Sept 17, 1957 A. C. PUTNAM 2,806,601

DRY ORE CONCENTRATING DEVICES AND METHODS

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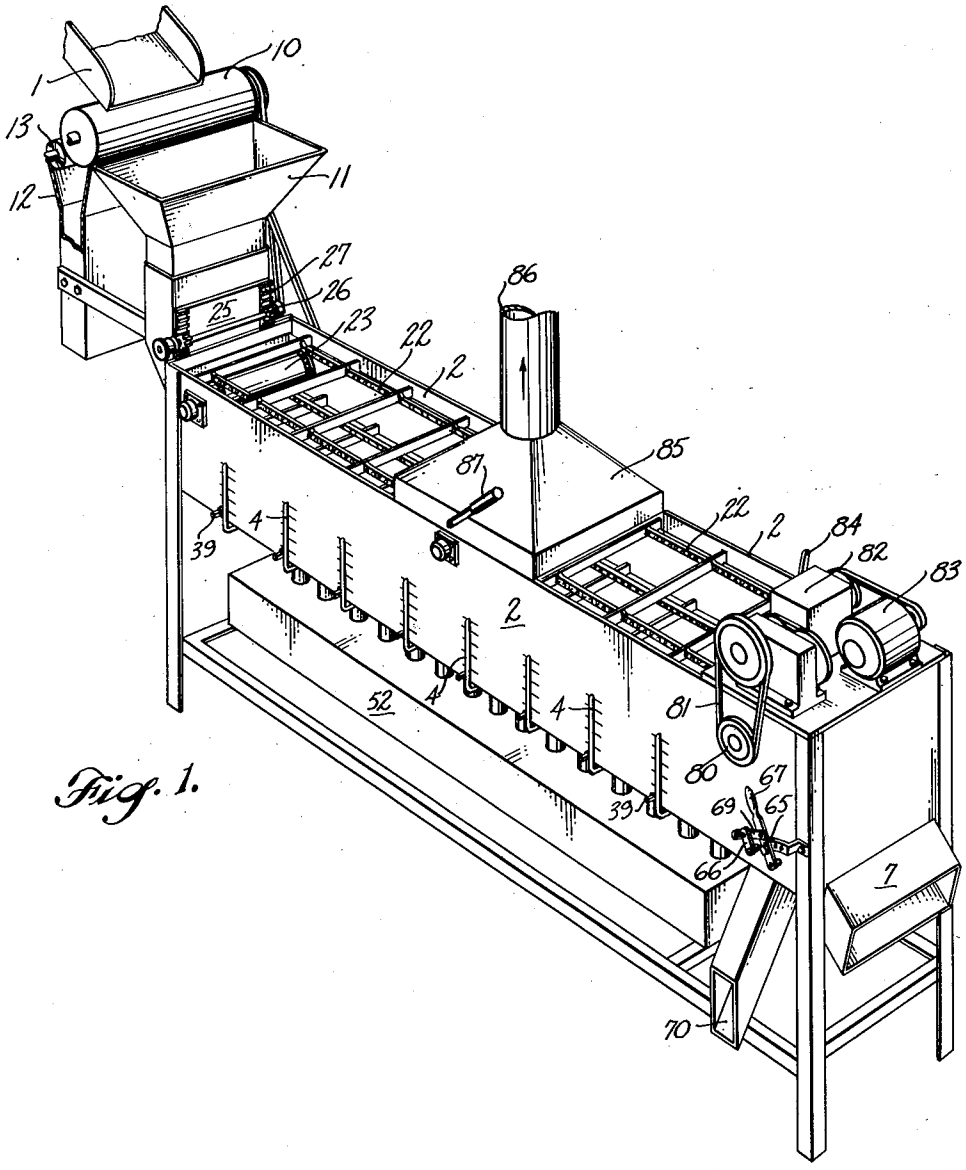


Fig. 1.

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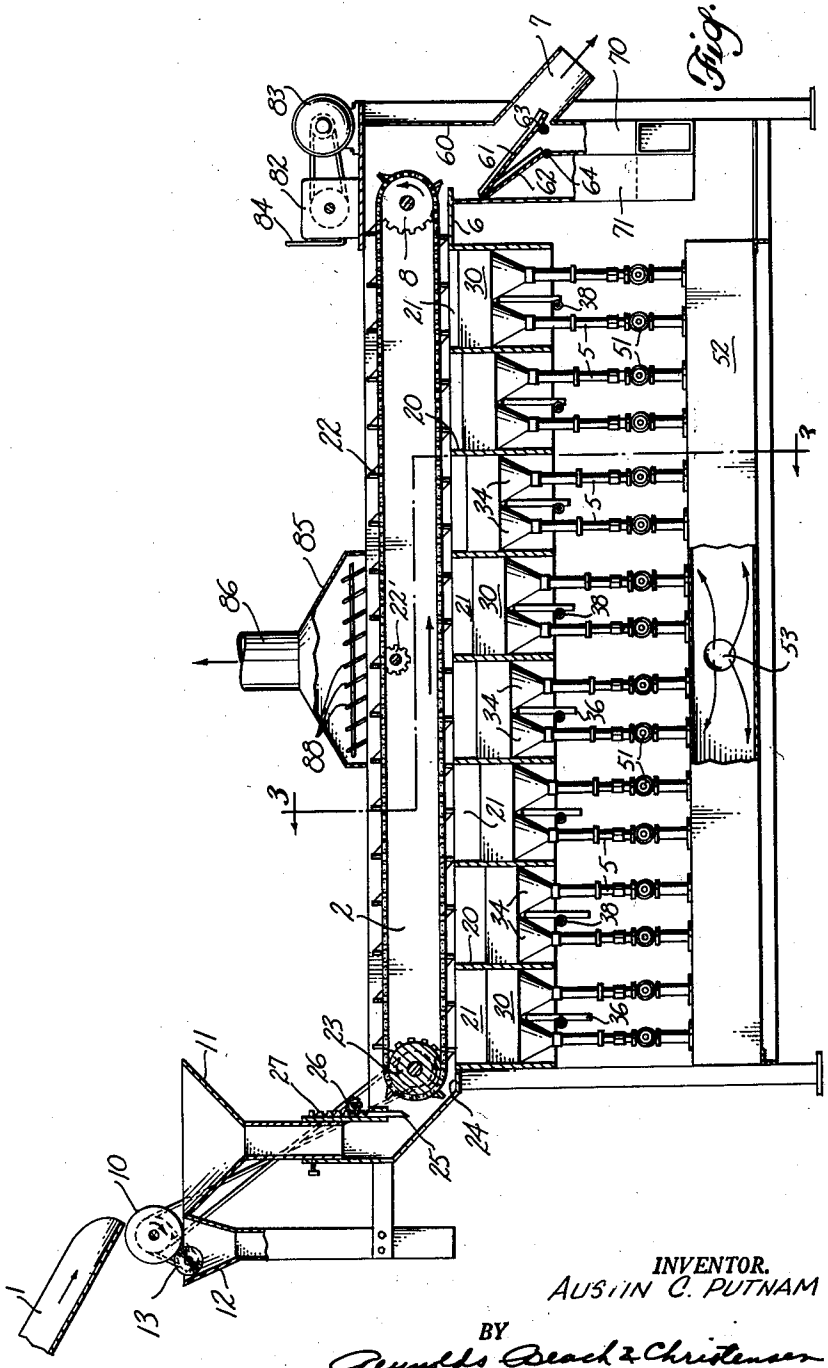
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DRY ORE CONCENTRATING DEVICES AND METHODS

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Fig. 2.



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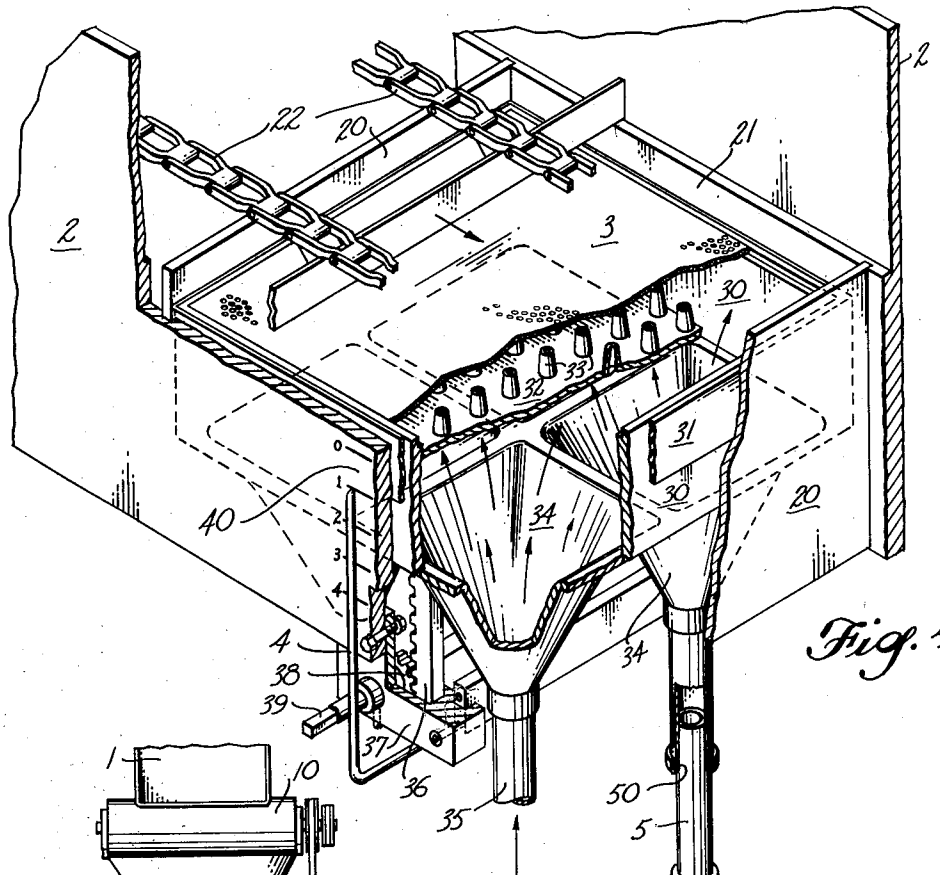


Fig. 4.

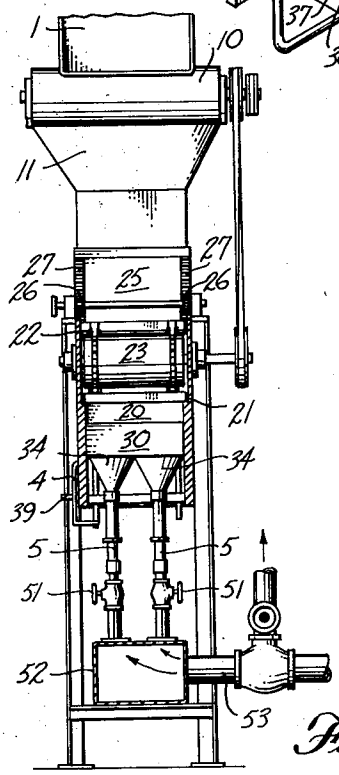


Fig. 3.

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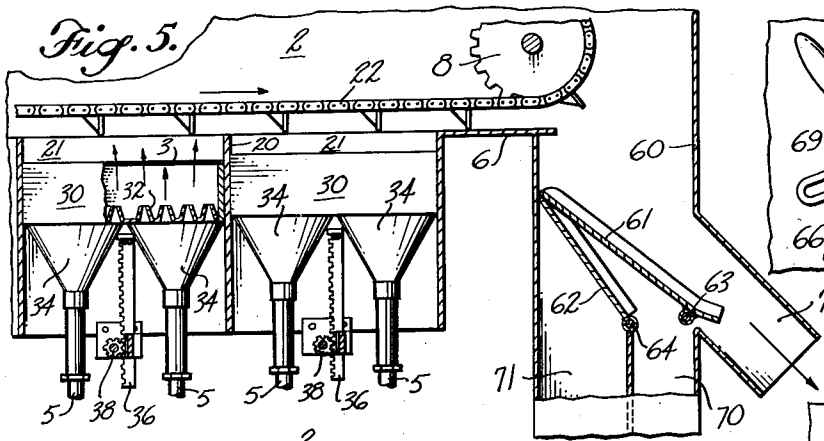
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Fig. 5.



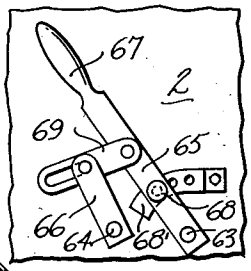
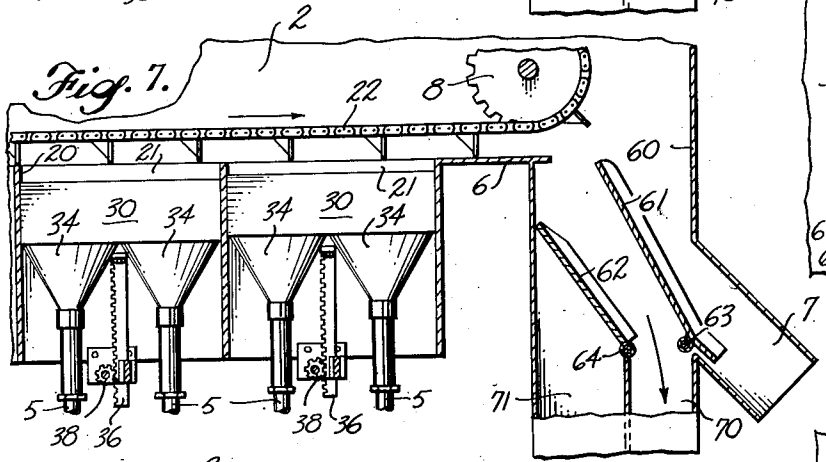


Fig. 6.

Fig. 7.



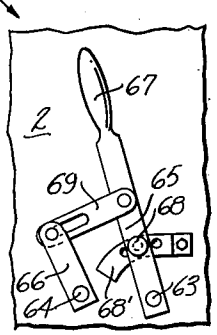
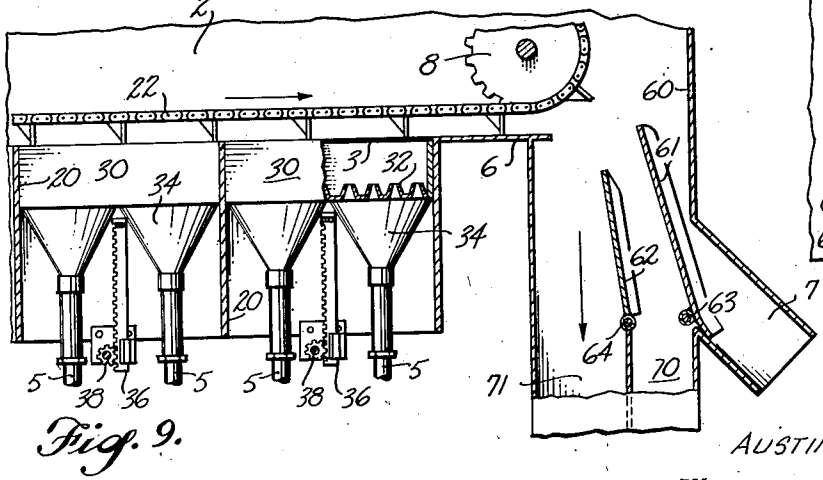


Fig. 8.

Fig. 9.



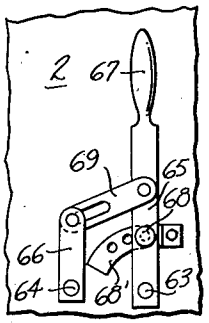


Fig. 10.

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2,806,601

DRY ORE CONCENTRATING DEVICES AND METHODS

Austin C. Putnam, Redmond, Wash., assignor, by mesne assignments, to Robert W. Beach, Seattle, Wash.

Application November 18, 1952, Serial No. 321,202

13 Claims. (Cl. 209—474)

The concentration of mineral ore to which the present invention pertains heretofore has been effected either by some type of wet process in which the ore, finely ground, is mixed with or carried by a liquid, or by a dry process in which separation of minerals from gangue has been accomplished principally by the action of gravity acting on particles of different specific gravity during agitation. In the present dry concentrating process such gravitational separation is assisted by air agitation rather than mechanical shaking, or at least in addition to mechanical shaking, and the process and apparatus for performing it are particularly concerned with preserving segregation of the values and the gangue after this has been achieved.

A particular object of the present mechanism and process is to accumulate effectively values separated from the gangue without interrupting the segregating operation until a substantial quantity of values has been collected and then to enable such accumulated values to be recovered quickly and easily.

Another object is to provide mechanism which can not only separate values from gangue, but which can segregate the values themselves into those bearing heavier metals and those bearing lighter metals.

Still a further object is to design a machine which can handle small quantities of ore, or which can be expanded easily to handle much larger quantities.

An object is to provide a machine for practicing a dry ore concentrating process which can be regulated accurately depending upon the type and quantity of values in the ore.

In the operation of such a machine it is an object to minimize the number of workmen and the amount of labor required.

An incidental object is to remove ore rich in magnetic iron, and iron objects, before the ore is passed through the concentrating machine.

For accomplishing the foregoing objects the concentrating machine includes pockets variable in effective depth to receive values from crushed ore raked across or otherwise conveyed over the pockets. The ore immediately above such pockets is kept agitated by the action of gentle currents of air passing upward through the pockets to promote segregation of the values and gangue and induce the values to settle into the pockets. The intensity of the air currents will be selected in accordance with the specific gravity of the ore, and the difference in specific gravity between the values and the gangue.

When the pockets have been filled the desired amount, the supply of ore may be interrupted, the depth of the pockets reduced and the values expelled from them raked into a concentrate receiver.

Additional advantages of the method of this invention and the preferred apparatus for performing it disclosed in the drawings will be understood from the following detailed description.

Figure 1 is a top perspective view of the ore-concentrating device with parts broken away.

Figure 2 is a longitudinal sectional view through the concentrating device.

Figure 3 is a transverse sectional view through the concentrating mechanism taken on line 3—3 of Figure 2.

Figure 4 is a top perspective view of a fragmentary portion of the ore concentrating mechanism on an enlarged scale with parts broken away to reveal internal structure.

Figure 5 is a longitudinal sectional view through a portion of the discharge end of the concentrating device, showing parts in one adjusted position, and Figure 6 is a fragmentary side elevation view of control mechanism with parts in corresponding position. Figure 7 is a longitudinal sectional view through the discharge end of the device comparable to Figure 5, but showing parts in a different adjusted position, and Figure 8 is a fragmentary side elevation view corresponding to Figure 6 with parts in adjusted position corresponding to those of Figure 7. Figure 9 is a longitudinal sectional view through the discharge end of the concentrating mechanism corresponding to Figures 5 and 7, but showing the parts in still a different position, and Figure 10 is a fragmentary side elevation view corresponding to Figures 6 and 8 but showing the parts in a different adjusted position corresponding to Figure 9.

In the dressing of ore the ore is first crushed finely and then is concentrated either by a wet process or by a dry process. As mentioned above, the present method employs a dry concentrating operation. The crushed ore is fed into the concentrator through a chute **1** shown in Figures 1 and 2 and drops onto a magnetized roller **10** which is turned slowly in a direction such that the surface contacted by the ore moves in the same direction as the ore. Highly concentrated iron ore and other iron objects will be attracted by the roller and adhere to its periphery, so that they are withdrawn from the flow of ore into the concentrator feed hopper **11** and are carried by the underside of the roll into a position above a magnetic material collecting hopper **12** arranged alongside the hopper **11**. A rotary brush **13**, arranged so that its bristles sweep the periphery of roller **10** and turning so that its line of contact moves oppositely to the portion of the roller **10** which it engages, will brush the magnetically attractable iron concentrate and other iron articles from the periphery of roll **10** to fall into the hopper **12** for collection separately from the rest of the ore.

The concentrator proper is in the form of a long trough **2** which is divided by partitions **20** extending crosswise of the trough length into a row of pockets extending in the direction of movement of the ore. The number of pockets in such row will depend upon the accuracy with which it is desired to segregate the values and the gangue, the difference in specific gravity between the values and the gangue, and the different types of metals included in the values and their difference in specific gravity. The greater the difference in specific gravity, the shorter may be the trough **2** and the fewer may be the pockets.

The ore in crushed form is conveyed through the trough **2** from the feed hopper **11** over the pockets **21** formed by the partitions **20** to the discharge end of the machine. While such ore conveying may be accomplished in different ways, such as by inclining the trough and agitating it, it is preferred that the ore simply be raked along this path by the flights of a scraper conveyor **22**. This conveyor will drag the ore slowly, and the depth of ore thus moved may be regulated by supporting the conveyor on a cylindrical sprocket drum **23** at the feed end. This drum is spaced above a plate **24** beneath it by a distance substantially equal to the vertical width of the conveyor flights. Into the space between the drum **23** and plate **24** ore is supplied from the hopper **11**, and the gate **25** assists in regulating the quantity of ore fed. The

position of this gate may be adjusted by pinions 26 meshing with racks 27 along opposite sides of gate 25, as shown in Figure 1. The gate may be closed to interrupt the supply of ore.

The pockets 21 are adjustable in effective depth by movement of the plate 3 forming the bottom of each pocket vertically between the partitions 20. The bottom plate of each pocket is movable independently of the bottom plates of all other pockets by mounting each such plate on a separate vertically adjustable support. Moreover, each pocket bottom plate 3 is foraminous for emission of a gentle current of air which breaths through the crushed ore above the pocket bottom to agitate it and induce gravitational separation of the particles of different specific gravity by the tendency of the air to suspend such particles a greater or lesser amount.

The supporting mechanism for the foraminous bottom plate 3 of each pocket 21 includes walls 30, shown best in Figure 4, enclosing an air supply chamber for example approximately square in cross section. Between the walls 30 and the pocket-forming partitions 20 may be interposed strips 31 of gasket material, such as felt, rubber or the like, preferably secured to the air chamber walls 30. These gasket strips effect a sliding fit of the air chamber within the pockets so that no ore can drop between the air pocket walls 30 and the partitions 20 and sides of trough 2, and air cannot escape downward instead of flowing up through the ore particles.

The apertures in the foraminous pocket bottom plate 3, forming the top of the air supply chamber, are sufficiently small as to prevent values, except mercury, or flour particles, such as gold, from falling through the plate into the air chamber. This plate may be of heavy screen or a perforate sheet. Screens of various mesh or plates having perforations of different size may be used from time to time depending on the particle size of the material being separated. Air is supplied to the air chamber beneath plate 3 through its bottom, which preferably is formed as a nozzle plate 32 from which air nozzles 33 project upward. Any values falling through the foraminous plate 3 will accumulate between the nozzles on the plate. The air flowing from the nozzles would prevent any dust or mercury from falling into them. The plate 3 can be removed from time to time to enable any values which have passed through it and collected on plate 32 to be cleaned out and recovered.

To provide uniform emanation of air over the entire area of plate 3, it is important that the flow of air through the various nozzles 33 on plate 32 be equalized as far as possible. Air may be supplied to them from flared transition ducts 34 opening immediately beneath the nozzle plate and supplied with air by pipes 35. Greater equalization of flow through nozzles 33 is achieved by providing several air supply ducts of this type instead of delivering all the air through a single large duct, in which event the velocity of the air at the center of the duct might be substantially greater than the velocity of the air along the sides.

In order to enable the pocket bottom plate 3 to be moved up and down for varying the effective depth of the pocket 21, the entire plate supporting assembly is vertically slidable within the walls of the pocket. Such mechanism is supported from the trough 2 by rack bars 36 slidably received in brackets 37 and meshing with pinions 38 carried by shafts 39. This shaft extends completely across the trough and carries a pinion 38 adjacent to each end so as to coordinate the vertical movement of racks 36 effected by rotation of pinions 38 by turning shaft 39. One end of this shaft may be of square or other noncircular shape to fit a wrench or crank for turning the shaft.

A rod 4 may be carried by the lower end of each rack 38 and extend laterally from it beyond the adjacent side of the trough 2, and then upwardly alongside such trough. The upper end of this rod will be moved vertically over a scale, indicating the position of the pocket bottom plate 3 relative to the top of the pocket defined by the upper edges of partitions 20 and the lower edges of conveyor flights of conveyor 22. Conveniently scale 40 may be graduated in inches and its numbers will increase downwardly as shown in Figure 4, so that the position of the upper end of rod 4 relative to such scale will designate the effective depth of the pocket in inches.

To accommodate the vertical movement of the air supply pipes 35 with the pocket bottom plate supporting mechanism a duct connection to each pipe 35 which is variable in length is provided. Such connection may incorporate a pipe 5 arranged telescopically relative to pipe 35 such as by being received slidably within it as illustrated in Figure 4. The slip joint between each pipe 5 and 35 is sealed by a suitable gasket 50. The supply of air to the several pipes 35 for each air chamber may be regulated in intensity both to equalize the flow of air through these pipes and to vary the composite air flow by the provision of a regulating valve 51 in each pipe 5. All of the air supply pipes may be fed from a single header 52, and the valves 51 controlling the flow through the pipes supplying air to one pocket may be regulated to feed a quantity of air different from that supplied to another or other pockets. The header 52 may receive air from a single source through a pipe 53.

Crushed ore scraped by the conveyor 22 to the discharge end of trough 2 may be dumped through any selected one of several discharge chutes by provision of the mechanism illustrated in Figures 5 to 10, inclusive. The ore is scraped across a plate 6 into a vertical shaft 60, from which it may be diverted into one of several discharge chutes, three being provided in the present mechanism. Diversion of the ore is effected by one or the other of the deflecting plates 61 and 62 carried by and swingable with pivot rods 63 and 64, respectively. The ends of these shafts project through the walls of the vertically disposed material discharge shaft 60, and the shaft ends thus projecting through the wall have secured to them arms 65 and 66, respectively, shown in Figure 6 and Figure 1, for example.

One of the discharge chutes 7 projects from the side of the vertical material discharge shaft 60 remote from the accumulating pockets 21 and extends generally in line with deflector plate 61, when it is in the position shown in Figure 5. Arm 65, controlling the position of this plate through its shaft 63, has on it a handle 67 by which the arm 65 may be moved from the position shown in Figure 6 to that of Figure 8. The handle and arm may be held in either of these positions by a spring-pressed latch pin 68 or detent engaging in apertures or depressions formed in the latch bar 68'.

The effect of swinging the deflecting plate 61 from the position of Figure 5 to that of Figure 7 is to open a passageway between deflecting plates 61 and 62 so that the material raked by the flights of conveyor 22 off the plate 6 will drop between these deflecting plates onto plate 62 instead of dropping onto plate 61 as previously. The material sliding down plate 62 will thus pass on down the portion of material discharge shaft 60 remote from accumulating pockets 21 into a second discharge chute 70 rather than being discharged through chute 7.

If handle 67 is swung from the position shown in Figure 8 to that of Figure 10, the deflecting plate 60 will be swung still farther toward vertical position as shown in Figure 9. At the same time the other deflecting plate 62, which was not moved by swinging handle 67 from the position of Figure 6 to that of Figure 8, will also be swung toward vertical by this same handle movement. To accomplish this operation arm 66 is connected to arm 65 by a lost motion slotted connecting link 69 which does not engage arm 66 to swing it when the handle 67 is moved only between the positions of Figures 6 and 8. When the handle reaches the position of Figure 8 in being

swung in the direction of the arrow, however, the lost motion between link 69 and arm 66 has been taken up so that, when handle 67 is moved farther toward the right, arm 66, and consequently plate 62, will be swung conjointly with handle 67, arm 65 and plate 61.

When the handle 67 has been swung into the position of Figure 10, the arms 65 and 66 and their respective plates 61 and 62 will have been swung into the positions illustrated in Figure 9. With the plates thus arranged material raked by the flights of conveyor 22 over the edge of plate 6 will drop between deflecting plate 61 and a side of the vertical material discharge shaft 60 adjacent to accumulating pockets 21. Such material will therefore not be discharged either from chute 7 or from chute 70, but will be discharged through chute 71 directed to the side of trough 2, as is chute 70, rather than from the end of such trough. Chute 71 is directed to the side of such trough opposite that to which chute 70 is directed, however, so that ample space will be provided for separate receptacles receiving material from each of the chutes 7, 70 and 71.

Where deflecting plate segregating mechanism of the type described in connection with Figures 5 to 10 is utilized, it will be evident that the crushed ore should not be scraped from plate 6 at high velocity, and, indeed, to afford adequate time for reasonably complete segregation of the articles of different weight, the conveyor 22 should not travel very rapidly. Consequently, it is driven by its mounting sprocket 8 turned by pulley 80 through a belt 81 quite slowly. The belt is driven by suitable reduction gearing 82 powered by motor 83, and the reduction ratio between the speed of pulley 80 and motor 83 may be selected by movement of speed regulating lever 84. The upper return stretch of conveyor 22 may be carried by one or more idler sprockets 22'.

Assuming that initially feed regulating gate 25 is closed and the trough 2 is empty, the operation of the ore concentrating machine is begun with all of the accumulating pocket bottom plates 3 disposed in substantially coplanar position slightly below the upper edges of partitions 20. Air valves 51 all having been regulated to supply the desired quantity of air for the particular ore being processed, the air supply blower is started and the driving mechanism for conveyor 22 is energized and set at the desired speed. With the deflecting plates 61 and 62 in the positions shown in Figure 5, the feed gate 25 is next opened to enable crushed ore to drop from the supply hopper 11 into the concentrating trough 2. Because the sprocket teeth do not project much beyond the periphery of cylindrical roll 23, only a rather small gap for passage of ore between the roller and plate 24 is afforded, thus automatically limiting the depth of the ore which can be moved through the trough to a depth approximately equal to the vertical width of the flights on conveyor 22.

As the ore in crushed form is raked into registry with the first pocket at the left of Figure 2, the air passing upward through the foraminous pocket bottom plate 3 will agitate the particles and hold the lighter particles in suspension as the conveyor continues to move, thus carrying such lighter particles forward into the next trough while the heavier particles, depending upon the intensity of the air flow, will drop into the first pocket and be prevented from continuing on through the trough by engagement with a partition wall 20. As this action continues, more and more of the heavier ore particles will accumulate in the first pocket at the left of Figure 2 until such pocket to its regulated depth of, say, one inch has been substantially filled. Under such circumstances the air emitted from plate 3 and breathing upward through the accumulated values cannot accomplish further segregation because the available space for reception of ore particles has been filled and the rest of the ore, irrespective of the relative specific gravity of its various particles, will all be raked by the conveyor 22 along the trough.

Unsegregated ore thus moved on into registry with the second accumulating pocket 21 will be subjected to the flow of air upward through this pocket, and again the lighter particles will be suspended and the entire body of ore in registry with this pocket will be agitated to assist in the segregating action. As previously described, the ore particles which cannot be floated by the air breathing through the body of ore will settle into the pocket below the upper edge of the partition 20 on its discharge side, and the suspended particles of the ore will be carried on down the trough 2 into registry with successive pockets. As this procedure continues, the effective depth of the second pocket also will become filled with heavier particles of the ore containing values, and the same action will occur successively in the other pockets in the direction of movement of the conveyor along the trough.

If it should be desired to separate the values themselves into classifications of different specific gravity, the valves 51 will be regulated so that those of the pipes supplying air to each pocket will supply air at the same velocity through the pipes, but less air will be supplied to a selected pocket as a whole than to each of the pockets on the feed side of such selected pocket. In fact, the air supplied to each succeeding pocket may be somewhat less than the amount of air supplied to each preceding pocket. The result of such air distribution will be that only the heaviest particles of ore will settle into the first pocket, while all the gangue and the lighter values will be carried over into registry with the second pocket. In the second pocket slightly lighter particles of ore will settle out, and the gangue and remaining ore values will be airborne into registry with the third pocket. If the quantity of air supplied to this pocket is still less than that supplied to any preceding pocket, the next fraction of the values will be segregated while the remainder of the ore passes on along the trough 2, and so on.

It will be evident that the accuracy of segregation of the values in accordance with this procedure will depend upon the difference in intensity of the air streams passing through the several pockets, and the accuracy with which such air flow is regulated. Eventually, the gangue will be airborne from a position above one pocket to a position above the next, and so on until it passes onto the plate 6 at the discharge end of the conveyor, from which it will be scraped by the conveyor flights into the vertical shaft 60 and will drop onto deflecting plate 61 and slide through chute 7 for disposal. The concentrator will continue to be operated in this manner until all the pockets have been substantially filled to their adjusted effective depths, as determined by observation of the operator. At that time, beginning with the pocket which is first filled and continuing with other pockets as they are filled, each shaft 39 will be turned in a clockwise direction, as seen in Figure 4, to lower the trough bottom plate 3 and thus increase the effective depth of the pocket. Such pocket depths preferably are increased by small increments, such as approximately an inch, and the amount of such increase can readily be determined by observing the movement of the indicating rod 4 relative to the scale 40 as an index.

The effective depth of the pockets will be increased successively in this fashion until at least one of the pockets has been substantially filled after it has been adjusted to its greatest possible effective depth. Such progressive adjustment promotes uniformity of segregation of the ore because it is probable that the air ascending four inches in the clear would not have the same ore particle flotation effect as if it ascended only one inch after breathing through ore particles accumulated in a pocket. If the air were adjusted to the same intensity in all the pockets, operation of the machine could be continued effectively until all the pockets had been substantially filled to their full effective depth, but if the values themselves are to be segregated into the heavier and lighter fractions in the manner discussed above, continuation of the machine's operation after the pockets receiving ore particles of one

specific gravity had been filled would result in additional particles of such specific gravity being scraped by the conveyor flights over into a pocket intended to receive values only of lighter material. At that time, therefore, operation of the concentrator should be interrupted.

While the ore segregating operation can continue for a considerable period of time in accordance with the process described, such operation is really a batch process. When the pockets 21 are filled to the greatest practical extent as discussed above, the feed gate 25 is closed to shut off further supply of ore to the concentrator. Simultaneously the handle 67 is swung from the position of Figure 6 to that of Figure 8, so that no further gangue is discharged through chute 7, or the receptacle for receiving gangue from such chute is replaced by one for middlings. As the movement of conveyor 22 continues, the ore scraped from plate 6 will be discharged between deflecting plates 61 and 62 and will slide down plate 62 and out through chute 70 if plate 61 has been thus shifted. These middlings will continue to be discharged until all of the ore in the trough 2 above the tops of the partitions 20 has been removed.

At this time lever 67 will be swung from its position of Figure 8 to that of Figure 10, so that no further ore can be discharged through chute 70, or, if the plates are not shifted, a values receiving receptacle for chute 7 is substituted for the middlings receiver. One shaft 39 or a few of them nearest to the discharge end of the trough 2 will then be rotated in a counterclockwise direction, as viewed in Fig. 4, to lift the pocket bottom plate or plates up even with the tops of the partitions 20 as seen in Figure 9, while the supply of air to the pockets is continued. Movement of the conveyor 22 in the direction of the arrow shown in Figure 9 scrapes the accumulated values thus lifted from the pocket or pockets across plate 6 into the section of shaft 60 adjacent to the accumulating pockets to drop out through chute 71.

It is immaterial if the quantity of ore passes above the flights on the lower stretch of the conveyor 22 as the trough bottom plate 3 is raised, because the flights will simply scrape as much of the ore as they can along and leave the rest to succeeding flights. If the values themselves have been segregated into different pockets 21 by varying the intensity of the air flow in the manner discussed, it will be necessary to wait until all of the ore particles have been scraped out of the portion of trough 2 above the top of partitions 20 before the pocket bottom plate of another pocket is raised. When the trough has thus been cleaned, the receptacle into which the values accumulated in the last pocket have been deposited is removed and an empty receptacle is placed to receive ore subsequently discharged from chute 71 from pockets containing heavier particles.

The shaft 39 of the pocket next farther from the discharge end of the conveyor is then turned in the counterclockwise direction as seen in Figure 4 until the trough bottom plate for this pocket has been elevated to a position flush with the upper edges of the partitions 20. The conveyor 22 will then scrape these values across the raised plate 3 of the pocket next to the discharge end of the trough, and thence across plate 6 and down shaft 60 for discharge through chute 71 into the waiting receptacle. When all the ore from this pocket has been scraped from the trough 2, the receptacle is changed again and the next pocket bottom plate is raised to a position flush with the upper edges of the partitions 20. This procedure is repeated until the concentrate has been emptied from all the pockets, whereupon classifying operation of the concentrator again is resumed. It will be evident that there is no need to change the containers receiving the values from chute 71 if the air flow through all the pockets is equal, because then the segregation will be simply between the gangue and the values collectively, rather than any separation of values of different specific gravity being attempted. The concentrator is capable of either type of operation, and the one selected will depend upon the type of ore being processed and the nature of the remainder of the refining operation.

Because the ore should be ground or crushed into very fine particles for processing in the manner described, it is probable that there will be some dust particles sufficiently fine and of material light enough actually to be floated out of the trough 2 itself. Ideally, of course, all the ore particles should be of exactly the same size in order to achieve the most accurate segregation by the apparatus and process described. To remove from the operation any dust particles which tend to float out of the trough itself, a hood 85 extending any desired distance along the top of the trough may be provided. To this hood is connected a suction pipe 86 for the purpose of drawing the air and airborne dust into a precipitating device. The sides of the trough 2 should, of course, be sufficiently high so that a reasonable opportunity is given for gangue particles to remain in the conveyor sweep path, or to settle back into it instead of being withdrawn through the hood. The degree of hood suction may be regulated by swinging handle 87, seen in Figure 1, to vary the opening of louvers 88 within the hood, which are shown in Figure 2. It should be emphasized, however, that this dust removal mechanism is simply a precaution for cleanliness and to eliminate discomfort to the workmen, and is not intended to influence the ore segregating and accumulating operation of the rest of the concentrator as described above.

The operation of the concentrator has been described for the purpose of concentrating ore, but it will be evident that the device may be used to perform the same process on other types of materials. The essential consideration for utilization of this process is that the material to be segregated be comminuted but not be reduced to dust, that the particles of material all be of the same size generally, and that the particles differ substantially in specific gravity. Also, it is desirable that the difference in specific gravity between the heaviest and the lightest particles be not very great, and that no substantial proportion of the particles be so light that they will be blown away easily. The concentrator, therefore, will be useful for processing various materials conforming to these specifications.

I claim as my invention:

1. The segregating process which comprises moving material particles of different specific gravity along a predetermined path, breathing air uniformly and continuously for a prolonged period upward through the material thus moved and thereby stratifying the material by suspending lighter particles of the material in such path and settling heavier particles below such path, blocking movement parallel to such path of heavier particles thus settled below such predetermined path, the air breathed upward through the material in such predetermined path passing first through the mass of heavier particles settled below such path, continuing to move such suspended lighter particles along such predetermined path, and subsequently removing such lighter particles from such predetermined path, raising such settled heavier particles back into such predetermined path, and effecting movement of such heavier particles along such predetermined path.

2. The ore concentrating process which comprises pushing finely crushed ore generally horizontally along a predetermined path, breathing air uniformly and continuously for a prolonged period upward through the ore and thereby suspending gangue particles in such path above particles of values settled below such path, while thus suspended continuing to push such gangue particles along such predetermined path, blocking continued movement parallel to such predetermined path of values incapable of being suspended in such path by such air and settled below such path, the air breathed upward through the ore in such predetermined path passing first through the mass of values particles settled below such path, inter-

rupting the supply of crushed ore to such predetermined path, removing the gangue particles from such predetermined path, raising such settled values particles back into such predetermined path, and thereafter resuming movement of the particles of values along such predetermined path.

3. A segregating device comprising means operable to convey material particles substantially horizontally along a predetermined path, walls forming the sides of a pocket beneath such path, a foraminous plate received within said walls and forming the bottom of such pocket, means operable to supply air upward through said plate, and means supporting and guiding said foraminous plate and movable to vary the elevation thereof for altering the effective depth of the pocket defined by said walls and plate.

4. The device defined in claim 3, index means disposed exteriorly of the pocket and adjacent to the exterior surface of a pocket wall, movable to indicate the elevation of the pocket bottom plate, and means interconnecting said index means and the bottom plate and operable to effect movement of said index means in response to movement of such plate.

5. A segregating device comprising conveyor means operable to convey comminuted material substantially horizontally along a predetermined path, means defining a material receiving pocket beneath said conveyor means, means operable to supply air to such pocket for emitting air therefrom into such predetermined path beneath said conveyor means, and means operable to increase incrementally the effective depth of said pocket.

6. An ore concentrating device comprising a pocket, means operable to supply air to said pocket for emission therefrom, conveyor means overlying said pocket and operable to convey above said pocket crushed ore for agitation by the air and suspension of gangue particles above said pocket, and means adjustable to vary the depth of said pocket for altering its capacity to receive values particles deposited therein, said conveyor means extending past said pocket in the direction of conveyor movement and being operable to convey the suspended gangue particles beyond such pocket.

7. An ore concentrating device comprising conveyor means operable to convey crushed ore along a predetermined path, means forming a plurality of pockets arranged in a row along and beneath said conveyor means, means operable to supply air to each of said pockets for breathing air through values settled into such pocket and for suspending gangue particles above such pockets in such predetermined path of movement, and means operable to vary separately the depth of the several pockets and conjointly the position of the air supply means for the respective pockets to maintain the desired relationship between each pocket and its air supply means.

8. A segregating device comprising means operable to convey comminuted material substantially horizontally along a predetermined path, walls forming the sides of a pocket beneath such path, a foraminous plate received within said walls and forming the bottom of such pocket, means supporting said plate and movable to vary the elevation thereof for altering the effective depth of the pocket defined by said walls and plate and including movable walls defining an air chamber beneath said plate, a movable air supply pipe connected to said movable walls and movable therewith, and a stationary air supply pipe connected by a slip joint with said movable air supply pipe.

9. A segregating device comprising means operable to convey material particles substantially horizontally along a predetermined path, means defining a material receiving pocket beneath such path including a foraminous plate defining the pocket bottom, a nozzle plate spaced below said foraminous plate and having a multiplicity of nozzles distributed over said nozzle plate and projecting upward therefrom, and air supply means disposed beneath said nozzle plate and operable to supply air to said nozzles for discharge through said foraminous plate.

10. An ore concentrating device comprising a generally horizontal trough, conveyor means operable to convey crushed ore along said trough, a plurality of partitions extending transversely of said trough and defining a plurality of pockets arranged in a row along and beneath said conveyor means, a foraminous plate forming the bottom of each pocket, air supply means disposed beneath said foraminous plate and operable to supply air for emission therefrom into said trough, and means supporting said foraminous plate and movable to vary the distance between said foraminous plate and said conveyor means, thereby to alter the effective depth of the pocket defined by said partitions and foraminous plate.

11. An ore concentrating device comprising a generally horizontal trough, conveyor means operable to convey crushed ore along said trough, a plurality of partitions extending transversely of said trough and defining a plurality of pockets arranged in a row along and beneath said conveyor means, a foraminous plate forming the bottom of each pocket, a nozzle plate spaced below said foraminous plate and having a multiplicity of nozzles distributed over said nozzle plate and projecting upward therefrom, and air supply means disposed beneath said nozzle plate and operable to supply air to said nozzles for emission from said foraminous plate into said trough.

12. An ore concentrating device comprising a generally horizontal trough, a scraper conveyor operable to convey crushed ore along said trough, a plurality of partitions extending transversely of said trough and defining a plurality of pockets arranged in a row along and beneath said conveyor, a foraminous plate forming the bottom of each pocket, a nozzle plate spaced below said foraminous plate and having a plurality of nozzles projecting upward therefrom, air supply means disposed beneath said nozzle plate and operable to supply air to said nozzles for emission from said foraminous plate into said trough, and means supporting said nozzle plate and said foraminous plate and movable to vary the distance between said foraminous plate and said conveyor, thereby to alter the effective depth of the pocket defined by said partitions and foraminous plate.

13. A segregating device comprising means operable to convey material particles along a substantially horizontal path, means operable to supply a current of air upward through such path for segregating gangue particles from values particles, means operable to block movement of such values particles along such path with the gangue particles, an upright discharge shaft operable to receive the gangue particles from such substantially horizontal path, a deflecting plate swingably mounted in said upright shaft and operable to deflect such gangue particles dropping therethrough into a gangue receiver, means operable to deliver such blocked values particles into such substantially horizontal path for movement therealong subsequent to movement therealong of such gangue particles, and means operable to swing said deflecting plate into nondeflecting position to enable descent of values particles therebelow through said upright shaft.

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