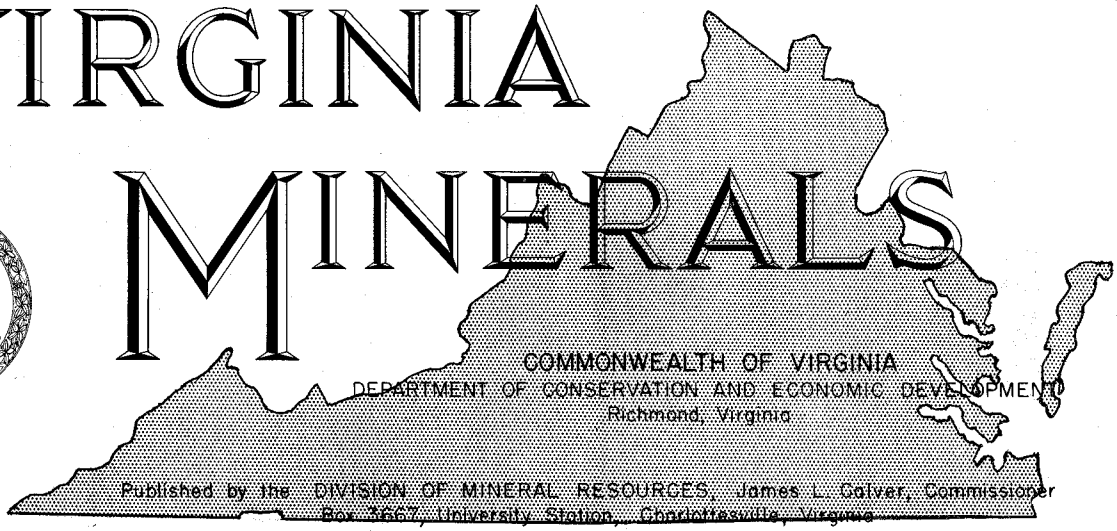
VIRGINIA MINERALS



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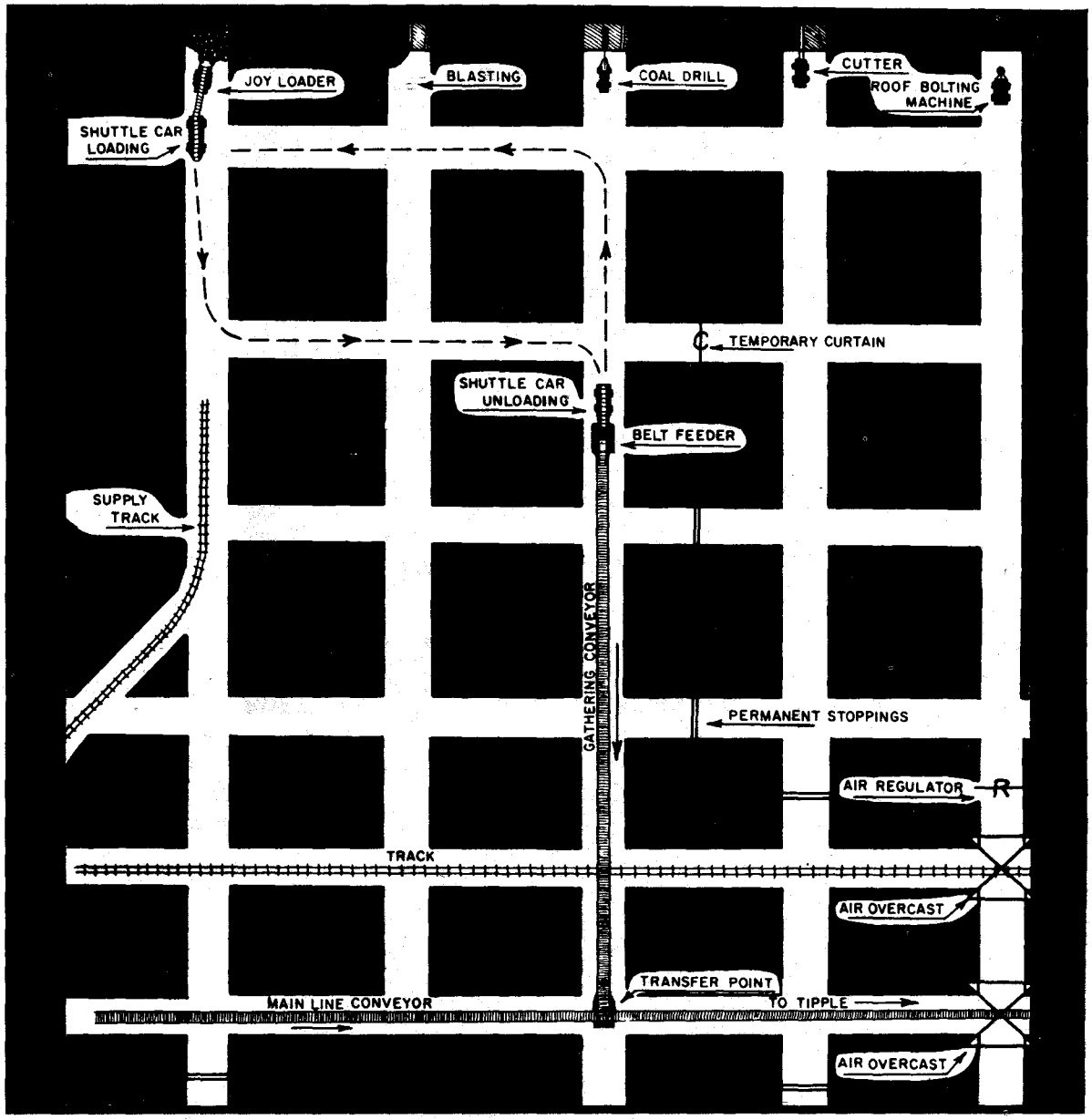
Highlights In The Virginia Coal Industry

Coal has played an important role in the economic life and development of Virginia. The year 1961 marks the 260th anniversary of the first discovery of coal by Colonel Byrd at a site about 14 miles west of Richmond, where it was first mined. Coal production from the Richmond basin was supplemented and overshadowed following the discovery of the Pocahontas district in southwest Virginia. In 1883 the first Pocahontas coal was mined in Tazewell County and hauled by the Norfolk and Western Railway to Hampton Roads. Coal became the leading commodity exported from the State. The cumulative production of coal mined in Virginia from the earliest recorded output to the end of 1960 is estimated at nearly 813 million short tons. The total original reserves are estimated to have been 12,051,000,000 short tons. Estimated remaining reserves amount to 10,225,000,000 short tons, of which recoverable reserves based on 50 percent recovery were 5,112,500,000 short tons as of January 1, 1961.

Virginia is the sixth largest producer of coal in the nation. For many generations, coal as a prime energy fuel has remained unchallenged and the long range prospects for coal indicate production will continue to rise in the future. It is estimated that production of coal will increase 50 percent by 1975. In response to the rising demand for power, the electric industry has doubled its generating capacity during the last ten years and further expansion continues. This demand comes not only from new manufacturing plants but also from the needs of a fast-rising population accustomed to the use of an ever-widening variety of electrical household appliances ranging from electric razors to air-conditioners and heating units. The second largest outlet for coal is the steel industry which uses about 1½ tons of coal for every ton of coke. One ton of coke is required for each 1¼ to 1½ tons of pig iron. The bituminous coals that have acceptable properties and characteristics are carbonized to produce light oils and coal tars. These are the raw materials used in organic chemicals, like synthetic rubber, detergents, plastics, wood preservatives, disinfectants, and many other items.

The World's Largest Coal Mine

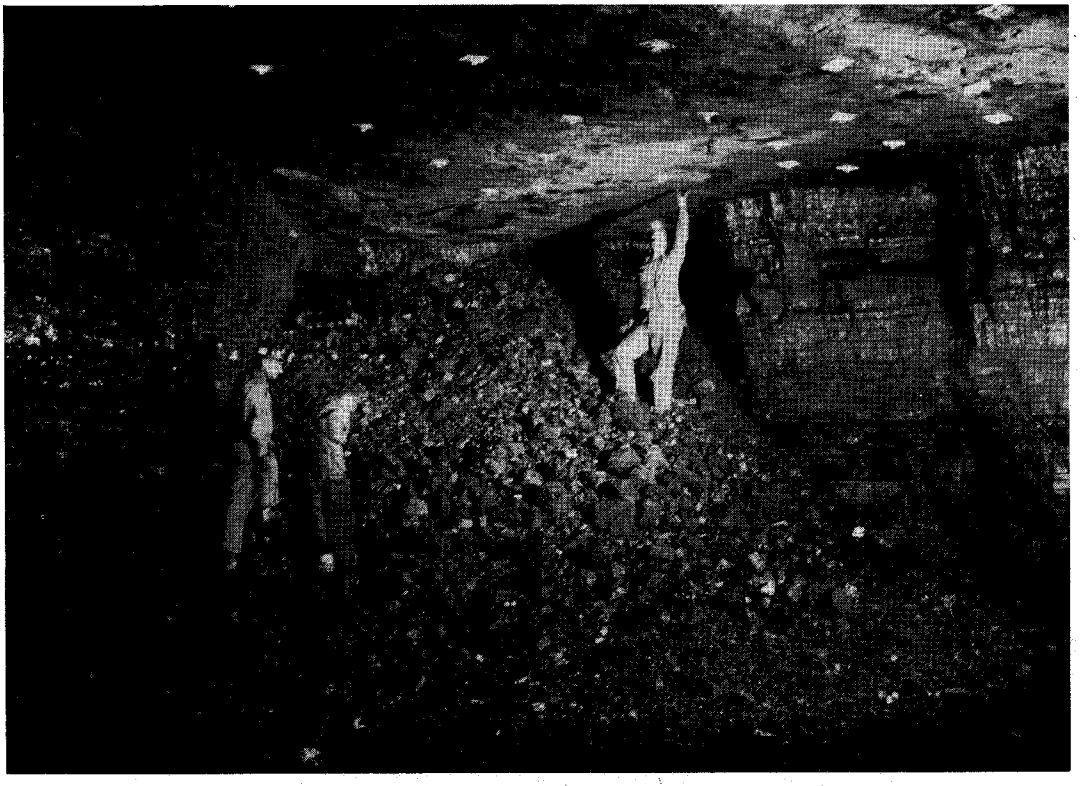
The world's most productive coal mine, the Moss No. 3 is owned and operated by the Clinchfield Coal Company, a Division of the Pittston Company, which has offices located in Dante, Virginia. Moss No. 3 mine, completely mechanized and first to use the machines of large size, design, and capacity in underground coal mining, is located in Dickenson County, Virginia, in the thick Tiller seam. It taps the largest single block of high grade metallurgical coal still left anywhere in the country. Of this vast reserve, 150 million tons have been assigned to Moss No. 3. Reserves of 50 million tons are assigned to Moss No. 2 located in Russell County, Virginia, and there is an additional 100 million tons in reserve to be divided between Moss No. 2 and Moss No. 3.



Schematic drawing of one mining section in Moss No. 3 mine

Development tonnage began underground in July 1958 and the preparation plant began operation October 15, 1958. In 1960 more than 4,700,000 tons of clean coal were mined and processed at the Moss No. 3 mine and preparation plant. The mine is now producing at the rate of 35 tons per man per day and is expected to greatly exceed this figure when peak production is reached. The tonnage from this plant in 1961 is expected to be 6,000,000 tons of clean coal.

The Moss No. 3 mine is made up of four separate drift openings called A, B, C and D portals. A and B portals are served by a common railroad loading point, designated Point No. 1; similarly C and D are served by loading Point No. 2. The raw coal is conveyed from the face to the outside loading point by belt conveyor, then moved by railroad train to the Moss No. 3 preparation plant located seven miles away at Clinchfield, Russell County, Virginia. At the preparation plant the coal is unloaded by rotary dump and the raw coal is carried by belts into the plant where it is sized, washed, dried, graded and loaded into railroad cars at a rate in excess of 1500 tons per hour.



Jawbone-Tiller seam in the Moss No. 3 mine

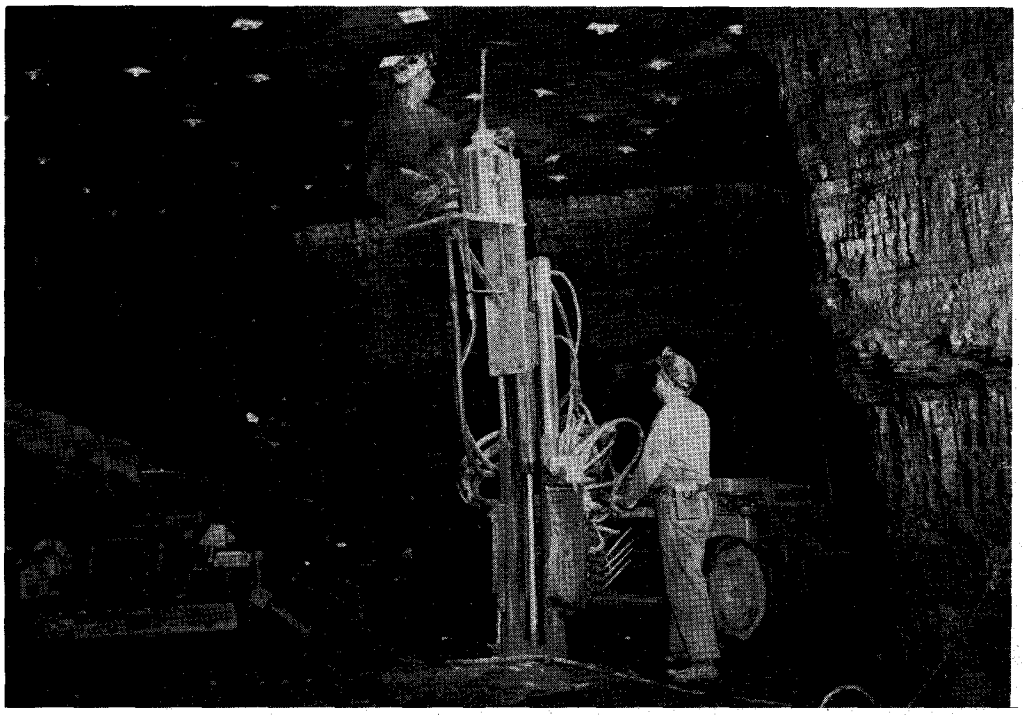
At the Moss No. 3 mine, the coal seam ranges from 10 to 18 feet thick and is made up of two seams, one the Tiller or No. 4 of the Norton formation, and the other the Jaw Bone, or the No. 5. Normally, the two are 75 feet apart. But in the area of Moss No. 3, they merge to form one thick seam of two benches. The combined seam retains the Tiller designation. Between the two benches, there is some rock parting in the form of shale. For a long time, this had prevented exploitation of the seam, since it would have been too expensive to remove the shale from the coal. The development of the Moss No. 3 preparation plant has finally made the cleaning of this coal economical.

The mine has been assigned 15 square miles of the Tiller seam, an area which contains 150 million tons of recoverable coal. It underlies Sandy Ridge, whose highest point is 3,300 feet above sea level. Close by is the small town of Duty. The preparation plant is located near Carbo, eight miles away by the rail line that hauls the coal from the mine to the plant.

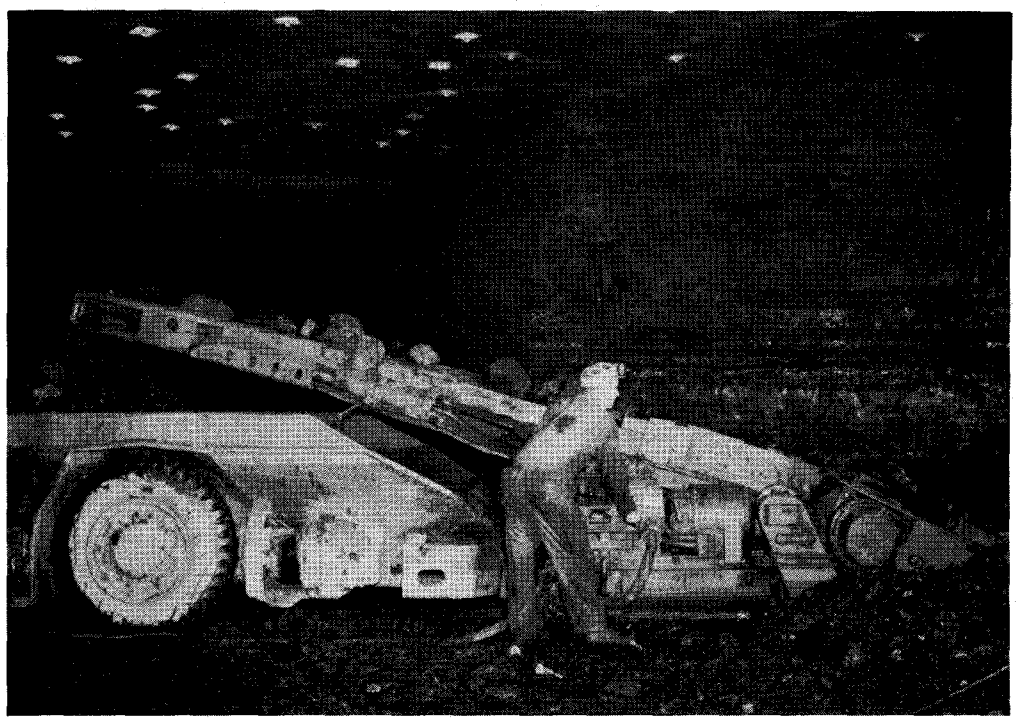
The reasons for placing the preparation plant at such a distance from the mine are threefold. First, Duty had no adequate water supply. Second, the land around Duty lacked the flat, open space needed for a preparation plant as extensive as the one for Moss No. 3. Third, there was no suitable place for waste disposal at Duty. Carbo, on the other hand, offered these things that Duty lacked.

The schematic drawing of a mining unit, see illustration, shows the path of movement of coal from the Joy Loader by way of shuttle car to the gathering conveyor. It is carried by this conveyor to the transfer point where it is discharged onto the main conveyor for transport to the outside and to the tipple.

The drawing also shows the relative position of the mining equipment in face preparation and loading. When each of the units is finished in the places shown on the diagram, the roof bolting machine will move to the left to the position now occupied by the Joy Loader. The other four units will each move one place to the right. Continuation of this type rotation keeps a supply of coal cut, drilled and shot down for constant operation of the Joy Loader.

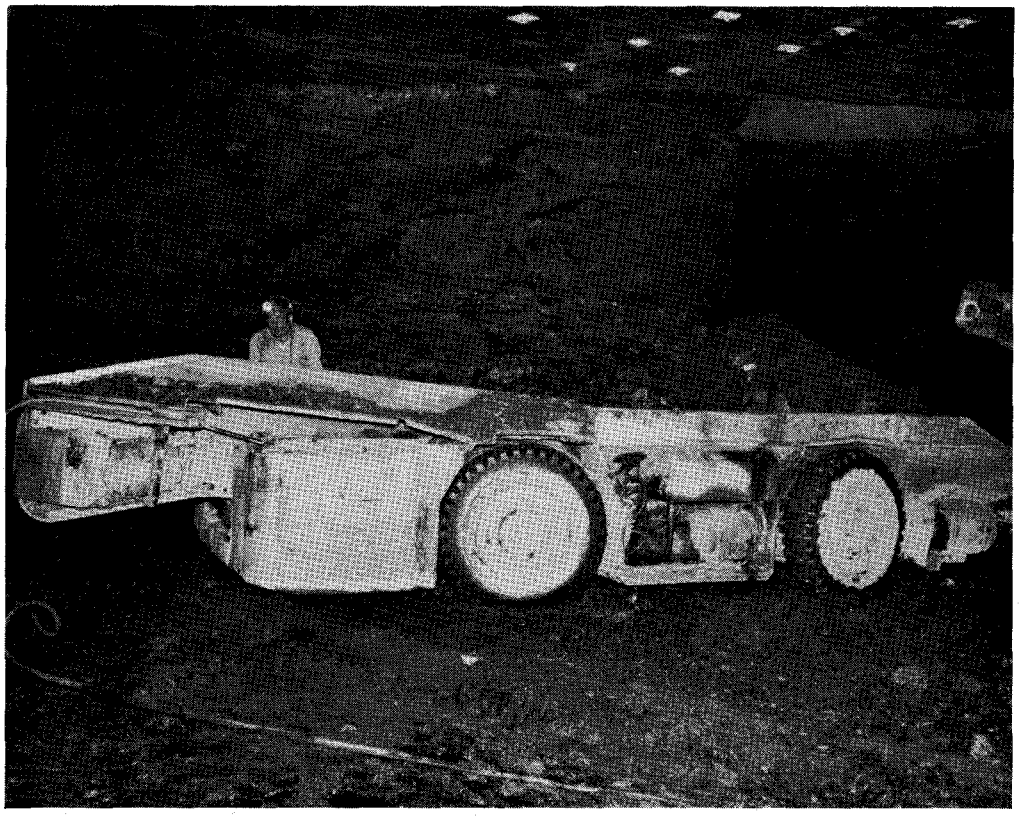


Roof bolting machine, Moss No. 3 mine



Loading machine and shuttle car, Moss No. 3 mine

It will be observed that two shuttle cars are used in the cycle. While one car is being loaded by the Joy Loader, another car will carry its load to the gathering conveyor, discharge and return just before the other shuttle car is finished loading. They swap out under the Joy Loader without its stopping. The objective is to always have a place prepared and coal ready to load so that when the Joy Loader finishes loading out one place, it quickly moves over to the next and continues loading coal without interruption or waiting.



Shuttle car for transportation of coal from face to belt conveyor, Moss No. 3 mine

The dark portions of the drawing represent coal in place and the light portions where coal has been extracted during the process of development.

On the surface, 900-ton-capacity surge bins collect the coal, which is then loaded into hopper cars of the Norfolk and Western Railway. About four trains a day are necessary to haul the coal to the Moss No. 3 preparation plant at Carbo.

At the preparation plant, the rail cars are dumped by rotating the entire car through an upside-down position. Coal then flows through a number of processing steps in the plant, of which 90 percent are automated and controlled by one man. The entire plant requires only 18 men per shift, yet has a capacity of 1,500 tons per hour.

Coarse coal is separated from the fine, and both are cleaned by successive washing operations. The coarse coal is separated into either a "metallurgical" or a "steam" grade, the metallurgical being the more critical of the two as far as ash content, sulphur content and burning efficiency are concerned. After cleaning, the coal undergoes additional processing that might include crushing, sizing, mechanical moisture removal and heat drying.

Most of the steam coal produced by the plant is shipped directly to the generating station of the Appalachian Power Company near Carbo. This station alone will consume 1.8 million tons of coal per year.

The Beatrice Pocahontas Shaft Mine

A new coal mine, providing employment for some 400 persons and having an annual capacity of 1,200,000 tons, will be developed jointly by Republic Steel Corporation and Island Creek Coal Company. Making the announcement of June 9, 1961, T. F. Patton, Republic's President and chief executive officer, and R. E. Salvati, Chairman of the Board and chief executive officer of Island Creek, said a new corporation, the Beatrice Pocahontas Company, will be formed by the two companies. Plans for the new company are being completed. Closing transactions are expected to take place within the next two months upon completion of financing and related arrangements.

On June 15, 1961, James L. Hamilton, President of Island Creek and Cecil Underwood, a former Governor of West Virginia and a Vice President of Island Creek, made public the plans for development of the new shaft mine. The plant site of the Beatrice mine will be in Buchanan County, near Grundy, between the communities of Kreene Mountain and Oakwood. It will be served by the Norfolk and Western Railway. The mine, which will require a multi-million dollar investment, will produce coal from the Pocahontas No. 3 seam, a high quality, low ash, low sulphur, metallurgical coal. It will be the first shaft coal mine in the United States to reach a depth of 1,300 feet. The shaft will be begun by August 15 and will produce 200,000 tons during the first 12 months of operation, 600,000 during the second, and in the third will reach capacity production of 1,200,000 tons annually. The Beatrice mine will be equipped with the most modern mining and preparation equipment available and, because of its recoverable reserves, will be engineered for the long life of 40 years with a total output of 60 million tons.

Island Creek Coal Sales Company, a subsidiary of Island Creek, will market a portion of the output from the Beatrice mine. The product will be a low-volatile metallurgical coal, which is highly desirable in steel manufacturing. At least 50 percent of the production will be hauled to Republic Steel coke ovens in Cleveland, Hampton, Youngstown, and other places. After conversion into coke, it will be utilized in Republic's steel mills. The other half of the production will be sold to other steel manufacturers.

Oil and Gas Exploration in Eastern Virginia

The deepest well ever drilled on the Coastal Plain in Virginia, the Roberts Drilling Company No. 1 Townsend, was recently abandoned at a total depth of 3278′ in King William County. The well, located on the basis of non-geologic advice, surpassed in depth the only other deep test—the Elkins Oil and Gas Co. No. 1 Phillips in Mathews County, which was drilled to 2325′ in 1929. Although the Townsend well did not encounter any shows of oil or gas, it is significant because it penetrated a previously unknown Triassic basin concealed beneath the younger Coastal Plain sediments, and it was drilled several hundred feet into Precambrian (?) basement rocks.

The well was drilled in an area in which Miocene sediments, commonly overlain by a few feet of Pleistocene surficial materials, occur at the surface. Caving conditions and resultant sample contamination were extreme during much of the drilling so that examination of the samples is inconclusive. The presence of prominent red clastic rock fragments in many samples from approximately 834′ to 2609′ suggests that the well encountered a previously unknown Triassic basin; the Cretaceous-Triassic contact, however, has not been picked with certainty. Fragments of igneous and metamorphic rocks that occur in samples from 2083′ to 2609′ may represent materials incorporated in Triassic conglomerates and breccias, a rubble zone on the surface of the Precambrian (?) basement, or penetration of the basement rocks. It is believed that samples below approximately 2609′ represent the drilling of the Precambrian (?) basement rocks.

WELL COMPLETION REPORT

Operator: Roberts Drilling Company
Farm: Hugh Townsend
Well No.: 1
Location: King William County
Old Church 7½′ topographic quadrangle
11,100′ N. of 37° 40′)
E approximate
12,000′ ~~W~~. of 77° 15′)
The well is eighteen miles northeast of Richmond and three miles southwest of Manquin.
Elevation: 37.04′ (Ground)
Total Depth: 3278′
Rig: Cable tools
Drilling Commenced: June 3, 1960
Drilling Completed: March 4, 1961
Well Abandoned: March 4, 1961
Result: Dry hole
Mechanical logs: No commercial logs run
Casing: 250′ 13⅜″
812′3″ 10¾″
1890′ 8″
2610′ 7″
Shows of oil or gas: None

Water:
Fresh water reported from surface to 600′
(Hole full of water at 165′, 305′, and 372′)
Salt water reported at 900′
Flow of water estimated at 18 gallons during each 2½ hours encountered at approximately

3100′. Water analysis by U. S. Bureau of Mines is as follows:

Radical	*Milligrams per liter*
Calcium (Ca)	1,000
Magnesium (Mg)	400
Sodium (Na)	16,200
Carbonate (CO_3)	336
Bicarbonate (HCO_3)	79
Sulfate (SO_4)	285
Chloride (Cl)	27,700
Total Solids	46,000

Specific Gravity 60°/60°: 1.038
pH: 11.50

Three thin sections of representative rock types from interval 3209-3259′ were made. Rock types and major constituent minerals were identified as follows: hornblende schist that contains hornblende, quartz, and magnetite; quartzite that contains quartz, chlorite, biotite; and gneiss that contains quartz, sericite, chlorite and hornblende. A total of 341 samples for the depth interval from 163 to 3266′ have been placed in the Well Sample Repository of the Virginia Division of Mineral Resources in Charlottesville.

Underground Storage of Liquid Propane

The Washington Gas Light Co. will dig out a huge cavern under a wooded Fairfax County tract to serve as a storage place for liquid propane if county supervisors approve the plan.

An application from the gas firm to undertake the project is now pending before the Board of Supervisors. Company officials indicated that work would get started soon after county approval was received.

Engineering plans call for mining a two-acre cavern some 450 feet below the ground's surface. The subterranean area would have a capacity of six million gallons of liquid propane.

The procedure in constructing storage caverns is usually to drill a vertical shaft to the required depth and then bore large tunnels in a cross-hatched pattern horizontally through the solid rock. Liquid propane would be brought to the site by railroad car for transfer into the cavern.

The site for the proposed project is part of the old Ravensworth tract on the Southern Railway lines between Springfield and the Ft. Belvoir Reservoir. *From* Construction, May 29, 1961.

Staff Changes of Virginia Division of Mineral Resources

Mr. Coyd B. Yost, Jr., has recently accepted a position with the U. S. Department of Agriculture. Mr. Richard (Herbert) DeKay has been promoted and placed in charge of ground-water studies conducted by the Division. He was formerly employed by the American Smelting and Refining Company at their Eastern United States Exploration Office in Knoxville, Tennessee. Mr. DeKay completed his undergraduate studies in geology at Allegheny College, Meadville, Pennsylvania, after an interruption of four years with the United States Air Force, which included a three year tour of duty overseas. He then attended the Graduate School of the University of Tennessee, Knoxville, Tennessee, where he specialized in stratigraphy and sedimentation. Mr. DeKay and his wife, Caroline, have two daughters, Susan and Sandra.

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Mr. Laurence (Hamilton) Gardner was employed by the Division on May 1, to assist in ground-water studies. He formerly worked as a geologist with Texaco, Inc. in western Colorado and Utah where he worked in many phases of oil exploration. He is an active member of the American Association of Petroleum Geologists. After obtaining a geological engineering degree from the Colorado School of Mines, he served in Korea and Japan as a terrain intelligence officer with the U. S. Army Engineers. He and his wife, Marilyn, have two sons, Steve and Mark.

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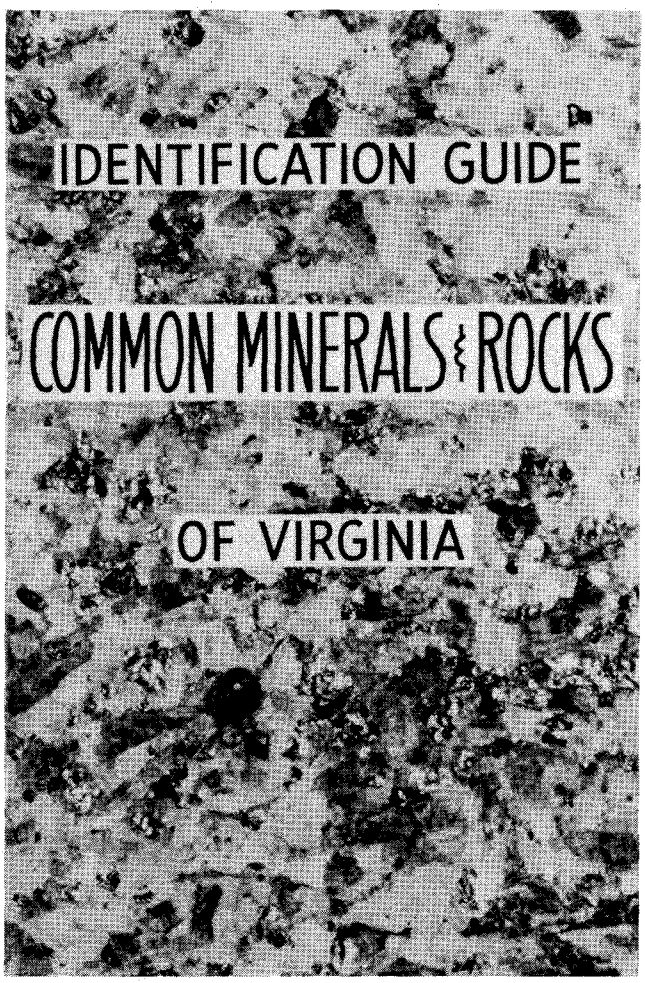
Mr. Carlisle (Titus) Spiker, Jr., has recently joined the Division. Currently, he is mapping the geology of the northwestern part of Fluvanna County. Mr. Spiker began to study engineering at Texas A & M, and after a four year tour with the U. S. Air Force in England, he attended the University of Virginia where he obtained a B.A. degree in geology. Previously, Mr. Spiker was employed by the Division on a part-time basis to help with the preparation of geologic maps and of materials for display purposes. At present, he is assisting in the compilation of an index to geologic maps in Virginia. Mr. Spiker's main interests lie in petrology and structural geology. He and his wife, Florence, have a son, Michael Carlisle.

Division of Mineral Resources
Box 3667
Charlottesville, Virginia

Form 3547 Requested

New Publications



Inf. Circ. 3. IDENTIFICATION GUIDE TO COMMON MINERALS AND ROCKS OF VIRGINIA by G. B. Baetcke. 51 p. Price: $0.75

This publication is designed to serve as a basic guide for the identification of the common minerals and rocks of Virginia. Contained are descriptions of more than fifty minerals and rocks together with discussions of their physical and chemical properties, geologic origin, geographic distribution, commercial history, and present use. In order to provide a means for rapid mineral and rock identification, keys, charts, and descriptions of physical tests are included. Some of the described minerals and rocks are illustrated with photographs of specimens recently collected in Virginia. In addition, information about equipment, sampling methods, and specimen preparation is included to aid those who wish to assemble a mineral and rock collection.

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Inf. Circ. 4. DIRECTORY OF ROCK AND MINERAL PRODUCERS IN VIRGINIA by D. C. Le Van and R. F. Pharr. 25 p. Price: nc

The Division has recently published as Information Circular 4, a directory of rock and mineral producers in Virginia. This Directory contains a listing of all active producers, exclusive of the coal industry, on record as of March 15, 1961. The producers are arranged by county under 35 categories of raw materials or commodities. The local mailing address, address of main office elsewhere in Virginia, if any, and the name of the nearest town are given for each operation. Copies of Information Circular 4 are available without charge upon application to the Division.