

been transported the interior of the rimu flume near its top end is perceptibly worn into grooves by the moving coal. In the event of further installations being made in this Dominion substitution of a galvanized-steel trough-shaped flume is well worth consideration.

The following extract from an article upon the transportation of coal by flume by the Montana Coal and Coke Company at Aldridge, Montana, was published in *Mines and Minerals* of November, 1909, the writer being Robert M. Magrew, General Superintendent of Mines:—

*"Flume Construction and Grading.*—The flume is both economical in construction and in operation. It consists simply of a *rectangular flume* lined with sheet iron. The bottom board is 2 in. by 10 in., the sides 2 in. by 12 in., and the top 2 in. by 14 in., making the inside area 10 in. by 10 in. This is lined with No. 26 gauge black sheet iron, which is shaped at the company's shops to conform to the size of the flume. In laying the iron it is lapped a few inches in favour of the grade, and if kept in reasonable repair is practically watertight.

"The flume is about 9,000 ft. in length, the first 3,000 ft. having a grade of about 4 ft. to the 100. The grade then breaks sharply and varies from 15 to 35 degrees for a distance of about 3,500 ft., the remaining 2,500 ft. being on a gradually lessening grade until it again becomes 4 ft. to the 100.

"All minor gulches are crossed on trestles constructed of 2 in. by 4 in. lumber, but where any marked degree of expense would have been entailed by trestling the flume is curved to conform to the topography of the ground. No trouble was experienced with the curves or changes of grade, but when changing from a steep to a lighter pitch the flume area had to be enlarged for some little distance to allow for the swelling of volume due to the decrease of velocity. Elevation had to be given all curves. This was easily determined by leaving the flume unnailed to stringers on all curves; then after turning on the water it was a small job to key up the outer edge to the proper elevation. These precautions would not have been necessary in the case of a flume carrying much less than its actual capacity, but for the sake of safety were carried out.

*"Construction Cost.*—About 50,000 ft. of lumber are required per mile of flume. This allows 42,240 ft. for the flume proper, the balance being for cleats, trestles, sills, &c. Taking an arbitrary figure—say, 30 dollars per thousand for lumber and cost of erection—would make a total of 1,500 dollars per mile of flume ready to receive iron lining. The cost of No. 26 gauge black iron is 3.65 dollars per hundredweight f.o.b. Chicago, freight added making it cost 5.25 dollars in Electric. This runs approximately 66½ linear feet per hundredweight; so the cost per mile would be 415.80 dollars. The cost of bending and putting in place the iron lining would amount to about 75 dollars, making a total cost of 1,990.80 dollars per mile for material and construction. This makes a very good showing in comparison with the cost of a surface tram road over the same ground.

*"Operation and Maintenance.*—The cost of operation of the flume is practically nil during the warmer months, but during the winter it requires the services of two men for about an hour in the morning to patrol from each end and clean out any masses of snow or slush ice which may have collected after the turning-on of the water. The washer is not started during this season until the flume is reported clear. No water is allowed to flow through the flumes during the winter months after the washer is shut down for the day, as experience has shown that it freezes from the sides and bottom, and will close the entire flume area in a very short time. The scouring effect of the coal prevents this trouble during the shift. Three 1-in. steam lines exhaust into the sludge-tank at this season, so that the first flow of water through the flume is many degrees warmer than it would otherwise be.

"The cost of maintenance is not great, the principal item being the cost of the sheet iron. The life of the iron used will average about two years. Experiments contemplated for the near future are expected to determine the relative efficiency of various weights of iron, as it is thought that a heavier iron, although higher in first cost, will last proportionately longer, thereby decreasing the maintenance account an appreciable degree. It is also intended to equip a section with galvanized iron, and another section with iron of semi-cylindrical shape. The present flume has been in operation about nine years, and it is estimated that it should last five years longer with very little repair. Taking first cost into consideration, this makes the item of maintenance a very reasonable one.

*"Carrying-capacity.*—The capacity of the flume is, of course, governed by the volume and velocity of the water. Experience has shown that a flow of 1.58 cubic feet per second, or 63.36 miners' inches will transport safely from 35 to 45 tons per hour on a minimum grade of 4 ft. to the hundred, and this at practically no cost for operation. No accurate data are at hand showing the varying amounts of coal carried per pound of water for given grades, but the above can be taken as the maximum amount it is safe to transport with this volume of water. It would not be deemed advisable to construct a flume for this purpose on less than a 4-per-cent. grade.

*"Receiving-bunkers.*—The coal is received at the discharge end of the flume in a series of large tanks located over the bunkers, the water releasing it from suspension as the larger area of the tank brings it to rest. The coarser particles are deposited near the inflow, grading down in size through the length of the first tank through the overflow into the second tank, where the fines are collected. The first tank is dumped usually about four times to one dumping of the second tank; the water being switched temporarily to the middle of the tank while one end is being dumped, and then back again until the entire tank is emptied. The tanks have a capacity of about 23 to 25 tons each, and are dumped by a series of slide-gates in the bottom, the coal falling into bunkers having a total storage capacity of about 1,400 tons. It is here drained for forty-eight hours before being charged into the ovens.

"There is also in operation a flume of about 2,500 ft. in length, connecting one of the mines with the washer. This consists of a 10 in. terra-cotta pipe laid with cement joints. The mistake was made, however, in putting it too deep in the ground, making it very difficult to locate a break if one occurs. Some of this pipe has been taken out after a service of seven years, and the wear is scarcely noticeable."

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FRANK REED,

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