

Industry Shows Remarkable Growth

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IMPROVE ROCK WOOL MANUFACTURE

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PROBABLY, the most rapidly growing rock products industry during the past few years, and particularly in 1937, has been the manufacture of mineral wool—from the standpoint of increase in the number of plants, the tonnage produced, and the development of operating technique.

Surveys of the industry, however, reveal a marked lack of standardization. Certainly a great many varieties and qualities of rock wool are now on the market. The cupola is the standard method of manufacture, but it is doubtful if any two companies are consistent in their regulation of the wool making process. Differences in the types of raw materials, their chemical composition and melting points; proportion of the batch; the quality and purity of fuels; the melting temperatures; temperatures of the molten mass when "blown"; air and steam pressures; and structural design of the cupola, all have their influence on the quality of the final product.

In spite of this lack of standardization, builders have created a demand for an efficient insulating material, and ex-

perimentation by manufacturers and others interested has resulted in a finer product.

Production Statistics Encouraging

Production of mineral wool in 1928 for the United States was 50,000 tons. In 1937, the estimated capacity was 500,000 tons. The number of plants has increased from eight in 1929 to 60 in 1937; truly a remarkable growth. A number of established stone producers are manufacturing rock wool as a by-product.

Federal Rock Wool Plant of Kansas City

Typical practices can best be treated by discussing operating methods of a new modern plant. The plant which we have chosen is that operated by the Federal Rock Wool Co., Kansas City, Mo. This plant is owned by a producer of commercial crushed stone and its original design incorporates several interesting features.

Materials from which mineral wool is made are very numerous and include

calcareous shales, metallurgical slags, sand, soda ash and limestone and waste glass, combination of dolomites and limestone with shale or clay, old china or crockery, firebrick and sometimes top soil.

At the plant under consideration, various rocks are blended and melted to make a lightweight, white wool of low thermal conductivity, and the process has been largely developed by the "trial and error" method.

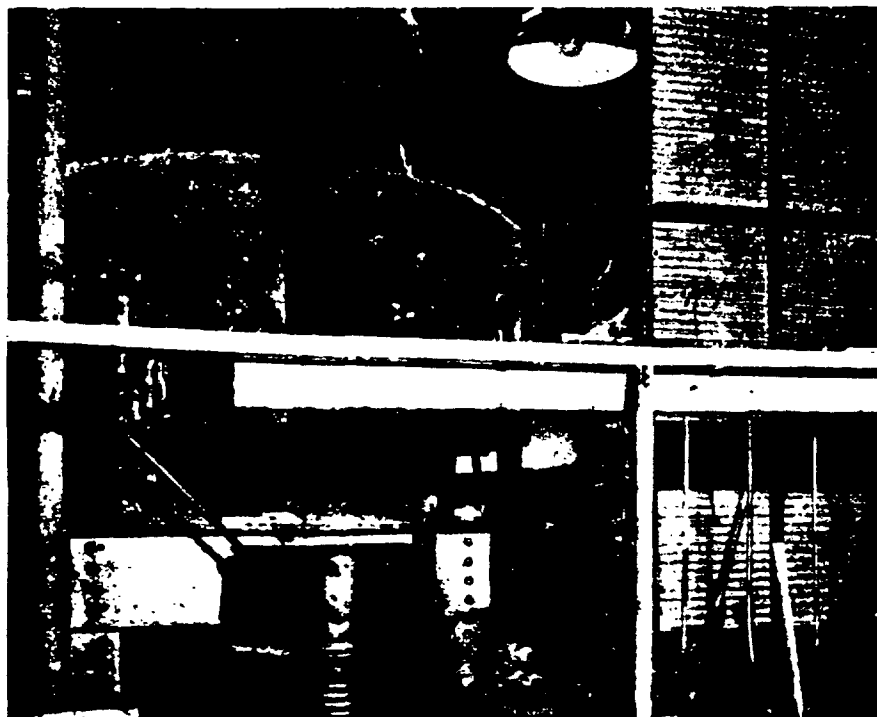
The plant is within a short hauling distance from the commercial stone mines. Stone from these mines, with a calcium carbonate content of about 90 percent, makes up about 50 percent of the materials charged into the cupola.

Louis Marino, president of the company, developed the process and designed the plant. Several of the original features of the plant are unprotected by patents and the methods by which the process was developed were not the outcome of chemical analyses but by experimentation. It is therefore inadvisable and impractical to go into all details of the manufacture of wool at this plant.

Blend 23 Varieties of Stone for Feed

Mr. Marino, the president of the Federal Rock Wool Co., has been interested in the production of stone in Jackson county for over 20 years, and has utilized his knowledge of rocks in the surrounding country to advantage in formulating a proper blend for rock wool. According to Mr. Marino, some 500 different rocks, including limestone, flints and others of igneous origin, are available in Jackson county and his selection for the feed into the cupola has been determined by actual experimentation and without knowledge as to which are basic and which are acidic.

The most successful batch of raw materials consists of 23 varieties of rock, including the Bethany stone, all of which are trucked to the plant from within a radius of 25 miles. The hair trigger control used in blending various stones has proven to be of the utmost importance. This close control results in the production of a wide variety of rock wools with considerable differences in physical properties, just by slight changes in the constituents. While about 50 percent of the feed comes from the commercial stone mines, on the other



Blowing the molten rock by steam into the collecting chamber at the new plant of Federal Rock Wool Co. The cupola is water-jacketed to its full height and steam is generated to pressures exceeding 100 p.s.i. within the water jacket. When the fire is started in the cupola, three hours are needed to reach the desired pressures. Steam is blown through a single stream of molten rock in front of the chamber opening

hand, as little as six tons of another variety is used in three weeks of operation, to make the best wool for domestic use.

All stone is trucked to the plant bins. Truckers are hired by Mr. Marino to "pick up" the different rocks from charted locations. Stone feed is proportioned according to exact weights. The plant itself is a new 42- x 115-ft. stone veneer building, designed for installation of a second cupola at a future date.

Although the manufacturing process, the method of collecting the wool and its handling, in the main, are similar to those used in other plants firing cupolas, the equipment has structural features that are somewhat different. The cupola is essentially an old steam boiler, without the flues, with a 6-ft. outside diameter, and is 14 ft. in height. It is water-jacketed to its full height with a 3- to 6-in. space between the outer wall and the jacket shell.

Generate Steam in Water Jacket

Steam for blowing the molten rock into the collecting chamber is generated within the water jacket, simultaneously with the melting of the rock and not from an outside source. When the fire is started in the cupola and coke is added, about three hours is required to develop the desired steam pressures to "blow" the wool. Steam pressures are varied between 100 and 125 p.s.i. Two reserve steam pressure tanks of 1200



Bats of rock wool are measured by marking knives and cut to size as the wool is carried over the conveyor from the collecting chamber. Loose wool recovered in auxiliary chambers is collected and removed by entering the chambers through the doorways seen on the right. The men in the foreground are boxing the wool product. To the left of the conveyor are J. G. Hoover, vice-president, Louis Marino, president, and E. J. Flinn, secretary-treasurer of Federal Rock Wool Co., from left to right

gal. and 400 gal. capacities are provided. Alternate beds of coke and stone are fed into the cupola in the conventional manner and the molten rock flows into the path of the steam jet from a single opening. The quality of the finished product is influenced, and its physical characteristics varied, by changes in the coke-stone ratio.

Rock wool is blown into a collecting chamber 48 ft. in length, 12 ft. high and 6 ft. wide. The illustration shows the rolls which are not anchored to a fixed position, but are allowed to slide up and down through a 12-in. channel bar. The bats are cut by hand into 15- x 23-in. sizes to the desired wall thicknesses, and boxed in cardboard boxes direct from the cutting table. The conventional box contains 24-sq. ft. of rock wool in bats.

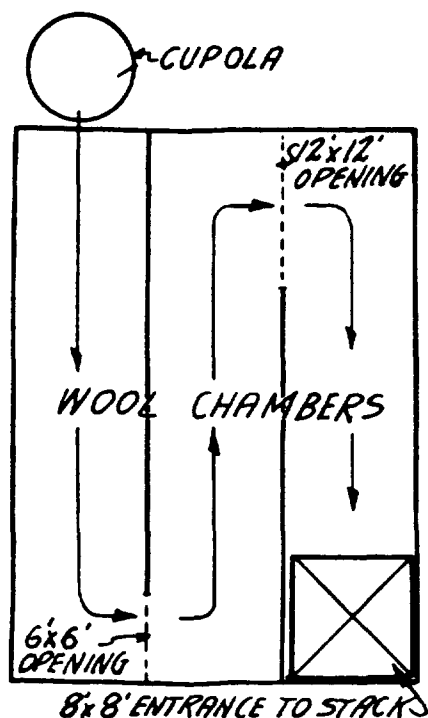
Baffle Arrangement To Recover Fine Wool

In the accompanying sketch is shown how approximately a ton per day of fine wool, which ordinarily would be carried away with the exhaust steam out through the stack, is recovered. The mixture of steam, or air, and wool must pass through a circuitous route on its way to the stack, and the "baffle" arrangement arrests the speed of fine particles to the point where practically all the wool in suspension is dropped into two chambers and recovered. At the point where the air exhausts to the outside,

the chimney has a horizontal baffle to force much of the very fine material not already settled out in the first two chambers to fall into the third chamber.

Thus far, the only test made on the insulating qualities of the rock wool was made before it was perfected to the present degree. This test, made by the Kansas City Testing Laboratory, gave a thermal conductivity of 0.26 B.t.u. per hour per sq. ft. and with a temperature gradient of 1 deg. F., per inch of thickness. A 3 $\frac{3}{8}$ - x 15- x 23-in. bat picked at random from the commercial wool stored in cardboard containers weighed 3 $\frac{1}{4}$ lb. or 4.48 lb. per cu. ft. The methods of operation may, of course, be changed to give a wool varying widely in quality and weight.

In addition to bats, loose wool and granulated wool are produced. Trim scraps are thrown into a home-made shredder and the shredded wool is carried over a bucket elevator, 37-ft. centers, and chuted through a 25-ft. circular screen to a 6-ton bin. Shot is removed through the $\frac{1}{4}$ -in. screen openings. The shredded product is packed directly out of the bin chutes into 35-lb. paper bags. Plant capacity per 24 hr. is 300 boxes or 7200 sq. ft. of bats, 3 $\frac{3}{8}$ -in. thick, a ton of granulated wool, and a ton of loose wool. Officers of the company, besides Mr. Marino, are J. G. Hoover, vice-president and E. J. Flinn, secretary-treasurer.



Baffle arrangement in the collecting chamber, which successfully recovers much of the fine product that would otherwise pass out the stack with the exhaust steam