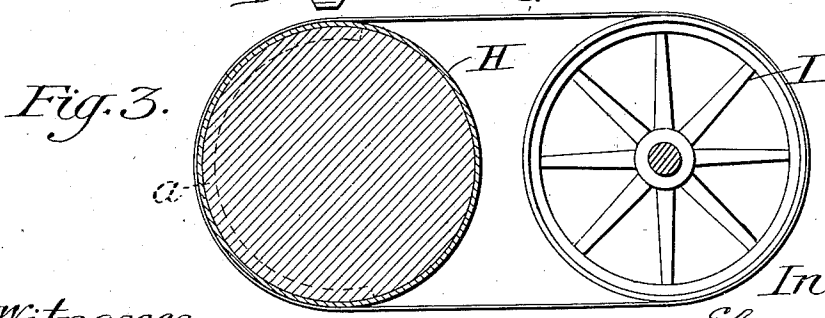
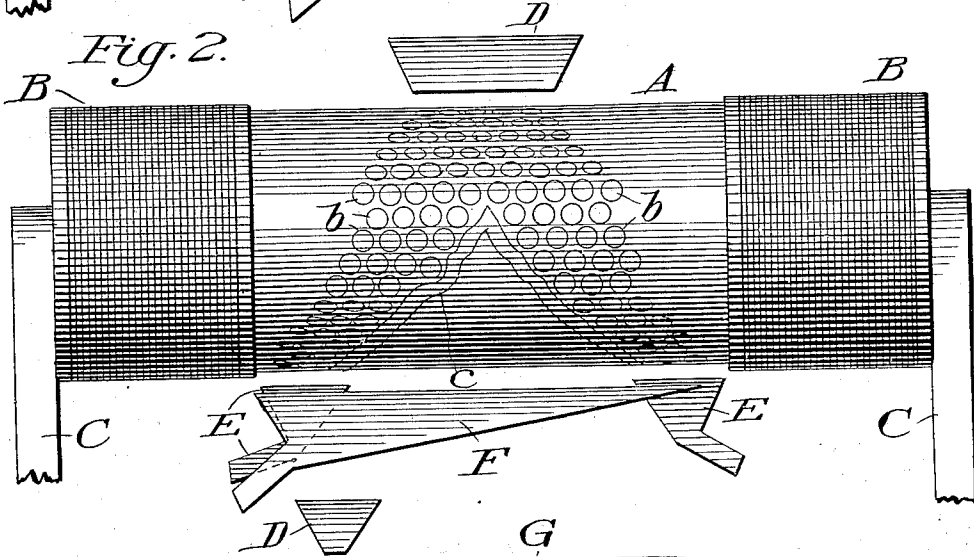
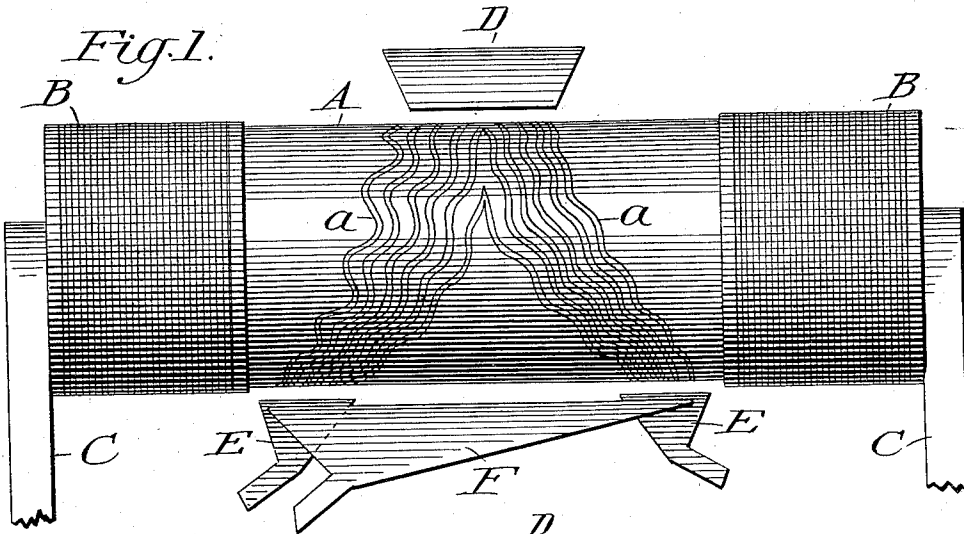
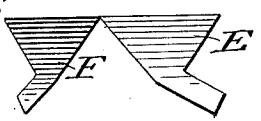


E. GATES.
MAGNETIC SEPARATOR.
(Application filed July 12, 1900.)

(No Model.)



Witnesses
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UNITED STATES PATENT OFFICE.

ELMER GATES, OF CHEVY CHASE, MARYLAND, ASSIGNOR TO THEODORE J. MAYER, OF WASHINGTON, DISTRICT OF COLUMBIA.

MAGNETIC SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 662,414, dated November 27, 1900.

Application filed July 12, 1900. Serial No. 23,370. (No model.)

To all whom it may concern:

Be it known that I, ELMER GATES, a citizen of the United States, residing at Chevy Chase, county of Montgomery, State of Maryland, have invented certain new and useful Improvements in Magnetic Separators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to certain new and useful improvements in magnetic separators of that type wherein the magnetic particles to be separated, such as magnetic iron ore or the like, are caused to follow wavy or zigzag magnetic lines of force and to constantly change their structural arrangement during the travel of the material through the separator, whereby the non-magnetic material is thoroughly sifted out and disassociated from the magnetic particles, the latter being finally led off to a separate point or points of collection. The present invention relates to a particular form of apparatus embodying this generic principle of operation.

In the accompanying drawings, Figure 1 represents a front elevation of a magnetic separator embodying my present invention, the conveyer-belt being omitted. Fig. 2 represents a like view of a modification thereof. Fig. 3 represents a central cross-section of the apparatus shown in Fig. 1, but with the feeding and receiving hoppers shown in elevation.

Similar letters of reference indicate similar parts throughout the several views.

Referring to the drawings, A indicates a magnet-core supporting at its outer ends the energizing-coils B and suitably mounted in standards, (indicated at C.) The magnet-core in the form of the invention shown in Fig. 1 is provided with a series of zigzag or wavy grooves *a*, as indicated, which grooves may conveniently be filled with non-magnetic material—as, for instance, lead. These grooves at their upper portions are located immediately below the feed-hopper D, but at their lower portions branch off into lateral paths which terminate immediately above the receiving - hoppers E, which latter are not only out of range laterally of the path of de-

scant of the non-magnetic particles, but are also located well beneath the cylinder A and in the rear of the receiving hopper F for said non-magnetic material.

In lieu of the wavy grooves shown in Fig. 1 I may employ a corresponding arrangement of recesses *b*, as shown in Fig. 2, in which case, however, I provide the cylinder with the groove *c* of inverted-V shape. The recesses *b* and the groove *c* may likewise be provided with a filling of lead or other non-magnetic material.

About the stationary cylinder A, I pass an endless band or apron G, and between the cylinder and said band I interpose a rotatory shell H (see Fig. 3) of sheet-brass or other non-magnetic material. The belt G may conveniently be made of canvas or of sheet-brass and passes around an actuating-drum I, as shown.

In the operation of the apparatus I energize the magnetic cylinder A to such a degree that when the material to be separated is fed over the periphery thereof the magnetic particles will arrange themselves in frond-like or moss-like structures following the wavy or zigzag conformation of the grooves *a* or the similar zigzag spaces left between the recesses *b*. The material to be separated being fed from the hopper D upon the traveling apron G is conveyed by the latter over the cylinder A, the intervening shell H rotating freely, and thereby relieving the apron from excessive friction. During the operation of the apron the magnetic particles arranging themselves in the frond-like structures referred to follow the wavy or zigzag paths indicated and finally discharge into the receiving-hoppers E, which are arranged well underneath the solenoid. The non-magnetic particles, on the other hand, as they are sifted and shaken out of the magnetic particles by the constant rearrangement and re-formation of the frond-like structures fall directly into the hopper F and are led to a separate place of discharge or collection.

Having thus described my invention, what I claim is—

1. A magnetic separator, comprising a magnetic cylinder having grooves or recesses in its periphery, said grooves or recesses hav-

- ing a zigzag or wavy arrangement, so as to provide corresponding wavy or zigzag magnetic fields of force, and a traveling apron passing over said cylinder; substantially as described.
- 5 2. A magnetic separator, comprising a magnetic cylinder having grooves or recesses in its periphery, said grooves or recesses having a zigzag or wavy arrangement, so as to
- 10 provide corresponding wavy or zigzag magnetic fields of force, a traveling apron passing over said cylinder, and interposed rotatory shell between the cylinder and apron; substantially as described.
- 15 3. A magnetic separator, comprising a magnetic cylinder, having in its periphery grooves or recesses arranged to provide zigzag magnetic fields of force, said zigzag fields dividing and extending laterally beyond the range
- 20 of fall of the non-magnetic portion of the material fed to the separator, and a traveling apron passing around the cylinder; substantially as described.
4. A magnetic separator, comprising the
- 25 magnetic cylinder A, the energizing-coils B, the feed-hopper D, and the traveling apron G, the said cylinder being provided with

grooves or recesses arranged in the general configuration of an inverted V; substantially as described.

5. A magnetic separator, comprising the magnetic cylinder A, the energizing-coils B, the feed-hopper D, and the traveling apron G, the said cylinder being provided with grooves or recesses arranged in the general configuration of an inverted V, the ends of said V extending laterally beyond the outer ends of the hopper and beneath the cylinder; substantially as described.

6. A magnetic separator, comprising the magnetic cylinder A, the energizing-coils B, the traveling apron G, the feed-hopper D, and the receiving-hoppers F and E, the said cylinder being provided with grooves or recesses arranged in accordance with the general configuration of an inverted V; substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ELMER GATES.

Witnesses:

JOHN C. DANIEL,
A. E. GRANT.