

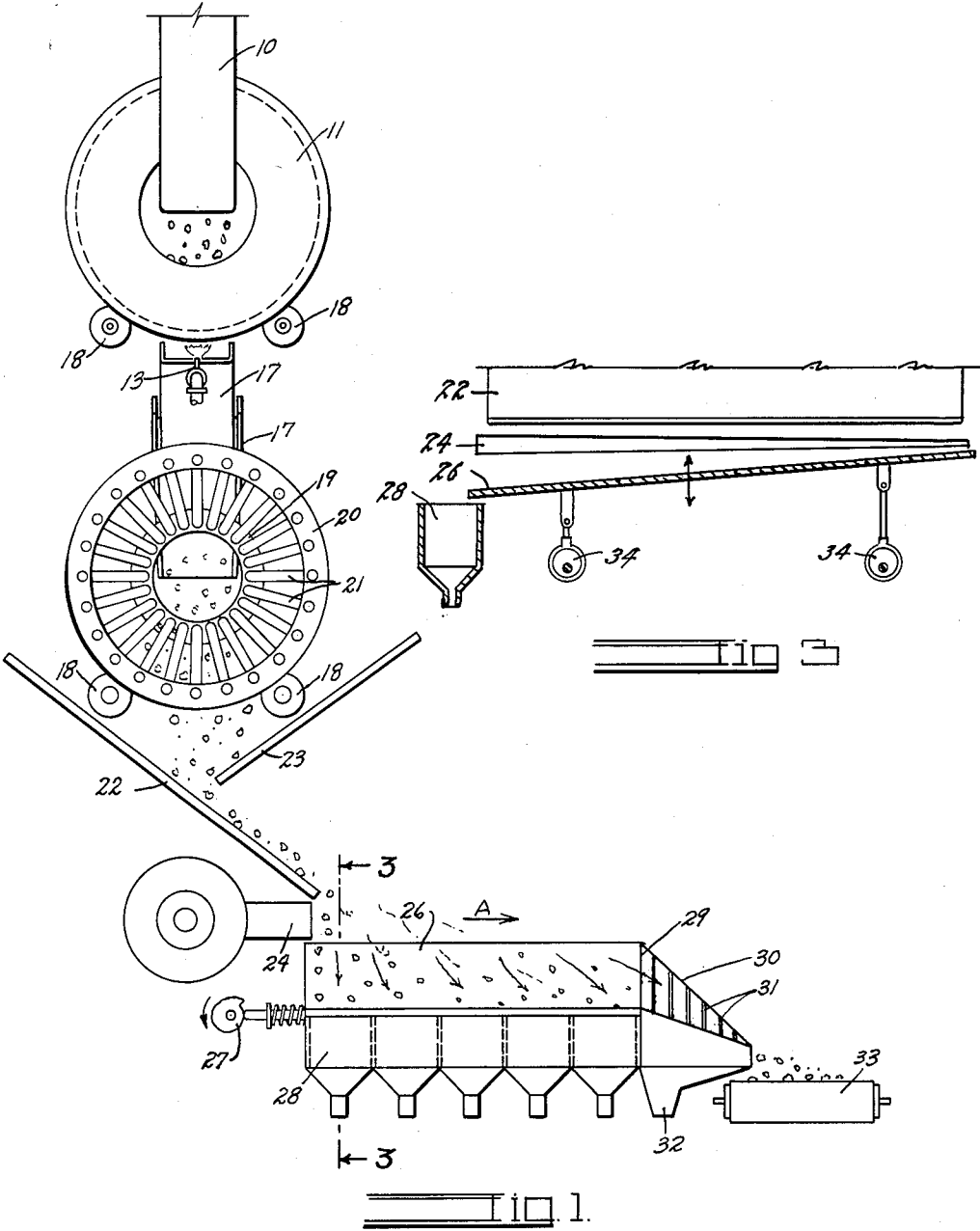
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H. BROWN ET AL
MINERAL CONCENTRATORS

2,717,692

Filed June 30, 1952

2 Sheets-Sheet 1



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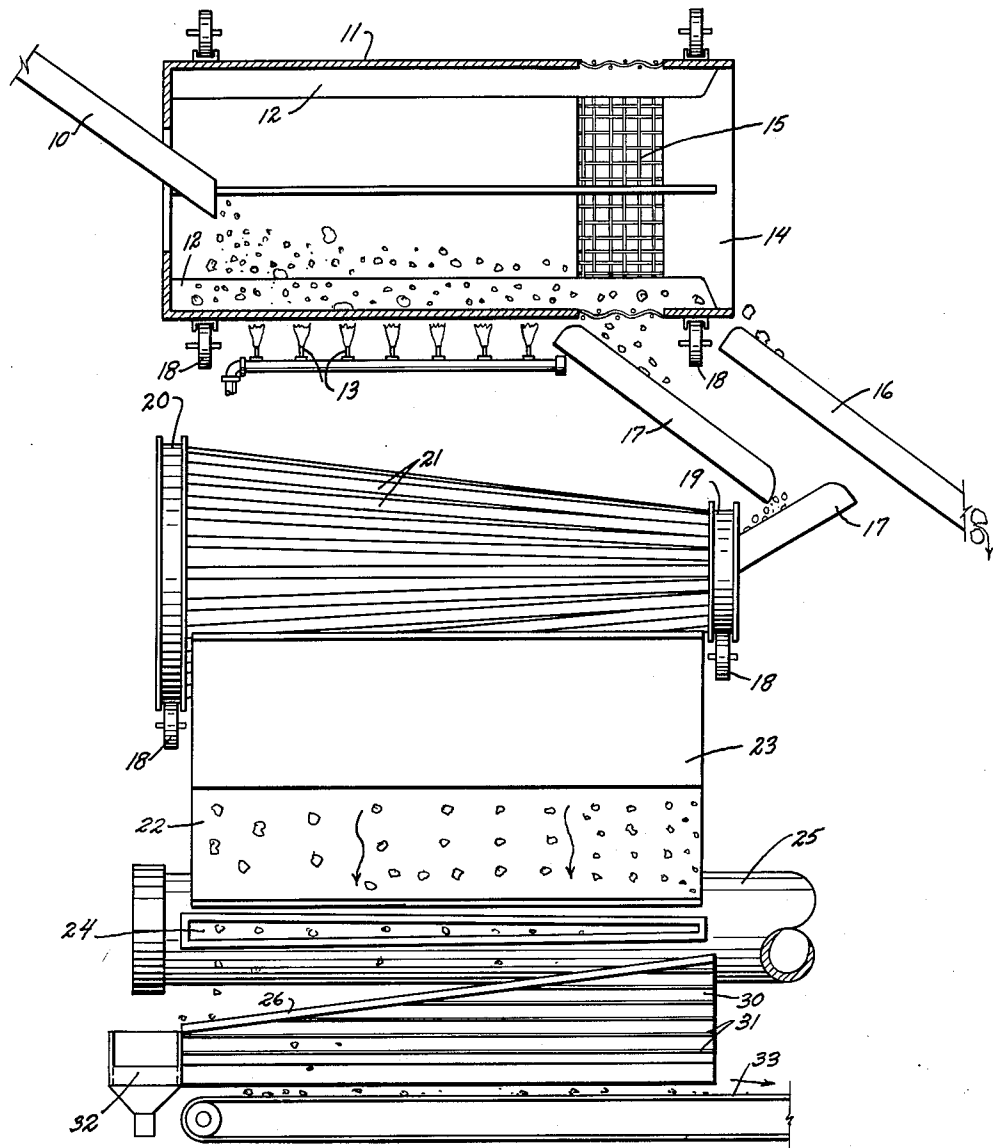


FIG. 2

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MINERAL CONCENTRATORS

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4 Claims. (Cl. 209—19)

This invention relates to a process and means for recovering mineral values from ore. Many values are present in mineralized areas, the recovery of which has been impractical due to a lack of water in the area and to the expense involved in hauling the ore to a mill accessible to water.

The principal object of this invention is to provide a highly efficient process and means whereby the mineral values may be commercially separated from sands or crushed ore by the use of flowing air and without the use of water.

Other objects and advantages reside in the detail construction of the invention, which is designed for simplicity, economy, and efficiency. These will become more apparent from the following description.

In the following detailed description of the invention, reference is had to the accompanying drawing which forms a part hereof. Like numerals refer to like parts in all views of the drawings and throughout the description.

In the drawings:

Fig. 1 is a side diagrammatic view or flow sheet, illustrating the steps and elements of the improved process;

Fig. 2 is a similar front diagrammatic view thereof; and

Fig. 3 is a longitudinal section of a concentrating table used in the improved process, taken on the line 3—3, Fig. 1.

The improved process can best be described by following through a typical batch of mineralized ore. While the process will be described as being used on crushed rock containing ore values, it will operate similarly on value-bearing sands and earths.

The ore is crushed to a predetermined mesh, depending upon the amount of crushing necessary to free a commercial amount of the ore values therefrom. For descriptive purposes, let us assume the ore has been crushed to "X" mesh.

The crushed ore is fed from a feed chute 10 into a revolving conditioning and drying drum 11 provided with suitable internal lifting vanes 12 and with any suitable heating means such as gas burners 13. The lifting vanes continuously lift and drop the contained ore in the heated atmosphere of the drum to loosen the values therefrom and to increase the pulverization thereof and to expose each particle to the heat so as to bring the latter to a perfectly dry powdered, air-floatable condition.

The ore gradually travels through the conditioning drum toward an open discharge extremity 14. The wall of the drum 11 adjacent the discharge extremity 14 is provided with an open mesh screen 15, or with corresponding perforations, having an "X" mesh. All oversize ore pieces travel across the screen 15 and discharge from the open extremity 14 into an oversize return chute 16 from which the oversized pieces will be returned for regrounding.

The proper mesh particles fall through the screen 15 into delivery chutes 17, which deliver the particles into a conical, revolving, classifying barrel mounted on suitable rollers 18. The classifying barrel classifies and delivers the particles in accordance with their respective sizes

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or meshes. The classifying barrel comprises a small-diameter terminal ring 19 and a large-diameter terminal ring 20. A plurality of straight, elongated rods 21 extend between the rings 19 and 20 adjacent the peripheries of the latter in uniform, spaced relation. The difference in circumference of the two rings 19 and 20, combined with the uniform spacing of the rods, causes the rods to gradually and uniformly separate from each other as the larger ring 20 is approached. This provides a universally variable screen extending from an infinitely small mesh adjacent the ring 19 to the "X" mesh adjacent the ring 20.

The ore particles are fed into the small-diameter extremity of the classifying barrel and, due to the rotation of the barrel, will drop from rod to rod as they travel toward the larger-diameter extremity. The instant each particle reaches a longitudinal position in the barrel corresponding to the mesh of that particle, the latter will drop through between the rods onto an inclined plate 22 and deflecting board 23. This arrangement results in dropping the particles throughout the length of the plate 22 in exact proportion to the particle size, that is, the smallest particle will fall to the plate at the right extremity of Fig. 2, and the largest particles will fall to the plate 22 at the left extremity thereof.

The particles will roll or slide from the plate 22 and drop in a vertical, curtain-like sheet before a proportionally tapered, elongated, air blast port 24. The air blast port receives a moving volume of air from a suitable air conduit 25 from a suitable fan or blower (not shown). The air blast port extends horizontally of the falling air curtain in uniform spaced relation thereto.

The vertical width of the elongated opening in the air port 25 is directly proportioned to the sizes of the particles falling from the plate 22 and the port is so positioned that the narrower air discharge is positioned at the small particle extremity and the wide air discharge is positioned at the large particle extremity.

The particles fall upon an inclined concentrating table 26, which is vibrated by means of any suitable vibrating mechanism, such as diagrammatically indicated by the eccentric 27. The vibration of the table causes the lighter particles to travel across the table in the direction of the arrow "A" in Fig. 1. The heavier particles will gradually move down the incline of the table 26 and discharge over the lowermost extremity thereof into suitable receiving hoppers 28. Naturally, the heaviest particles will travel the shortest distance in the direction of the arrow "A," and will be deposited in the left-hand hopper 28 of Fig. 1. The lightest values will travel the greatest distance across the table in the direction of the arrow "A" and reach the right-hand hopper 28.

Therefore, the values in the hoppers will be classified according to weight throughout the width of the table. The waste material discharges over the discharge edge of the table 26, indicated at 29, onto an inclined apron 30 provided with longitudinally extending, spaced-apart riffles 31. The riffles 31 catch any of the heavier values which may escape from the table 26, and direct these values longitudinally of the table to a receiving hopper 32, wherein the most valuable part of the waste material is collected.

The worthless gangue falls from the apron 30 onto a waste conveyor 33, to be carried to the dump.

The feature of principal value in the improved method and means is the exact proportioning of the particles along and above an exactly proportioned air orifice, so that the smallest particles will be subjected to the least air, and so that the largest particles will be subjected to the most air, the proportion being so arranged that the heaviest values in the smaller particles will be carried substantially the same distance from the air orifice as the heaviest particles in the largest-mesh material.

The efficiency of the recovery is greatly increased by applying vertical vibrating devices 34 to the table 26 to impart a vertical bouncing or vibration to the table which will throw the lighter particles into the air blast for classification and discharge.

While a specific form of the improvement has been described and illustrated herein, it is to be understood that the same may be varied, within the scope of the appended claims, without departing from the spirit of the invention.

Having thus described the invention, what is claimed 10 and desired secured by Letters Patent is:

1. Means for recovering metallic values from ore comprising: a rotary screening barrel of smaller diameter at its feed extremity than at the other extremity; a plurality of straight, spaced-apart rods forming the wall of said barrel, said rods being spaced closer together at said feed extremity than at said other extremity; means feeding ore into the feed extremity of said barrel; an inclined plate below said barrel receiving the ore particles falling between said rods and causing said particles to fall over its lower edge in a vertical curtain-like layer of particles uniformly varying in size in accordance with the spacing of said rods; an air orifice positioned to one side of the vertical plane of said lower edge and extending spaced from and horizontally across the entire width of said curtain-like layer; and means for supplying air to said orifice.

2. Means for recovering metallic values from ore as described in claim 1 in which the vertical width of the opening of said orifice increases in width across said curtain-like layer in proportion to the increase of particle size in the latter.

3. Means for recovering metallic values from ore as described in claim 2 having a table positioned below said orifice to receive the ore falling through said air blast; and means for vibrating said table to cause said particles to travel to and fall from one edge thereof.

4. An apparatus for recovering and grading metallic values from crushed ore comprising a horizontally disposed rotary drum having an inlet at one end and at its

other end being open for discharge of oversized ore from the drum, a portion of the wall of the drum near the open end thereof constituting screening for discharge of ore particles of predetermined size from the drum inwardly of the open end of the drum, a heater for said drum, a horizontally disposed classifying barrel rotatably mounted and consisting of end rings and straight rods extending between the rings longitudinally of the barrel, one ring being smaller than the other and the rods extending therefrom in gradually transversely spaced relation to each other towards the larger ring for passage of ore particles between them according to size, means for delivering ore particles passing from drum through the screening thereof into the barrel through the smaller ring thereof, a plate under said barrel disposed at a transverse incline and extending approximately the full length of the barrel, air blast means having an elongated nozzle under said plate and having an outlet presented towards the lower edge of the plate and gradually increasing in dimensions from one end of the plate towards the other end thereof, a table for receiving ore particles from the lower side edge of said plate elongated away from said nozzle and disposed at a downward incline in the direction in which the outlet of the nozzle increases in size, and a series of receptacles disposed in side by side relation to each other along the lower edge of said table and open at upper ends.

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