

box, three sides of which are made of solid plank, the fourth side being left open. When the reservoir is filled this box is closed by pieces of heavy plank laid transversely. As far as the mere filling of the reservoir is concerned, the box might as well be closed by one solid piece; but the object of a number of pieces is to discharge the water gradually. This is done by removing the pieces one after another as the water is lowered, so that the sands may be kept in suspension and carried through the culvert. Were the box open at the bottom, or to its full height at once the sands would be carried into the culvert in such a quantity as to clog it. This culvert, in which the box ends, passes through the dam and under the lower reservoir and lower dam to the bed of the creek below. The lower dam is arranged in the same way. When the reservoirs are not in use the water in the creek passes through the culvert, and when they are not filled the boxes are closed. The water accumulates in the upper reservoir for about six hours, after which it overflows, leaving all the coarse sands in the upper reservoir, and carrying only with it the finer slimes, which settle in the lower one. From this the clarified water is pumped at the rate of 60 cubic feet per minute to a height of about 200ft. into a tank at the Highland mill. The coarse sands are removed from the upper reservoir every twenty-four hours. In order to do this, the transverse planks on the discharge-box are removed one after another, and the water passes off, conveying the sand with it. As this process takes four hours, and the filling six hours, there are fourteen hours of overflow into the lower reservoir where the slimes settle. These are removed once in two months in the same way.

"The fuel for the mills under the Homestake management is supplied by the Black Hills and Forte Pierre Railroad Company. This road, with about thirty miles of 3ft. gauge track, runs along the divide between Gold Run and City Creek, terminating at a point about fourteen miles south of Lead City. The whole section was originally heavily wooded, but it has been quite denuded by the constant demands made upon it. The railway is very winding, and is quite a feat of engineering. It runs down the slope into Whitewood Creek, and up the opposite height, until it finally reaches the point where timber is still to be obtained. This road, as soon as spring opens, is employed in transporting wood and timber which has been cut and stored along its line, and is in constant use until the heavy snows block it for the winter—generally from January to April. It has three branches towards the three towns where the mills are situated, and communicates directly with these by means of long wooden chutes down which the wood is discharged. These are from 700ft. to 1,500ft. long, running down the slope of the mountain. The chutes are 25ft. wide by 12in. deep, and are made of planks 4in. in thickness. The bottom and 9in. of the sides are lined with iron $\frac{1}{2}$ in. in thickness. The fall of the chute is 6in. to the foot, until the curves begin, when it is $4\frac{1}{2}$ in. to the foot. This continues to the nozzle, which is elliptical. When the chute is in use a small current of water is passed through to prevent the iron from becoming too hot, and also to act as a lubricator. The cordwood, unloaded into the top of the chute, passes down the incline with great velocity. At the nozzle it is deflected from its course, and, through the momentum obtained in its downward passage, the timber shoots up into the air and drops some distance off on the wood-pile. In order to discharge wood on a somewhat larger area the nozzle is made movable. The Caledonia mill has its wood hauled by teams, but is making experiments with soft coal, as the price of wood is £1 4s. 6d. per cord.

"*Auxiliary Arrangements.*—As the thermometer often sinks to 40° and 50° Fahr. below zero the mills and the water used in them have to be warmed. This is generally done by the use of steam. Along the ground-floor, in front of the apron-plates, there runs a sheet-iron drum 18in. in diameter, through which the waste steam from the engine is conducted. The battery-water is prevented from freezing by steam coils passing through the supply-tanks. Fire-plugs, with necessary attachments, are placed at regular intervals, to be used in case of accident.

"To reduce the cost of repairs and renewals, which is so large a part in the expenses of gold-milling, the Homestake Company has a foundry where rock-breaker shoes and dies, pitmans and toggle-plates, mortars and dies, boss-heads, tappets, thimbles for props, cams and hubs of cam-shaft, pulleys, and all shaft-boxes are cast from No. 1 and No. 3 foundry iron and worn-out castings. These are sometimes bought at a $\frac{1}{2}$ d. a pound. The casting is all done in sand, with the exception of the rock-breaker shoes and dies and faces of the battery dies, which are chilled.

"*The Mills in Detail.*"

"The six mills under the Homestake management have the same patterns for all parts, needing frequent renewal. This greatly reduces the amount of material kept on hand and the labour and cost of repairs.

"*Grizzlies.*—These are coarse screens, upon which the ore arriving from the mine is dumped and separated, the screened portion dropping directly into the bins. This relieves the rock-breaker of ore not requiring to be crushed, and only the coarse ore has to be shovelled into it. They are from 3ft. to 4ft. 6in. wide, from 10ft. to 14ft. long, and set on an angle of about 40deg., representing a rise of about $7\frac{1}{2}$ in. to the foot. They are made generally of wrought-iron bars 1in. in width and from 2in. to 4in. in depth, and spaced from $1\frac{1}{2}$ in. to 2in. apart, being held in place by sometimes five iron rods an inch in diameter, provided with washers at proper intervals. The weight of a grizzly 4ft. 6in. by 12ft. in size, with twenty-four bars 1in. wide and 2in. deep and $1\frac{1}{2}$ in. apart, is given as 2,040lb. These grates last about four years. In some instances old wrought-iron rods, with base turned up, take the place of standard rectangular bars, but they do not last much over one year.

"*Rock-breakers.*—All the Homestake mills use the Blake. The coarse ore rolling down from the grizzlies collects on the crusher-floor, and is fed by hand into the mouth of the breaker on the same level. From the crusher it passes into the bins, which have already received the fine ore from the grizzlies. The No. 5 breaker used—the largest pattern in the market—has a receiving capacity of 9in. by 15in., and is set to crush from $1\frac{1}{2}$ in. to $1\frac{3}{4}$ in., and is run twenty hours out of the twenty-four, each crusher being calculated to serve twenty stamps. The