

Flotation in the Mill Flow-Sheet

A Few General Remarks on the Milling of Ores That Involves the Use of the Flotation Process.

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The sulphide minerals now recovered by the flotation process will practically all pass through a 60-mesh standard Tyler screen. A typical screen-analysis of flotation concentrate shows:

Flotation-Concentrate Screen-Analysis.

Heads—8.31 per cent. Cu.

Mesh.	Total p.c. Weight.	Cumulative p.c. Weight.	Assay p.c. Cu.	Total p.c. Contents.
40	3	3	..	..
60	6	9	6.40	7.0
80	6	15	6.48	4.9
100	3	18	..	..
150	13	31	7.68	17.5
200	19	50	8.52	19.6
200 (minus)	50	100	8.48	51.0

Thus, it is seen that the flotation process is applicable to the recovery of such minerals as are crushed through a minus 80-mesh, and, in general, is adapted only to the treatment of the so-called mill slimes.

In the crushing of ores to the various sizes required for the separation of minerals, there is always a part of the product that must be classed as slimes. For instance, the product from a Blake rock-crusher showed 40 per cent of the material on a 1-inch square opening; and 5 per cent of the total product passed through an 80-mesh screen. In the following cumulative screen-analysis of the ball-mill discharge, it is to be noted that 64.7 per cent is minus 80-mesh.

Screen-analysis of the ball-mill discharge.

40-mesh	6.8 per cent
80-mesh	35.3 "
100-mesh	46.0 "
200-mesh	62.3 "

On account of the physical properties of the sulphide minerals, they are invariably crushed fine, and to a greater extent, than the usual associated gangue minerals. Thus in many instances, an ore that is ground quite coarse will have over half of its valuable constituents in the fines. In order to illustrate this point the following screen-analysis is given:

Flotation-heads screen-analysis.

Heads—1.38 per cent Cu.

Mesh.	Total p.c. Weight.	Cumulative p.c. Weight.	Assay p.c. Cu.	Total p.c. Contents.
20	5.9	5.9	1.00	4.2
40	13.0	18.9	1.06	9.8
60	15.5	34.4	1.30	14.4
80	9.6	44.0	1.36	10.5
100	7.0	51.0	1.52	7.5
150	11.0	62.0	1.58	12.4

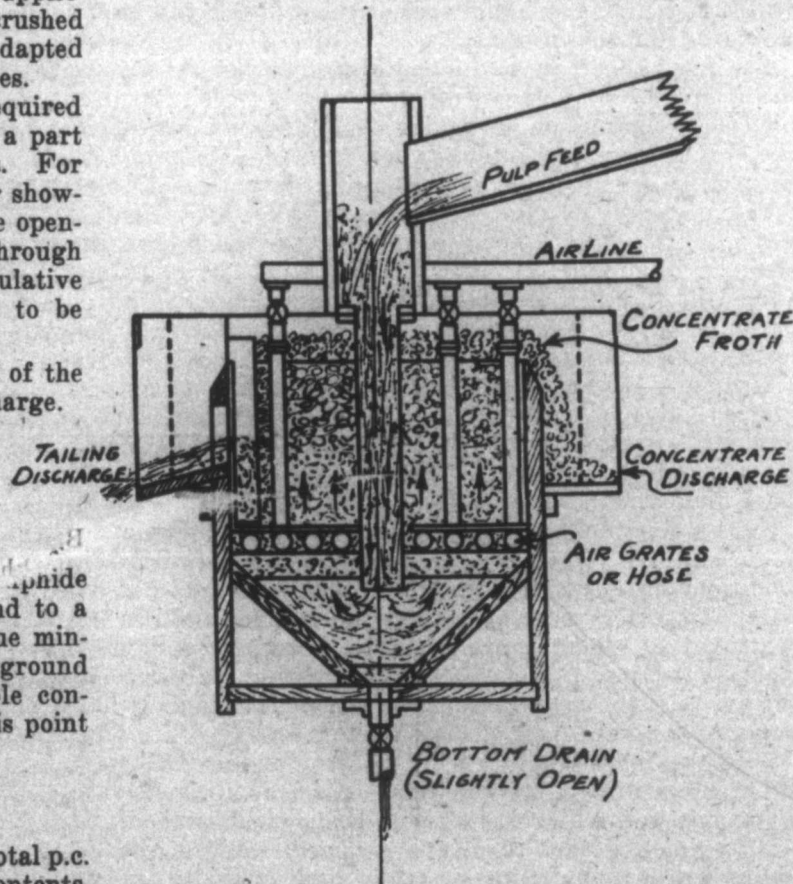
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200	6.2	68.2	1.56	6.9
200 (minus)	31.8	100.0	1.52	34.3

All the sulphide minerals that are minus 80-mesh can be recovered effectively by the flotation process.

In the evolution of the art of ore-dressing (which, one might say, had its origin in the simple separation by hand-picking), treatment of the fines has, up to quite recently, been carried on as an adjunct to the principal operation of coarse concentration by gravity. The introduction of the flotation process has, in many cases, modified the entire plan of operation, wherein coarse concentration was dispensed with entirely and the ores were crushed with a view to producing an all-slime product, suitable for flotation. The treatment of an ore entirely by flotation, involving as it does the all-slimes of the ore, can be done in a mill arranged



Sectional View of Petersen Flotation Cell in Operation.

with a simple flow-sheet. But this simplicity in mill-design is often obtained at the expense of higher crushing costs, and for this reason, gravity concentration is still considered an essential feature to be included in the design of modern mills.

In the milling of ores, wherein the valuable constituents are included with the sulphides, and it is desirable to recover all the sulphide minerals, a cus-