

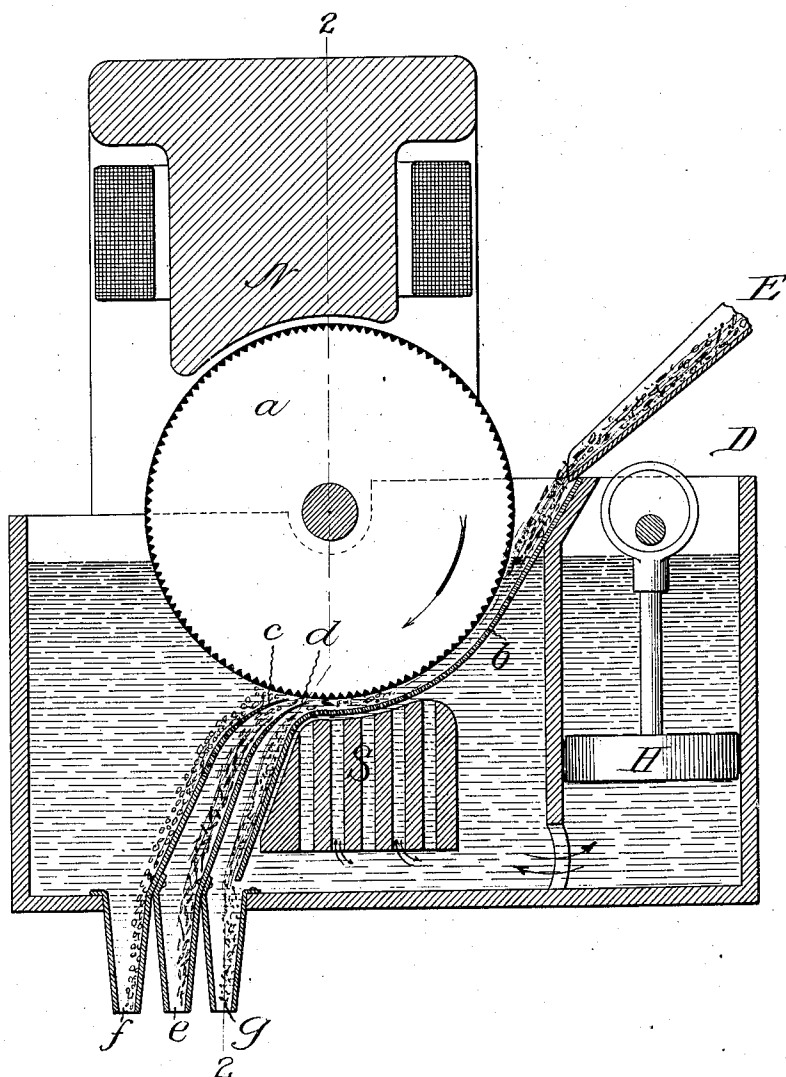
No. 851,046.

PATENTED APR. 23, 1907.

H. H. WAIT.
MAGNETIC ORE SEPARATOR.
APPLICATION FILED MAR. 20, 1905.

2 SHEETS—SHEET 1.

Fig 1



Witnesses:
Ed. C. Darrow
Irving Mac Donald

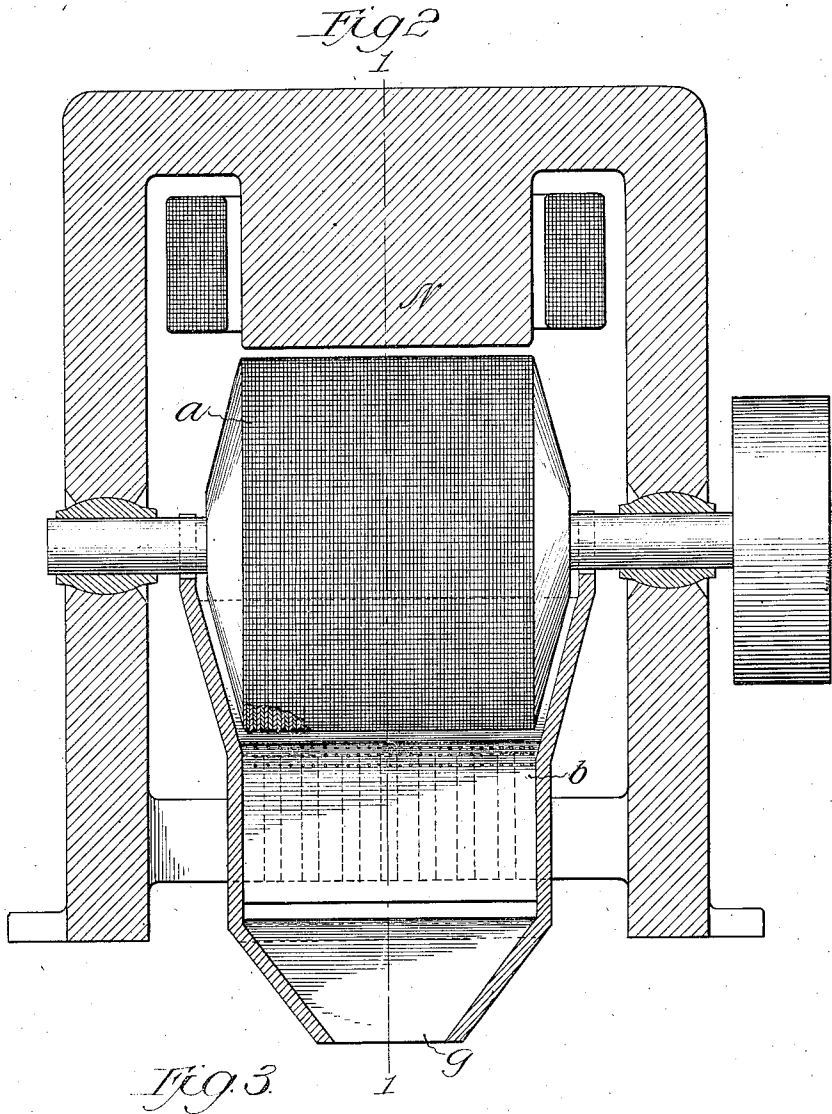
Inventor:
Henry H. Wait,
By Burton & Tanner
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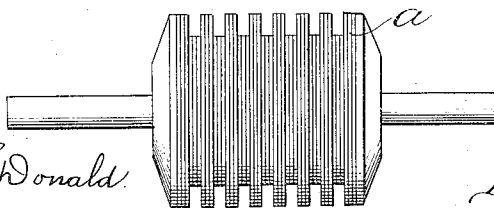
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APPLICATION FILED MAR. 20, 1905.

2 SHEETS—SHEET 2.



Witnesses:

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Inventor:

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UNITED STATES PATENT OFFICE.

HENRY H. WAIT, OF CHICAGO, ILLINOIS, ASSIGNOR TO INTERNATIONAL SEPARATOR COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF NEW JERSEY.

MAGNETIC ORE-SEPARATOR.

No. 851,046.

Specification of Letters Patent.

Patented April 23, 1907.

Application filed March 20, 1906. Serial No. 251,070.

To all whom it may concern:

Be it known that I, HENRY H. WAIT, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Magnetic Ore-Separators, of which the following is a full, clear, concise, and exact description.

My invention relates to a magnetic ore-separator; and its object is to provide an improved simple machine which will be especially efficient for the concentration of ores or mixtures of materials in the presence of water and in which materials of different specific gravities, some of which are magnetic, may be separated by a single operation.

Briefly, my invention contemplates the provision of means whereby the separating action of a powerful magnet is augmented by vibratory motion in a fluid medium which carries the material in proximity to the magnet.

I will describe my invention in detail by reference to the accompanying drawings, which illustrate the preferred embodiment thereof, and the parts, improvements, or combinations which I regard as novel will be pointed out in the appended claims.

In the drawings, Figure 1 is a vertical sectional elevation of the machine. Fig. 2 is a transverse vertical section on plane 2 2 of Fig. 1. Fig. 3 is a detail view illustrating a modified form of armature-cylinder for the separators.

The same letters of reference indicate the same parts wherever shown.

In general the principle of this machine is to pass the material to be treated through a fluid medium, such as water, to which fluid a vibratory motion is imparted by any suitable means, and to associate a powerful magnet (preferably moving) with the apparatus in such a way as to attract the more permeable particles of the mixture, the vibratory motion in the fluid serving to bring the material being treated into intimate relation to the magnet to loosen or assist in the segregation of the material, so that the influence of the magnet upon the permeable particles in the mixture will be rendered more effective, and also to produce a further separation of the materials on a basis of their relative specific gravities.

As shown in the drawings, a magnetic separating-cylinder *a* is arranged to rotate on a horizontal axis between the poles N and S of a suitable field-magnet, said poles being placed respectively above and below the cylinder, and said cylinder is arranged to rotate in a trough containing water or other suitable fluid medium.

An inclined screen or support *b* is provided immediately below the surface of the cylinder, the space between the cylinder and screen forming the working passage through which the material being treated is caused to progress. A chute *E* is shown, through which the material is fed into the working passage.

Between the magnetic cylinder and the pole-piece S there is of course an intense magnetic flux, and this flux is preferably caused to converge toward the surface of the cylinder by means of permeable projections or teeth upon the surface of the latter, from which teeth the lines of force are dispersed or fanned out. It is understood that in magnetic attraction the movement of the particle is along converging lines of force, and it will be seen that when the material passes through the dense field existing between the cylinder *a* and pole-piece S the more permeable particles will be drawn up toward the surface of the cylinder.

A reciprocating piston H in one compartment of the trough is shown for giving a vertical vibratory or oscillating motion to the water, and the screen or support *b* is finely perforated, so that this vibration in the fluid will be transferred to the materials in the working passage. The pole-piece S is also preferably perforated, as shown, to allow the vibratory motion to be communicated as directly as possible to the fluid at the place where separation takes place.

A suitable divider-plate *c* is mounted with its edge close to the surface of the cylinder near the point where the screen *b* turns down and away from said cylinder—that is to say, where the material as it progresses along the passage leaves the region of the magnetic field. This divider is so placed that the non-magnetic material passes down on one side of it and leaves the machine at the spout *e*, while the magnetic material is carried over beyond the dividing edge and is finally released

on the other side and discharged through the spout *f*. The vibratory motion in the fluid medium also tends to produce a separation of the material according to the specific gravities of the ingredients. An auxiliary divider-plate *d* may therefore be located opposite the mouth of the working passage in front of what may be termed the "magnetic divider" *c*. The agitation of the water in the working passage tends to make the lighter particles of non-magnetic ore rise toward the top, so that they will be carried on past the divider *d* to be discharged through spout *e*, while the heavier particles will not be carried on, but will drop down in front of said plate *d* and may be discharged through a spout *g*. The magnetic particles will be carried on until they have passed the farthest divider *c*, either because they have adhered to the surface of the cylinder, and so been positively carried over, or because their apparent or effective specific gravity has been so modified by the presence of the magnet that they are held suspended in the water so near the top of the stream of ore that its natural flow carries them over.

The location of the separating-cylinder between opposing magnet-poles of opposite polarity, as shown, is advantageous, because the magnetic pull on the armature and also its weight may be approximately balanced, and also because a neutral point is established upon the surface of the cylinder at a point between the poles at which the attracted material will be released.

The spaces between the teeth are preferably filled with wax or other suitable non-magnetic material, so that the physical surface of the cylinder is comparatively smooth to avoid unduly churning the water in its rotation.

The cylinder may be grooved instead of being toothed—that is to say, the dispersions of the flux can be from lines or narrow areas continuing clear around the circumference. Fig. 3 shows such a grooved construction with considerable spacing between the circumferential ridges to allow the water to pass to and fro more readily.

The operation of the machine has already been indicated as an incident to the description of its structure. The ore is fed into the chute *E*, and the armature *A* is caused to rotate in the direction of the arrow. The piston *H* is also caused to reciprocate, as by the eccentric mechanism shown. The result will be not only a very efficient magnetic separation of the permeable particles from the rest of the ore, but also a gravitational separation of the heavier particles from those which are lighter, the magnetic product being discharged at *f*, the lighter non-magnetic

product at *e*, and the heavier non-magnetic product at *g*.

It will be evident to those skilled in the art that many modifications may be made in the machine illustrated without departing from the general ideas herein set forth.

I claim—

1. In an ore-concentrator, the combination with a revolving magnetic cylinder having means for causing flux dispersions at its periphery, of a magnet-pole below said cylinder, a support forming a passage-way between said cylinder and magnet-pole for the materials to be separated, a divider for separating the attracted from the non-attracted materials, a vessel adapted to contain a fluid medium surrounding the operating portion of the cylinder, and means for imparting a vibratory motion to said fluid medium.

2. In an ore-concentrator, the combination with a revolving magnetic cylinder having means for causing flux dispersions at its periphery, of a magnet-pole below said cylinder, an inclined screen, extending between said cylinder and magnet-pole and forming a passage-way for material to be separated, a vessel adapted to contain a fluid medium surrounding the operating portion of the cylinder, and means for imparting a vibratory motion to said fluid medium.

3. In an ore-concentrator, the combination with a revolving magnetic cylinder having means for causing flux dispersions at its periphery, of a magnet-pole below said cylinder, said magnet-pole being provided with perforations opening along the surface thereof, an inclined screen, extending between said cylinder and magnet-pole and forming a passage-way for material to be separated, a vessel adapted to contain a fluid medium surrounding the operating portion of the cylinder, and means for imparting a vibratory motion to said fluid medium.

4. In an ore-concentrator, the combination with a revolving magnetic cylinder having means for causing flux dispersions at its periphery, of an inclined support adapted to pass materials to be separated along the under side of said cylinder, a magnet-pole below said cylinder, a magnet-pole of opposite polarity above the cylinder, a divider near the under side of the periphery of said cylinder, a vessel adapted to contain a fluid medium, surrounding the operating portion of said cylinder, and means for imparting a vibratory motion to said fluid medium.

In witness whereof I hereunto subscribe my name this 13th day of March, A. D. 1905.

HENRY H. WAIT.

Witnesses:

IRVING MACDONALD,
DE WITT C. TANNER.