April 11, 1961 B. F. HEARN 2,979,197

ORE SEPARATING APPARATUS

Filed June 21, 1957 5 Sheets-Sheet 1

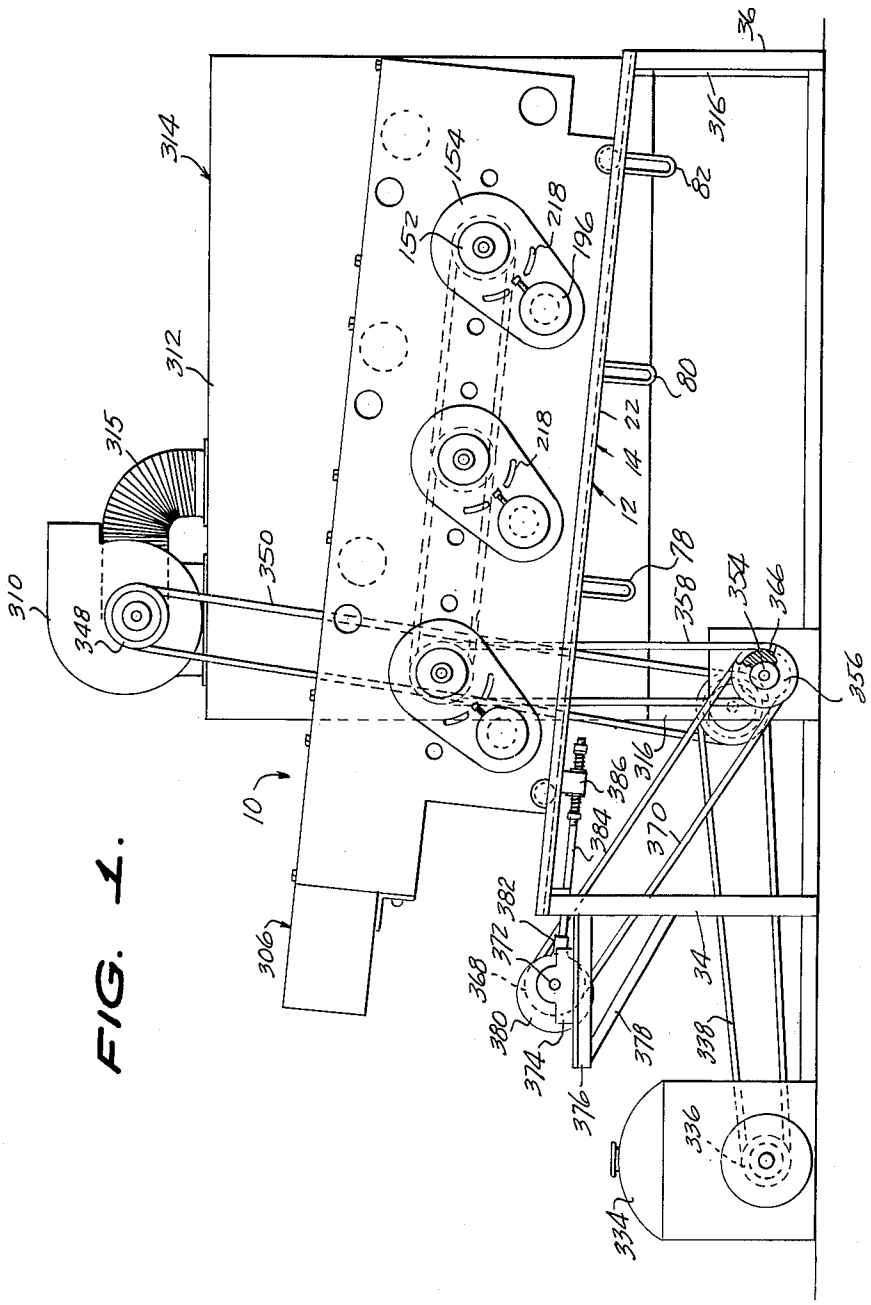


FIG. 1.

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ORE SEPARATING APPARATUS

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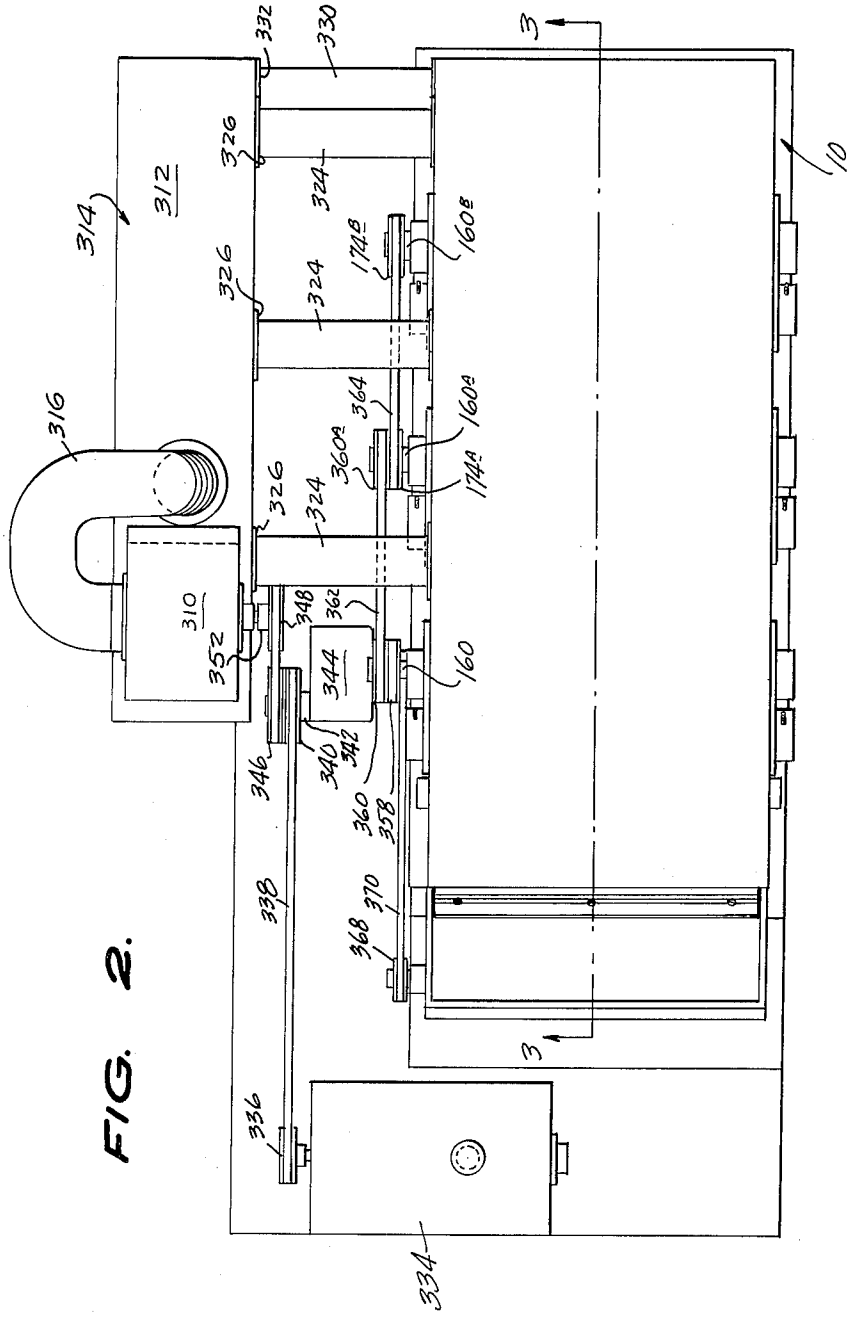


FIG. 2.

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ORE SEPARATING APPARATUS

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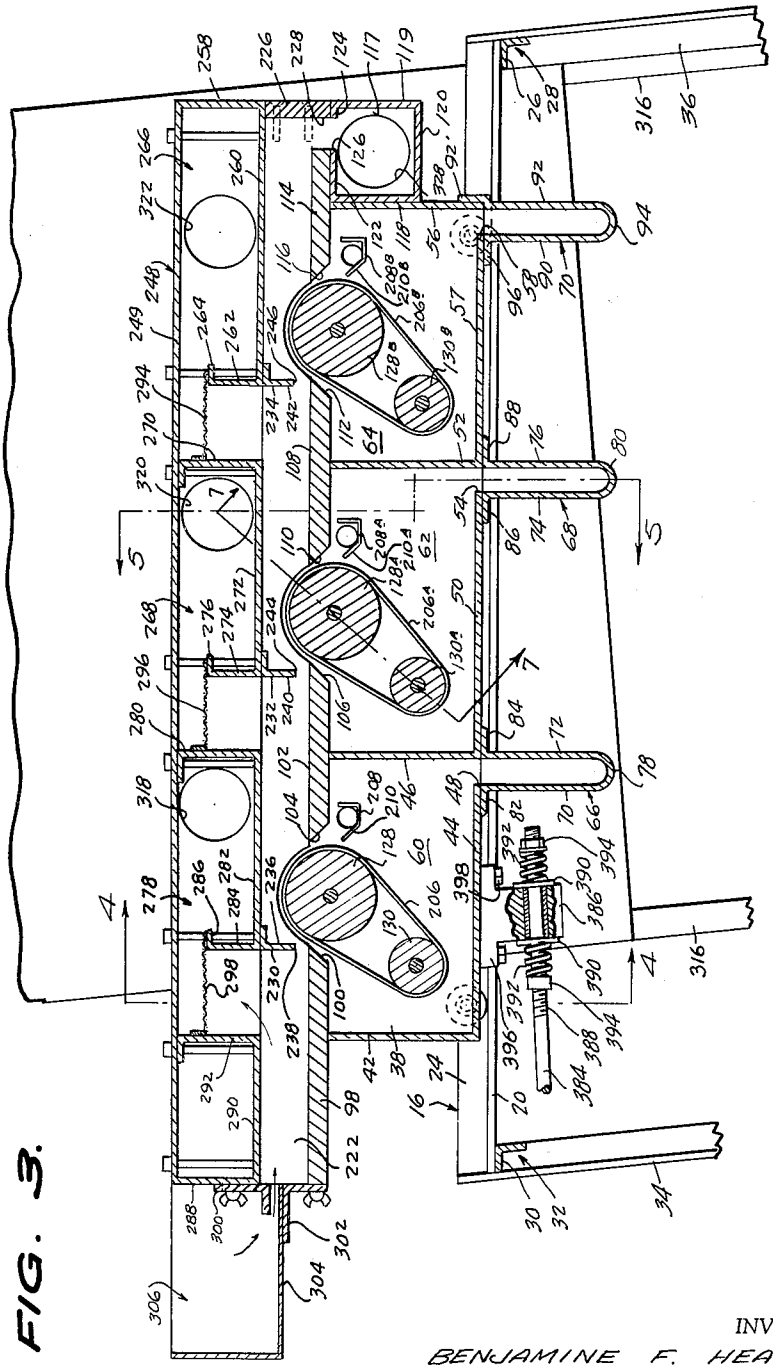


FIG. 3.

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ORE SEPARATING APPARATUS

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FIG. 4.

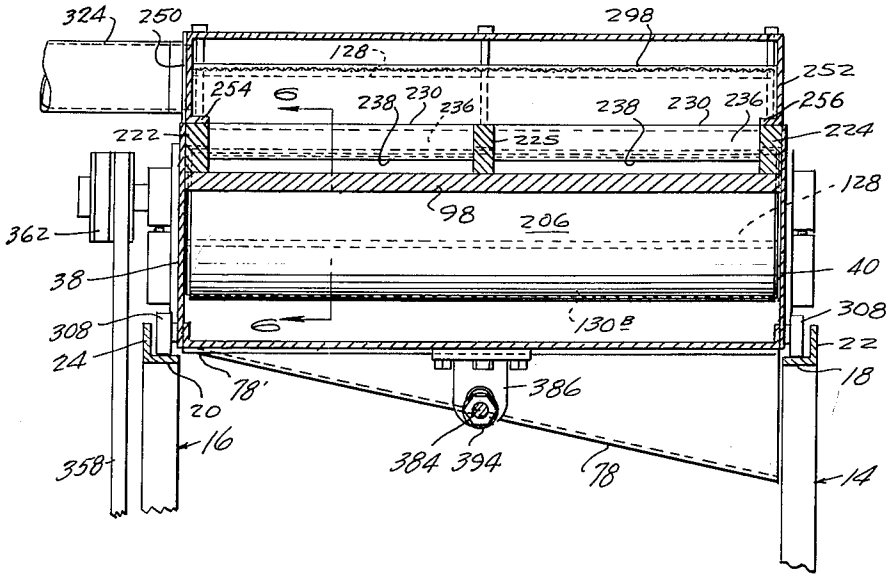
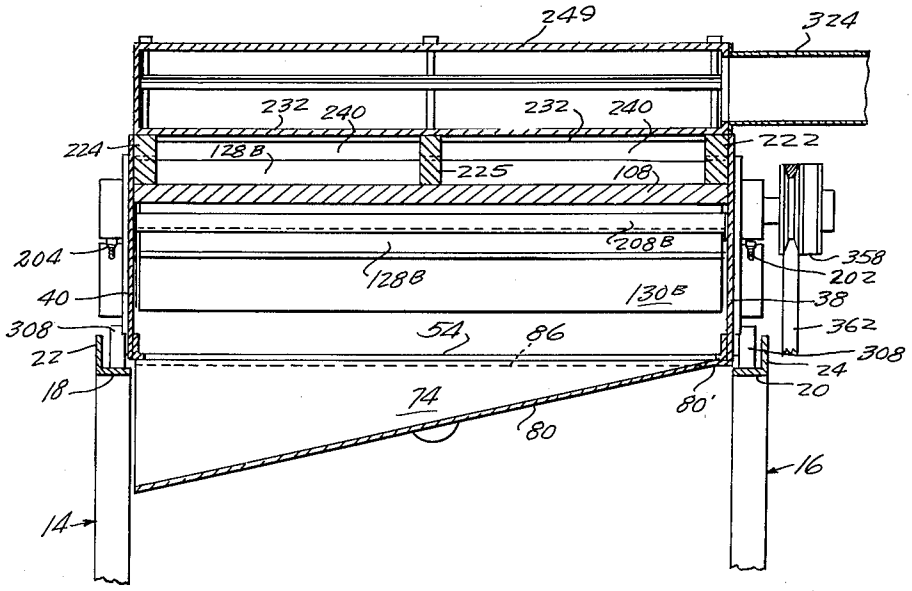


FIG. 5.



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ORE SEPARATING APPARATUS

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FIG. 6.

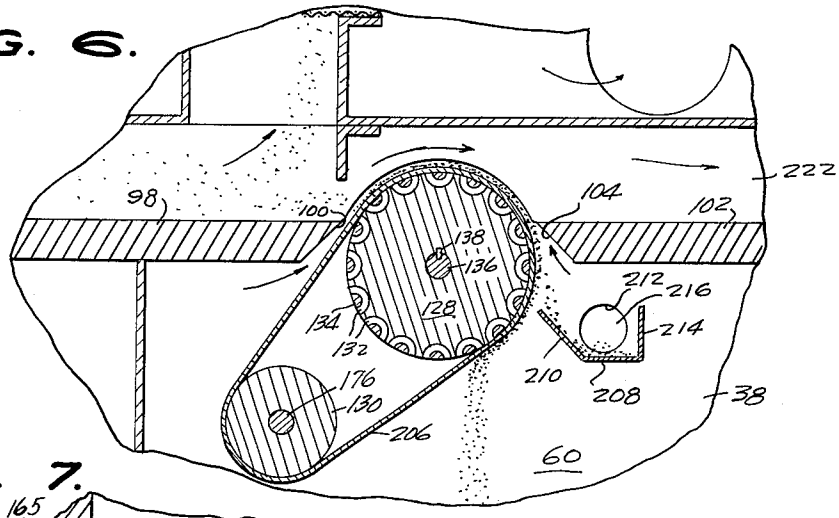
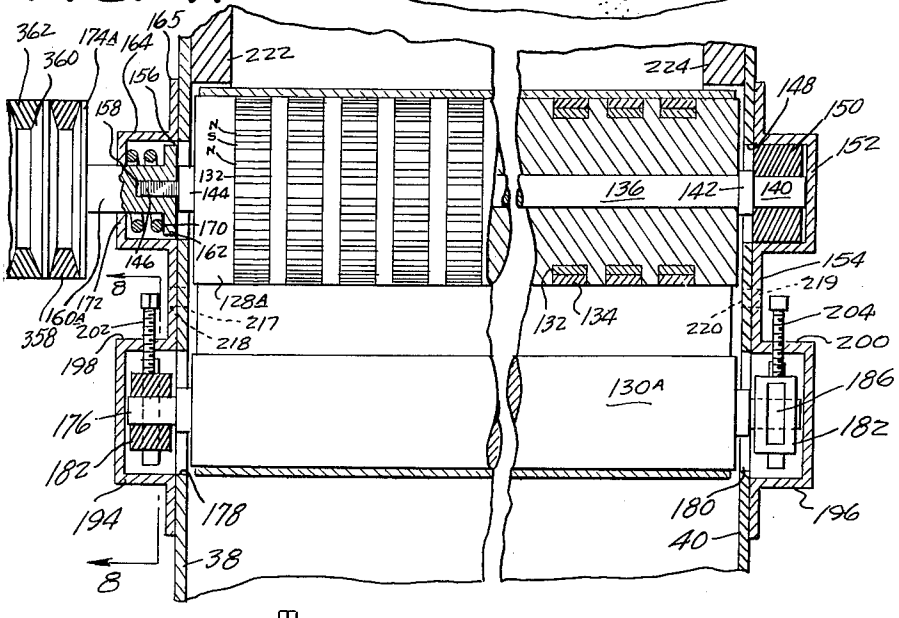


FIG. 7.



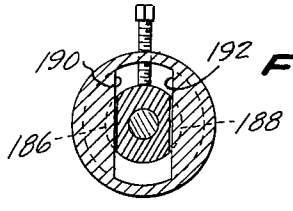


FIG. 8.

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United States Patent Office 2,979,197 Patented Apr. 11, 1961

2,979,197

ORE SEPARATING APPARATUS

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Filed June 21, 1957, Ser. No. 667,079

1 Claim. (Cl. 209—39)

This invention relates to ore separating apparatus, and more specifically, the invention pertains to apparatus for separating ores having magnetic properties from those having lesser or non-magnetic characteristics.

One of the primary objects of this invention is to provide ore separating apparatus in which advantage is taken of the specific gravity and density of materials as well as the law of gravity and the phenomena of magnetism.

Another object of this invention is to provide ore separating apparatus in the presence of an air stream to separate metals having a greater specific gravity and density from those having smaller values thereof.

A further object of this invention is to provide ore separating apparatus of the type referred to supra wherein the ore fines are separated from the ore tailings in a multistage process.

This invention also contemplates, as a further object thereof, the provision of apparatus of the type described above which is noncomplex in construction and assembly, inexpensive to manufacture, and which is durable in use.

Other and further objects and advantages of the instant invention will become more evident from a consideration of the following specification when read in conjunction with the annexed drawings, in which:

Figure 1 is a side elevational view of an ore separating device constructed in accordance with the teachings of the present invention;

Figure 2 is a top plan view of the apparatus shown in Figure 1;

Figure 3 is a longitudinal cross sectional view taken substantially on the horizontal plane of line 3—3 of Figure 2, looking in the direction of the arrows;

Figure 4 is a detail cross sectional view taken substantially on the vertical plane of line 4—4 of Figure 3, looking in the direction of the arrows;

Figure 5 is a detail cross sectional view taken substantially on the line 5—5 of Figure 3, looking in the direction of the arrows;

Figure 6 is an enlarged fragmentary detail cross sectional view taken substantially on the vertical plane of line 6—6 of Figure 4, looking in the direction of the arrows;

Figure 7 is an enlarged fragmentary detail cross sectional view taken substantially on the line 7—7 of Figure 3, looking in the direction of the arrows; and

Figure 8 is a fragmentary detail cross sectional view taken substantially on the vertical plane of line 8—8 of Figure 7, looking in the direction of the arrows.

Referring now more specifically to the drawings, reference numeral 10 designates, in general, an ore separating device or apparatus constructed in accordance with the present invention. As is seen in the figures, the apparatus 10 comprises an elongated substantially open rectangular frame 12 including a pair of laterally spaced longitudinally extending and substantially parallel side angle frame members 14, 16. The angle frame members 14, 16 include a pair of bottom flanges 18 and 20, respectively, and a pair of side flanges 22, 24 respectively, to which further reference will be made below.

One pair of adjacent ends of the side frame members 14, 16 are welded or otherwise fixedly secured to the flange 26 of an end frame member 28, and the other adjacent pair of ends of the side frame members 14, 16 are secured to the flange 30 of a second end frame member 32.

The frame 12 is supported on suitable legs 34 at the corners of the left hand end thereof as viewed in Figures 1 and 3, and on legs 36 at the corners of the right hand end, the legs 34 being of greater length than the length of the legs 36 so that the frame 12 is supported thereon in a downwardly inclined position.

Reference numerals 38 and 40 designate a pair of laterally spaced elongated and substantially rectangular side walls disposed in parallel relation. An L-shaped member including an end wall 42 and a bottom wall 44 extends between and is secured to the side walls 38, 40. The bottom wall 44 projects forwardly from the end wall 42, and the inner end of the bottom wall 44 terminates in spaced relation relative to a vertical end wall 46 of a second L-shaped member to form an elongated substantially rectangular transversely extending slot 48. The end wall 46 is substantially parallel to the end wall 42 and has integrally connected therewith a second bottom wall 50. As before, the end wall 46 and the bottom wall 50 extend between and are secured to the side members 38, 40. In a similar manner, an upright end wall 52 of a third L-shaped member is fixedly secured to the side walls 38, 40 in spaced relation with respect to the adjacent end of the bottom wall 50 to form a transversely extending substantially rectangular slot 54. The end wall 52 is substantially parallel to the end wall 46 and has a bottom wall 57 integrally connected therewith. An end wall 56 is fixedly secured to and extends between the side walls 38, 40 in spaced relation relative to the adjacent end of the bottom wall 57 to form a third transversely extending substantially rectangular slot 58.

From the foregoing description it now becomes obvious that three separate chambers 60, 62 and 64 have been constructed.

A plurality of substantially U-shaped material discharge chutes 66, 68 and 70 are provided, of which the chutes 66 and 68 are identical in construction and the chute 70 differs therefrom in but incidental details. As illustrated, the chutes 66 and 68 are each formed with laterally spaced and substantially parallel side walls 70, 72 and 74, 76, respectively, connected by bights 78 and 80, respectively, at one pair of adjacent ends. As is seen in Figures 4 and 5, the bight 78 and 80 extends downwardly at an angle from the points 78', 80' adjacent the upper ends of the side walls 70, 72 and 74, 76, respectively, at one of the respective ends of the chutes 78, 80.

The side walls 70, 72 and 74, 76 adjacent their respective upper ends are integrally connected with a pair of laterally spaced outwardly turned flanges 82, 84 and 86, 88, respectively.

The chutes 78, 80 are positioned below the slots 48, 54 with the flanges 82, 84 of the chute 78 abutting against and are welded to the underside of the bottom walls 44 and 50. In a similar manner the flanges 86, 88 are secured to the bottom walls 50 and 57.

The chute 70 is formed with spaced and substantially parallel side walls 90, 92 having a downwardly inclined bight 94 exactly as in the case of the chutes 66 and 68, and the upper end of the side wall 90 terminates in a lateral flange 96. The chute 70 is positioned below the slot 58 and the flange 76 is secured, as by welding to the underside of the bottom wall 57. The side wall 92 is vertically extended in an offset portion 92' which extends along the outer side of the end wall 56 and is rigidly connected to the lower marginal edge thereof.

As is seen in Figure 3, an elongated substantially rectangular platform 98 is fixedly secured or made integral with the upper end of the end wall 42. The platform extends transversely between the side walls 38, 40 and has an inner end portion projecting partially over the chamber 60, the inner end thereof being chamfered at 100 to serve a purpose to be described. A substantially rectangular platform 102 is integrally connected with or fixedly secured to the upper end of the end wall 46, the platform 102 having portions thereof extending over both of the chambers 60 and 62 and having chamfered ends 104, 106. The chamfered ends 100, 104 are disposed in spaced confronting relation.

A third substantially rectangular platform 108 extends transversely between the side walls 38, 40 and is integrally connected with or fixedly secured to the upper end of the end wall 52. The platform 108 has portions thereof extending over the chambers 62 and 64 and its ends are chamfered at 110, 112. The chamfered ends 106 and 110 are disposed in spaced confronting relation.

Reference numeral 114 denotes a fourth substantially rectangular platform integrally connected or otherwise rigidly secured to the upper end of the end member 56. The platform 114 has a portion extending over the chamber 64 which terminates in a chamfered end 116 disposed in spaced confronting relation relative to the chamfer 112. The platform 114 has a second portion projecting beyond the other side of the end wall 56 which serves a function to be described.

Reference numeral 117 designates a transversely extending substantially rectangular compartment having a pair of laterally spaced and substantially rectangular side walls 118, 119, a bottom wall 120 and a flange 122 extending from the upper end of the side wall 118 at right angles with respect thereto and being substantially parallel to the bottom wall 120. The upper end of the side wall 119 terminates in an inwardly extending flange 124 disposed in spaced confronting relation relative to the flange 122 to define a slot 126 therebetween. Any conventional means may be employed to secure the ends of the compartment 117 to the side walls 38, 40 with the flange 122 juxtaposed against the underside of the aforementioned other portion of the platform 114.

An upper roller 128 extends transversely across the chamber 60 as does a lower roller 130. The structural detals thereof and the journals therefor are illustrated in Figures 6 and 7 of the drawings.

As is seen in the figures, the rollers 128, 130 are formed of a plastic material or of any other material not affected by a magnetic field. A plurality of horseshoe type permanent magnets 132 are embedded within the roller 128 with the longitudinal axes thereof extending substantially parallel to the longitudinal axes of the roller 128. The magnets 132 are circumferentially arranged on the roller 128 in a plurality of axially spaced series, and the space between each pair of north and south poles (indicated as N and S) is filled with a plastic material 134. It should be noted that the magnets 132 are positioned on the roller 128 with the north pole of one adjacent the south pole of a next adjacent magnet 132.

An elongated shaft 136 extends coaxially through the roller 128 and is keyed at 138 for rotation therewith. One end of the shaft 136 is reduced in diameter at 140 and a stop collar 142 is fixedly secured thereon in abutting relation relative to the adjacent end of the roller 128. The collar 142 prevents relative movement between the shaft 136 and the roller 128 so that the roller 128 cannot be inadvertently or accidentally displaced from over the end 140. An enlarged cylindrical boss 144 is fixedly secured to the other end of the shaft 136 to prevent displacement of the roller 128 from the shaft 136 in the other axial direction. The boss 144 terminates in a substantially rectangular tongue or key 146.

The reduced end 140 of the shaft 136 projects through an opening 148 formed in the side wall 40 and is journaled in a bushing 150 disposed within a hollow cylindrical boss 152 at one end of a journal plate 154. The keyed end 146 projects through an opening 156 formed in the side wall 38 and is received within a substantially rectangular recess 158 which extends inwardly from one end of a coupler shaft 160. The shaft 160 is provided with a flange 162 adapted to engage the boss 144, and the flange and a portion of the shaft are engaged within a hollow cylindrical boss 164 of a second journal plate 166. A helicoidal spring 170 is interposed between the flange 162 and the end wall 172 of the boss 164, the spring constantly biasing the shaft 160 for movement toward the shaft 136.

The other end of the shaft 160 projects through an opening 173 formed in the end wall 172 and has a V-type pulley 174 fixedly secured thereon for rotation therewith.

The roller 130 is also formed of a plastic material or of any other suitable material not affected by a magnetic field. The roller 130 is mounted on a shaft 176, the opposed ends of which project through openings 178 and 180 formed in the side walls 38 and 40, respectively.

The shaft 176 is journaled at its opposed end in a pair of adjustable bearings 182. The bearings 182 are each formed with a pair of oppositely disposed grooves 186, 188 which slidably receive therein a pair of ribs 190, 192 which project from opposite sides of a pair of journal boxes 194, 196 integrally connected with the plates 154 and 168. As is seen in the drawings, bolts 202, 204 are threaded through the journal boxes 194, 196 for engagement with the bearings 182. An endless belt 206 is trained around the rollers 128, 130.

As is seen in Figures 3 and 6, the roller 128 is supported between the side walls 38, 40 in such a manner that the roller 128 is disposed in spaced confronting relation with respect to the chamfered ends 100, 104 and with a portion thereof projecting above the platforms 98 and 102.

A substantially U-shaped channel member 208 extends between and is supported on the side walls 38, 40 forwardly of the roller 128. As is seen in Figures 3 and 6, the channel member 208 has a side wall 210 which is inclined rearwardly towards the roller 128 and the side wall 38 is apertured at 212 between the side wall 210 and the other side wall 214 of the channel member 208, the aperture 212 forming a cleanout port. The port 212 is normally closed by a plug 216. The side wall 38 is also provided with a pair of arcuate slots 217 which are aligned with arcuate slots 218 formed in the plate 168, and similar slots 219, 220 are formed in the plate 154 and side wall 40, respectively.

The chamber 60, the rollers 128, 130, and the elements associated therewith as described above comprise the first of a series of ore separating chambers of the multistage ore separating apparatus 10. In the succeeding stages the component parts of the first stage are duplicated in every detail except one (to be discussed below) and consequently, to avoid needless repetition, the elements of the succeeding two stages will bear corresponding reference numerals to which, for the purpose of identification, the reference letters "A" and "B" have been added.

A pair of elongated substantially rectangular stringers 222, 224 are fixedly secured to the marginal edges of the platforms 98, 102, 103 and 114. A substantially rectangular closure member 226 extends transversely across the forward ends of the stringers 222, 224 and is seated on the flange 124 in spaced relation with respect to the adjacent end of the platform 114 to define a slot 228 therebetween. As is seen in Figure 3, the slot 228 is in open communication with the slot 126.

A plurality of angle iron spacers 230, 232, 234 extend transversely between and are rigidly secured to the stringers 222, 224, and a central divider 225 at longitudinally spaced intervals.

The spacers 230 are each provided with a depending

flange 236 which is proximate to but spaced from the chamfered end 100 of the platform 98 to form a substantially rectangular passage 238 therebetween. In a similar manner, the spacers 232 and 234 are provided with depending flanges 240 and 242, respectively, to define similar passages 244, 246 between the adjacent chamfered ends 106, 112 of the platforms 102 and 108.

An elongated substantially hollow rectangular top closure member is designated at 248. The member 248 is provided with a top wall 249 from which depend a pair of laterally spaced and substantially parallel side walls 250, 252 having inwardly turned flanges 254, 256, respectively, supported on the stringers 222, 224 (see Figure 4), and a forward, depending end wall 258 engaging, at its lower end, the closure member 226. The end wall 258 is integral with a bottom wall 260 which projects inwardly therefrom in spaced parallel relation with respect to the top wall 249. The inner end of the bottom wall 260 is integrally joined to an upright wall 262 having a flange 264 at the upper end thereof. As is seen in Figure 3, the inner end of the bottom wall 260 is supported on the spacer 234. The above recited structure defines a chamber 266. A second chamber 268 is defined by an end wall 270 which extends from the top wall 249 to one end of a bottom wall 272 having an upright wall 274 at its other end. As before, the upper end of the upright wall 274 terminates in a flange 276. A third identical chamber 278 is provided rearwardly of the chamber 268 and includes the end wall 280, bottom wall 282 and upright wall 284 having a flange 286 at the upper end thereof. The bottom walls 272 and 282 are supported on the spacers 232 and 230, respectively.

The top wall 249 terminates in a depending end wall 288 which connects with a bottom wall 290 that extends substantially parallel to the platform 98. The inner end of the bottom wall is integral with an end wall 292 which, at its upper end, engages the top wall 249.

Screens or filters 294, 296 and 298 extend between and are secured to the flanges 264, 276, 286 and the adjacent end walls 270, 280 and 292, respectively.

An L-shaped member 300 is secured to the lower end of the end walls 288 and a similar inverted L-shaped member 302 is secured to the other end of the platform 98 and the bottom wall 304 of a material feeding hopper 306 is rigidly secured thereto.

Reference numeral 308 designates rollers extending from the side walls 38 whereby the above described apparatus is mounted for reciprocation on the flanges 18 and 20 between the flanges 22, 24.

A vacuum pump 310 is supported on the top wall 312 of a substantially hollow rectangular material collecting receptacle 314 and is connected therewith through a conduit 315. The receptacle 314 is supported on suitable legs 316 in laterally spaced relation with respect to the apparatus 10.

Referring now to Figures 2, 3 and 4, it is seen that the side wall 250 is provided with a plurality of longitudinally spaced apertures 318, 320 and 322 which communicate with the chambers 278, 268 and 266, respectively. One end of a plurality of conduits 324 is connected to the apertures and the other ends thereof are connected with the receptacle 314 through rubber gaskets 326. A similar aperture 328 communicates with the chamber 117 and is connected through a conduit 330 and rubber gasket 332 with the receptacle 314.

Reference numeral 334 designates a prime mover such as, for example, an internal combustion engine on the drive shaft of which is mounted a V-pulley 336. An endless belt 338 connects the pulley 336 in driving relation with a pulley 340 mounted on a power input shaft 342 of a speed reducer 344. The shaft 342 also carries a second pulley 346 which is connected in driving relation with a pulley 348 through the endless belt 350. The pulley 348 is connected on the drive shaft 352 of the exhaust or vacuum pump 310. The power output shaft 354 has a first pulley 356 mounted thereon which is connected through the endless belt 358 with the pulley 174 mounted on the shaft 160. A second pulley 360 is mounted on the shaft 160 and is connected through an endless belt 362 with a pulley 360A mounted on the shaft 160A. The pulley 174A is connected in driving relation through the endless belt 364 with a pulley 174B mounted on the shaft 160B.

A second pulley 366 is also mounted on the shaft 354 and connects with a pulley 368 through the endless belt 370. The pulley 368 is mounted on a shaft 372 journaled in a pair of journals 374 disposed in laterally spaced relation. The journals 374 are supported on a suitable frame 376 which is braced by the struts 378 from the legs 34. A disk 380 is mounted for eccentric rotation with the shaft 372 and has a socket 382 projecting from its periphery. One end of a shaft 384 is fixedly secured in the socket 382 and the other end thereof extends loosely through a hanger bracket 386.

The other end of the shaft is partially threaded at 388 and washers 390 are mounted thereon and engage against opposite ends of the hanger 386. A pair of helicoidal springs 392 are interposed between the washers 390 and tension adjusting nuts 394 threaded on the threaded portion 388 of the shaft 384.

The hanger bracket is provided with a flange 396 which receives bolts 398 therethrough for connection with the bottom wall 44.

As has been stated above, one of the primary objects of this invention is to separate ferrous ores from mineral bearing ores, sands, dusts and other similar materials. The separation is accomplished in the multiple stage apparatus 10 in accordance with the proportion the ferrous material bears with respect to the other materials or minerals with which it is mixed. To accomplish this multistage separation, and for reasons to be made apparent below, the field strength of the roller 128 is less than the field strength of the roller 128A, and the field strength of the latter is less than the field strength of the roller 128B.

To operate the apparatus 10, the prime mover or internal combustion engine 334 is first set into operation to simultaneously activate the vacuum pump 310 and the speed reducer 344. With the speed reducer 344 in operation, the rollers 128, 130, 128A, 130A, 128B and 130B are rotated, and the apparatus is set into oscillation through the eccentric disk 380, the shaft 384, the helicoidal springs 392, and the bracket 386. Thereafter, the material to be separated or classified is first screened and placed into the hopper 306.

With the vacuum pump in operation, a large volume high pressure air stream is created within the apparatus 10 and the vacuum pulls the screened material from the hopper and into the passage extending between the platform 98 and the bottom wall 290. The vacuum draws lighter dust-like particles upwardly for passage through the filter 298 and into the vacuum chamber 278. These particles then pass through the aperture 318 and one of the conduits 324 into the receptacle 314. Thus, this dust is withheld from the belt 206. The heavier particles of the mineral bearing ore are drawn by the vacuum through the slot 238 and impinge against the belt 206. As has been set forth above, the filed strength of the roller 128 is less than the field strength of either of the other two rollers 128A and 128B. As a result, only those materials having a high ferrous content will adhere to the belt 206. The belt 206 being formed of non-magnetic materials will permit the ferrous bearing ore to separate therefrom and fall into the chamber 60 as soon as the ferrous bearing material has been drawn out of the magnetic field of the roller 128 (see Figure 6).

During this operation some of the heavier ores may have been carried over the belt 206 and pass through the slot extending between the chamfered end 104 of the platform 102 and adjacent portions 106. These heavier ores

possess a smaller percentage of ferrous material than the ore being deposited in the chamber 60, and to prevent the mixing thereof, the side 210 of the U-shaped channel member 208 is disposed in the path of the descent of the undesired material and guides the same into the channel member 208 from whence it may be removed after the plug 216 has been extracted from the opening or aperture 212.

The force of the vacuum is sufficiently great to carry some of the material to be classified or separated across the space which extends between the belt 206 and the chamfered end 104 of the platform 102. Here again, the force of the vaccuum is sufficiently great to pull through the filter or screen 296 the finer particles of the material for deposit within the chamber 268. From the chamber 268 these dust-like particles are exhausted through the opening 320 and are transferred to the receptacle 314 through a second conduit 324.

The vacuum is sufficiently high to cause the material remaining on the platform 102 to pass through the slot 244 for impingement on the second roller 128A. This roller having a greater field strength than the roller 128 causes minerals having a somewhat lesser ferrous content to adhere to the belt 206A for deposit within the chamber 62 in the manner described. The materials, at this stage, having practically no ferrous content and being relatively heavy are caught in the U-shaped channel member 208A for subsequent removal. Suction or vacuum again draws the remaining materials across the gap between the chamfered ends 110 and the adjacent portion of the belt 206A for travel across the platform 108. The finer dust-like particles now remaining are drawn through the filter or screen 294 and pass into the chamber 266. From this chamber the fine dust-like particles are exhausted through the opening 322 and the third of the conduits 324 and pass into the receptacle 314.

The roller 128B having the greatest magnetic field now causes materials passing thereover having a small ferrous content to adhere to the belt 206B for deposit in the chamber 64. Again, the undesired materials which pass over the belt 206B are caught or trapped in the U-shaped member 208B for subsequent removal in the manner described.

After this final stage of separation or classification of materials, the ore which now remains passes over the platform 114 and the exhaust vacuum means causes the same to pass into the chamber 117 from whence it is exhausted through the opening 328 and conduit 330 for deposit within the receptacle 314.

During all of the aforesaid separation stages, the apparatus has been reciprocated continuously to effect a more even flow of the material passing across the platforms 98, 102, 108 and 114. These platforms being inclined (as described above) facilitate the passage of the material being classified or separated across the platforms.

As the material fines build up within the chambers 60, 62 and 64 they are discharged through the U-shaped members 66, 68 and 70.

While the above described classification of materials has indicated that the apparatus 10 be continuously oscillated, under some conditions this is unnecessary. Much depends upon the dryness and size of the material to be separated. If these characteristics are present, the oscillating means may be disconnected from the apparatus 10, and while it has been specified that horseshoe type permanent magnets are employed, this invention can be practised using bar magnets, electromagnets, or any other magnetic material capable of establishing a magnetic field around the rollers 128, 128A and 128B.

From the foregoing specification it should now become quite evident that advantage has been taken of the specific gravity and/or density of the materials being separated as well as the law of gravity and the phenomena of magnetism.

Having described and illustrated one embodiment of this invention in detail, it will be understood that the same is offered merely by way of example, and that this invention is to be limited only by the scope of the appended claim.

What is claimed is:

Ore separating apparatus comprising a supporting frame, said frame including a pair of oppositely-disposed longitudinally-extending flanges, a plurality of connected chambers disposed in side-by-side relation and coacting as a unit, each of said connected chambers having a pair of opposed side walls, rollers mounted on each of said side walls, said rollers engaging and supporting said unit for reciprocable movement on said flanges relative to said frame, a first roller extending between and supported for rotation between said side walls in each of said chambers, said first rollers being formed of non-magnetic material, a plurality of permanent magnets embedded circumferentially in each of said first rollers to create a magnetic field completely therearound, a second roller for each of said chambers, each of said second rollers extending across and being supported for rotation on each of said pair of side walls below said first rollers, said second rollers each being formed of a non-magnetic material, an endless belt trained around each pair of said first and second rollers, said belt being formed of non-magnetic material, and each of said second rollers being positioned outside of the magnetic field of said first rollers, a platform fixedly secured to said side walls between each adjacent pair of said first rollers, a compartment for each of said chambers, said compartment being positioned above its respective associated chamber, each of said compartments having an opening formed therein, a filter extending across each of said openings, a second platform supported on said side wall and having an end thereof proximate to but spaced from one of said first rollers, all of said platforms being in the same plane and inclined at a small angle to the horizontal, an ore hopper opening on said last named platform to feed ore thereon, vacuum means disposed adjacent said unit and rigidly secured on said frame, said chambers of said unit being simultaneously reciprocable relative to said vacuum means when said unit is reciprocated, resilient conduits connecting each of said chambers and compartments with said vacuum means to draw said ore from said hopper across said platforms for successive impingement against said first rollers, the lighter dust-like portions of said ore being filtered through said filters for deposit in said compartments, the ore bearing magnetic material adhering to said belts until said belts move out of the magnetic field of said first rollers, a substantially U-shaped channel member disposed within each of said chambers, said U-shaped channel members extending between and being fixedly secured to said side walls adjacent to but spaced from one of said platforms, respectively, each of said U-shaped channel members having a side wall inclined towards its immediately adjacent one of said first rollers to receive therein the lighter magnetic ore discharged from each of said first rollers, the heavier magnetic ore bearing material adhering to said belts until said belts are moved out of the magnetic field of said first rollers whereupon said heavier magnetic ore bearing material is released from said belts and falls into said chambers, and the dust and lighter ore bearing non-magnetic materials being withheld or removed from said platforms and said belts by said vacuum means.

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