O. A. ZANDER.

METHOD AND APPARATUS FOR MAGNETIC SEPARATION.

APPLICATION FILED FEB. 9, 1911.

1,074,999.

Patented Oct. 7, 1913.

2 SHEETS—SHEET 1.

Fig. 1.

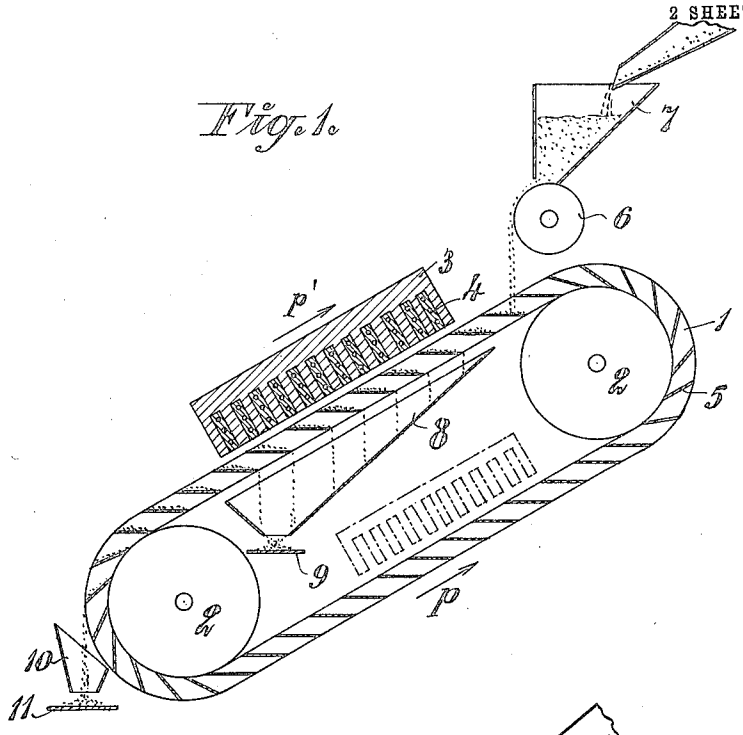
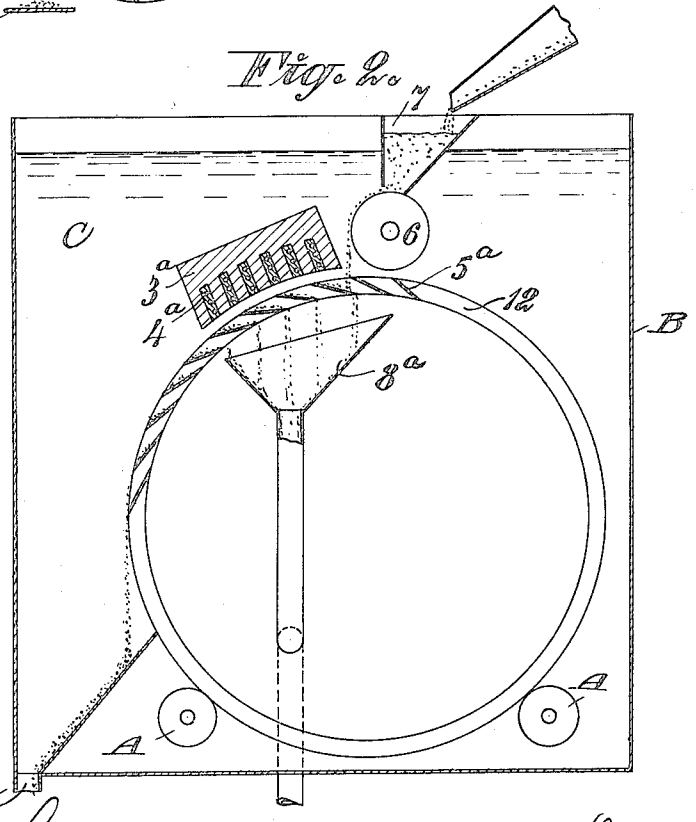


Fig. 2.



Witnesses:-

Louis Armour

Clarissa Frank

Inventor

Oscar Alfred Zander

by

his Attorney

O. A. ZANDER.

METHOD AND APPARATUS FOR MAGNETIC SEPARATION.

APPLICATION FILED FEB. 9, 1911.

1,074,999.

Patented Oct. 7, 1913.

2 SHEETS—SHEET 2.

Fig. 3c

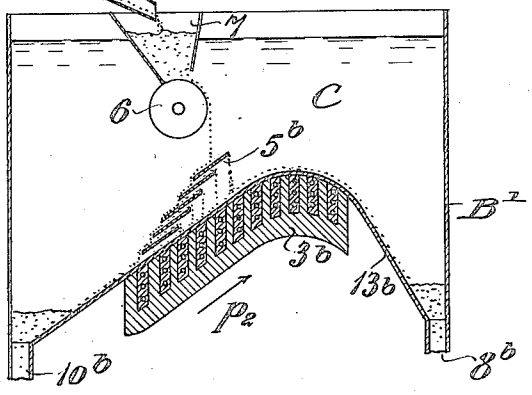
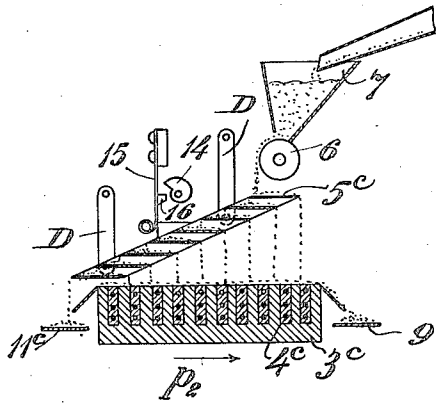


Fig. 4c



Witnesses:-

Louis Armour

Clarence Tiandt

Inventor

Oscar Alfred Zander

by Otto Munn

his Attorney

UNITED STATES PATENT OFFICE.

OSCAR ALFRED ZANDER, OF STOCKHOLM, SWEDEN.

METHOD AND APPARATUS FOR MAGNETIC SEPARATION.

1,074,999. Specification of Letters Patent. Patented Oct. 7, 1913.

Application filed February 9, 1911. Serial No. 607,643.

To all whom it may concern:

Be it known that I, OSCAR ALFRED ZANDER, a subject of the King of Sweden, and resident of 12 Vestmannagatan, Stockholm, in the Kingdom of Sweden, engineer, have invented certain new and useful Improvements in Methods and Apparatus for Magnetic Separation, of which the following is a specification, reference being made to the accompanying drawings.

My invention relates to a novel method of, and apparatus for, magnetic separation by means of which the magnetic particles of ore or other material acted upon, are separated from the non-magnetic parts thereof.

The object of the invention is to produce a novel method and apparatus whereby ore may be quickly and efficiently separated into its magnetic and non-magnetic constituents.

In carrying my method into practice I preferably feed the ore on to a series of superposed overlapping supports, and thereafter subject the ore while on said supports to the action of a traveling magnetic field whereby the magnetic field acts to separate the magnetic ore particles from the entire ore body.

Numerous forms of apparatus may be employed in carrying out this invention, and in the accompanying drawing wherein I have shown four such forms, Figure 1 is a vertical sectional view of one form of apparatus; Fig. 2 is a similar view of a modified form of apparatus wherein the separation is effected in a body of substantially still water; Fig. 3 is a view similar to Fig. 2 of a still further modified form; and Fig. 4 is a vertical sectional view of a further modified form wherein the superposed supports are subjected to vibratory action.

Irrespective of the form of apparatus employed, the essential steps of the method remain the same, and as stated above consist in first feeding crushed ore (or such other material as is to be subjected to the separation process) on to a series of superposed overlapping supports, which in some instances may be inclined, and while the ore is on these supports subjecting the same to the action or influence of a traveling magnetic field, produced by a polyphase alternating current, whereby the magnetic force traveling along the line of the supports separates from the ore thereon the magnetic particles.

I will now proceed to describe in detail the several forms of apparatus shown in the accompanying drawing.

Referring first to Fig. 1, 7 indicates a suitable hopper from which the ore is fed over a roller 6 on to a traveling belt 1 running over suitable rollers 2, the belt traveling in the direction of the arrow p. This belt is provided with a series of shelves or supports 5 the ends of which overlap. 3 designates a suitable iron body having embedded therein windings 4 through which the polyphase alternating current passes for the purpose of producing the field of magnetic force which travels in the direction indicated by the arrow p', which it will be noted is opposite the direction in which the supports 5 are carried by the belt 1. As the ore is fed on to the shelves 5 and past the magnetic field the latter will separate out the magnetic particles of the ore causing such magnetic particles to travel over and drop from the rear or inner ends of the shelves or supports and into the receptacle 8 and thence on to a conveyer 9. The non-magnetic particles are not affected by the magnetic field and are carried by the belt down into the receptacle or hopper 10 and thence on to the conveyer 11. It is advisable in all forms of the invention to provide a rather thin layer of ore on each of the shelves 5 inasmuch as the separation of the magnetic particles from the remainder of the ore body is in this manner facilitated. The thinness of the layer does not detract from the capacity of the apparatus, inasmuch as the shelves 5 may be made practically of any width desired and thus very large bodies of ore may be treated in a relatively short time.

Referring to Fig. 2, 7 indicates a hopper and 6 a feed roller over which the ore passes. 12 designates a circular belt or band passing over and guided by rollers A. This circular band supports the shelves or supports 5^a which are successively brought under the influence of the traveling field consisting of the iron body 3^a and windings 4^a. The magnetic particles of ore are caused, by the magnetic field, to drop into the receptacle 8^a and the non-magnetic particles pass out at 10^a. In this form of the invention the separation is carried on in a receptacle B containing a body of substantially still water C. It will be understood that this water is not kept in circulation and there is practically

no movement of the same except as water is drawn off and fresh water charged into the receptacle.

In Fig. 3 the separation occurs in a receptacle B′ containing the body of substantially still water C. The ore is fed from the hopper 7 over the feed roller 6 on to a series of inclined fixed supports 5^b which overlap. The iron body 3^b in which the traveling magnetic field of force is produced is arched and is arranged under a diamagnetic arch 13^b leading at one side to the outlet 8^b and at the other side to the outlet 10^b. As the ore is fed on to the supports or shelves 5^b the traveling field of force separates out the magnetic particles from the ore body and causes these magnetic particles to travel in the direction of the apex of the arch whence they fall a distance by gravity to the outlet 8^b. The field of force travels in the direction of the arrow p^2. The non-magnetic particles of the ore fall from the shelves by gravity down the sides of the arch opposite 8^b and out through the outlet 10^b.

In Fig. 4, 7 designates the hopper and 6 the feed roller. 5^c designates a series of inclined shelves carried in a frame hung on links D. 3^c and 4^c designate the body in which the traveling field of force is produced, the direction of travel being indicated by the arrow p^2. As the field travels it separates out the magnetic particles and causes them to fall on to the conveyer 9^c. The non-magnetic particles are shaken off the shelves 5^c on to the conveyer 11^c by means of a rotating pawl 14 adapted to strike an abutment 16 formed integrally with a spring 15 connected to the frame which supports the shelves 5^c.

Having thus described my invention what I claim is:—

1. The herein described method of magnetic ore separation which consists in arranging ore in a series of overlapping spaced layers or strata and traveling a magnetic field of force transversely of said series and in a direction substantially parallel to that in which the ore is fed to form the layers for separating out of the ore body the magnetic particles thereof.

2. The herein described method of magnetic ore separation which consists in arranging ore in a series of inclined overlapping spaced layers or strata, traveling a magnetic field of force transversely of said series and in a direction substantially parallel to that in which the ore are fed to form the layers whereby the magnetic particles in said ore are separated out of the ore body by traveling upward, and removing the non-magnetic particles by gravity.

3. In ore separating mechanism, the combination with a series of overlapping supports, of means for feeding ore to said supports and means for producing a field of magnetic force and traveling the same in a direction transverse to the said supports and substantially parallel with the direction of feed of the ore.

4. In a magnetic ore separator, the combination with a series of fixed inclined overlapping supports, of means for feeding the ore downwardly on to said supports and means for producing and traveling a magnetic field of force in a direction transverse to said supports and substantially parallel with the direction of feed of the ore.

5. In a magnetic ore separator, the combination with a casing having a body of substantially still water therein, of a series of overlapping supports in said casing, means for feeding ore downwardly on to said supports and means for producing and traveling a magnetic field of force in a direction transverse to said supports and substantially parallel with the direction of feed of the ore.

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

OSCAR ALFRED ZANDER.

Witnesses:

HANS B. OHLSSON,

CARL TH. SUNDHOLM.