No. 790,342. PATENTED MAY 23, 1905.

H. H. CAMPBELL.

CONCENTRATOR.

APPLICATION FILED APR. 14, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

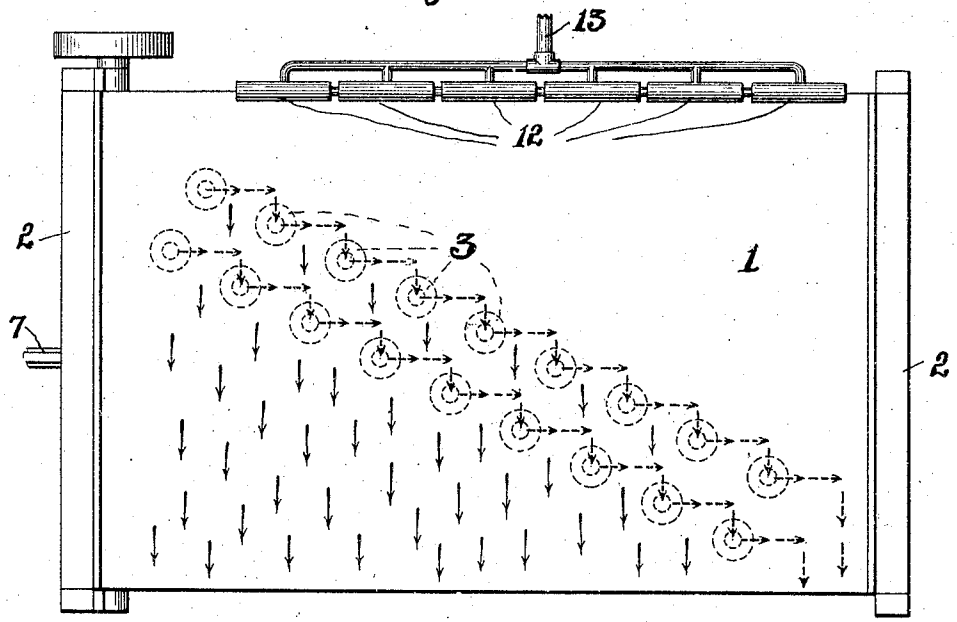
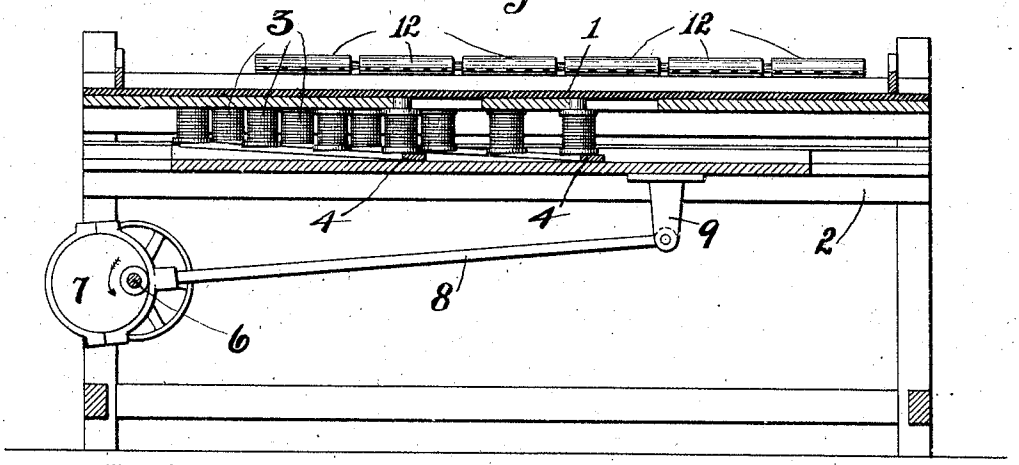


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

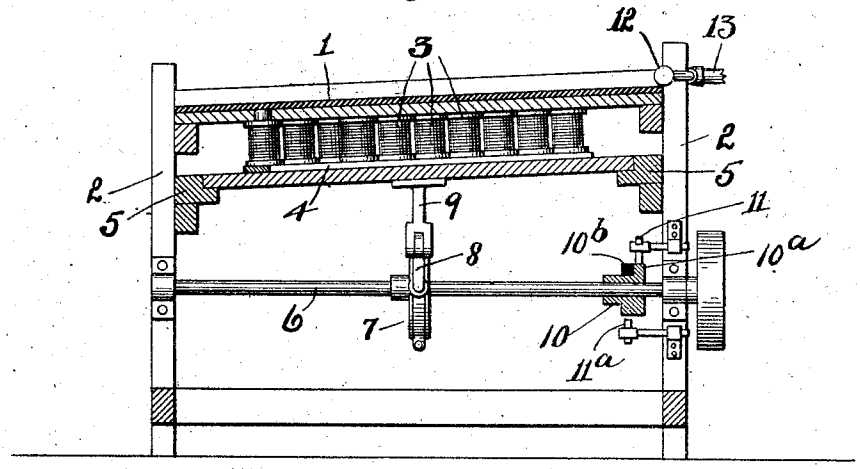


Fig. 4.

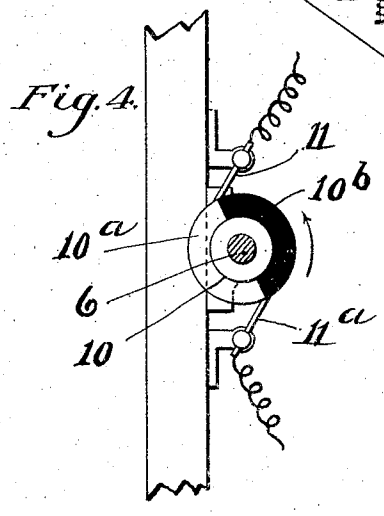
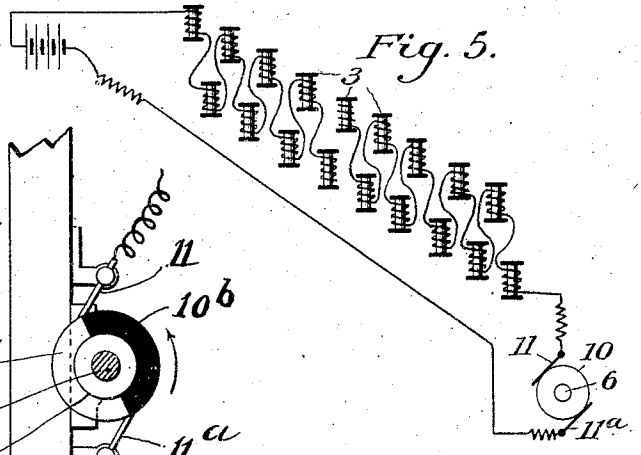


Fig. 5.



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UNITED STATES PATENT OFFICE.

HARRY H. CAMPBELL, OF STEELTON, PENNSYLVANIA.

CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 790,342, dated May 23, 1905.

Application filed April 14, 1904. Serial No. 203,187.

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 longitudinal section. Fig. 3 is a transverse section. Fig. 4 is a detail of the switch for causing the demagnetization and remagnetization of the magnets. Fig. 5 is a diagrammatic illustration of the electrical connections.

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

The invention consists of a table, preferably inclined, a series of electromagnets arranged in a diagonal row or rows adjacent said table, means for reciprocating said magnets in a direction lengthwise of the table, means for demagnetizing said magnets at the end of their forward stroke and remagnetization of the same at or immediately before they reach the limit of their return stroke, whereby the magnetic particles of the ore allowed to flow upon the table at a point above the first magnet of the series are carried by that magnet to a point above that vacated by the next forward magnet, which particles are left free to descend when the first magnet is demagnetized and are, so to say, caught by said second magnet on the return stroke thereof, and so on, consecutively, step by step, in stair-like lines until said particles finally escape the last magnet of the series and fall from the table, the non-magnetizable particles simply descending the table unaffected by the magnets. Usually means—such, for example, as a stream of water—will be employed to facilitate the escape of the non-magnetic or earthy particles of the ore.

Referring to the accompanying drawings, which illustrate a preferred form of the invention, 1 is an inclined table that is supported by a frame 2. Beneath and adjacent to this table is a series of electromagnets 3, that are secured to a bed 4, Figs. 2 and 3, which is adapted to slide in guide-brackets 5, projecting from the inner sides of frame 2. These magnets are arranged as clearly shown by dotted lines in Fig. 1—that is to say, they occupy a diagonal line beginning at a point adjacent an upper corner of the table and ending near the lower corner at the opposite side of the table. The bed 4 is adapted to be reciprocated longitudinally—that is, transversely with reference to the table—by any suitable means—as, for example, by a driven shaft 6, carrying an eccentric 7, whose strap is connected by a rod 8 with a lug or projection 9 from the under side of the bed. In the present instance the means for demagnetizing and remagnetizing the magnets consists of a cylindrical switch 10, which is in circuit with the magnets and with a suitable source of electrical energy, (not shown,) upon the shaft 6, one portion of which, 10^a, is of conducting and the other portion, 10^b, of non-conducting material, one of the brushes, 11, of which switch will be in continual contact with the portion 10^a and the other brush, 11^a, will be in contact with the portion 10^b during one-half of the revolution of the switch.

The mode of operation of the apparatus is as follows, premising that the parts are in the position occupied by them immediately prior to a forward stroke of the bed 4—that is, of the series of magnets—at which time, as shown in Fig. 4, the brush 11^a has begun to run upon the conducting portion 10^a of the switch, and consequently the magnets are magnetized. As the shaft continues its rotation (in the direction of the arrows in Figs. 2 and 4) the bed 4 is advanced in the direction of the arrow adjacent thereto in Fig. 2, and the magnets will continue magnetic until the shaft has made half a revolution thereof—that is, up to the limit of the forward stroke of the bed—when the said brush 11^a will bear against the non-conducting portion of the switch, thus demagnetizing the magnets during the return stroke. During the reciprocation of the magnets the ore is allowed to flow upon the table above the upper or first magnet of the series, and the magnetic particles of the ore coming within the field of attraction of the magnet

are held thereby and are carried on the forward stroke of said magnet to a point above that which will be occupied by the next magnet of the series on the return stroke of the latter, and the said particles descending the last-mentioned magnet will likewise attract the same and on the next forward stroke carry the particles to the position to descend to the succeeding magnet on the return stroke, and so on, these particles moving in the line indicated by the broken arrows in Fig. 1 until the demagnetization of the last magnet of the series allows the particles to escape from the table. Thus the said particles are caused to travel in a zigzag line across the table. The free or non-magnetic particles of the ore flow or roll off the table, as indicated by the full-line arrows in said Fig. 1. As it will sometimes be necessary or desirable to assist the downward movement or separation of the ore, I provide near the upper or higher edge of the table a series of sprinklers 12, that communicate with a pipe 13, leading from a source of water-supply, whereby water in a thin stream is flowed over and down the table and carries off the non-magnetic particles. Other suitable means may be employed in lieu of a current of water for the like purpose.

There may be secured to the bed 4 one or more additional series of magnets similar to the first series, as shown and indicated by dotted lines in Fig. 1, those of the lower series being, respectively, below the spaces intervening between the magnets of the first series, as indicated. Thus any of the magnetizable particles that may have escaped from the influence of a magnet of the first series will be caught by the next one below on the second series.

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

1. In an ore-separator, the combination of the table, the series of magnets arranged adjacent thereto in a row extending from near one corner of the table to near the diagonally opposite corner thereof, means for reciprocating said magnets transversely to said table, and means for magnetizing and demagnetizing said magnets at predetermined times, and means tending to carry the material in the direction transverse to that of the magnet series, substantially as and for the purpose set forth.

2. In an ore-separator, the combination of the inclined table, the series of magnets arranged adjacent thereto in a row extending from near an upper corner of the table to near the diagonally opposite lower corner thereof, means for reciprocating said magnets in a direction transverse to that of the incline of said table, substantially as set forth.

3. In an ore-separator, the combination of the table, the series of magnets arranged adjacent thereto in a row extending from near one corner of the table to near the diagonally opposite corner thereof, means for reciprocating said magnets in a direction parallel with and transverse to said table, and means for causing water to flow over upon and from said table in the direction transverse to that of the reciprocation of said magnets, substantially as and for the purpose set forth.

4. In an ore-separator, the combination of the table, the series of magnets arranged adjacent thereto in a row extending from near one corner of the table to near the diagonally opposite corner thereof, the second like series of magnets staggered with relation to said first series, means for reciprocating said two series of magnets in a direction transverse to said table, means for magnetizing and demagnetizing said magnets at predetermined times, and means tending to carry the material in a direction transverse to that of the movement of the magnet series, substantially as and for the purpose set forth.

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

HARRY H. CAMPBELL.

Witnesses:
HOMER LITZENBERG,
J. B. F. LAURIE.