No. 823,235. PATENTED JUNE 12, 1906.

H. H. WAIT.

MAGNETIC SEPARATOR.

APPLICATION FILED MAR. 20, 1905.

2 SHEETS—SHEET 1.

Fig. 1

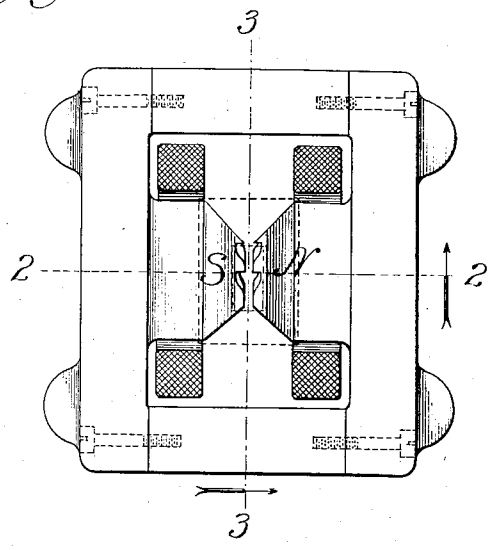
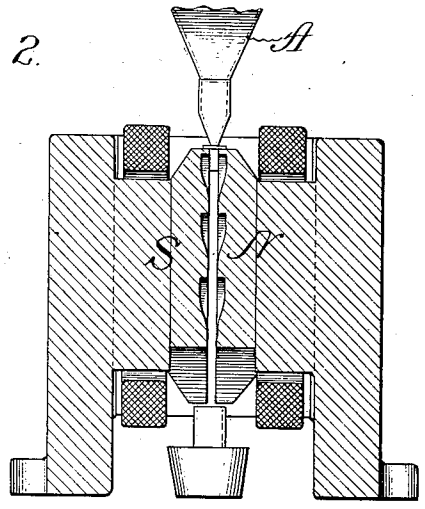


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

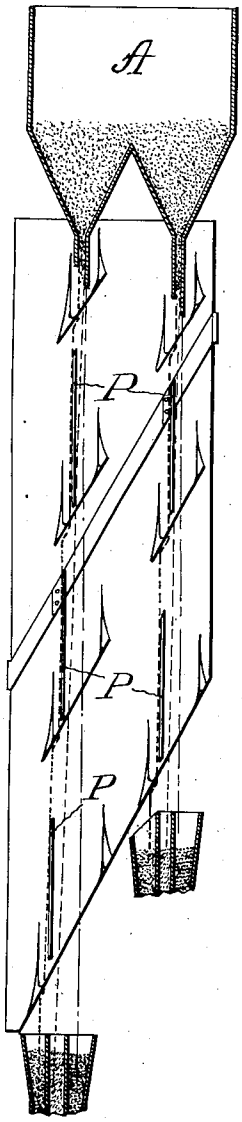
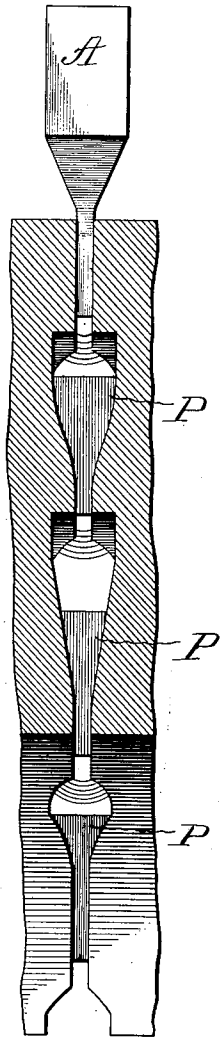


Fig. 4.



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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 SEPARATOR.

No. 823,235. Specification of Letters Patent. Patented June 12, 1906.

Application filed March 20, 1905. Serial No. 251,074

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 Separators, of which the following is a full, clear, concise, and exact description.

My invention relates to a magnetic ore-separator, and has for its object to provide a simple machine requiring very little energy for its operation in which the magnetically-attracted particles will be effectively separated from the non-magnetic material and will not be liable to mingle therewith after the initial separation has taken place.

The ore-separator of my invention may consist simply of a passage between magnetic surfaces, through which the material is passed, with means for providing diagonal lines of magnetic concentration or "magnetic riffles" across the passage, adapted to divert the more permeable particles, in combination with dividers located above the riffles in position to prevent the attracted particles which were diverted by one riffle from being drawn back again toward the path of the non-magnetic material in approaching the succeeding riffle.

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

Figure 1 is a plan view of the ore-separator. Fig. 2 is a sectional elevation thereof on line 2 2 of Fig. 1. Fig. 3 is a sectional elevation on line 3 3 of Fig. 1, on an enlarged scale, showing the arrangement of the magnetic riffles and the divider-plates. Fig. 4 is a sectional view showing, on a larger scale, the working passage illustrated in Fig. 2.

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

The machine shown in the drawings consists in its elements of two magnetic pole-pieces of opposite polarity facing each other in such a way as to form a working passage through which the material to be separated is passed. A feeding chute or hopper A is shown at the top, by which the material may be introduced into the working passage between the two magnet-poles. Magnetic particles under the influence of a magnet tend to move toward the densest portion of the field. In the ore-separator illustrated the working passage is provided with a series of magnetic riffles or lines, along which the magnetic density is increased, these riffles or lines of magnetic concentration extending diagonally downward across the path through which the material to be separated falls.

Preferably the magnetic riffles are provided by forming the opposing faces of the magnet-poles as indicated in Fig. 4—that is to say, with a series of projections gradually sloping toward each other in a downward direction and ending in sharp edges, at which the magnetic flux will be most highly concentrated. As shown in Fig. 3, these sharp edges will extend across the pole-pieces in diagonal lines. The magnetic riffles will therefore form what may be called an "inclined" hammock of magnetic lines of force, which will tend to arrest falling magnetic particles and cause them to follow for a short distance the diagonal course determined by the direction of the riffle, so that in this way the magnetic particles will be separated from the non-magnetic material falling straight down.

It will be noted that there is a gradually-increasing density of the magnetic flux between the ridges on the pole-faces, this flux reaching a maximum at the sharp lower edges of such ridges. The magnetic material leaving the lower edge of one of these ridges or riffles will therefore as it continues to fall be subjected to an increasing magnetic attraction toward the next riffle, and as the next riffle is diagonal the tendency will be for the magnetic material to be deflected back again toward the path of the non-magnetic particles. This action is, however, not as strong as the deflecting action of the sharp edge of the riffle. It is nevertheless considerable, and I therefore provide divider-plates P P, located between the paths of the magnetic and non-magnetic material as it leaves each riffle, and extending downward to the edge of the succeeding riffle, so as to prevent the attracted material from being drawn back again into the path of the non-attracted material. In the drawings the riffles are shown at different distances apart and at different angles of inclination, the ob-

ject being to proportion the magnetic action to the increase in velocity of the falling particles.

I claim—

1. The combination with magnet-poles of opposite polarity facing each other to constitute a working passage, of means for directing material to be separated through said passage, means for concentrating the magnetic flux across said working passage in lines diagonal to said passage, and dividers above the diagonal lines of concentration adapted to prevent the magnetic particles from being deflected in approaching said lines of concentration.

2. The combination in a magnetic separator having a working passage, of means for establishing a magnetic riffle diagonally across said working passage, and a divider-plate in the path of material approaching the riffle, adapted to prevent the magnetic particles from being deflected in approaching said riffle substantially as and for the purpose set forth.

3. In a magnetic separator, the combination with a series of magnetic projections, of means for passing material to be separated across said projections, and divider-plates separating the attracted and non-attracted particles located in the path of material in the approaches to said projections, whereby the magnetic particles are permitted to move freely under the influence of the projection in one part of the field, but are prevented from moving in the opposite direction where the field has a counter action.

4. The combination in a magnetic separator having a working passage, of magnetic riffles in said working passage, and a series of divider-plates separating the attracted and non-attracted particles located in the path of the magnetic particles after the particles have left each riffle.

5. In a magnetic separator, the combination with opposing magnet-poles of opposite polarity arranged to form a working passage, of means for directing material to be separated through said passage, said magnet-poles being formed with ridges in corresponding diagonal lines upon the faces thereof, forming a series of inclined magnetic riffles, vertical divider-plates beginning below each riffle and extending toward the succeeding riffle, whereby attracted material leaving the riffle upon one side of the divider-plate is prevented from being diverted toward the path of the non-attracted material by the action of the succeeding riffle.

6. In a magnetic separator, the combination with opposing magnet-poles of opposite polarity facing each other to constitute a working passage, of a series of ridges upon said pole-faces to concentrate the magnetic flux in lines diagonal to the working passage, the angles of inclination of said diagonal lines being increased toward the lower end of the passage.

7. In a magnetic separator, the combination with magnet-poles of opposite polarity facing each other to constitute a working passage, of a series of diagonal magnetic riffles in said working passage, said riffles being located progressively at increasing distances apart and at progressively greater angles of inclination.

8. The combination in a magnetic separator having a working passage, of diagonally-inclined magnetic riffles in said working passage, and vertical dividing-plates located above said riffles, said riffles being spaced at successively greater distances apart and with successively greater inclinations toward the lower end of the working passage, substantially as set forth.

9. In a magnetic separator, the combination with magnet-poles of opposite polarity facing each other to constitute a working passage, of means for establishing a magnetic riffle diagonally across said passage, and a divider-plate in the path of material approaching said riffle.

10. The combination in a magnetic separator having a working passage, of diagonal magnetic riffles in said passage, and a series of divider-plates between the riffles between the paths of the attracted and non-attracted particles, adapted to prevent said attracted particles from being drawn into the path of said other particles.

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.