST, & AMPHIBOLE SCHIST
- HORNBLende GNEISS & AMPHIBOLITE
- ▨ LYNCHBURG FORMATION
- ▩ CATOCTIN GREENSTONE
- ↘ STRIKE & DIP OF BEDDING
- ↙ STRIKE & DIP OF FOLIATION
- ⊗ ACTIVE QUARRIES

ALBERENE STONE DIVISION OF THE GEORGIA MARBLE COMPANY

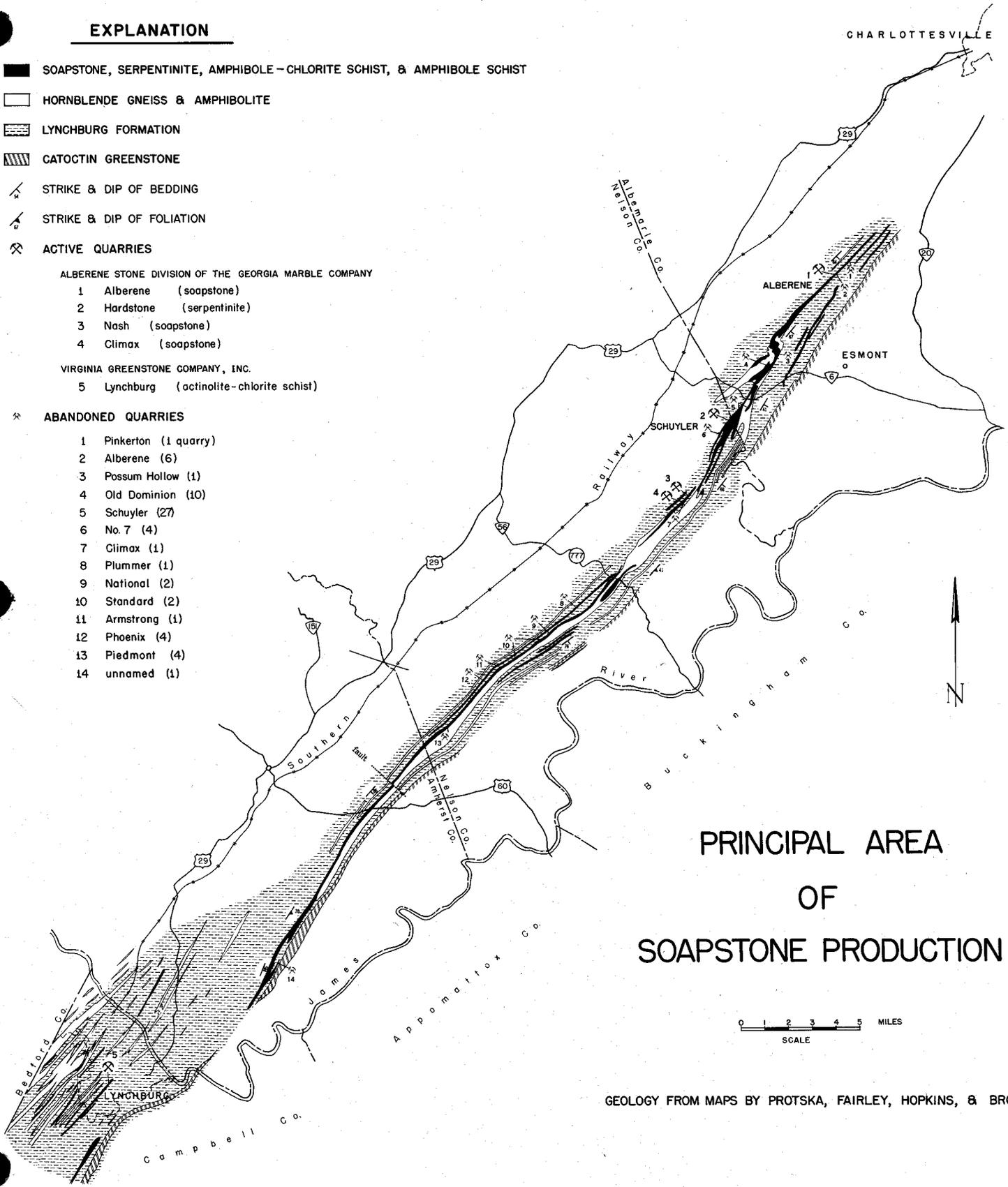
- 1 Alberene (soapstone)
- 2 Hardstone (serpentinite)
- 3 Nash (soapstone)
- 4 Climax (soapstone)

VIRGINIA GREENSTONE COMPANY, INC.

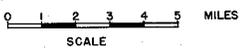
- 5 Lynchburg (actinolite-chlorite schist)

⊗ ABANDONED QUARRIES

- 1 Pinkerton (1 quarry)
- 2 Alberene (6)
- 3 Possum Hollow (1)
- 4 Old Dominion (10)
- 5 Schuyler (27)
- 6 No. 7 (4)
- 7 Climax (1)
- 8 Plummer (1)
- 9 National (2)
- 10 Standard (2)
- 11 Armstrong (1)
- 12 Phoenix (4)
- 13 Piedmont (4)
- 14 unnamed (1)



**PRINCIPAL AREA  
OF  
SOAPSTONE PRODUCTION**



GEOLOGY FROM MAPS BY PROTSKA, FAIRLEY, HOPKINS, & BROWN

MAP PREPARED BY C. T. SPIKER, JR.

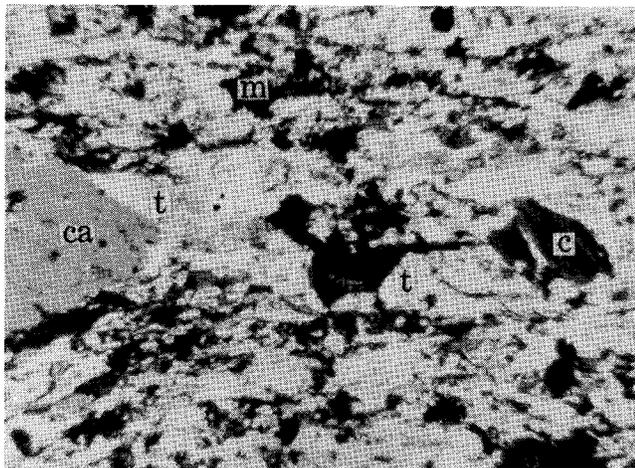


Figure 3. Photomicrograph of Alberene Stone, regular grade soapstone: t, talc; c, chlorite; ca, carbonate; m, magnetite. Crossed nicols. X 40.

Grayson County—In 1900 soapstone was mined 2 miles southwest of Blue Ridge Mill on the Floyd Cox farm near Piney Creek (Stose and Stose, 1957).

### Geology

Two areas of soapstone and related rocks have been studied in detail. One is the principal area of soapstone occurrences between Lynchburg and Charlottesville (Figure 2) and the other is in Carroll and Grayson counties.

Soapstone, serpentinite, amphibole-chlorite schist, and amphibole schist in the principal area of soapstone production occur interlayered and grade one into the other. These rocks are largely in the form of tabular bodies that dip steeply to

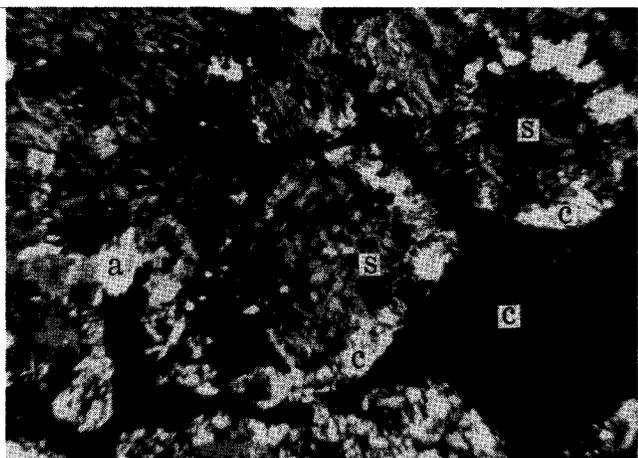


Figure 4. Photomicrograph of Alberene Serpentine, serpentinite: s, serpentine; c, chlorite; a, amphibole. Crossed nicols. X 40.

the southeast. The tabular bodies are conformable with the foliation of adjacent hornblende gneiss, amphibolite, and rocks of the Lynchburg formation. Hornblende gneiss and amphibolite occur as concordant tabular bodies. The chief rock types of the Precambrian Lynchburg formation are biotite-quartz gneiss, mica schist, graphitic schist, and conglomeratic gneiss. Most probably soapstone and related rocks of the principal area of soapstone production are metamorphosed ultrabasic igneous rocks. These rocks are believed to be intrusions, but it has been suggested that they may be altered lavas (Brown, 1958). Brown believes their age is at least no younger than late Precambrian or early Cambrian.

The soapstone and related rocks in Carroll and Grayson counties are conformable within the Lynchburg formation (Stose and Stose, 1957). The largest body of such rock is greater than seven miles long and is up to one mile wide. These rocks are also believed to be metamorphosed igneous intrusions.

### Rock Descriptions

Soapstone quarried by the Alberene Stone Division is composed of talc with various quantities of chlorite, amphibole, and carbonate. Magnetite is a common minor constituent (Figure 3). The rock is dark gray to greenish gray with some thin veins of white carbonate, quartz, or talc. The soapstone is fine- to medium-grained and some contains coarse carbonate grains. Some masses have only an indistinct foliation, while in others foliation is definite. The abrasive hardness (Bureau of Standards rock hardness test) for *Alberene Stone*, regular grade soapstone, is approximately 6.

Some of the stone from the Alberene Stone Division soapstone quarries contains only small quantities of talc and could be classed as amphibole schist. This stone has an appearance similar to the soapstone, although it has an abrasive hardness of 20 to 30.

Serpentinite, marketed under the trade name *Alberene Serpentine*, is greenish black, fine-grained, and massive and takes a good polish. It is composed mainly of the minerals serpentine, amphibole, chlorite, and small amounts of talc, magnetite and other minerals (Figure 4). Its abrasive hardness is about 45.

Virginia Greenstone Company, Inc. produces two varieties of stone. One is greenish gray actinolite-chlorite schist and the other is bluish gray tremolite-chlorite schist. Each variety contains a few grains of magnetite, pyrite, and pyrrhotite, and each is medium-grained and contains

coarse amphibole grains (Figure 5). The amphibole takes a better polish than the chlorite, and therefore the polished stone has a mottled appearance. Ankerite is scattered through the tremolite-chlorite schist and may occur in the form of veins. The abrasive hardness of the surfaces on individual pieces of schist varies greatly and is related to the foliation. A surface cut parallel to the foliation of the greenish stone has a hardness of about 10. Surfaces cut perpendicular to the foliation have a hardness range from 19 to 43. These different cuts are made depending on the use of the stone.

Soapstone quarried by the Blue Ridge Talc Company is 60 to 75 feet wide, has a nearly vertical dip, and is enclosed within the Lynchburg formation (Virginia, Geologic Map of, 1928).

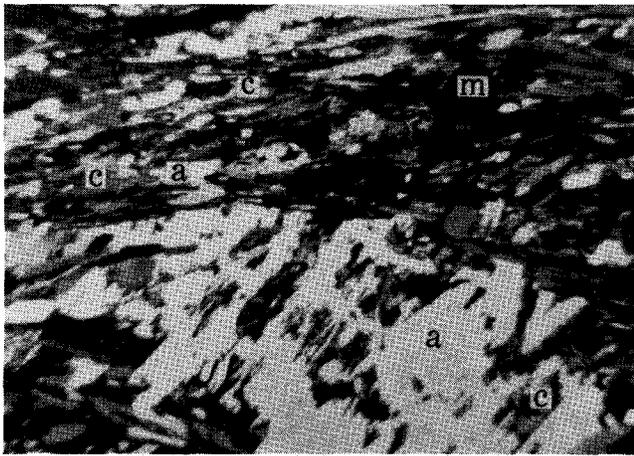


Figure 5. Photomicrograph of Virginia Greenstone, actinolite chlorite schist: a, amphibole; c, chlorite; m, magnetite. Crossed nicols. X 40.

The soapstone has a prominent foliation and is fine-grained; some contains coarse carbonate grains. The rock contains talc, chlorite, carbonate, and small amounts of pyrite and chromium-bearing magnetite (Figure 6).

#### Quarrying of Dimension Stone

The Alberene Stone Division is now operating three soapstone quarries and one serpentinite quarry. The quarries average about 100 feet in width and length, and 150 feet in depth. A "bridge-wall" from 25 to 40 feet thick is usually left between adjacent quarries to support the quarry walls. There are over 60 abandoned quarries within the principal area of soapstone production (Figure 2).

Virginia Greenstone Company, Inc., operates one quarry. It is near the intersection of Daniel and Harper Streets in Lynchburg, and the stone

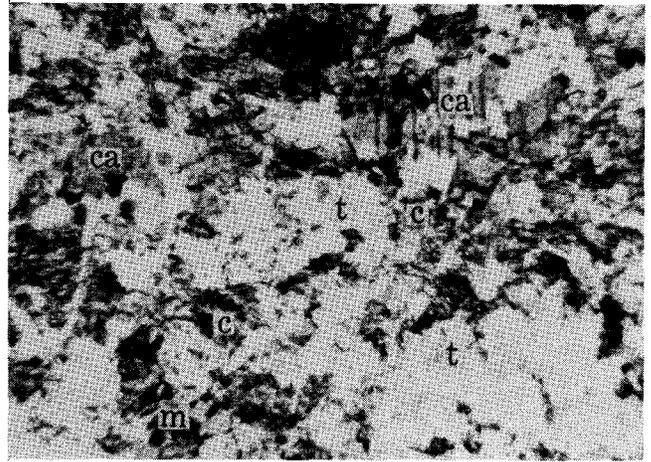


Figure 6. Photomicrograph of Blue Ridge Talc Company soapstone: t, talc; c, chlorite; ca, carbonate; m, magnetite. Crossed nicols. X 40.

plant is on Fort Avenue a few blocks away. The quarry is about 200 feet wide, 400 feet long, and 100 feet deep.

*Virginia Greenstone* and *Alberene Stone* are quarried in much the same manner (Figure 7). Before adjacent material or new localities are developed they are evaluated by examination of core drilled from the rock. The overburden of soil and weathered rock is then removed. Across the width of the quarry vertical cuts are made perpendicular to the foliation of the rock. Virginia Greenstone Company, Inc., uses channeling

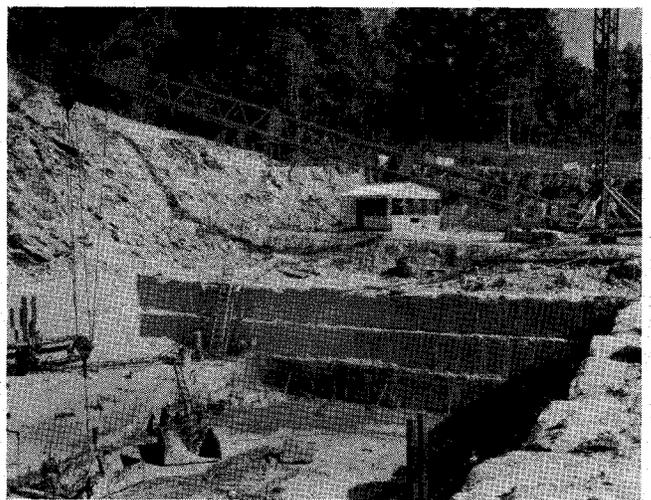


Figure 7. Nash quarry of Alberene Stone Division.

machines to accomplish this operation, and the Alberene Stone Division drills rows of vertical holes which are then broached. The first few blocks are undercut with hand operated pneumatic drills; then in soft stone a Jeffrey undercutter, which operates like a chain saw, is used. Hard stone is undercut with mounted pneumatic drills. After the stone is undercut, individual blocks are broken loose by drilling a series of holes along natural parting planes of the foliation and then wedging the blocks free. The blocks are rhombohedral-shaped and approximately  $3 \times 4 \times 7$  feet. The stone is rhombohedral-shaped because the natural parting planes are not vertical. By the use of huge overhead cranes the stone is lifted to the surface and placed on a waiting railroad car or truck.

A considerable portion of the stone is discarded because of the presence of thin veins of undesirable minerals, stains caused by weathering, or seams along which the rock breaks. The quantity of usable stone is greater from the hard stone quarries than from the soapstone quarries.

#### Milling of Dimension Stone

The main processes of milling at the Alberene Stone Division and the Virginia Greenstone Company, Inc. are quite similar. At the mill the blocks, weighing as much as ten tons, are lifted by crane onto a low, flat top, rail cart and rolled under gang saws. A gang saw consists of a series of long steel bars mounted in an overhead frame (Figure 8). The saws are moved back and forth across the stone, and a slurry of water and sand is constantly poured over the stone and steel bars. The abrasive action of the sand does the cutting. The majority of the stone is cut and ground into slabs  $\frac{7}{8}$  to  $1\frac{1}{4}$  inches thick. The cutting time for soapstone is from 18 to 24 hours, while the time for cutting comparable blocks of serpentinite is from 4 to 7 days of continuous sawing.

After the blocks are sawn into slabs, the slabs are drenched with water and then dried with a jet of compressed air. Any areas that remain wet are indicative of cracks that have absorbed the water. The cracks are marked so that the part of the rock containing the cracks will not be used.

Patterns of the desired products are drawn on the slabs and they are then cut into the desired shapes and sizes with circular saws that have diamond impregnated edges (Figure 9). The slabs are then placed on a rubbing bed where they are ground to the proper thickness and are given a "sand-rubbed" surface. The rubbing beds

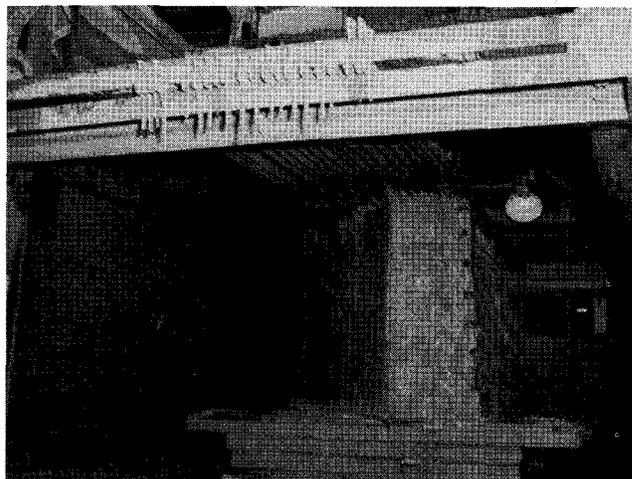


Figure 8. Gang saw at Virginia Greenstone Company, Inc.

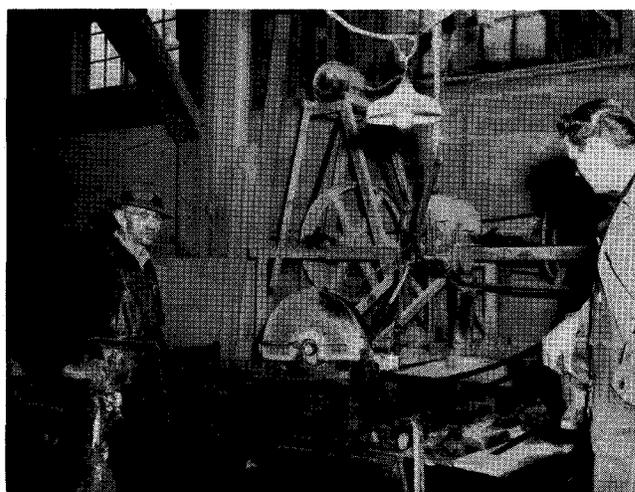


Figure 9. Diamond saw at Virginia Greenstone Company, Inc.

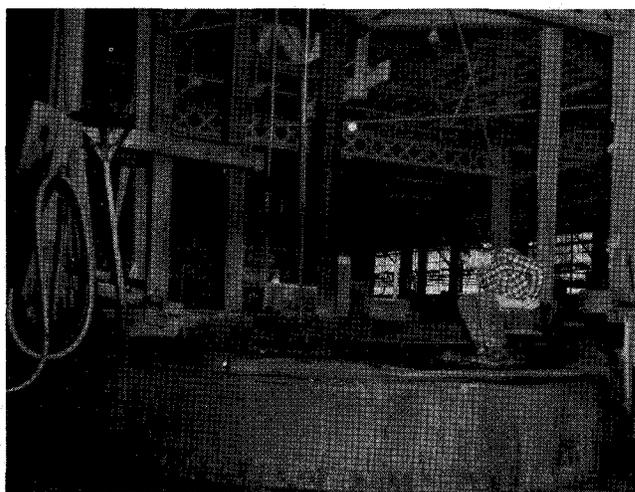


Figure 10. Rubbing bed at Alberene Stone Division.

are huge steel disks that revolve on a vertical shaft which extends to the ceiling of the plant (Figure 10). The grinding medium consists of steel "shot" and water that is continuously poured over the disk.

If a honed surface is desired, a surfacing machine containing a carborundum wheel is used (Figure 11). If a high polish is desired, the stone is buffed with the same machine after honing. Final milling operations include grooving, drilling, and cutting the "sand-rubbed" honed or polished stone. The stone is crated and shipped either as an assembled product or as slabs to be assembled at their destination.

Laboratory sinks are made by each of the companies. A bonding and sealing agent is placed in the joints during the assembly of the sinks. Grooves and bolts are also used to hold the sinks together.

#### Uses of Dimension Stone

*Virginia Greenstone* is used primarily for architectural purposes, and *Alberene Stone* is used largely for laboratory furnishings.

Some of the very earliest dimension soapstone products from Albemarle and Nelson counties were laundry tubs, slate pencils, heating and cooking stoves, and fire bricks. When the Alberene Stone Division quarries were first opened, the company specialized in making laundry sinks and an assortment of other products such as foot warmers, cooking disks, furnace linings for pulp and paper mills, snow melters (used by railroads to keep switches from freezing) insulation stone for switchboards, and cemetery headstone. These products were made to standard sizes and kept in stock by the company, but through the years they have been discontinued, and now the company makes products to individual specifications.

Because soapstone is highly resistant to chemicals and to the conduction of heat and electricity, it is used extensively as laboratory furnishings: sinks, table tops, fume hoods, shelves, floor tiles, drain boards, gutters, peg boards, animal cages, aquariums and special items. Usually *Virginia Greenstone* and the hardest grades of *Alberene Stone* are used for architectural purposes. The stone is used for exterior and interior trim as spandrels, window sills, stools, caps, bulkheads, facing, coping, mullions, door trim, plinths, base and wainscot, fireplace facings and linings, benches, stair trends, floor tile, toilet and shower compartments, and flagging. *Virginia Greenstone* is also used as "rock-face" veneer (Figure 12).

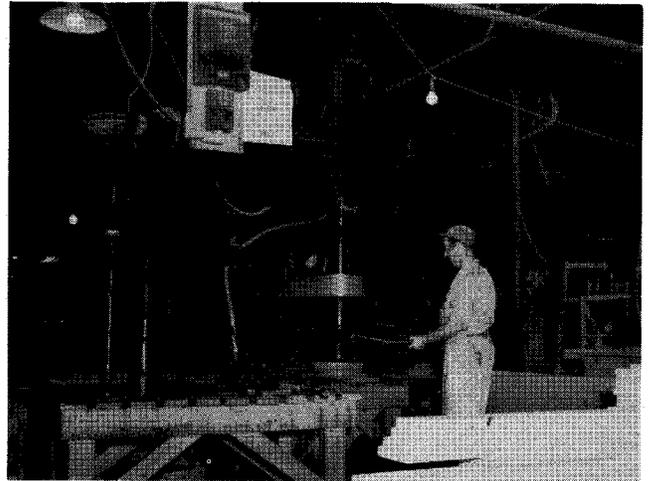


Figure 11. Surfacing machine at Alberene Stone Division.

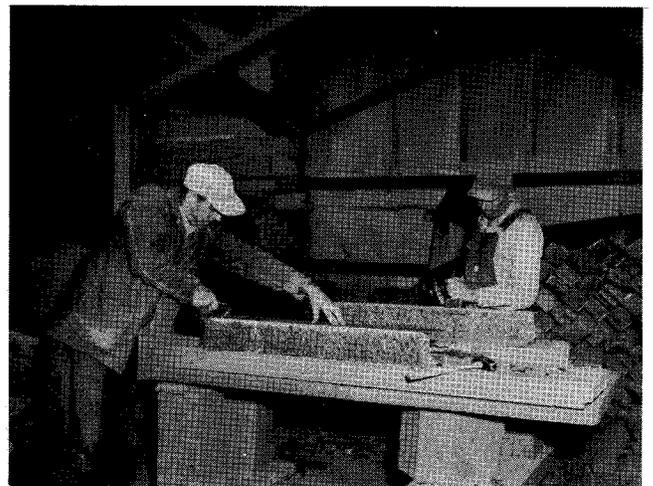


Figure 12. Shaping "rock-face" veneer at Virginia Greenstone Company, Inc.

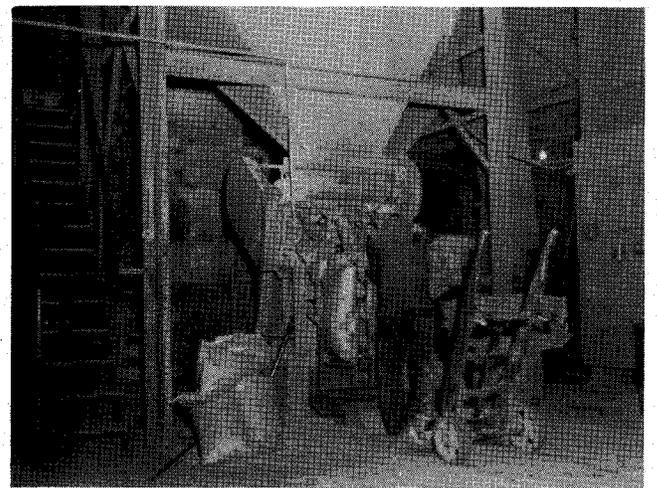


Figure 13. Bagging of ground soapstone at Blue Ridge Talc Company.

Form 3547 Requested

### Ground Soapstone

At Henry the Blue Ridge Talc Company produces ground soapstone from its King-Ramsey quarry. Two men working part time operate the quarry that is approximately 200 feet long, 50 feet wide, and 50 feet deep. Rock from the quarry face is blasted loose and the larger rocks are broken with a pneumatic hammer. The material is then transported to the plant on motorized rail cars. The rock is crushed in a swinging-hammer mill, dried in a rotary dryer, ground in a Raymond four-roller mill, graded in a cyclone air separator, and packaged in paper bags (Figure 13). The ground soapstone is used in foundry facings, insecticides, and other products. The material is marketed as yellow or gray ground soapstone. The yellow material is derived from the weathered rock, the gray from the fresh rock.

Dimension stone scraps from the Alberene Stone Division are ground at a mill approximately 200 yards from the main plant. These soapstone scraps are ground in a gyratory crusher, a hammer mill, a ball mill, and a tube mill. The material is screened or air classified to the desired sizes. This ground soapstone is used in the manufacture of roofing and rubber products.

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### New Publication

Bulletin 76. GEOLOGY AND MINERAL RESOURCES OF ROCKINGHAM COUNTY, by W. B. Brent. 174 p., 2 maps. Price: \$4.00  
Geologic map available separately. Price: \$3.00

### Mineral Industries

Southern Materials Co., Inc., has begun production of sand and gravel at a pit near Cheriton, Northampton County.

W. E. Graham and Sons, Division of Vulcan Materials Co., has opened a quarry near South Boston, Halifax County, for the production of crushed stone.

The following previously unreported companies are producing sand and gravel in Fairfax County: Mt. Vernon Sand and Gravel Co., Inc.; George F. Dodd Gravel Corp.; Sidney R. Johnston; Edsell Corp.; and M. J. Bles Construction Co.

Buffalo Mines, Inc., will soon complete modification of its plant near Piney River, Nelson County, in order to produce coated roofing granules in addition to the granules and ceramic materials currently produced.

### Oil and Gas Exploration

Interest in exploration for oil and gas in the western portion of Virginia has increased in recent months. Actual drilling for natural gas continues in three gas-producing counties of southwestern Virginia. In Buchanan County six wells are currently being drilled or are in various stages of being completed as gas wells. Companies engaged in these operations are the United Fuel Gas Company, the Cabot Corporation, and the United Producing Company, Inc., all of Charleston, West Virginia. Four additional wells have been proposed in this county and will be commenced in the near future. The Clinchfield Coal Company, of Dante, Virginia, is drilling one well each in Wise and Dickenson counties. Natural gas from wells in Buchanan County is marketed through pipelines of the Hope National Gas Company and gas from wells in Dickenson County through lines of the Kentucky-West Virginia Gas Company.

In the Coastal Plain portion of the state, a Kentucky drilling contractor is currently drilling a test well near Manquin in King William County in an area previously unexplored for oil or gas.