dry methods are being used, a large proportion of the coal is coming from virgin territory and consequently has but little rock mixed with it, so that the force of men required to eliminate the rock is correspondingly reduced. The tonnage produced per man in the upper field is greater than in the Lehigh or lower regions; this is because of the mining conditions prevailing in the lower fields, reference to which has already been made.

Leading Anthracite Breakers

The preparator, commonly known as the breaker, will be discussed, to show how the features mentioned are assembled to obtain the best results. The breakers described show the practice in practically the entire anthracite field. Two of these breakers are in the Scranton region, one is in the Wilkes-Barre, one in Nanticoke, one in Hazelton, one near Mahanoy City, one near Lykens, and one in the Panther Creek Valley.

Marvine Breaker, Hudson Coal Co.

In 1920, construction was started on a 5000-ton steel breaker at the Marvine colliery, of the Hudson Coal Co., in order to concentrate in one breaker the preparation of material that was being handled in two old structures wherein the dry method of preparation was in use. Besides, the old Marvine breaker was unable to handle the tonnage that the mines could produce.

The Manville breaker, one of the two eliminated by this concentration, is situated about 1 mi. from the Marvine. The coal is now dumped in this old plant and run through a pair of rolls, which crushes it to steamboat size, then by chutes it is delivered into railroad cars that convey the coal to the new Marvine breaker, where it is dumped into a conveyor line.

The Marvine has two hoisting shafts 2000 ft. (609.6 m.) apart, but one of these was used only to hoist the coal from the lower to an intermediate level, where it was sent to the main shaft up which it was hoisted into the breaker. As the new breaker can handle the output from both shafts, the output is practically doubled.

One interesting feature of this new breaker is that the coal from one of the shafts is carried to the breaker over the main line of the Delaware & Hudson R. R. and across the Lackawanna river; two belt-conveyor lines, approximately 1100 ft. (335 m.) in length, Fig. 39, transport it in this latter portion of the journey.

The new Marvine breaker is constructed of steel and prepares the coal by the wet method. The building is as nearly fireproof as it can be made. The only wooden construction is the jigs, the inside lining of the loading pockets, the treads of the stairs, the shaker sides, hangers, and arms, the

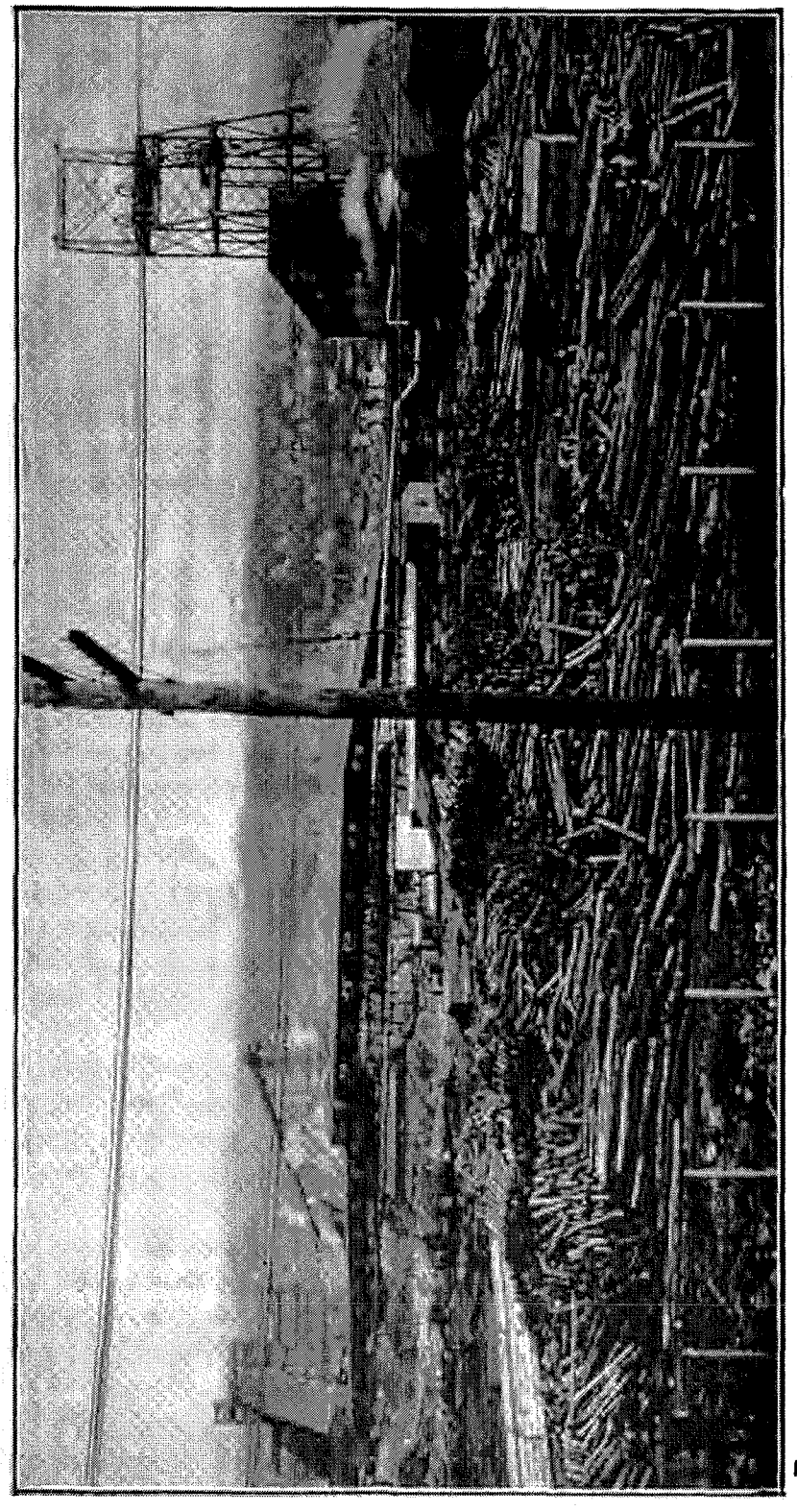

FIG. 39.—VIEW OF LONG CONVEYOR LINES THAT TRANSPORT COAL FROM HEAD HOUSES TO MARVINE BREAKER; THESE CONVEYOR LINES ARE 1100 FT. LONG.

slate-conveyor trough, and the troughs on the three main conveyor lines. The breaker is electrically operated throughout and controlled from a central switchboard. It is equipped with 44 Delaware, or Tench, piston-type jigs, and a complete plant for the treatment of the silt is installed nearby. The latter consists of Dorr thickeners and classifiers and Deister-Overstrom concentrating tables.

The coal is crushed on the ground level before it is taken into the breaker, so that the only crushing done is that of the grate, or broken, coal when no market can be found for this size. Crushing the coal on

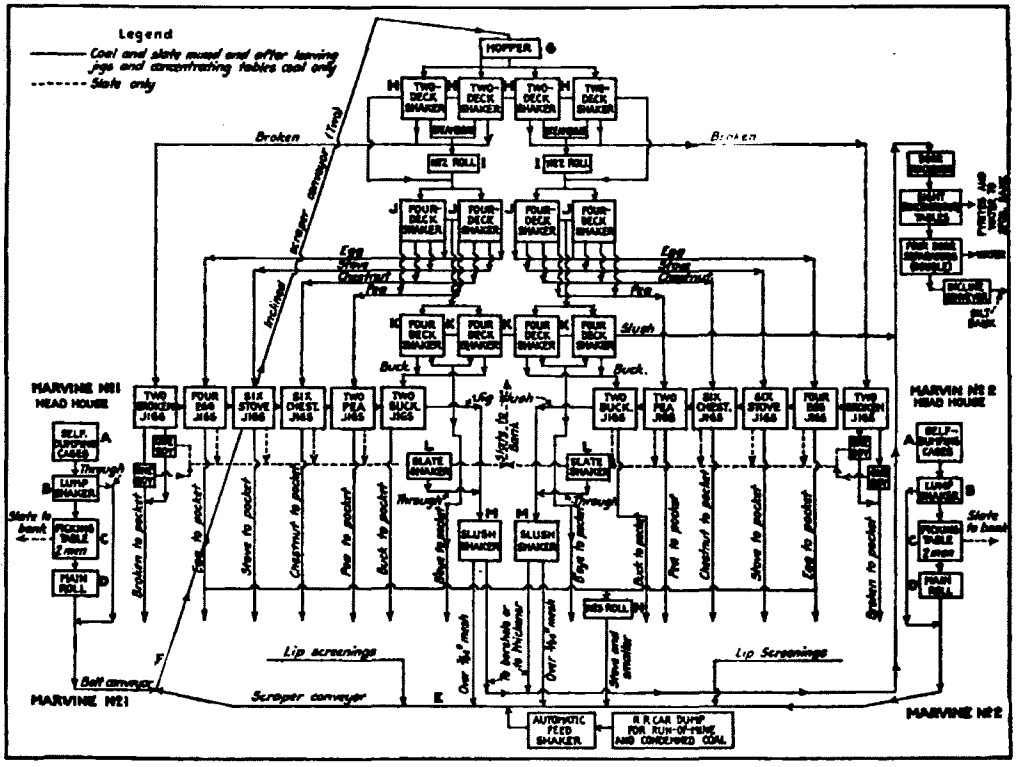

FIG. 40.—FLOW SHEET OF MARVINE BREAKER.

the ground level has the advantage of eliminating the heavy crushers and bull shakers at the top of the building, which cause severe stress on the structure, and permits a considerable reduction in the height of the structure. Another interesting detail is the complete elimination of coal-carrying elevators. Water is supplied to this breaker from the Lackawanna River by electrically driven pumps.

This breaker is constructed in two distinct units; that is, it is so built that either half of the breaker is a complete operating unit and can be shut down without interference with the running of the coal through the other half.

The following is a description of the flow of coal through the breaker and the method of preparation followed, Fig. 40.

The two head houses *A*, situated at the top of the two hoisting shafts, are identical in construction. Coal is hoisted from each shaft, which contains two hoisting compartments in which self-dumping cages operate. The coal is dumped into a chute, which delivers it to the lump shaker *B*. The lump-size coal passes from this shaker on to a gravity picking table *C*, where two men remove the rock, which is sent to the slate bank. The coal passes through the main rolls *D*, which crush it to steamboat size and smaller. The material passing through the lump shaker *B* is conveyed by chutes to a point under the rolls *D*, where it mixes with the material from the rolls.

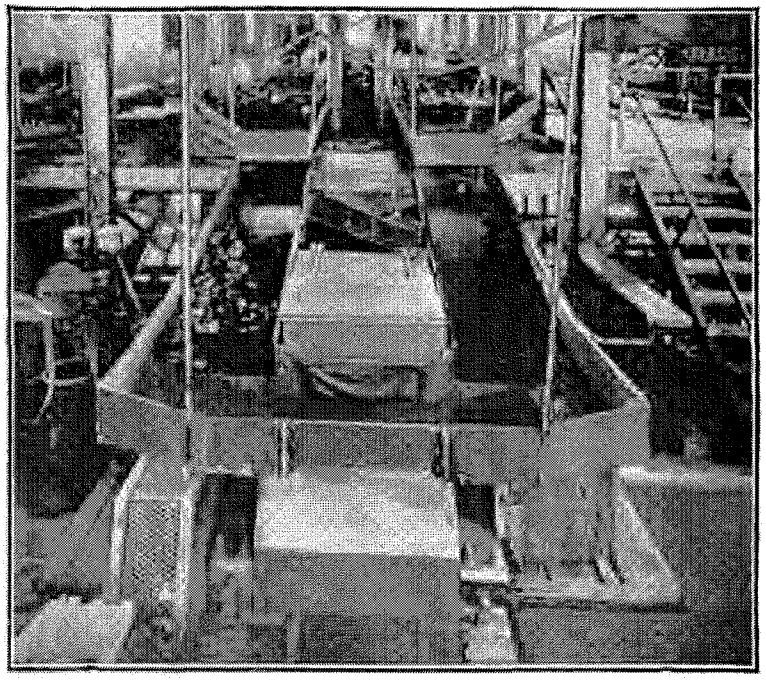

FIG. 41.—GRATE AND EGG SHAKERS IN MARVINE BREAKER.

From head house No. 1, the coal is transported by means of the two belt-conveyor lines for a distance of approximately 1100 ft. to the inclined scraper-conveyor lines *F*. The coal from head house No. 2 is moved by a scraper conveyor *E*, which travels directly underneath the center of the breaker. Into this is delivered, as it passes under the building, all material such as products of the rolls breaking egg coal, material from the slate shaker, that from the slush shaker, and from the lip screens. This conveyor also receives the material dumped from railroad cars, either run-of-mine, previously crushed to steamboat size, and condemned coal, both of which are fed to this conveyor by an automatic feed. This conveyor line delivers its material to the inclined scraper conveyors *F*, each of which is designed to handle the entire tonnage of this breaker. These conveyors deliver the material to a hopper *G* at the top of the

building, thence the material passes to four double-deck shakers *H*, Fig. 41. The steamboat material passes from the deck of these shakers into the No. 2 rolls *I*, where it is crushed to egg and smaller. The material passing from the second deck of the shakers *H*, which is the broken, or grate, size, is sent either to the No. 2 rolls *I*, where it is crushed to egg and smaller, or, when a market exists for this size, it goes to two jigs on each side of the breaker from which the coal product, after passing a picker boy, goes to the loading pocket, and the slate product, after passing a picker boy, goes to the slate bank. Experience has shown that it is necessary to employ one boy on the slate and one on the coal discharged from each of the jigs in order properly to prepare this coal for the market and maintain the slate free from coal.

Material passing through the shakers *H*, being egg coal and smaller sizes, is mixed by chutes with the product of the No. 2 rolls *I*. This material then passes on to four sets of four-deck shakers *J*, which size the coal into egg, stove, nut, and pea. The egg coal, which comes from the top deck, goes to four jigs on each side of the breaker. Washed coal from these jigs goes directly to the loading pocket and the slate to the slate bank, both without any hand picking. In case egg coal is not in demand, this size after leaving the jigs may be passed to the egg-coal rolls *N* which break it down to stove and smaller sizes; the material from these rolls passes into the main intake conveyor underneath the breaker.

Stove coal, coming from the second deck of these shakers, goes to six jigs on each side of the breaker. The washed coal from each jig passes to the loading pocket and the slate to the slate bank, both without picking. Chestnut coal, from the third deck, goes to six jigs on each side of the breaker; as in the case of the other sizes, the washed coal goes to the loading pocket and the slate to the slate bank. Pea coal, from the fourth deck, goes to two jigs on each side of the breaker and, as before, the coal product of these machines goes directly to the loading pocket and the slate is sent to the slate bank.

Material passing through these shakers *J*, consisting of No. 1 buckwheat and smaller sizes, goes to the 4 four-deck shakers *K*, which make No. 1, No. 2, No. 3, and No. 4 buckwheat, the last three sizes being mixed and shipped as bird's-eye. No. 1 buckwheat comes from the upper deck and passes to two jigs on each side of the breaker; the washed coal from these machines goes to the loading pocket and the slate to the slate bank. No. 2 buckwheat, from off the second deck, No. 3 buckwheat, from the third deck, and No. 4 buckwheat, from the fourth deck, mix at the end of the shakers and the resulting bird's-eye is conducted, by chutes, to the loading pocket. The slush, or material which passes through all decks, is conducted to a separate building for further treatment.

All slate from the jigs pass over slate shakers *L* to reclaim the fine

breakage. The material going over these shakers passes to the slate bank; that passing through them joins with the slushings from the jigs. This mixture then passes over the slush shakers *M*. The material passing over a 3/64-in. (1.2 mm.) mesh goes into the main conveyor line *E* underneath the breaker. The material going through these slush shakers passes to the plant for the treatment of the slush.

Lip screenings from all the loading pockets, Fig. 42, go to the main conveyor line *L* under the breaker. The slush-treatment plant, which

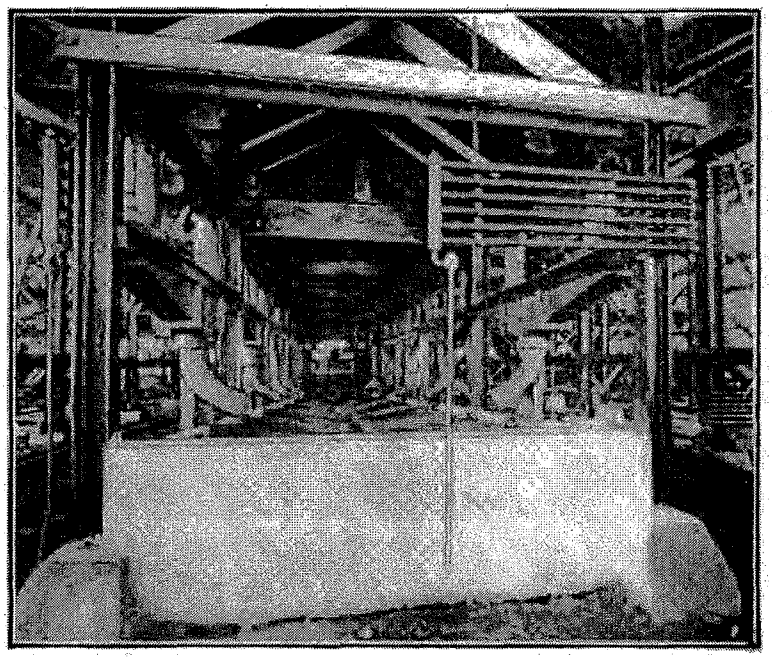

FIG. 42.—BOTTOM OF LOADING POCKETS OF MARVINE BREAKER.

receives all the slush from the breaker, consists of a Dorr thickener, in which the slush is settled out of the water; that which overflows contains only the smallest particles of the suspended solids. The thickened material from these machines is fed to eight concentrating tables and the coal from these passes to four Dorr separators where a large percentage of the water is removed. The coal is then conveyed to a stock pile or a loading pocket for shipment.

Pyrite from the concentrating tables may be recovered or discarded as desired. The water from the Dorr thickener and separator passes out of the plant.

No. 1 Breaker, Pennsylvania Coal Co.

At No. 1 colliery of the Pennsylvania Coal Co. at Dunmore, just outside of the city of Scranton, a new breaker is being constructed. This also is a steel and concrete structure; several details, however, vary