DESCRIPTION OF THE LLOYD COPPER COMPANY'S CONCENTRATING MILL AT BURRAGA, N.S.W.

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Concentration at the Lloyd Copper Company's Mill, Burraga, N.S.W.

The ore is chalcopyrite in quartz and schist. The sp. gr. of the mineral varies from 4.1 to 4.3, the theoretical value of the copper being 34.5 per cent. The ore is hauled up an inclined way from the chute at the mine in two self-tipping trucks, each supplying a separate bin.

From these bins the ore is hand-fed to two rock breakers of the Blake type, being first moistened with water. These breakers crush to 2½ in. size. This size enables a good percentage of picked ore to be obtained and yet produces only a small amount of slimes.

Each of these breakers feeds on to a shaker, where the ore is hand-picked. These shakers consist of a trough-shaped table of rectangular section suspended by iron rods and slope towards the tail. A backwards and forwards motion of about 1¼ in. is imparted to these by a cam underneath, and the ore gradually moves towards the tail. Water is fed in at the heads of these shakers. There are two boys at each who remove the higher grade ore, and throw it into bins from which it is trucked to a bin over the hauling way to the calciners. The maximum amount of ore that can be picked out in twenty-four hours is twenty-five tons. The hand-picked ore averages about 13 per cent. copper, and is roasted in kilns.

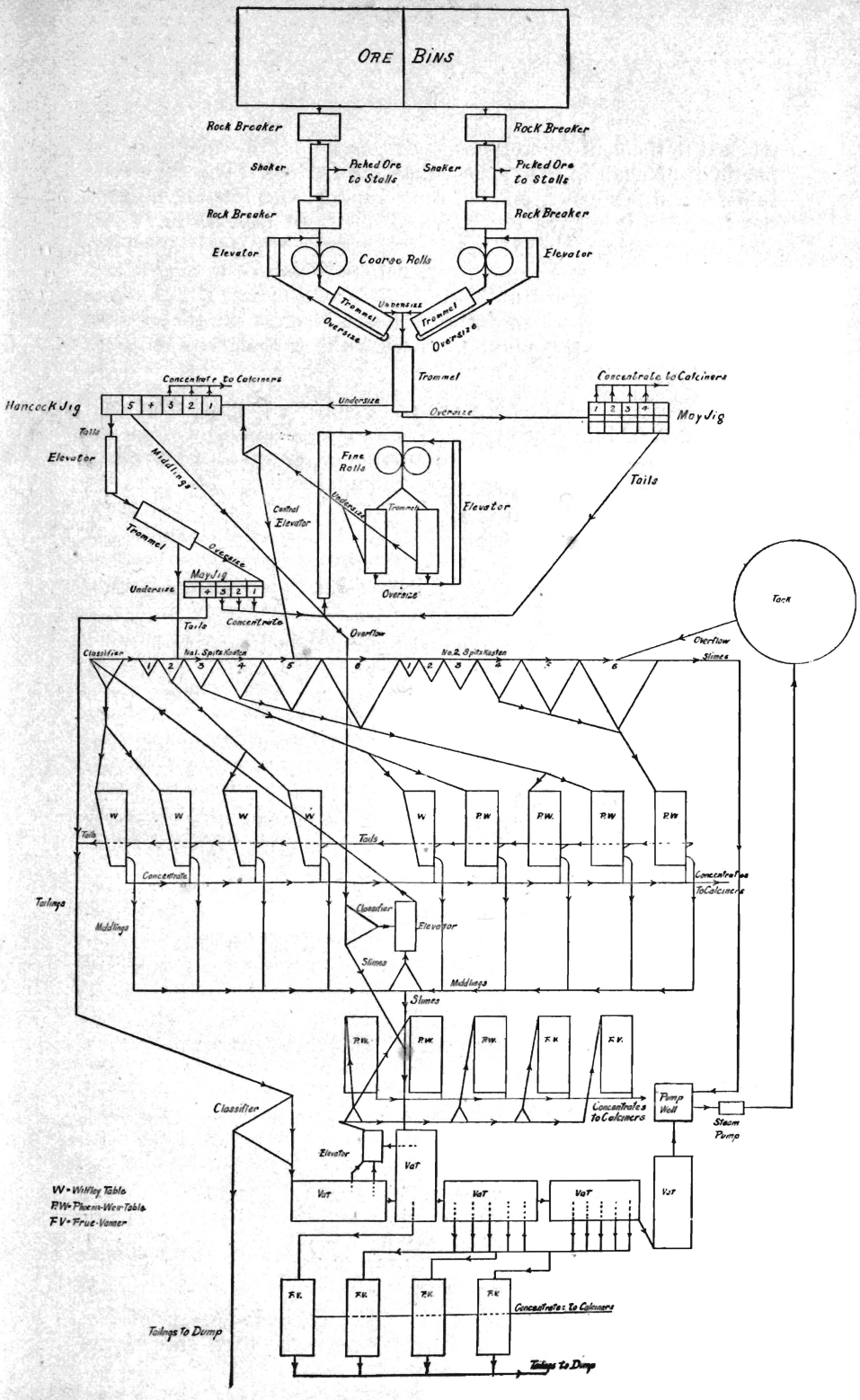
The ore from the tail of each shaker falls into a second breaker similar to the first, and crushing to about 1½ in. After this it passes into a pair of coarse rolls. The ore is passed through the second set of breakers to prevent jarring in the rolls. These have tires of 1 per cent. manganese steel. One roll is driven off the main shaft of the mill engine by means of toothed gearing, a friction clutch being employed on the shaft so that the rolls can be quickly thrown out of gear if a piece of iron enters them. The movable roll is driven by friction from the fixed roll, both working face to face. One of the rolls has a flange on either edge.

Sometimes an end thrust is set up due to the uneven wearing of the rolls. This tends to grind one of the flanges away. By means of movable wedge-shaped pieces, the bearings of the movable roll can be raised or lowered. Thus the axes of the rolls can be thrown out of parallel, and a counter-end thrust established which prevents the grinding away of the flange.

On leaving the coarse rolls the ore passes into a pair of trommels with ¼ in. holes. The oversize from these trommels goes to two elevators which return it to the coarse rolls. The undersize from the above two trommels passes into one trommel with 1-16 in. holes. The oversize from this goes to a large May jig and the undersize to a Hancock jig. The May jig has four pairs of hutches and a pair of tailings hutches. The screen has ¼ in. holes. The ragging used is ½ in. rich ore. The concentrates from the two pairs of head hutches are always rich enough to send to the calciners and those from the tail hutches usually so. The concentrates are run out from time to time into trucks underneath. They contain about 7 cwt. of concentrates, and are emptied into a bin beside the hauling way to the calciners. The concentrate from the head hutches goes about 16 per cent. copper and the average from the jig is 13 per cent. The tails run along a launder to a central elevator, and the overflow to the last hopper of the spitzkasten. The product of the last two hutches of the jig if too poor is run to this elevator also.

The May jig is of the fixed sieve type, the necessary vertical motion of the water being produced by plungers working on one side of each hutch. The amount of throw of each plunger can be varied independently of the rest or all may be varied together.

The Hancock jig has five hutches and a tails hutch. The screen over the first three hutches is 1-6 in. and over the last two 1-7 in. The concentrates from the first three hutches are continuously running into trucks underneath, where they settle, a large amount of water being got rid of by overflowing. The product from the last two hutches is discharged along launders to the central elevator. The concentrates average 12 per cent. copper, the middlings 3½ per cent., and the tails 1 per cent. The Hancock jig is of the movable sieve type. This is moved up and down in a direction sloping up from the head to the tail by means of a cam underneath the tank, the motion being communicated to the sieve by means of iron connecting rods. It is possible to alter the direction of the motion, and also to change its magnitude so as to suit different classes of feed. The tails from this jig are raised by an elevator and pass into a trommel with 1-16 in. holes. The undersize goes to a spitzkasten, and the oversize to a small May jig. Only three hutches are in use, not including the tails hutch. The product from the first three hutches goes to the central elevator. This sometimes contains 7 per cent. copper and is then


Ore Bins
Rock Breaker
Rock Breaker
Shaker
Picked Ore to Stalls
Shaker
Picked Ore to Stalls
Rock Breaker
Rock Breaker
Elevator
Coarse Rolls
Elevator
Trommel
Undersize
Trommel
Oversize
Oversize
Trommel
Concentrate to Calciners
Hancock Jig
5 4 3 2 1
Undersize
Oversize
Concentrate to Calciners
1 2 3 4
May Jig
Tails
Elevator
Middlings
Fine Rolls
Tails
Central Elevator
Undersize
Trommel
Elevator
Trommel
Oversize
May Jig
Undersize
4 3 2 1
Oversize
Tails
Concentrate
Overflow
Tank
Overflow
Classifier
No.1 Spitzkasten
No.2 Spitzkasten
Slimes
1 2 3 4 5 6 1 2 3 4 5 6
W W W W W P.W P.W P.W P.W
Tails
Tails
Concentrate
Concentrates To Calciners
Tailings
Middlings
Classifier
Elevator
Slimes
Middlings
Slimes
P.W. P.W. P.W. F.V. F.V.
Classifier
Concentrates to Calciners
Pump Well
Steam Pump
Elevator
Vat
Vat
Vat
Vat
Vat
W = Wilfley Table
P.W = Phoenix-Weir Table
F.V = Frue-Vanner
F.V. F.V. F.V. F.V.
Concentrates To Calciners
Tailings To Dump
Tailings To Dump

trucked to the concentrate bins. It consists for the most part of particles of chalcopyrite attached to quartz, etc. The tails contain from 6 per cent. to 9 per cent. copper, and are taken from the fourth hutch from the head. The screen has 1-7 in. holes. The central elevator raises concentrates from the small May jig, middlings from the Hancock jig, and tails from the large May jig to a set of fine rolls. These rolls are similar to the coarse rolls, and are belt-driven from the main shaft. They run at a speed of 40 revs. per minute, whereas the coarse rolls only do 25.

On leaving the rolls the ore passes into a pair of trommels with 1-10 in. holes. The oversize from these is raised by an elevator to the fine rolls again, and as too much water in the buckets would clog the discharge a large amount is allowed to overflow from this elevator to the central elevator pit. The undersize from these trommels runs into a small fox, where a fair amount of water and a small amount of slime is got rid of. This runs to the spitzkasten, and the greater portion of mineral matter goes to the Hancock jig.

There are two spitzkastens with six hoppers each and working in series. The Hancock jig tails go to the second hopper in No. 1 spitzkasten, the first not being in use. The overflow from the Hancock jig and the small May jig also goes here. These spitzkastens supply pulp to Wilfley and Phœniz-Weir concentrating tables as follows:—The second hopper in No. 1 spitzkasten supplies two Wilfley tables, the third one Wilfley and one Phœnix-Weir table, the fourth, fifth and sixth two Phœnix-Weir tables. The overflow from the sixth hopper goes to No. 2 spitzkasten. The first three hoppers are not drawn on for pulp, as the water in them is too disturbed for a separation. The fourth, fifth and sixth run into a launder supplying one Phœnix-Weir table. The concentrates from these tables run into a wooden trough running the width of the building, and from this are periodically shovelled into trucks and sent to the bins. The tails run into two launders, which combine and are discharged into the settling vats. The middlings run into a classifier. This gets rid of a large amount of water and slime, which goes to the settling vats. The middlings are discharged by a plug to the middlings elevator. The overflow from the central elevator pit and from trucks filling at the jigs also runs into a box beside this elevator. The slimes go to the vats and the pulp to the elevator. This raises the middlings to a classifier above the spitzkastens. The pulp supplies two Wilfley tables and the overflow goes to the second hopper of No. 1 spitzkasten. The concentrate, middlings, and tails go to the same trough and launders as those for the first-mentioned tables. A certain amount of the overflow from the last hopper of No. 2 spitzkasten is used for wash water near the back end of the

table, fresh water being used only at the head end. The concentrates from all these tables averages about 13 per cent. copper and the tails 9 per cent. The tails from these tables and from the little May jig go to a classifier. The pulp from this constitutes from 85 to 90 per cent. of the total tails of the mill, and averages under 1 per cent. copper. It runs on the dump, where it is allowed to settle in boxes, from which it is shovelled out from time to time. This is to keep the tails in such a position that they could be easily handled in case leaching were resorted to in order to recover the copper remaining in them. The overflow from the above classifier goes to one end of a wooden vat of V-shaped cross section. This vat is 18 ft. long by 6 ft. broad by 6 ft. deep. The overflow from the boxes at the middlings elevator is discharged into one end of a similar vat. The overflow from the first vat goes to the other end of the second vat; this overflows into a third vat; this in turn into a fourth, and this into a fifth, which finally discharges into the pump well, which raises the water which contains a certain small amount of slime to the storage tank supplying water to the rest of the mill. The overflow pipe from this tank discharges into the last hopper of No. 2 spitzkasten. The overflow from this hopper goes to the pump pit. There are two spigots in the first vat and one in the second which supply pulp to an elevator. This raises it to a launder supplying a small classifying box. The pulp goes to two Phœnix Weir tables. The overflow goes to another classifier supplying pulp to a third Phœnix-Weir table, the overflow goes to another classifier, whose products go to two Frue vanners. The concentrates from the tables go to the trough before mentioned. The middlings from the first two tables run into the tails launder from the other tables. The third table is not run for middlings. The tails from these tables, as well as from the vanners, run into the second vat. The second, third, and fourth vats supply pulp to four Frue vanners. These vats have a rising discharge similar to that on the spitzkastens. Five spigots in the fourth supply pulp, which is nearly all treated by one vanner. What is not treated by this, together with one plug in the third vat, goes to a second vanner. The remainder of the pulp from the third vat goes to a third vanner. One spigot in the second vat supplies one vanner. The tails from these vanners run into a launder, discharging into a dam in the tailings heap. These tails constitute from 10 to 15 per cent. of the total tails from the mill, and average 1.6 per cent. copper and upwards. The concentrates average 13 per cent. copper.

The ore from the mine contains from 2 to 2.5 per cent. copper. The mill treats 200 to 240 tons in 24 hours, during which time 26 to 30 trucks of concentrate are obtained from the May jig, 46 to 60 from the Hancock, and 15 to 18 from the tables, and to 6 to 9 from the four last Frue vanners. Slag from

an old dump where the furnaces were originally situated is from time to time treated in the mill. This contains from 1.3 to 1.5 per cent. of copper, and does not give a concentrate with a copper value as high as that obtained from the ore as the copper bearing matte is of nearly the same specific gravity as the slag in which it is contained.