Dec. 19, 1939. W. L. OPIE 2,184,226

ORE AND LIKE CONCENTRATOR

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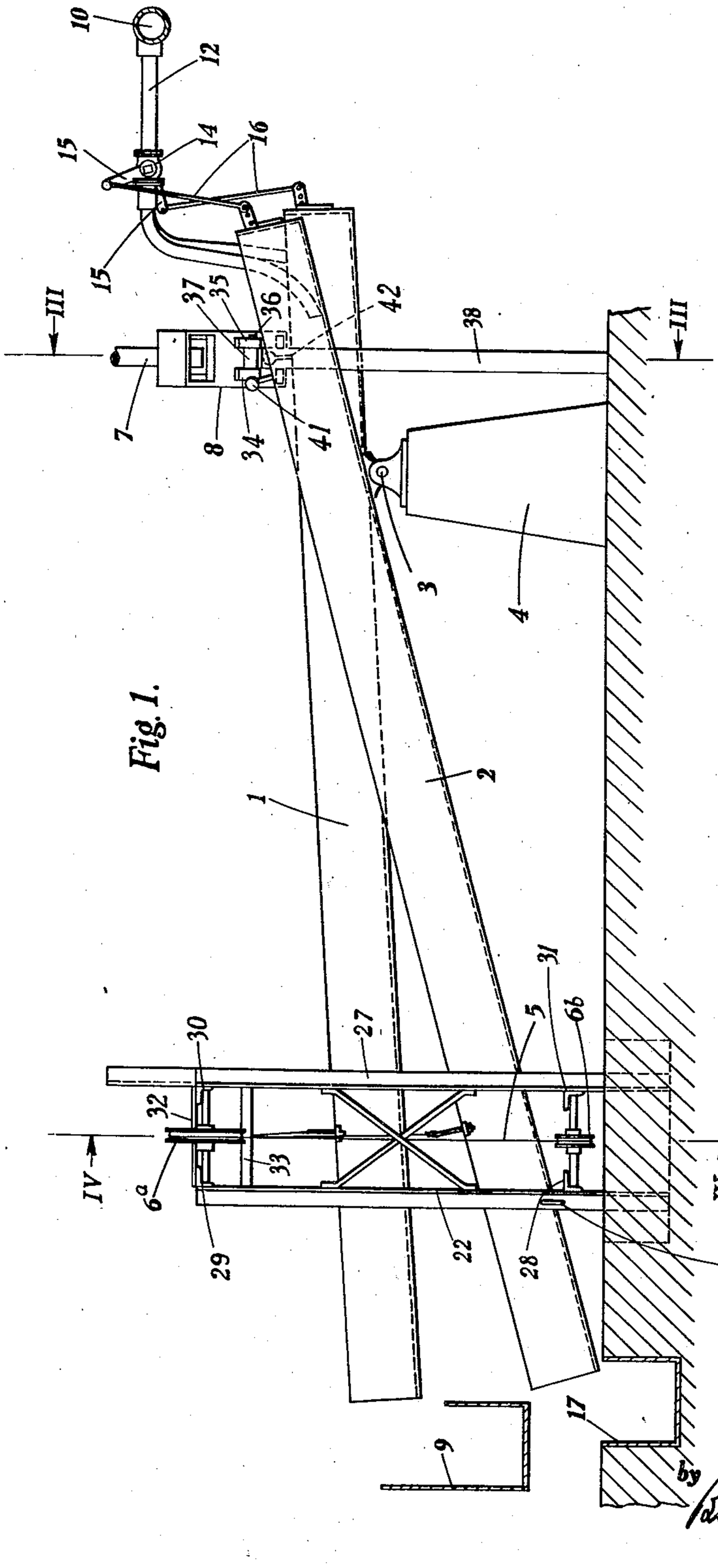


Fig. 1.

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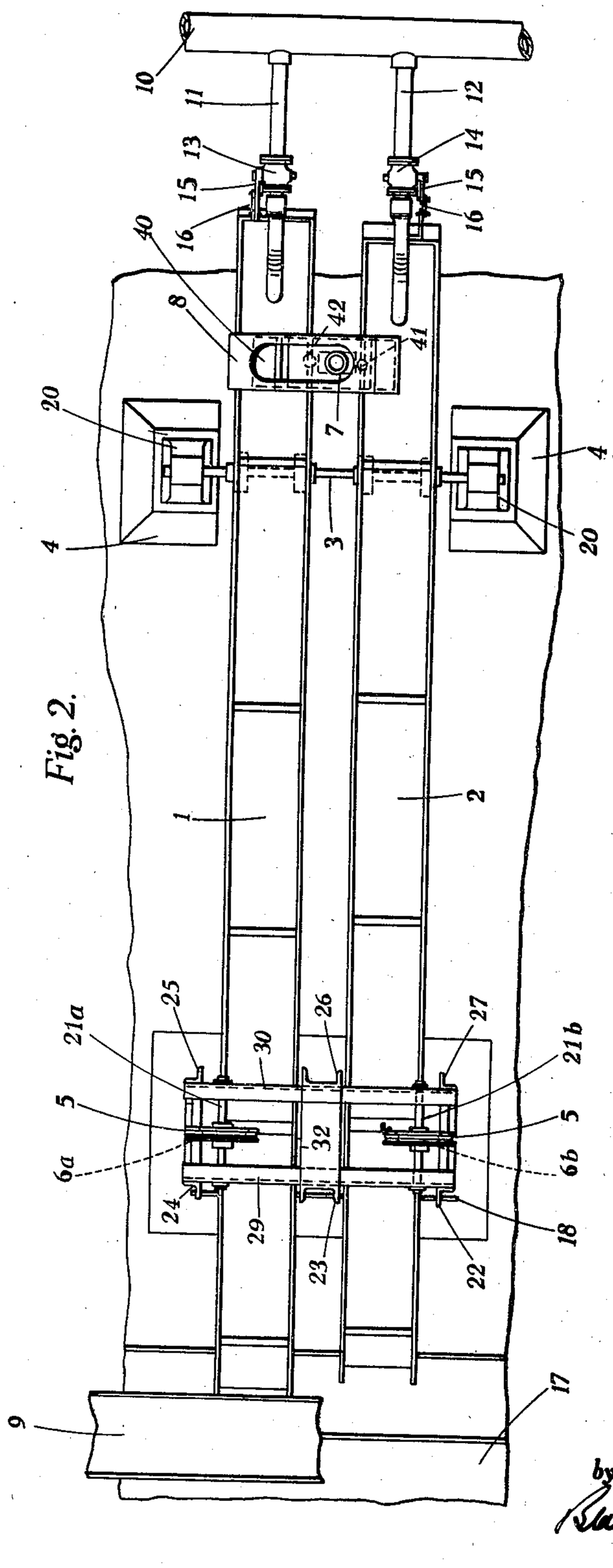


Fig. 2.

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*Fig. 3.*

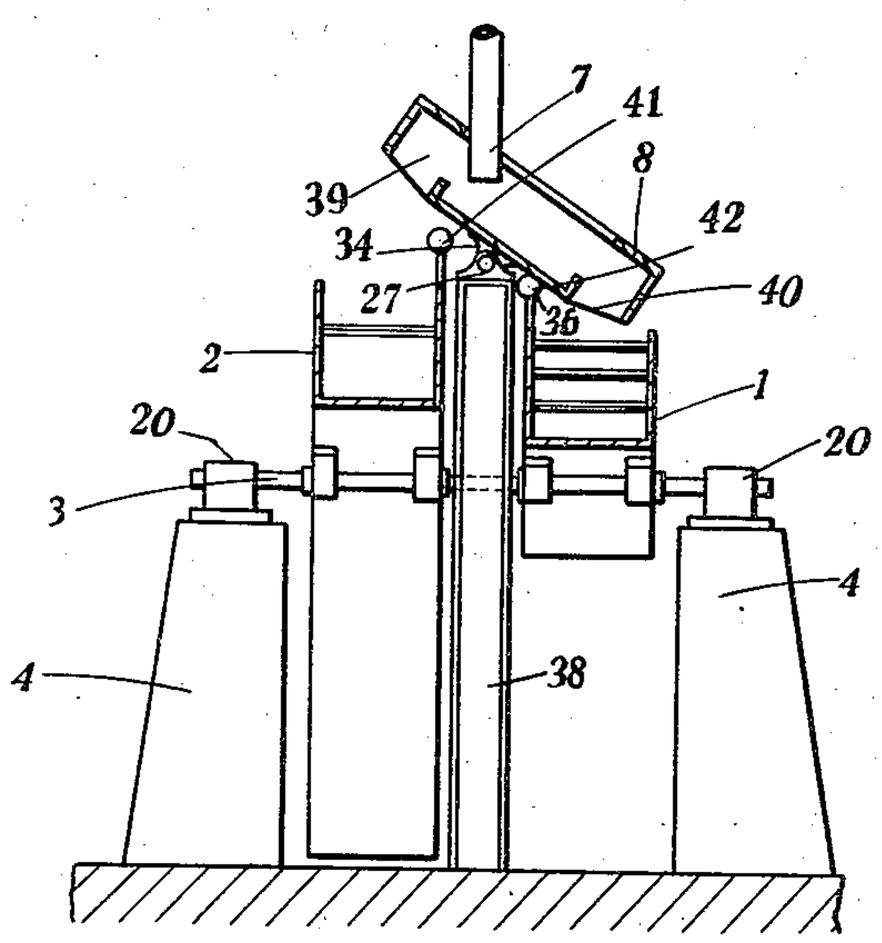
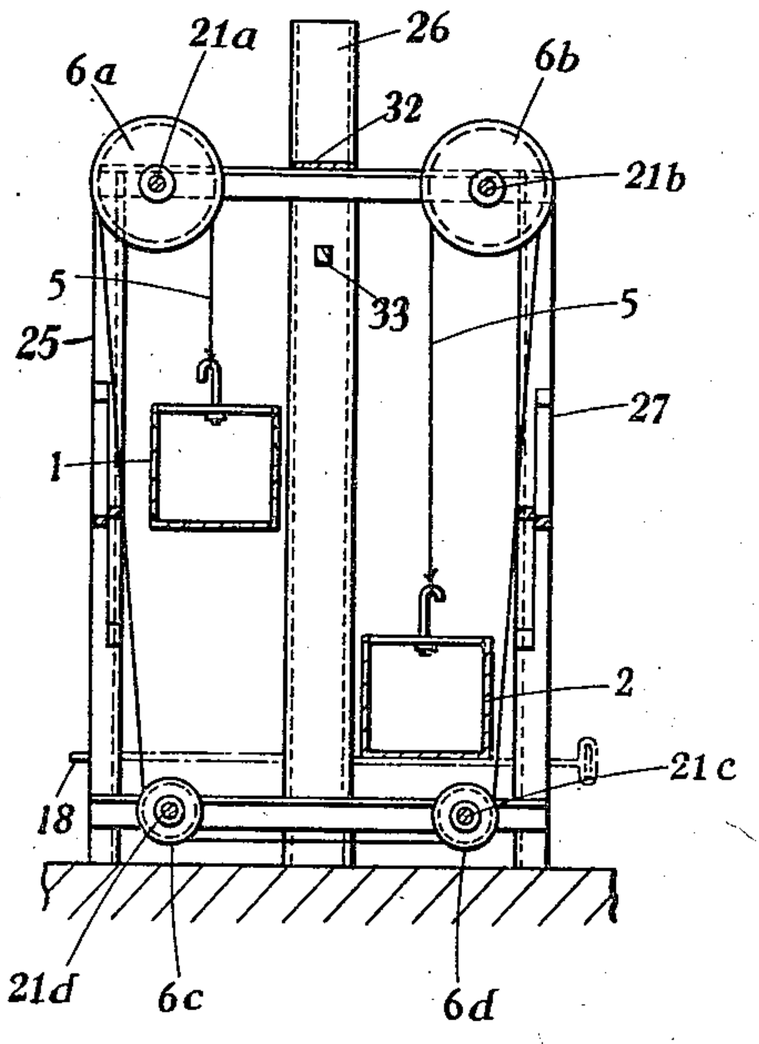



*Fig. 4.*

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# UNITED STATES PATENT OFFICE

2,184,226

## ORE AND LIKE CONCENTRATOR

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Application September 6, 1938, Serial No. 228,699

9 Claims. (Cl. 209—489)

This invention relates to ore and like concentrators of the kind in which the ore is concentrated by gravity separation with the aid of a stream of water which carries away the gangue, leaving the concentrate behind.

An important object of the invention is to provide an improved concentrator that will concentrate low grade iron ore, or other material in which the concentrate predominates in volume, efficiently and wholly automatically and that is cheap to make and operate.

A further object of the invention is to make use of the ore itself to effect the alternate operation of a plurality of sluice boxes, and to control the means for supplying the ore to the boxes.

Another object of the invention is to provide means for automatically flushing ore out of each sluice box when it becomes full.

Other objects of the invention will appear hereinafter.

In my invention I make use of two or more sluice boxes to which the ore or the like is admitted in succession. The essential feature on which my invention is based is that the initiation of the discharge of one box and the charging of another is effected by the weight of the concentrate in the box to be discharged.

By the term "sluice box" I mean any container in which gravity concentration with the aid of a stream of water can take place, whether that container has one or more than one channel for the ore or the like material; thus, although I prefer to use an open two-walled trough, I intend the term "sluice box" to include both a box divided into two or more channels by longitudinal partitions and a number of two-walled containers arranged side by side and arranged to rock together.

In order to give those skilled in the art a clear understanding of my invention, I will now describe the preferred embodiment of it with reference to the accompanying drawings, in which

Figure 1 is a side elevation of the concentrator;

Figure 2 a plan thereof; and

Figures 3 and 4 are sections on the lines III—III and IV—IV respectively in Figure 1.

The concentrator comprises two sluice boxes 1 and 2 mounted to rock about a rod 3 carried in bearings 20 on pedestals 4. The sluice boxes are interconnected close to their lower ends, which are open, by a wire rope 5 which passes over pulleys 6*a*, 6*b*, 6*c* and 6*d* carried respectively on shafts 21*a*, 21*b*, 21*c* and 21*d* rotatably mounted in a frame composed of uprights 22, 23, 24, 25, 26 and 27, transverse members 28, 29, 30 and 31, and longitudinal horizontal members 32 and 33. The wire rope 5 ensures that when one box rocks in one direction the other is rocked in the other direction. The boxes rock between two extreme positions, namely charging and discharging positions, and in the drawings the box 1 is shown in the charging and the box 2 in the discharging position. The charging position is also the concentrating position and in it the box is inclined at a small angle to the horizontal. The boxes are prevented from rocking below the discharging position by a stop bar 18, which passes through the uprights 22, 23 and 24.

The ore to be concentrated arrives mixed with water in slurry-like form through a pipe 7 and is delivered through a rocking feed box 8 to the two sluice boxes alternately. The feed box 8 has on its underside two lugs 34 and 35 each formed with an opening, and a shaft 36 passes through the two openings and is fixed in the lugs. This shaft is carried in a bearing 37 fixed to the top of an upright 38. The feed box 8 is formed with two discharge openings 39 and 40 and in the position shown in the drawings ore entering through the pipe 7 is discharged through the opening 40 into the sluice box 1. The ore flows along the sluice box and gravity concentration takes place in the sluice box, the water carrying the gangue with it and running out from the open end of the box into a discharge launder 9, while the concentrate remains in the box. When the amount of concentrate in the box on the lower side of the pivot is enough to overcome the friction at the pivots and pulleys the box 1 rocks downwards into the discharging position and lifts the box 2 into the charging and concentrating position. This movement effects reversal of the feed box 8, as a projection 41 on the upper end of the box 2 comes into contact with the underside of the feed box 8 and rocks the latter about its axis. Thus the incoming ore is now fed into the box 2. At the same time water is supplied to the box 1 to flush the concentrate out of it.

The flushing water comes from a pipe 10 from which two pipes 11 and 12 containing valves 13 and 14 run to points above the ends of the sluice boxes. The valves are connected by cranks 15 and connecting rods 16 to the ends of the sluice boxes, so that each time the boxes rock the valves are opened or shut as the case may be. In the position illustrated the valve 13 in the pipe 11 is shut, and the valve 14 in the pipe 12 is open so that water is being supplied to the sluice box 2 to flush the concentrate out of it.

The concentrate is flushed into a launder 17

placed below, and nearer to the pivots of the sluice boxes than, the launder 9.

When the box 2 contains enough concentrate it rocks downwards with the result that the box 1 rocks upwards and a projection 42 on the box 1 strikes the underside of the rocking feed box 8 and rocks it. Thus the process proceeds indefinitely first in one box and then in the other so long as ore is supplied the pipe 7.

If it is found that the boxes tend to change over too quickly on account of inadequate frictional resistance at the pivots and pulleys, a trigger or latch may be arranged to engage each box in the charging position, so that the resistance of this must be overcome before the boxes can change over.

I claim:

1. A concentrator of the character herein set forth comprising a plurality of sluice boxes pivotally mounted near adjacent feed ends and to which the ore is admitted in succession, flexible means connecting and supporting the opposite adjacent ends of said boxes in substantially counterbalanced relation, and means to initiate the discharge of one box, and means to wash the concentrate from one box, and means to feed ore to another box, said last two means being controlled by movement of the boxes by the weight of the concentrate.

2. A concentrator of the character herein set forth comprising two sluice boxes, horizontal axes adjacent the feed ends about which said boxes rock, means for admitting ore into the boxes alternately whereby each box rocks into a discharging position under the weight of the concentrate in it and raise the other box to charging position, and flexible means connecting and supporting said boxes to permit the rocking of one box downwardly and the other box upwardly into a charging and concentrating position.

3. A concentrator of the character herein set forth comprising two sluice boxes, horizontal axes near the feed end about which said boxes rock, a flexible connection between and supporting the opposite ends of said boxes whereby as each box rocks downwardly into a discharging position under the weight of the concentrate in it swings the other box automatically upwards into a charging and concentrating position, and a feed device controlled by movement of the boxes adapted to feed the ore to the two sluice boxes alternately by the rocking of the boxes.

4. A concentrator according to claim 1, including a source of water supply whereby the concentrate is flushed out of the sluice boxes by a stream of water, the flow of which is controlled by the movement of the full sluice box under the influence of the weight of the concentrate in it.

5. A concentrate according to claim 3, including a source of water supply, and means connected with the boxes whereby the boxes in rocking serve both to move said feed device to supply ore to the box in the charging and concentrating position and to control the flow of water into the box in the discharging position to flush the concentrate out of that box.

6. A concentrator according to claim 3, in which the feed device is in the form of a feed box rockable about an axis transverse to the rocking axes of the sluice boxes.

7. A concentrator of the character herein described comprising two sluice boxes arranged side by side to which the ore is admitted in succession, a horizontal axis near adjacent feed ends of said boxes about which said sluice boxes are arranged to rock under the weight of the concentrate, flexible connecting means interconnecting the boxes adjacent the opposite ends so as to normally maintain them in balanced relationship with respect to each other whereby as one is in raised position to be charged the other is in lowered position to discharge, means including a valve for feeding the concentrate to said sluice boxes, and means connecting the valve and boxes for determining the flow of said concentrate to a particular sluice box depending upon its relative position.

8. A concentrator according to claim 7, including a source of water supply, and means for directing the water to the box which is in lowered position.

9. A concentrator according to claim 7, including means for delivering water to the sluice box only when in lowered position, and means connecting the sluice boxes with the supply of concentrate and the source of water supply for controlling the feed of the concentrate and the water to the boxes.

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