No. 663,764. Patented Dec. 11, 1900.

E. KREUSER & H. E. LANGGUTH.

MAGNETIC SEPARATOR.

(Application filed June 11, 1900.)

(No Model.)

Fig. 1.

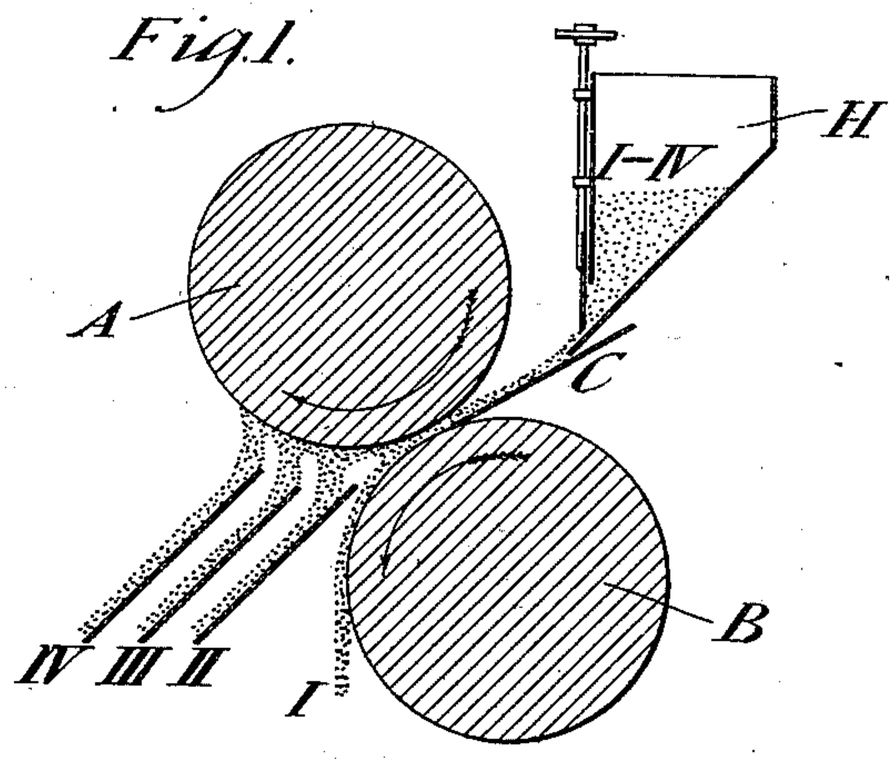


Fig. 2.

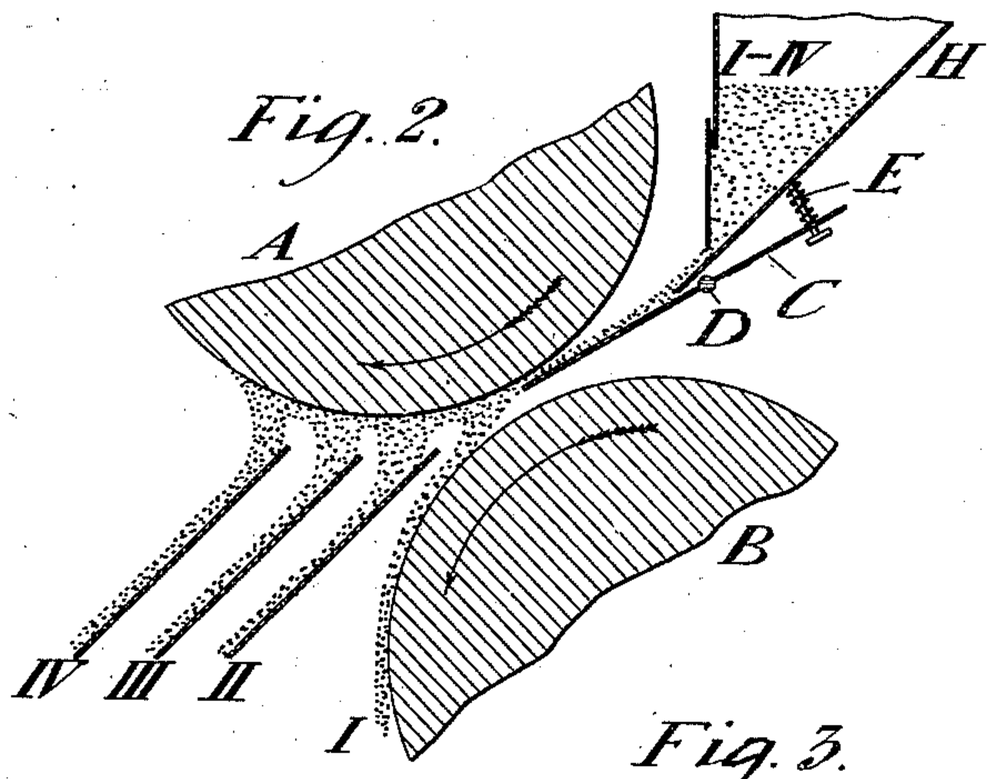
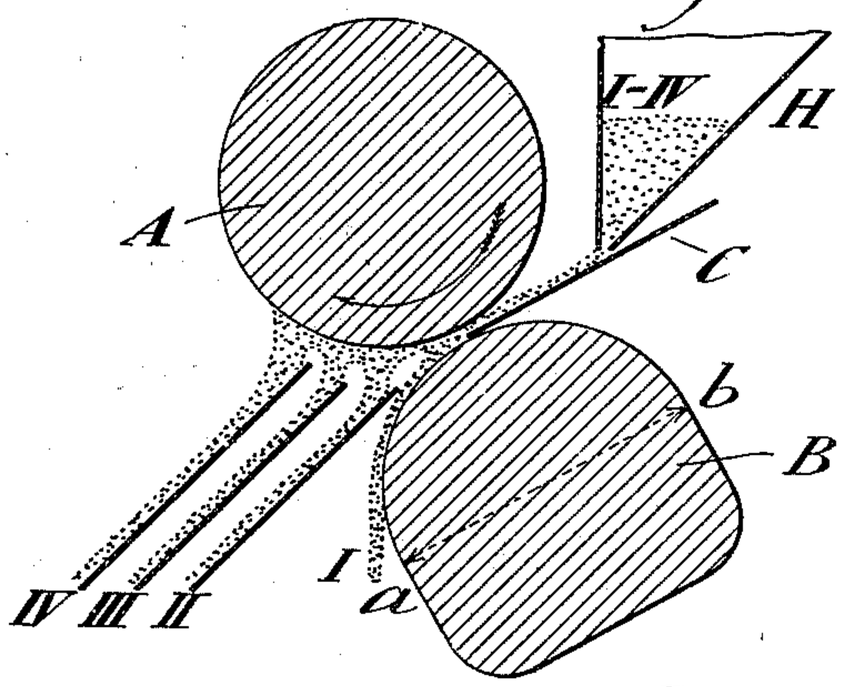


Fig. 3.



Witnesses

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UNITED STATES PATENT OFFICE.

EMIL KREUSER AND HUGO ERICH LANGGUTH, OF MECHERNICH, GERMANY, ASSIGNORS TO MECHERNICHER BERGWERKS-ACTIEN-VEREIN, OF SAME PLACE.

MAGNETIC SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 663,764, dated December 11, 1900.

Application filed June 11, 1900. Serial No. 19,910. (No model.)

To all whom it may concern:

Be it known that we, EMIL KREUSER and HUGO ERICH LANGGUTH, citizens of Germany, residing at Mechernich, Rhine Province, Germany, have invented certain new and useful Magnetic Separators, (for which we have applied for a patent in Germany, dated February 1, 1900,) of which the following is a specification.

This invention relates to apparatus for magnetic separation by which strongly and feebly magnetic substances may be separated both from intermixed non-magnetic substances and from each other.

The method of working eliminates the process for first preparing the strongly-magnetic substances or that for separating one after the other the feebly-magnetic ones. It renders available at the same time in one process all degrees of magnetic susceptibility in the materials to be separated.

Apparatus constructed according to this invention consists of a rotatory roller-magnet, the poles of which are circular in cross-section, and a second magnet or mass capable of magnetic induction, which is placed below the roller-magnet. The form of this second magnet or mass is limited only in so far that the pole-surface opposite the rotatory magnet must have a radius of curvature such that the density of the lines of force of the magnetic field produced shall diminish gradually from the middle to the ends of the field. It is a matter of indifference whether this pole-surface partakes of the rotation of the upper magnet or remains at rest. The materials to be separated are introduced into the middle of the magnetic field along an inclined slide made of a material having no magnetic susceptibility. Both the magnetic field itself and the slide are capable of adjustment as regards their inclination, so that this may be varied. The distance of the slide from the pole-surface of the rotatory magnet is also adjustable. By adjustment of the inclination of the delivery-slide a variable speed of delivery of the material moving thereon by its own weight can be secured according to the magnetic character and size of the substances to be separated. The material is thus delivered at the point of least distance between the two surfaces, so that it is subjected to the strongest and most favorable degree of attraction of the pole, which thereupon carries the magnetic substances into zones of lines of force of decreasing strength, where they are separated into different classes by gravity, inertia, and magnetism. The non-magnetic substances fall over the end of the delivery-slide in their natural bath uninfluenced by the magnetic field and are collected together. If the delivery-slide be arranged as a lever and is held against the upper magnet by the pressure of a light spring, it will carry the material whatever its size directly against the upper pole. By such automatic adjustment of the slide the best working effect is obtained, and at the same time there is a smaller consumption of magnetic—that is, electrical—force and less attention is necessary.

The unavoidable stoppages due to the friction of the moving material may be reduced to a minimum by a small and easily-changed slide of zinc, copper, sheet-brass, glass, or the like. As compared with all delivery devices hitherto in use in such apparatus that described above presents a considerable advantage.

In the accompanying drawings, Figure 1 is a vertical section through the roller-magnets, hopper, and delivery-slide of a machine constructed in accordance with this invention. Fig. 2 is a similar view showing a modified arrangement of the delivery-slide. Fig. 3 is a similar view showing a stationary lower magnet.

In Figs. 1 and 2, A and B are the circular poles of the magnets, both of which rotate in the direction indicated by the arrows. The material is delivered from the hopper H down the slide C. In Fig. 2 this slide is pivoted at D and is held against the upper magnet A by the spring E, so that the grains of material are always pressed against the pole whatever their size and their separation is effected with the least expenditure of magnetism.

In Fig. 3 only the upper magnet A rotates in the direction of the arrow. The lower magnet B is stationary and only that portion *a b* of its surface which is turned toward the upper magnet is cylindrical for the purpose of gradually diminishing the density of the lines

of force of the field from its middle to its edge.

Owing to the rotation of the magnetic pole the material passes into fields of gradually-decreasing strength, and it will consequently fall away from the upper pole at that point of the circular path where the action of gravity overbalances the magnetic attraction. With one and the same kind of ore all the particles will be raised to the same height. A mineral of a less magnetizable nature will be acted upon by gravity at an earlier point of travel, while a mineral having a higher magnetic susceptibility will fall away at a still greater distance from the strongest point of attraction, and in each case all particles having one and the same degree of magnetic susceptibility will fall away at one and the same point of the path through which it travels.

The device for intercepting and conveying away the separated ores is shown as consisting of three chutes, respectively indicated by the numerals II III IV, of which the first, II, catches the weakest magnetic materials, III the stronger magnetic material, and IV the strongest magnetic material. The chutes are so arranged as to deliver the separated material into separate piles or compartments. (Not shown.) The described arrangement of chutes is fully shown and described in the patent to Emil Kreuser dated October 3, 1899, No. 634,356, and need not, therefore, be further described.

Having thus described the nature of this invention and the best means we know of carrying the same into practical effect, we claim—

1. An apparatus for separating substances of different magnetic susceptibility, consisting of two magnets arranged one above the other, the upper one comprising a rotatable cylindrical magnet, and an inclined slide or chute having no magnetic susceptibility, the lowermost end of said slide or chute being projected between the magnets into the center of the magnetic field at the point of least distance between the magnetic surfaces, substantially as described.

2. An apparatus for separating substances of different magnetic susceptibility, consisting of two magnets arranged one above the other, the upper one comprising a rotatable cylindrical magnet, a pivoted inclined slide or chute having no magnetic susceptibility, the lowermost end of said slide or chute being projected between the magnets into the center of the magnetic field at the point of least distance between the magnetic surfaces, and a spring arranged to hold the lower end of the slide in yielding contact with the upper rotatable magnet, substantially as described.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

EMIL KREUSER.
HUGO ERICH LANGGUTH.

Witnesses:
F. E. MALLETT,
F. ENGELS.