

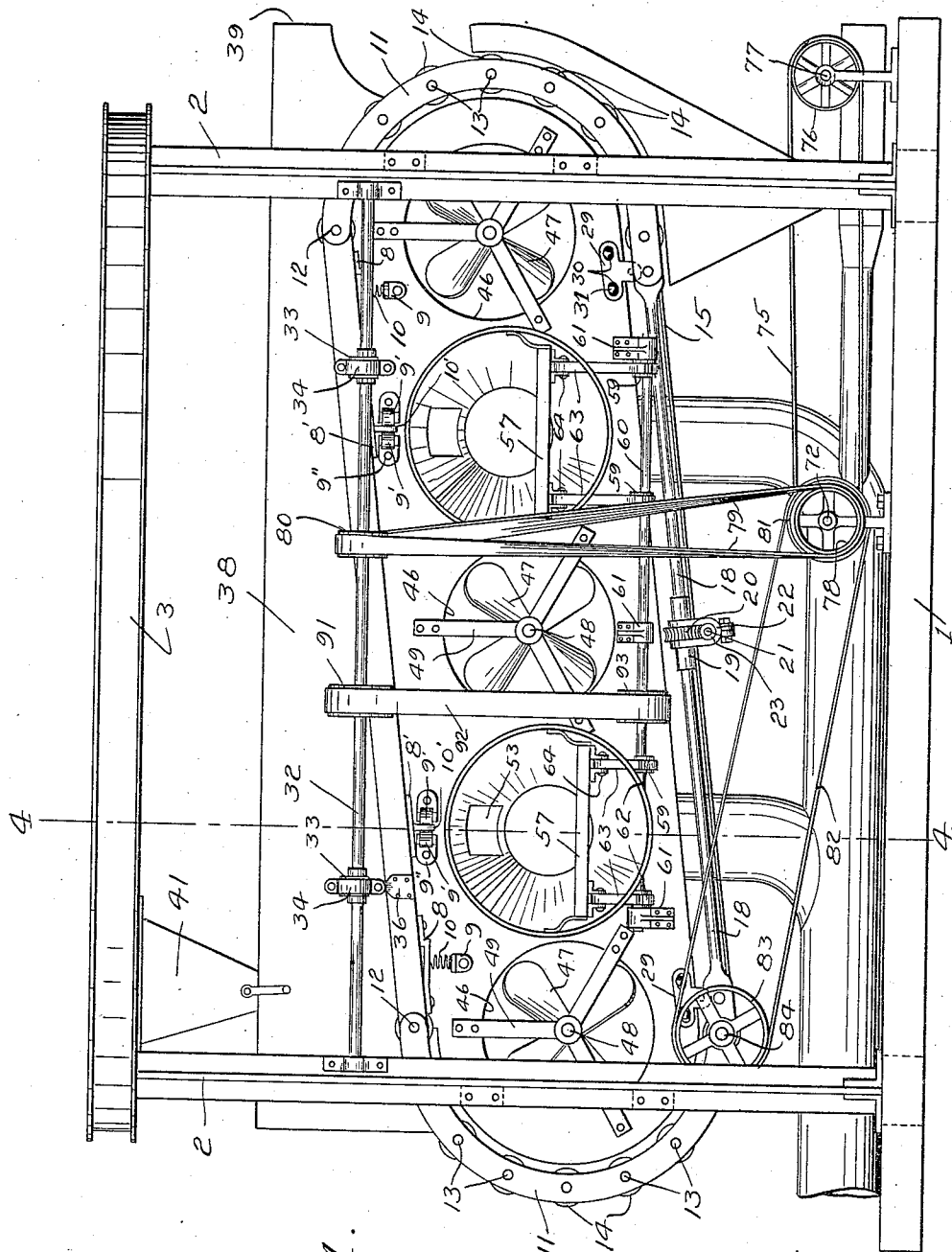
H. J. NIELSEN, C. J. BORGLIN & L. C. A. SOEBORG.
CONCENTRATOR.

APPLICATION FILED MAY 11, 1912.

Patented May 6, 1913.

4 SHEETS—SHEET 1.

1,061,106.



WITNESSES:

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Fig. 1.

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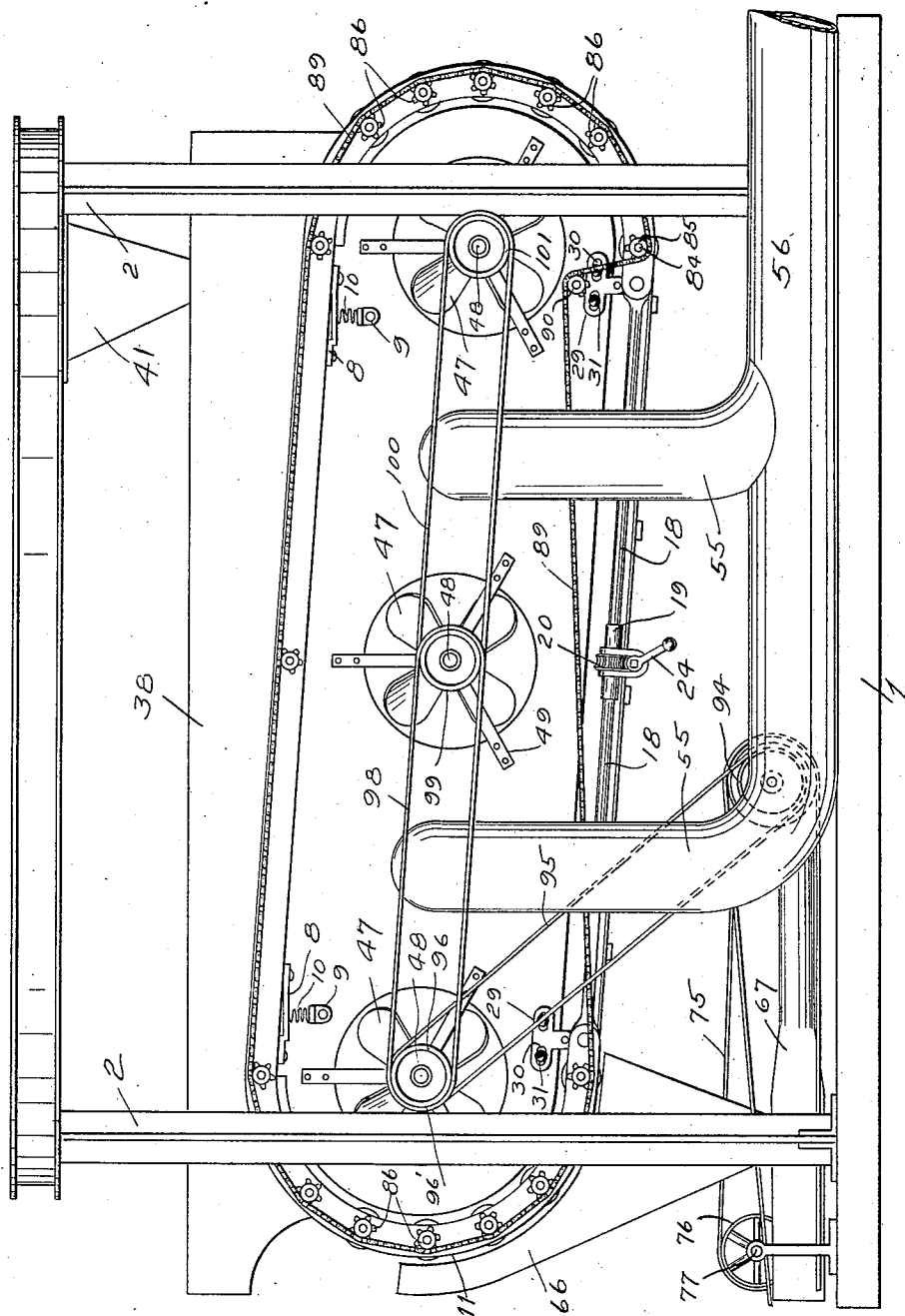
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4 SHEETS—SHEET 2.



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Fig. 2.

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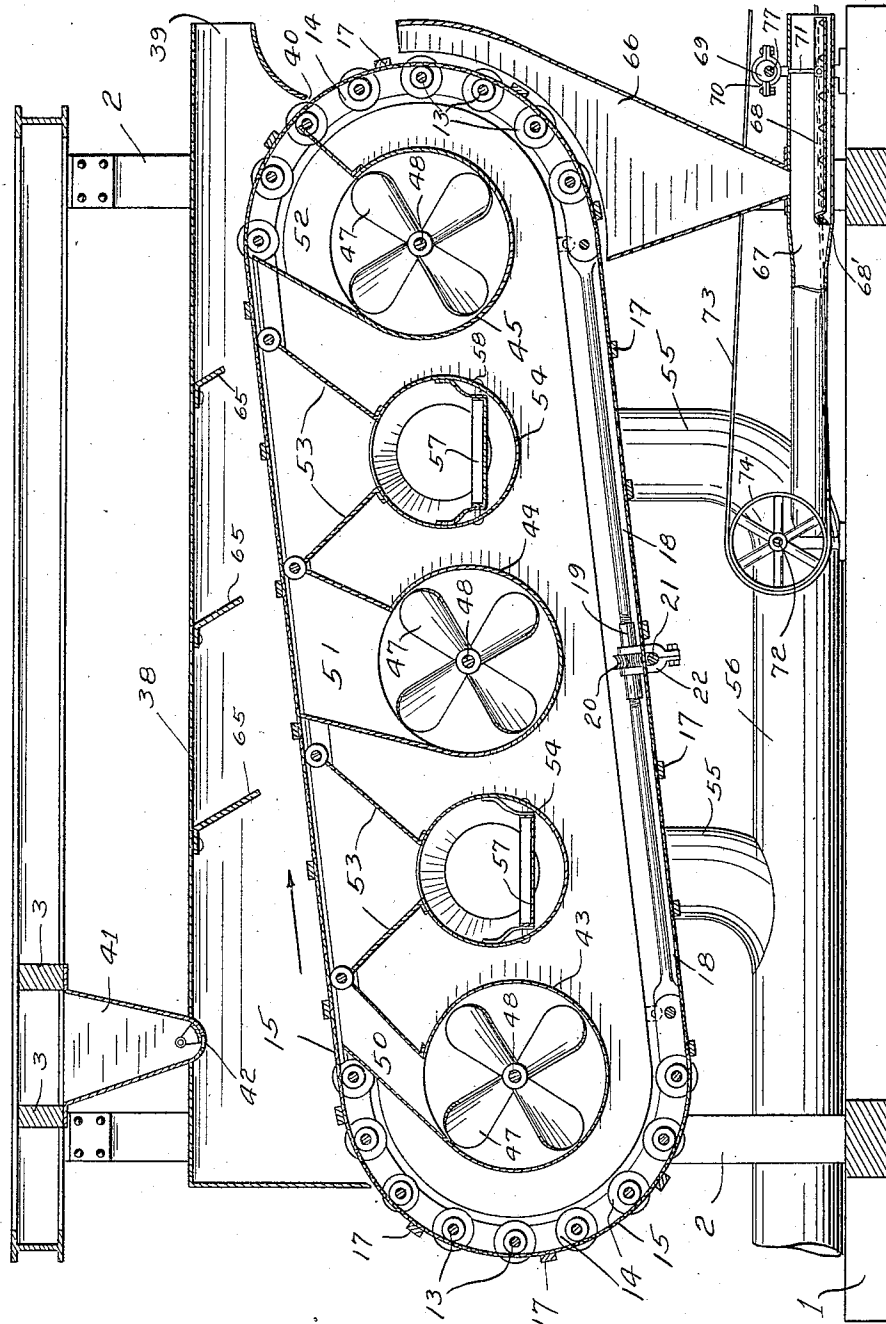
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Fig. 3.

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4 SHEETS—SHEET 4.

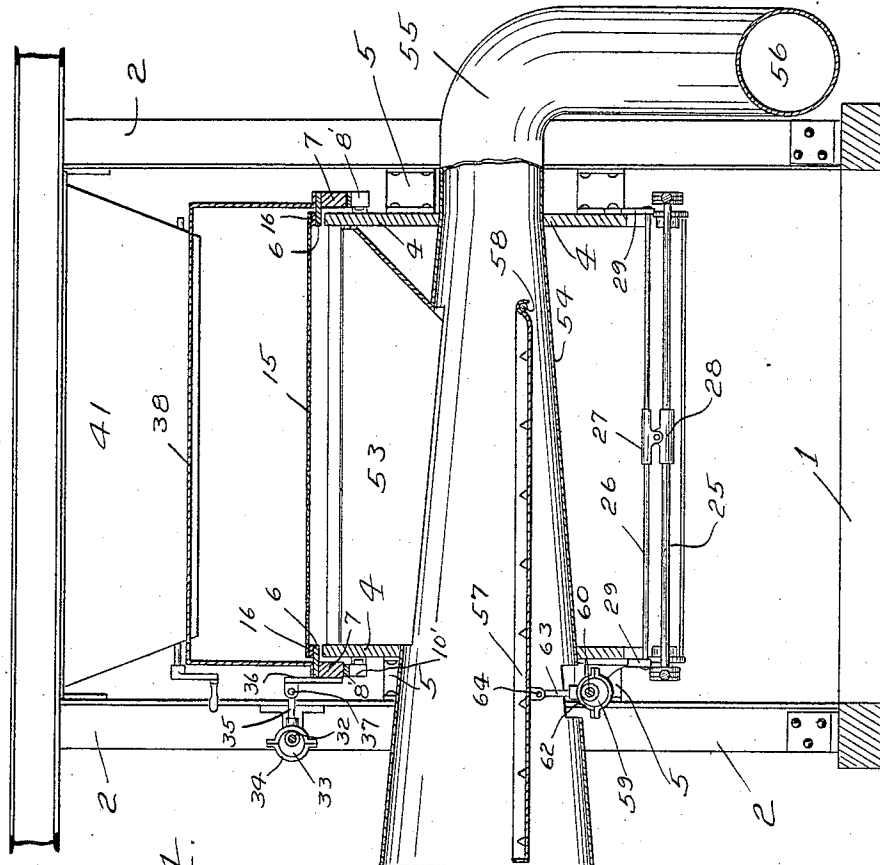


Fig. 4.

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UNITED STATES PATENT OFFICE.

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CONCENTRATOR.

1,061,106.

Specification of Letters Patent.

Patented May 6, 1913.

Application filed May 11, 1912. Serial No. 696,744.

To all whom it may concern:

Be it known that we, HOLGER J. NIELSEN, CHARLES J. BORGLIN, and LUDVIG C. A. SOEBORG, the former a subject of the King of Great Britain and the two latter citizens of the United States, the two former residing at San Francisco and the latter at Alameda, in the counties of San Francisco and Alameda, respectively, and State of California, have invented certain new and useful Improvements in Concentrators, of which the following is a specification.

This invention relates to ore concentrating machines, and more particularly to that class of apparatus for effecting concentration of finely divided ore by the dry process.

The present invention is an improvement on the apparatus disclosed in our copending application for Letters Patent filed November 25, 1911, Serial No. 662,296, relating to ore concentrators.

The principal object of this invention is to simplify the apparatus thereby reducing the cost of manufacture to a minimum, consistent with the desired efficiency of the apparatus in separating the particles of low specific gravity from those of higher specific gravity.

In the drawings, forming a part of this specification, Figure 1 is a side elevation of a concentrator embodying our invention. Fig. 2 is a view similar to Fig. 1 looking from the opposite side of the machine as disclosed in Fig. 1. Fig. 3 is a longitudinal sectional view through the machine. Fig. 4 is a transverse section on the line 4-4 of Fig. 1.

Similar characters refer to similar parts throughout the views.

Suitable frame work is provided comprising a base 1, uprights 2 and cross ties which are preferably built up of angle iron to provide rigidity to the structure. The uprights 2 carry side plates 4 spaced apart in parallel relation to each other, a convenient means of connecting the plates and uprights being through angle plates 5, which space the former from the latter sufficiently to provide an area for motion transmitting means to be subsequently described. These plates 4 are preferably rounded at their ends and disposed with their upper and lower margins inclined upwardly toward

what is hereinafter termed the discharge end of the apparatus.

Adjacent the upper margin of each plate 4 we provide a screen supporting track 6 which is preferably mounted upon longitudinally extending strips 7, disposed externally of the plate, the said strip being supported by the plate 4, through the agency of brackets 8 on the former, coacting brackets 9 on the latter and springs 10 interposed between each pair of brackets 8 and 9. This mounting permits the tracks 6 to have imparted thereto a resilient reciprocatory movement. Semi-circular arms 11 are pivoted, as at 12, to the strips 7 and conform substantially to the contour of the outer ends of plates 4. These arms 11 provide bearings for transversely extending shafts 13 upon which are rigidly mounted flanged guide wheels 14 for movably mounting an endless screen belt 15 of fine wire mesh. This screen belt is reinforced at its edges by flexible material 16 which contacts with wheels 14 and track 6 in its travel thereover, and transverse slats 17 are provided to which the screening material is secured to prevent sagging. The lower ends of arms 11 have pivoted thereto links 18 which project toward the center of the machine and have their ends screw-threaded, so that the links at each side of the machine may be connected by a turn buckle 19 adapted to draw the said arms 11 at the opposite ends of the machine, toward each other, or separate them to provide the desired tension to screen belt 15. In order to operate the turn buckles 19 simultaneously, they are provided with worm wheels 20, while a shaft 21, supported by brackets 22, carries coacting worms 23, and by rotating the shaft 21, as by crank 24, the turn buckles 19 may be actuated as desired. The complementary arms 11 at each end of the apparatus are connected by a rod 25, adjacent their lower ends and this rod is supported by a rod 26 carried by side plates 4, as hereinafter described, a block 27 being carried by rod 26 pivotally supporting a sleeve 28 loosely embracing the said rod 25. The rod 26 is carried by the side plates 4 by being secured to brackets 29, having elongated slots through which bolts 31 pass and are screwed into the plates 4. Thus, before adjusting

the arms 11 through handle 24, the said bolts 31 are first loosened and again tightened after the desired tension is put upon the screen belt 15. A reciprocatory movement is imparted to the members supporting screen belt 15 by means of a shaft 32, supported by uprights 2, having eccentrics 33, the straps 34 of which are connected by links 35 to brackets 36 on the strips 7, at one side of the apparatus. In order to provide for the proper play of the eccentric straps 34, the links 35 are pivoted to brackets 36 as at 37. The strips 7 are guided in their movement responsive to the action of eccentrics 33, by means of guide brackets 8' secured to said strips and each having a downwardly extending portion 10' which operates between rollers 9' rotatably carried by supports 9'' on the side plates 4. The tracks 6 also carry a housing 38 to form an agitating chamber which extends from one end of the said plates 4 to the other end, over the screen belt 15. An exhaust 39 is provided for light particles and air, and an exhaust 40, for the heavy particles conveyed by the said belt 15. A hopper 41 carried by cross ties 3 and having a valve controlled opening 42, opens into the said agitating chamber adjacent the lowermost end of the upper lap of the belt 15, which latter is caused to travel in the direction indicated by the arrow.

Intermediate the plates 4 we provide a plurality of air accumulating chambers 43, 44 and 45, which are preferably cylindrical in shape and open laterally to the atmosphere by communicating with apertures 46 in the side plates. Adjacent each opening 46 a fan 47 is mounted upon shafts 48, carried by brackets 49, secured to the plates 4, and these fans, when rotated, force air into the said accumulating chambers 43, 44 and 45. The accumulating chamber 43 has a conduit 50 which directs the air accumulated therein, diagonally forwardly and upwardly through screen belt 15, the egress opening of said conduit being in close proximity to the belt and preferably slightly in advance of where the incoming material from hopper 41 is deposited upon the belt 15. The accumulating chamber 44 has a conduit 51 also directing the air therefrom upwardly through the belt 15, but this conduit is relatively larger than conduit 50 and directs its current substantially perpendicularly through the belt 15. Chamber 45 has a conduit 52 directing the air therefrom upwardly through the belt at substantially right angles thereto, and is disposed with its egress opening in close proximity to the discharge opening 39 of casing 38.

Between conduits 50 and 51, and 51 and 52, are disposed below belt 15, receiving hoppers 53 which are constricted or tapered downwardly and open into frusto-conical

shells 54 which extend transversely through and between the side plates 4. The smaller ends of these shells 54 communicate, by branch conduits 55, with a main air supply conduit 56 which may convey a current of air to deliver the same into said shells, the current being generated in any suitable manner, such as by a centrifugal fan, not shown in the drawing. Within each of the said shells 54 we provide a longitudinally extending riffle plate 57 disposed to receive the material of high specific gravity from hopper 53. Each plate 57 is pivoted as at 58, adjacent its inner end and they have an oscillatory movement imparted thereto by eccentrics 59, mounted on shaft 60 supported by bearings 61 on side plate 4, eccentric straps 62 of eccentrics 59 being operatively connected to the plates 57 by links 63 pivoted as at 64.

On the inner side of the top of casing 38 we prefer to dispose baffle plates 65 which are so disposed as to encounter the material agitated by the air currents issuing from conduits 50 and 51 and to thoroughly agitate the floating material. We also prefer to constrict the agitating chamber formed by casing 38, toward the discharge end of the apparatus and the said baffle plates 65 are accordingly reduced in size as they approach this end. We also prefer to dispose some of the plates 65 so as to direct the floating material toward the hoppers 53.

The discharge opening 40 of casing 38 delivers to a hopper 66 which in turn delivers the material received, to a conduit 67 in communication with main conduit 56. In this conduit 67, a riffle plate 68, is pivoted at 68' and agitated by eccentric 69, the strap 70 of which is operatively connected to the riffle plate 68 by link 71. The riffle 67 is so disposed as to finally agitate the material received thereon so that the current of air through conduit 67 may remove any light material associated therewith.

Any suitable motion transmitting means may be provided to actuate the several movable members; however, the preferred arrangement, as disclosed in the drawing, is by providing a main drive shaft 72 driven by belt 73 through pulley 74. This shaft 72 through belt and pulley 75 and 76, respectively, drives the shaft 77 of eccentric 69. By means of pulley 78, belt 79 and pulley 80, the shaft 32 is driven; and through pulley 81, belt 82 and pulley 83, shaft 84, carrying a sprocket 85 is driven, this sprocket 85 together with sprockets 86, which are secured to shafts 13, receive a chain 89 which may be tensioned by idler sprocket 90. The shaft 32 carries a pulley 91 and belt 92 therefor, trained over a pulley 93 on shaft 60, turns the latter. On the opposite end of shaft 72 is secured a pulley 94 which drives by means of belt 95, the pulley

96 on shaft 48 at the discharge end of the machine. This shaft 48 also carries a second pulley 96' or 96 is of sufficient width to receive a second belt 98 which drives the next shaft 48. In like manner a belt 100 drives pulley 101 on the last shaft 48, thus driving all fans 47 simultaneously.

The operation of the machine is as follows: Assuming that the several movable elements are active and the ore to be concentrated is admitted into the chamber formed by casing 38, through hopper 41, the screen belt 15 carries the ore forwardly as indicated by the arrow and it is encountered by the strong air current from conduit 50 which raises the particles which do not remain on the screen belt, to agitate them by the baffle plates 65, such particles as are of sufficiently small size and of sufficient specific gravity fall through the screen into the first hopper 53, where they are delivered on riffle plate 57 and again agitated and encountered by the air current from main conduit 56 which removes the light particles thus conveyed. Such material as does not find ingress into the first hopper 53 is subjected to action of air current from conduit 51 which again agitates and separates the particles. Those particles reaching the second hopper 53, that pass through the screen, are treated in substantially the same manner as described in connection with the first shell 54. Such material traveling over the second hopper 53 is again acted upon by the air current from conduit 52 which finally removes all light material floating in the agitating chamber by forcing it through opening 39, and also subjects the material of high specific gravity, on the screen belt, to ventilation. That material traversing conduit 52 on the belt 15 is delivered to hopper 66, and onto riffle plate 68 where it receives further agitation and is relieved of remaining light particles. Throughout the operation, belt 15 is given a lateral reciprocatory movement by the eccentrics 33, as previously described, which facilitates dislodging of the material so that the several air currents may ventilate through the screen and efficiently remove the lighter particles from those of higher specific gravity.

We claim:

1. An ore concentrator comprising in combination, a movable screen belt adapted to receive the material to be treated upon its upper plane surface, means forming an agitating chamber above said belt and having a discharge opening adjacent the discharge end of said belt, instrumentalities for delivering a plurality of air currents upwardly through said screen belt toward said discharge opening of said agitating chamber, and means disposed below said belt intermediate said air current delivering instrumen-

talities for receiving material passing through said belt.

2. An ore concentrator comprising in combination, a movable screen belt adapted to receive the material to be treated upon its upper plane surface and inclined with its discharge end uppermost, means forming an agitating chamber above said belt and having a discharge opening adjacent the discharge end of said belt, instrumentalities for delivering a plurality of air currents upwardly through said screen belt toward said discharge opening of said agitating chamber, and means disposed below said belt intermediate said air current delivering instrumentalities for receiving material passing through said belt.

3. An ore concentrator comprising in combination, a movable screen belt adapted to receive the material to be treated upon its upper plane surface, means forming an agitating chamber above said belt constricted toward the discharge end of said belt and having a discharge in proximity thereto, instrumentalities for delivering a plurality of air currents upwardly through said screen belt toward said discharge opening of said agitating chamber, and means disposed below said belt intermediate said air current delivering instrumentalities for receiving material passing through said belt.

4. An ore concentrator comprising in combination, a movable screen belt adapted to receive the material to be treated upon its upper plane surface, means forming an agitating chamber above said belt and having a discharge opening adjacent the discharge end of said belt, conduits for delivering air currents upwardly through said screen belt toward said discharge opening of said agitating chamber and with their axes more nearly approaching a perpendicular to said belt as they are disposed near the discharge end of said chamber, and means disposed below said belt intermediate said conduits for receiving material passing through said belt.

5. An ore concentrator comprising in combination, a movable screen belt adapted to receive the material to be treated upon its upper plane surface, means forming an agitating chamber above said belt and having a discharge opening adjacent the discharge end of said belt, instrumentalities for delivering a plurality of air currents upwardly through said screen belt toward said discharge opening of said agitating chamber, baffle plates disposed within said agitating chamber in relative proximity to the said air currents delivered by said instrumentalities, to agitate the material floated thereby, and means disposed below said belt intermediate said air current delivering instrumentality for receiving material passing through said belt.

6. In an ore concentrator, the combination of a movable conveying screen belt adapted to receive the material at its upper plane surface, means forming an agitating chamber above said belt and constricted toward the discharge end thereof, mechanism for delivering a plurality of air currents upwardly through said screen belt toward the discharge end of said chamber, and means disposed alternately of said instrumentality for delivering air currents, for receiving the material of higher specific

gravity not carried away by said air currents, substantially as and for the purposes set forth.

15

In testimony whereof we affix our signatures in presence of two witnesses.

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LUDVIG C. A. SOEBORG.

Witnesses:

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."