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This Month

What's Happening 33

Editorial—Research to Develop Profits from Waste Products 37

Rocky's Notes—The Teamsters' Union and Its Head Man 39

Labor Relations Trends 41

People in the News 43

Industry News 47

Hints and Helps 50

New Machinery 52

Increase Crushed Stone Capacity for Diversified Concrete Products 56
Maule Industries, Inc., grown to be one of the largest rock products companies, builds another crushed stone plant at Prospect, Fla. Pile-driver drilling and underwater blasting and excavation are some of the unusual practices *Walter B. Lenhart*

Portland Cement from Oil Shale 59
European experience points to substantial fuel economies in the manufacture of portland cement, using oil shale and limestone *Fred Kloiber*

Producing High-Grade "Sugar" Stone 60
Weaver Construction Co., Alden, Iowa, is a large producer of high-calcium limestone for the sugar beet industry, agricultural limestone and road materials *Ray C. Giddings*

Recover Specification Sand and Gravel from a Clayey Deposit 62
Becker County Sand and Gravel Co., solves problem of clay removal at Marlboro, S. C. plant by the use of scrubber screen, blade mills and liquid cyclones *Walter B. Lenhart*

More than Double Lime Capacity 66
M. J. Grove Lime Co., Stephens City, Va., installs vertical kiln with an integrally located gas producer, having center and side burners, with recirculation of hot gases through gas producer *Bror Nordberg*

More Efficient Mining and Modern Plant Double Asbestos Production *Marion L. Briggs* 74

Two Kilns in Series Produce Perlite *Hubert C. Persons* 81

Dedicate Million Dollar Stone Plant, New York Trap Rock Corp., Haverstraw, N. Y. 84

CONCRETE PRODUCTS—

Block Plant with Push-Button Controls 113
United Cement Products Co., Wichita, Kans., installs automatic controls for mixing and batching concrete *Tip Brown*

Spinning and Rolling in the Manufacture of Concrete Pipe 116
Hubert C Persons

Besser Celebrates Golden Anniversary 119

Radio Offers Many Advantages to the Ready-Mixed Concrete Industry 123
22. A producer views the ready-mixed concrete industry *Jos A. Nicholson*

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Modern mill at asbestos plant in Lowell, Vt. Also may be seen dried ore storage building and conveyors between structures

More Efficient Mining and Modern Plant

Double ASBESTOS Production

Ruberoid Co., Vermont Asbestos Division, with quarry near Lowell, Vt., constructs modern mill to process 10,000 tons of asbestos annually

By MARION L. BRIGGS

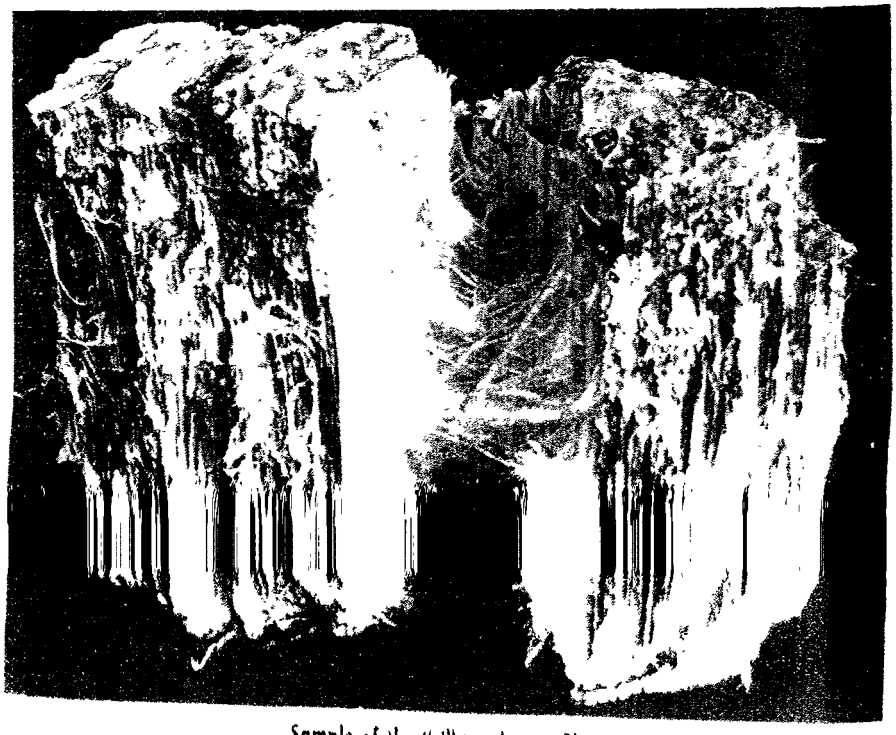
ONE OF THE MOST MODERN AND EFFICIENT asbestos mining plants in existence, producing 125 t.p.h. of raw ore and about 50,000 tons of asbestos fiber a year in round-the-clock operations, six days a week, is the Ruberoid Co. quarry in Lowell, north central Vermont. The erection of a new six-story mill and the introduction of a number of firsts to mining methods have greatly increased plant production and flexibility.

Located on 3360-ft.-high Belvidere Mountain, the plant is operated by the Vermont Asbestos Mines division of the company and produces 96 percent of the chrysolite, nonspinning, short-fiber asbestos in the United States. Its holdings extend over 2800 acres, equivalent to more than 50 times the size of Boston Common. Current operations are confined to the north slope of the mountain at 1050 ft., 1150 ft. and 1300 ft. levels.

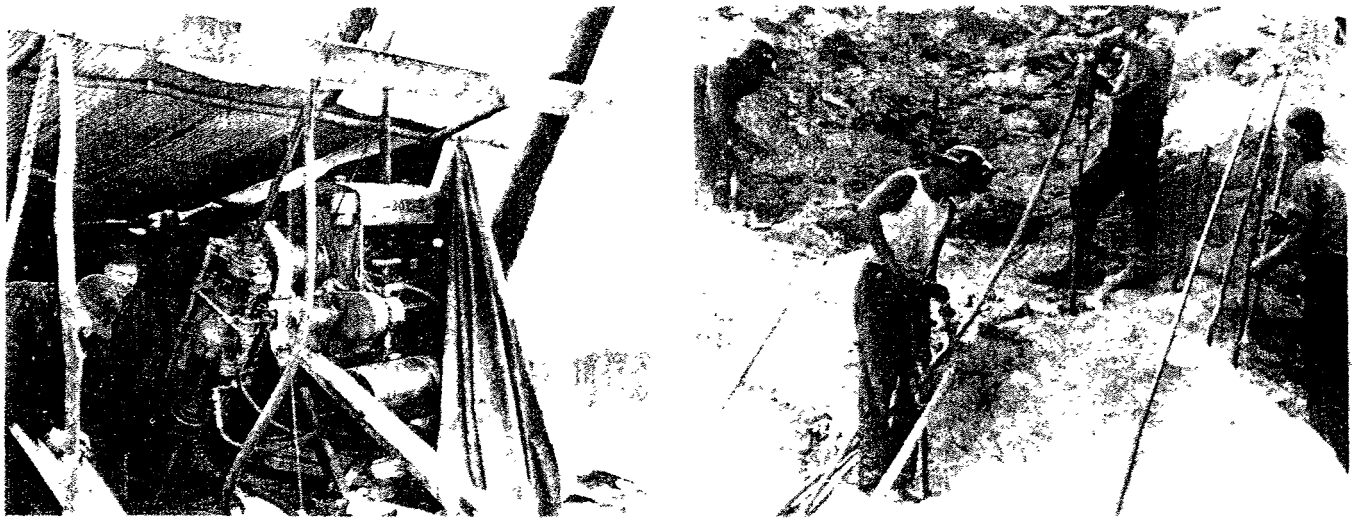
When the Ruberoid Co. took over this open-face mine in 1936 from the Vermont Asbestos Corporation of America, the quarry was yielding only about 50 t.p.h. of raw ore and 10,000 tons of asbestos a year. Operations were on the south slope of the mountain in the town of Eden, and were relatively simple. Within three years, the original mine capacity was increased by the company to 100 t.p.h. by the installation of new milling equipment and the discovery, by accurate prospecting, of a better grade of ore, with longer asbestos fiber, on the north slope of the mountain.

The new source of ore was developed, and a 5000-ft. aerial cableway constructed over the mountain to take the rock to the original mill. When the second mine site gave evidence of extensive and suitable asbestos ore deposits, the company closed down the old mine, discontinued the use of the aerial tramway, and in 1949 constructed its present modern six-story mill with industry-innovating-equipment and features.

In construction, the mill is of structural steel, has a 65,000-sq. ft. floor area, concrete main floor, foundations and footings, and corrugated asbestos-cement sidings and roofing. It contains surplus capacity to allow for bypassing any machine temporarily



Sample of the "silk" asbestos fiber



Left. One of the rotary core drills for proving deposits in the asbestos quarry. Right. Men at work with hand-operated compressed air drills preparing blast holes

out of operation. This bypassing, when necessary, in no way changes either the quality or the amount of the product.

Electric motors in the mill are interconnected in such a way to permit automatic starting and stopping. No bucket elevators are used. The mill building is heated in cold weather by means of hot air fed back from the drying ore, so that even at zero degrees the temperature is held between 60 and 70 deg. F.

All processing from the third-stage crushing of the asbestos ore is done in the mill. From a wet stockpile, with a capacity of 75,000 tons, the ore is reclaimed by a 24-in. tunnel belt conveyor, 250-ft. centers, that carries the rock up 45 ft. to the mill, where it discharges into two 7- x 60-ft. parallel-flow rotary dryers.

The innovation of outdoor stockpiling of wet ore by the Ruberoid Co. has the advantage of keeping about 250 men at work the year round, as operation of the plant can continue during low-temperature winter weather. Full-time employment at the plant means a livelihood to many Vermonters in surrounding towns, who come to work in company busses and get the highest average hourly wage in the area.

High Faces — Large Blasts

New to the mining industry, and economical, is the use this company makes of high faces and large blasts. Blast holes are drilled with Bucyrus-Erie 29T churn drills that average 2.40 f.p.h. The holes are $6\frac{1}{2}$-in. openings, and are spaced 10 to 18 ft. along the face. Shots average about 30 holes and produce about 50,000 to 100,000 tons of rock each. The unusually good breakage and a yield of close to 5 tons per lb. of explosive are partly attributable to the seams of fiber in the asbestos ore. Primacord safety fuse is used with 75 and 60 percent gelatin dynamite.

At the 1300-ft. level of the quarry, where current operations are in progress, the ore body is about 3000 ft. long and from 400 to 800 ft. wide. Its surface slopes to the 1050-ft. level, and working of the mine goes on in approximately 100-ft. benches from the top level down, in order to get the desired blend of ore.

After blasting, rock too large to handle is reduced in size by workers using hand-operated compressed air LB 57 jackhammers with detachable bits, and Joy TM 49 drifters. In working on hard rock, carbide bits are used in the jackhammers. Secondary shots are detonated by line current, and about 200 to 300 are made simultaneously.

The recent purchase of two 3-cu yd. Marion power shovels and one 7-cu. yd. shovel, the largest in New England, have speeded plant production. The big bucket lifts in one bite 7-cu. yd. of rock, weighing about 10 tons. All are powered by electricity.

Rear-dump 27 FD Euclid trucks, of 15-ton capacity, load from the piles of blasted ore, and carry it on short hauls to the primary crushers kept close to the working face. At the 1050-ft. level, the trucks discharge into a 40-ton steel hopper that feeds from a 15-ft. x 60-in. Kennedy-Van Saun pan feeder into a 48- x 60-in. Traylor primary jaw crusher. At the 1150-ft. level is a 36- x 42-in. primary jaw crusher.

The minus 6-in. product from the primary crusher at the 1050-ft. level moves along a belt conveyor to a $5\frac{1}{2}$-ft. Symons cone crusher, and from the primary crusher at the 1150-ft. level, it is carried to a $4\frac{1}{4}$-ft. Symons cone crusher. From both cone crushers, the crushed ore is taken by a conveyor to the wet stockpile near the plant.

Collect Wet Dust From Dryers

An innovation in the mining industry, believed to be first employed at the Ruberoid plant, is the collection of wet dust from the dryers. In their circular air-jacketed, oil-fired combustion chambers, the free moisture in the asbestos ore is cut down from 5 to 6 percent to less than 0.5 percent. From the discharge ends of the dryers, two 17,000-c.f.m. fans suck the escaping air, steam and gas and sweep it through two cyclone collectors 10 ft. in diameter into a 34,000-c.f.m. Orlon cloth bag dust filter. The cloth remains efficient for more than a year. Dampers with automatic controls keep the filter temperature from exceeding 240 deg. F. by letting the fans exhaust to atmosphere above this point, and strip heaters prevent the gaseous materials in the filter from dropping below the condensation point.

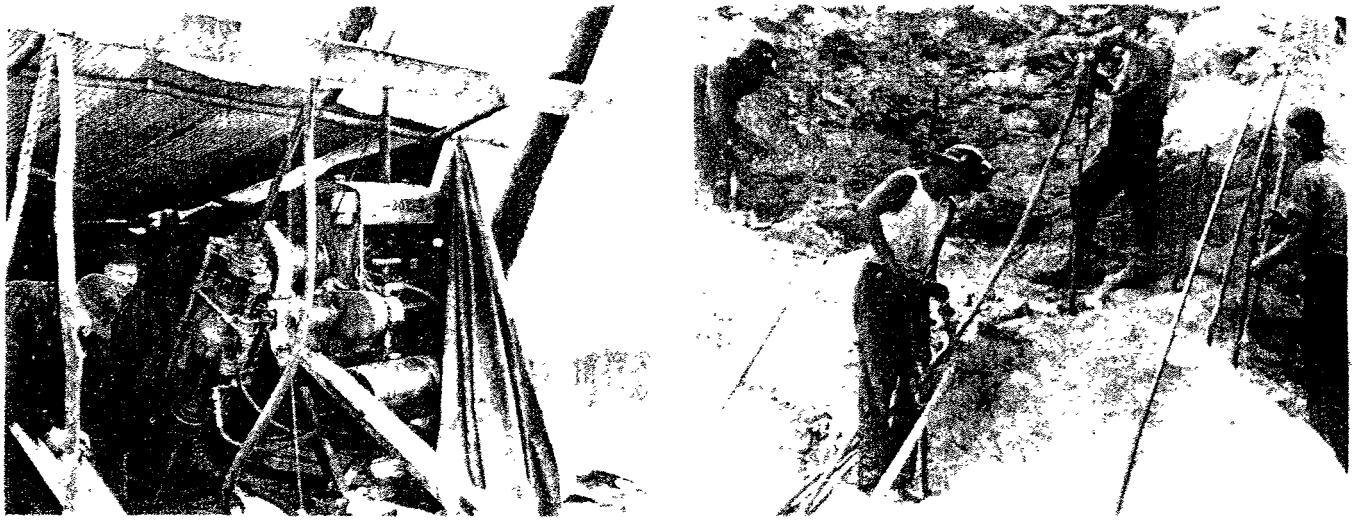
The dried ore leaving the dryers is carried on belt conveyors to a $5\frac{1}{2}$-ft. Symons short-head cone crusher, which reduces it to 1-in. minus size. They are then carried on to a pair of 3-ft. Symons short-head cone crushers for further reduction to $\frac{1}{2}$-in. minus size. In dry weather, it is possible to have the ore bypass the dryers and go direct to the cone crushers.

From the 3-ft. short-head cone crusher, the $\frac{1}{2}$-in. minus product moves along a 24-in. conveyor into a storage building with a 10,000-ton capacity. On a parallel belt conveyor, controlled by a Syntron vibrating feeder, the material moves to the processing mill, where it discharges onto a pair of identical flows. Noteworthy is the remote control governing the flow of ore to the feed conveyor by means of a Merrick Weightometer with a rheostat regulator and recording meter.

Removing the Fiber

Some of the "silk of the mineral kingdom" is aspirated by air suction from sloping tables oscillating slowly and reached before the ore enters the fiberizing machines. More of the asbestos fiber is broken loose from the ore as it goes through the fiberizers, where the rock and hard fiber are hurled against breaker plates. The loosened fiber in the machines is removed by a rapid downcurrent of air to screens with $\frac{1}{4}$ and $\frac{1}{8}$-in. openings, from which it is aspirated through piping into collectors.

After leaving the fiberizing machines, the asbestos ore goes over screens with $\frac{1}{4}$- and $\frac{1}{8}$-in. openings. The plus $\frac{1}{4}$-in. ore moves on to tail-



Left. One of the rotary core drills for proving deposits in the asbestos quarry. Right. Men at work with hand-operated compressed air drills preparing blast holes

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