No. 815,679. PATENTED MAR. 20, 1906.

H. H. CAMPBELL.

CONCENTRATOR.

APPLICATION FILED APR. 14, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

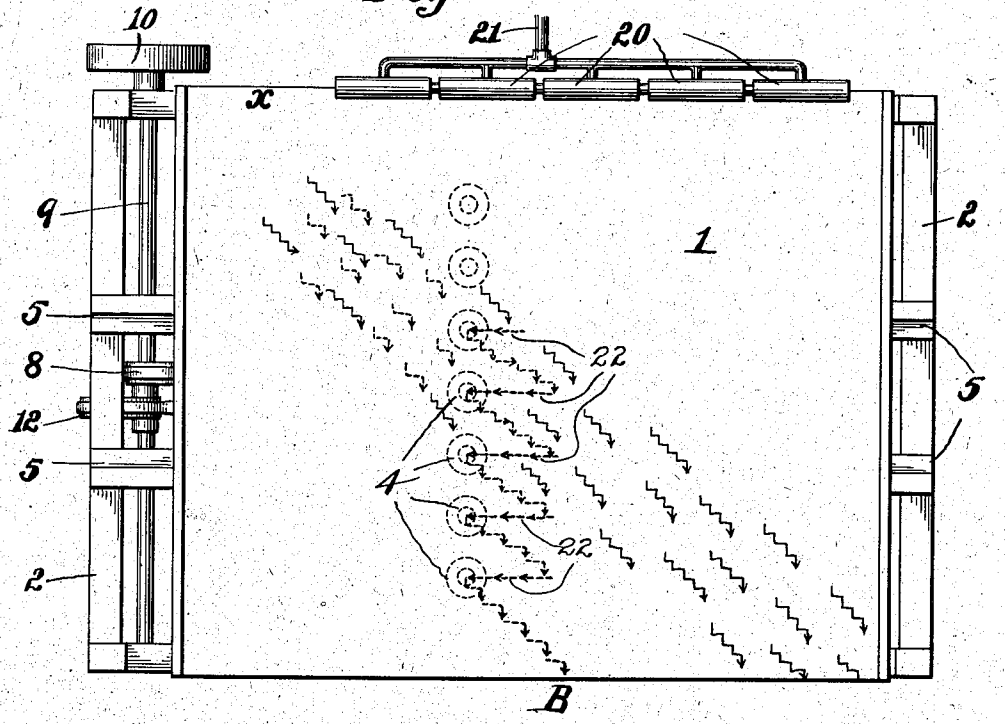
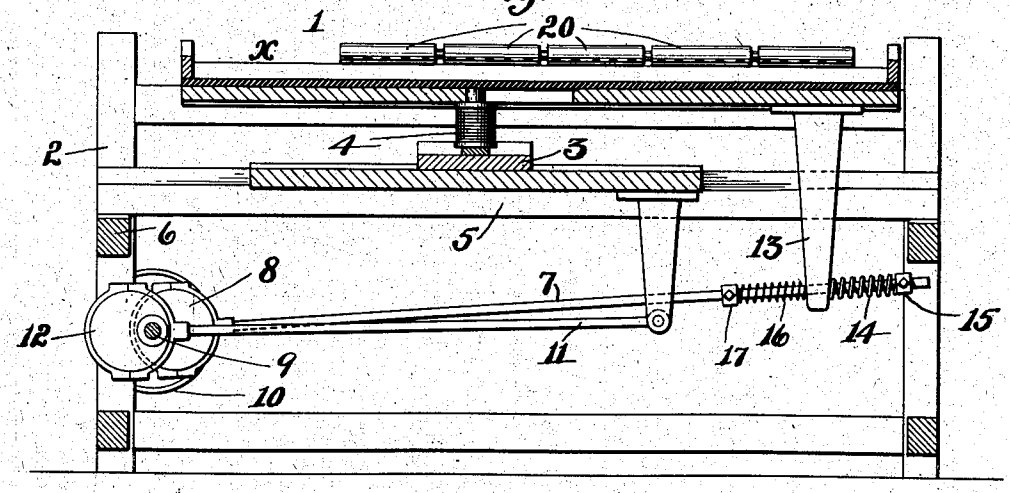


Fig. 2.



WITNESSES:

Chas. A. Teal

Walter C. Busey

INVENTOR:

Harry H. Campbell

BY

Joshua Busey

ATTORNEY.

No. 815,679. PATENTED MAR. 20, 1906.

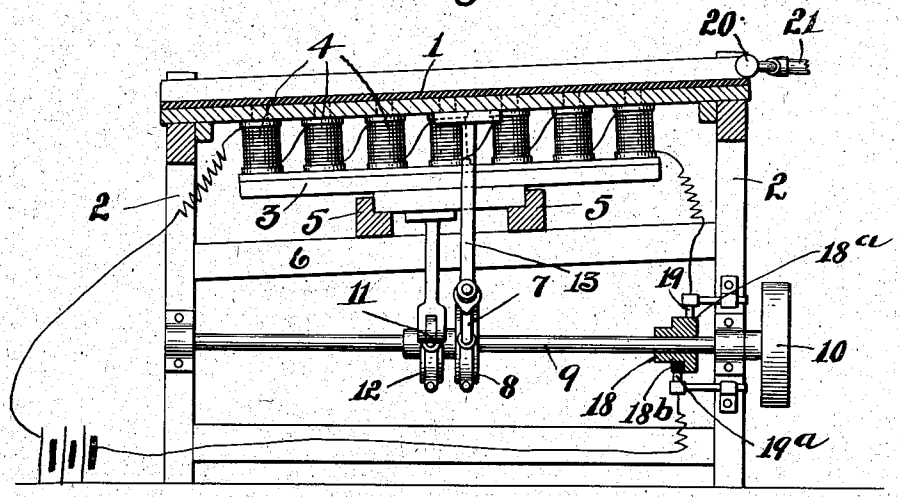
H. H. CAMPBELL.

CONCENTRATOR.

APPLICATION FILED APR. 14, 1904.

2 SHEETS—SHEET 2.

Fig. 3.



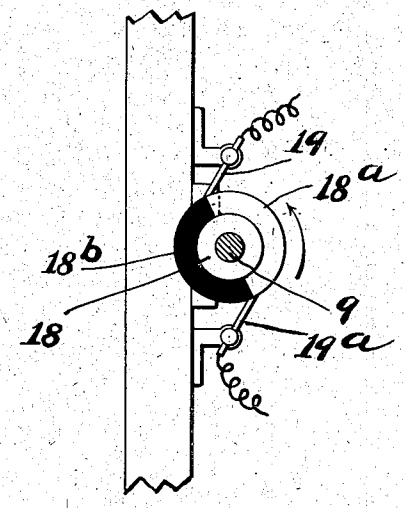


Fig. 4.

WITNESSES:

Chas. A. Teal

Walter C. Busey

INVENTOR:

Harry H. Campbell,

BY

Joshua Busey

ATTORNEY.

UNITED STATES PATENT OFFICE.

HARRY H. CAMPBELL, OF STEELTON, PENNSYLVANIA.

CONCENTRATOR.

No. 815,679. Specification of Letters Patent. Patented March 20, 1906.

Application filed April 14, 1904. Serial No. 203,188.

To all whom it may concern:

Be it known that I, HARRY H. CAMPBELL, a citizen of the United States, residing at Steelton, in the county of Dauphin and State of Pennsylvania, have invented certain new and useful Improvements in Concentrators, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, of which—

Figure 1 is a plan view. Fig. 2 is a transverse section. Fig. 3 is a longitudinal section. Fig. 4 is a detail of the switch for causing the demagnetization and remagnetization of the magnets.

This invention relates to improvements in apparatus for separating the magnetizable from the non-magnetizable particles of ores.

The invention consists of the combination of a support or table, means for imparting motion thereto, a series or row of electromagnets adjacent and arranged in a row substantially parallel with and transverse to the line of movement of said support, means for reciprocating said magnets in a direction transverse to the line thereof, means for demagnetizing said magnets during the length of their forward movement and for magnetizing them during the length of their return movement, and means tending to carry the material to be treated over and upon said support in a direction substantially parallel with the line of said magnet series.

The invention further consists of a reciprocatory table, preferably sloping, a series of electromagnets adjacent thereto, arranged in a row in a line with the slope of the table, and means for demagnetizing and remagnetizing said magnets at predetermined times with relation to the reciprocations and throw of the table, whereby separation of the ore particles above alluded to is effected in a manner hereinafter particularly described.

The invention also comprises certain features and details of construction hereinafter duly pointed out.

Referring to the accompanying drawings, which illustrate the preferred form of the invention, 1 is a table that is supported by a frame 2, in suitable guideways of which the table is adapted to slide, and which table is inclined, as more clearly seen in Fig. 3. Secured to a bar 3, beneath and adjacent to said table and extending transversely on the line of the incline thereof, is a series of electromagnets 4, that are suitably connected with a source of electrical energy. This bar is adapted to slide in guideways of bars 5, that are fastened to a cross-bar 6 of the frame 2. The table is connected by a rod 7 to the strap of an eccentric 8, mounted on a shaft 9, that is adapted to be driven by a belt (not shown) running over a pulley 10 on the shaft 9. The bar 3, that supports the magnets, is connected by a rod 11 to the strap of an eccentric 12. The rotation of the shaft 9—that is, the eccentrics—imparts reciprocatory movements to the table and the series of magnets. The two eccentrics are set, as shown, so that when the table moves in one direction the series of magnets move in the opposite direction. In order to effect a sudden jolt or bump of the table at or near the end of its forward stroke, I pass the connecting-rod 7 through a hole in an arm 13, that depends from the under side of the table. On the part of the rod beyond the said arm is a coil-spring 14, one end of which abuts against the latter and the other end against a collar 15 on rod 7, and on the opposite side of said arm is a similar spring 16, that abuts against the arm 13 and against a collar 17 on said rod. The first-mentioned spring 14 is of greater resistance than the second. The use and operation of these springs in reciprocating concentrating-tables being well known require no particular description.

Mounted on the shaft 9 is a circular switch 18, (which is in circuit with the magnets and with a suitable source of electrical energy,) one portion of which, 18^a, is of conducting material and the other portion, 18^b, of non-conducting material, one of the brushes 19 of which switch will be in continuous contact with the portion 18^a and the other brush 19^a will be in contact with the portion 18^b during one-half of the revolution of the switch.

Along a portion of the high end of the table is a series of sprinklers 20, that communicate by a pipe 21 with a source of water-supply, whereby a stream or thin sheet of water is allowed to flow upon and over the table.

Having described the construction of the invention, I proceed to explain the mode of operation thereof as follows, premising that the table is at about the limit of its forward throw and the magnets at about the limit of their rearward stroke. The ore in comminuted or pulp form is allowed to flow upon the upper corner of the table at *x*, Fig. 1, the

shaft 9 being then in motion, and thus reciprocating the table and magnets through the respective connections before described. The tendency of the particles of ore is to descend the table by their gravity and assisted by the downflowing water, if the same be used; but as the table moves forward it is jolted or bumped by reason of the described spring construction, the ore particles being thrown forward by their momentum in a line substantially at right angles to the course which they take by gravity or by the action of the water. The result is that the particles take a zigzag or diagonal course upon the table, as indicated in Fig. 1. When, however, the ore in that course comes into the field of the magnetized magnets, which is at the end of the forward stroke or the beginning of the return stroke, at which instant they are magnetized, they carry with them the magnetizable particles of the ore in the direction indicated by the dotted arrows 22 in Fig. 1, and when the magnets have reached the limit of their return stroke the said particles are released by the demagnetization of the magnets and are then free to move under the influence of the table and gravity, which table at the instant of demagnetization of the magnets reaches the end of its forward stroke, at which the jolting or bumping action takes place, as before described. The momentum of the particles throws them forward, as before, and they continue to travel in a diagonal zigzag line under the influence of gravity and the successive bumps of the table until they come into the field of the next magnet below, when it reaches the end of its forward stroke, and so on from magnet to magnet until being released by the lowermost magnet of the series these particles fall from the table at B. The non-magnetizable particles of the ore take continuous diagonal zigzag lines according to their weight and fall from the table adjacent to the forward lower corner thereof. The dotted lines and arrows in Fig. 1 indicate the approximate course of the magnetizable particles and the full lines and arrows that taken by the non-magnetizable particles.

Other suitable means for advancing the particles of material across the table in lines substantially parallel with the line of the magnets may be employed in lieu of that hereinbefore described.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In an ore-separator, the combination of a suitable support for the material to be treated, a row of electromagnets adjacent said support, means for imparting reciprocatory movement to said magnets in a direction transverse to the line thereof, means for causing said support to move in a direction transverse to the line of said magnets, means for demagnetizing said magnets during the forward stroke and for magnetizing the same during the return stroke, and means tending to carry said material over and upon said support in a direction substantially parallel with the line of said magnets, substantially as and for the purpose set forth.

2. In an ore-separator, the combination of the slidable table, means for imparting reciprocatory motion thereto, means for imparting a sudden bump or jolt thereto at the end of its forward stroke, a series of electromagnets adjacent to said table in a line substantially at right angles to the line of reciprocation of the latter, means for effecting reciprocations of said magnets reverse to those of said table, means for magnetizing said magnets at the end of their forward stroke, and demagnetizing the same at the end of their return stroke; together with means tending to advance the ore particles upon said table in lines transverse to the direction of reciprocation of said table and magnets, substantially as and for the purpose set forth.

3. In an ore-separator, the combination of the inclined slidable table, the series of electromagnets adjacent thereto in the line of the incline of said table, means for imparting a reciprocatory motion to said table, means for causing a sudden bump or jolt of the latter at the end of its forward reciprocation, means for effecting reciprocations of said series of magnets reverse to those of the table, and means for magnetizing said magnets at the end of their forward stroke and demagnetizing the same at the end of their return stroke, substantially as and for the purpose set forth.

4. In an ore-separator, the combination of a support for the material to be treated, means tending to move said material transversely over and upon said support, means for causing said support to move longitudinally, an electromagnet adjacent said support, means for imparting reciprocatory movement to said magnet in a direction at an angle to the direction of travel of the material across said support induced by said first-mentioned means, together with means for demagnetizing said magnet during its forward stroke and for magnetizing the same during the return stroke.

5. In an ore-separator, the combination of a support for the material to be treated, means tending to move said material transversely over and upon said support, means for causing said support to move longitudinally, a series of electromagnets adjacent said support and extending in a transverse direction relative thereto, means for imparting reciprocatory movement to said series of

magnets in a direction at an angle to the direction of travel of the material across said support induced by said first-mentioned means, together with means for demagnetizing said magnets during their forward stroke and for magnetizing the same during the return stroke.

In testimony whereof I have hereunto affixed my signature this 20th day of February, A. D. 1904.

HARRY H. CAMPBELL.

Witnesses:

HOMER L. LITZENBERG,

J. B. F. LAURIE.