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METHOD AND APPARATUS FOR SEPARATING ORES OR THE LIKE.

APPLICATION FILED JUNE 14, 1912.

1,083,979. Patented Jan. 13, 1914.

2 SHEETS—SHEET 1.

Fig. 1.

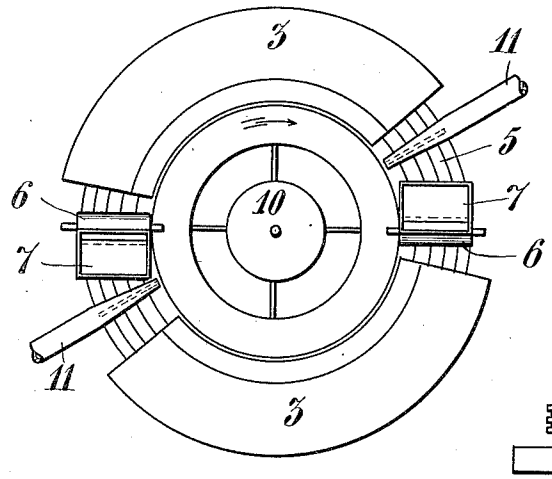


Fig. 5.

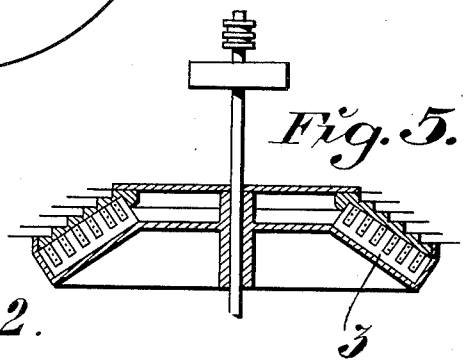
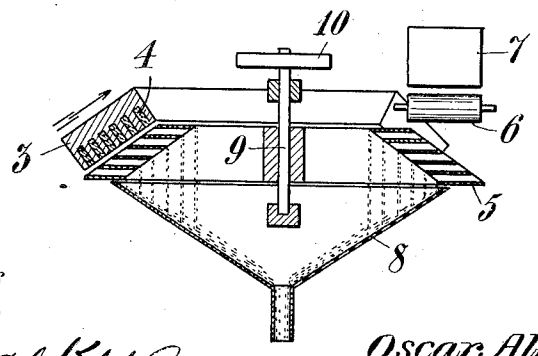


Fig. 2.



Witnesses

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2 SHEETS—SHEET 2.

Fig. 3.

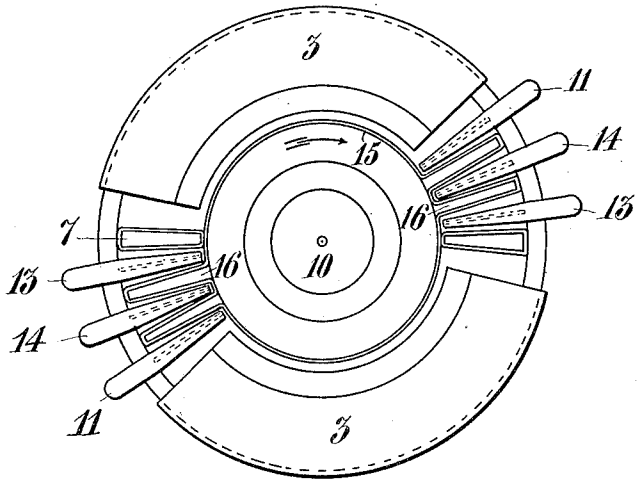
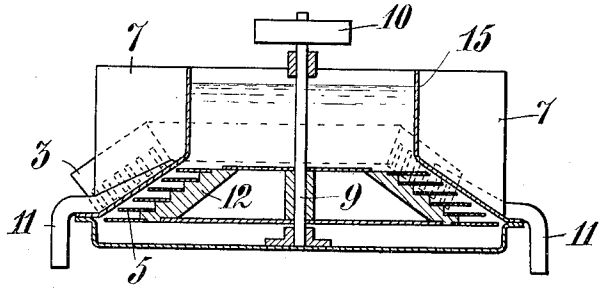


Fig. 4.



Witnesses

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METHOD AND APPARATUS FOR SEPARATING ORES OR THE LIKE.

1,083,979. Specification of Letters Patent. Patented Jan. 13, 1914.

Application filed June 14, 1912. Serial No. 703,709.

To all whom it may concern:

Be it known that I, OSCAR ALFRED ZANDER, a subject of the King of Sweden, and resident of Guldsmedshyttan, in the Kingdom of Sweden, engineer, have invented certain new and useful Improvements in the Method and Apparatus for Separating Ores or the like, of which the following is a specification, reference being made to the accompanying drawings.

My invention relates to a method of and apparatus for magnetically separating ores, and has more especial reference to a method and apparatus of the type disclosed by my copending application, Ser. No. 607,643, now Patent No. 1,074,999, dated Oct. 7, 1913, wherein ore is arranged in a series of successive layers differing in diameter from each other, a traveling magnetic field of force being employed to separate out the magnetic ore particles, such as the concentrate, while suction is preferably employed to remove such particles of the ore (the gangue) as have not been separated out by the traveling magnetic field of force.

Apparatus constructed in accordance with this invention may be arranged in such a manner, that the supports or shelves for the material to be separated consist of rings which rotate around a common axis and the diameters of which decrease upward or downward. The feeding down of the material on to the shelves, which partially cover each other, can suitably take place along a generatrix or, especially in large apparatus, along two or more generatrices. The body or bodies which cause the traveling (or rotating) field or fields may be situated beyond (above) or inside (below) the shelves or beyond as well as inside the same. In apparatus of this kind the non-magnetic particles or both these particles and the magnetic particles are, after the separation, removed from the shelves by suction.

On the accompanying drawings are shown by way of example two forms of this invention.

Figures 1 and 2 show a top view and a vertical section respectively of the one form, while Figs. 3 and 4 show in a similar manner the other form; and Fig. 5 is a detail view more fully hereinafter referred to.

In the apparatus shown in Figs. 1 and 2 the diameters of the shelves 5 for the material to be separated decrease upward, and the feeding down of the said material on to the shelves (by means of rollers 6 from receivers 7) takes place along two generatrices, situated diametrically. In consequence hereof two bodies 3, each causing a traveling field, extend along the outer edges of the shelves. The shelves are carried by arms, extending from a hub, which is fixed on a vertical, rotating shaft 9 provided with a pulley 10.

The spaces between the shelves 5 (Figs. 1 and 2) are open in both directions radially, so that the magnetic (or magnetizable) particles, which are moved inwardly by the traveling fields, that is to say to the inner edges of the shelves, can fall down past said edges into a collecting funnel 8. The non-magnetic (or non-magnetizable) particles remain on the shelves, until they reach suction nozzles 11 (having slots directed toward the shelves), which nozzles extend inwardly over the shelves and through which the last-mentioned particles are sucked away.

The apparatus shown in Figs. 3 and 4 is a modification of the one illustrated in Figs. 1 and 2 in so far, that the spaces between the shelves are closed inwardly. The shelves are fixed on a solid ring 12, which is steplike in section and which consists of a non-conducting material. The crushed ore is fed down on to the shelves from the receivers 7 situated diametrically opposite, on account of which situation there also in this case are two bodies 3 for the generation of the traveling field and two nozzles for the sucking away of the non-magnetic particles (the gangue). The magnetic particles (the concentrate) are moved by the traveling fields farthermost in under the shelves 5, while the gangue remains resting on the outer portions of the shelves and especially on those portions of the shelves which are not covered by superposed shelves. When the gangue during the rotation of the shelves comes below the suction nozzles 11, it is sucked away, while the concentrate remains on the shelves, until it comes to suction nozzles 13, the suction action of which is so powerful that it appears farthermost in under the shelves.

Between each pair of suction nozzles 11 and 13 there may be one or more suction nozzles for sucking away a mixture or mixtures of concentrate and gangue. The mixtures increase in purity and the action of

the suction nozzles should increase in the direction of rotation of the shelves. In Fig. 3 two such suction nozzles 14 are shown.

In apparatus having two or more traveling fields it may in certain cases be sufficient to provide one nozzle only for the sucking away of the pure concentrate.

If the bodies 3 causing the magnetic fields are situated inside (below) the shelves 5, they may, instead of being fixed (as is the case with the bodies 3 in Figs. 1 to 4), partake in the rotation of the shelves. In this case the bodies in question (whether fixed or rotating) may be replaced by a single, annular body, as no interruptions for the feeding and suction devices then are required. The windings of the annular body may then be carried out as rings placed the one beyond the other, the manufacture of the body thereby being facilitated and simplified.

The sucking away of the materials separated (or a mixture or mixtures of them) can take place either by means of air, as is the case in the apparatus shown in Figs. 1 and 2, or by means of water, as in the apparatus shown in Figs. 3 and 4, the parts of the last-mentioned apparatus being located in substantially still water contained in a vessel 15. The bodies 3 are mounted externally on the vessel 15, which is provided with projections 16, which facilitate the streaming of the water from the interior of the vessel to the suction conduits.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. The herein described method of magnetic ore separation which consists in arranging the ore in a series of successive layers varying in diameter subjecting said layers to the action of a traveling magnetic field and moving said layers in lines diverging from the line of travel of a traveling magnetic field of force whereby the magnetic particles of the ore will be separated from the non-magnetic particles thereof, and subsequently removing the remaining particles.

2. The herein described method of magnetic ore separation which consists in arranging the ore in a series of successive layers varying in diameter, traveling a magnetic field of force radially to said layers whereby the magnetic particles thereof will be forced radially of said layers, and subsequently removing different parts of said layers by suction applied at a plurality of points.

3. The herein described method of magnetic ore separation which consists in arranging ore in a series of superposed layers varying in diameter, and revolving said layers successively subjecting them to the action of a magnetic field of force traveling in a direction differing from that of the travel of the ore and to gangue removing influence, whereby the magnetic particles of the ore are moved by the magnetic field of force in one direction and the non-magnetic particles are subsequently removed.

4. The herein described method of magnetic ore separation which consists in arranging the ore in a series of superposed concentric layers independent of each other, revolving said layers relatively to an inwardly traveling field of magnetic force about the outer peripheries of said layers whereby the magnetic particles of the ore are moved toward the inner peripheries of said layers, and subsequently removing the remainder of the ore.

5. Apparatus for magnetic ore separation embodying therein a series of superposed concentric shelves of successively varying diameters, means arranged about the outer peripheries of said shelves for producing a traveling field of magnetic force, means for revolving said shelves as a unit relative to said means for producing the magnetic field of force, means for feeding ore by gravity to said shelves, and suction means for each shelf for removing the non-magnetic material.

6. Apparatus for magnetic ore separation comprising a series of concentric shelves of successively varying diameters and open radially at both sides, means for revolving said shelves as a unit, a collecting receptacle common to said several shelves, means for producing a traveling magnetic field of force adapted to force the magnetic ore particles into said collector, and means for removing the balance of the ore from said shelves.

In witness whereof I have hereunto set my hand in presence of two witnesses.

OSCAR ALFRED ZANDER.

Witnesses:

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Carl Th. Sundholm.

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