ever, in large quantities is not universal throughout the Coeur d'Alene district. Some mines, the Hecla for instance, have no zinc at all, while others have not as high a percentage as the Frisco which with the Tiger Poorman are about the worst in this respect. The process of separation is, of course, much simpler where there is no zinc sulphide in the material. The large specimen on the table marked A gives a very good idea of the material to be treated in the Frisco. In it can be seen the waste rock, both varieties of the Galena, and also, the powdery form of the zinc; the massive zinc also showing.

General Description of Mill.

The plant for separating these different constituents is contained in a 750 ton mill situated at the mouth of the mine tunnel. It is a five storey structure built up the side of the mountain, narrow at the top where the crushers are placed and broadening out for the jig and vanner rooms below. On the fifth floor are the crushers. Between the fifth and fourth floors, but in an extension by themselves, are the Pelton water wheels, four in number, which drive the coarse mill, the fine mill, the slime mill and the dynamo which supplies light to the mill and mine. Each of these is separated and may be speeded up, slowed down or shut off independently. On the fourth floor are all the rolls which are used in the mill—the dry rolls set immediately in front of the bin into which the crusher feeds; the Allis rolls which receive the middlings from the coarse jigs, and three fine rolls which crush the middlings from the fine jigs. On the third floor are the arrangements for classifying the feed for the different concentrating machines below. These consist of a separation by two sets of trommels, followed by an hydraulic classification as the feed passes down a launder over the jigs, followed by a settling out of the coarser slimes as the overflow from the jig launder flows through a tank above the tables, and a final settling out of the finer slimes as the round tables' overflow passes down a long tank behind the vanners. The second floor is the concentrating floor on which are the jigs, round tables and vanners. On the first or ground floor are the ore-bins, slime concentrate bins, apparatus for weighing and loading the ore, settling tank for mill overflow and also a lower vanner room.

Detailed Process.

As the mine and the general arrangement of the mill have been described, we might now consider somewhat in detail the treatment of the ore. The process is as follows—the ore is run out of the tunnel in a string of cars pulled out by a horse. The cars which are then on a landing a storey above the crusher floor are weighed, run over and dumped into a bin having a capacity of about 60 cars, which is behind and above the crushers. From this bin the ore slides over a grizzly down which it is raked by the crusher man to the crusher. The fine material passes through the grizzly and under the crusher, thus saving a needless waste of power. While being raked over the grizzly the feed is also cleaned of the wood, spikes, broken hammers, candle hooks, etc., which necessarily are mixed with it.

The crushing apparatus consists of two Blake crushers, one a 10 x 20 in., and the other a small emergency crusher 10 x 15 in. placed alongside in case the big one should have to be shut down for repairs. The capacity of the larger crusher is such that it can put through more than the jigs can handle. The jaw plates are set from 1 in. to 1¼ in. apart, the size of aperture varying slightly as owing to the fact that everything is put through the mill, the character of the feed varies a good deal. The crushed material falls into a bin from which it is fed by a shaker to the coarse or dry rolls. This feeder is a long shallow box shaken lengthwise by a cam and spring attachment, which is adjustable so that any desired feed may be given to the coarse rolls.

The rolls are 30 in. diameter, and 15 in. across the face. They are set ¾ in. apart and run at the rate of 34 R.P.M. From these rolls the feed slides by gravity to the trommels.

The trommels consist of two sets. The first set comprises two exactly similar trommels 6 ft. long x 3 ft. in diameter, each having two divisions with 10 m.m. and 15 m.m. holes respectively. They are set side by side, the left hand trommel handling the direct feed from the coarse rolls, while the similar trommel alongside handles the recrushed coarse-jig-middling from the Allis rolls.

The second set consists also, of two similar parallel trommels, 8 ft. long by 3 ft. in diameter, having three equal divisions with 3, 5 and 7 m.m. holes respectively. Each of these trommels handles half of the mixed feed passing through the 10 m. m. holes of the first set. All of the trommels are revolved by gear wheels at the rate of 20 R.P.M. and run wet, being watered by a row of spouts running along above them.

The feed is thus divided according to size, with 6 separate portions—the oversize of the 1st set, material between 10 and 15 m. m., the oversize of the 2nd set, material between 3 and 5 m. m., and material finer than 3 m. m The last two portions pass on to be further classified for the feed of the fine jigs, tables and vanners. The other four portions comprise the feed of the coarse jigs. As it would be tedious to enter into a detailed description of the throw, R.P.M. size of sieve and other particulars in regard to both the coarse and fine jigs, I submit information drawn up in tabular form giving the feed, the R.P M., the number of compartments in which concentrate is made, both Hutch and Top, and similar information of the middlings, the size of sieve used in the different compartments and finally whether tailings are made or not.

All of these jigs, with the exception of the Bull jig, which is a three compartment single jig, are four compartment ones, arranged in sets of twos placed back to back, each set handling one portion of the classified feed. The plunger is worked directly by an eccentric on a shaft run from an overhead pulley. The throw in the different compartments is not given in the tabulated statement because it varies a good deal, the variation depending not only on the feed treated but also on the fit of the plunger. It can only be stated that the Bull jig has an eccentric throw of from 2½ to 2 in., and that the rest of the coarse jigs have a throw varying between 1½ to 1 in. The throw in the fine jigs decreases from ⅞ down to ⅛ in. as the feed gets finer, but there is no uniform decrease, the lack of uniformity being not so noticeable as in the coarse jigs.

The coarse jig room contains the Bull jig and four sets of jigs, the extra set being provided to handle half of the feed from the 15 m.m. holes of the first trommel.

The concentrates from these coarse jigs are led down by pipes to the ore-bin below. The middlings are led down to an unwatering tank on the lower floor and are then raised by a bucket and belt elevator up to the roll floor, where they are put through a pair 36 by 14 in. Allis rolls. They then pass into the left hand trommel of the first set and so start through the mill again. The tailings go direct to the tail race.

This finishes the concentration carried on in the coarse mill as it is called, which comprises the crushers, the dry and Allis rolls, the two sets of trommels, No. 1 elevator and nine jigs. This mill is run by a separate Pelton water wheel and may be shut off independently of the rest of the mill. This is an important consideration especially as regards the slime mill which may be kept running even if the coarse, or fine mill for that matter, has to be shut down to repair the elevator, or on account of choked rolls an event which happens frequently.

We have now to consider the concentration carried on in the fine and slime mills. It will be remembered that the feed smaller than 5 m. m. passes on to be further classified. This is first done by a Calumet classifier running along above the "direct" fine jigs. This classifier