

No. 731,037.

PATENTED JUNE 16, 1903.

E. GATES.  
DIAMAGNETIC SEPARATOR.  
APPLICATION FILED JAN. 13, 1903.

NO MODEL.

Fig. 1.

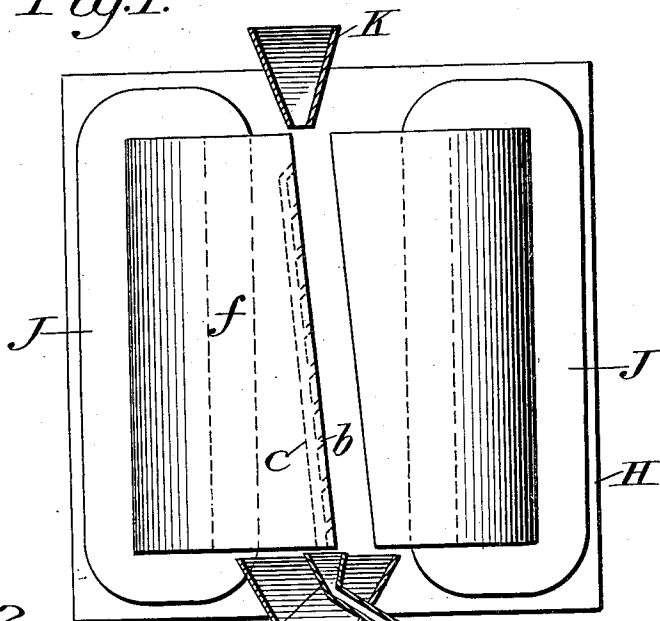
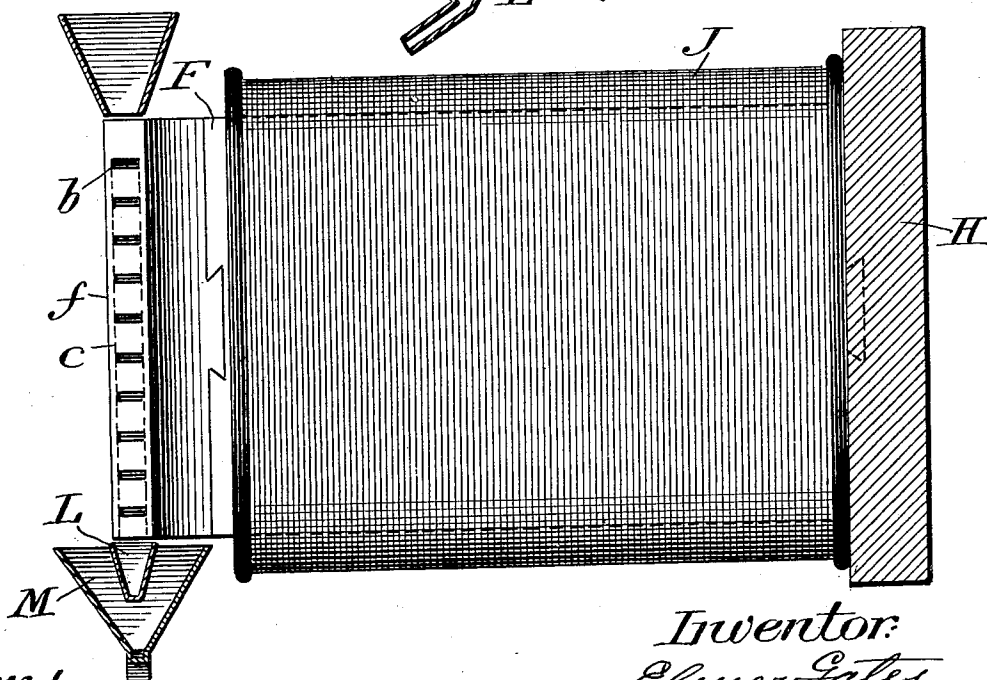


Fig. 2.



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.

## DIAMAGNETIC SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 731,037, dated June 16, 1903.

Application filed January 13, 1903. Serial No. 138,817. (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, Montgomery county, Maryland, have invented certain new and useful Improvements in Diamagnetic 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 ap-  
 5 pertains to make and use the same.

My invention relates to apparatus for separating diamagnetic substances from mixtures containing them or diamagnetic substances of varying diamagnetic susceptibilities from each other by feeding the material to be separated into the interpolar space through zones adjacent to the faces of the pole-pieces and continuing the material in the magnetic field until the particles to be separated have  
 15 gradually moved out toward the central neutral plane or zone, and finally collecting them from said neutral zone, the inert particles being received in a separate hopper.

In the accompanying drawings, Figure 1 represents a front elevation of a diamagnetic separator embodying my improvements. Fig. 2 represents a central vertical section thereof.

Similar letters of reference indicate similar parts throughout both views.  
 30 Referring to the drawings, H indicates the yoke, F the cores, *f* the pole-pieces, and *j* the coils or bobbins, of a powerful electromagnet. The pole-pieces are separated by a long narrow interpolar space and are preferably of the same height as the main body portions of the cores themselves, whereby a magnetic field of substantially uniform strength is established from top to bottom of the interpolar space. The feeding-hopper K is arranged in  
 40 close proximity to one of the pole-faces, as shown, and the two poles are given a slight inclination, so as to cause the interpolar field to occupy a corresponding position in space.

In the face of one of the pole-pieces *f* are formed a series of recesses or pockets *b*, inclined, as shown, and communicating with a channel or chute *c*, (indicated in dotted lines in Fig. 1,) said chute discharging into a tailings-hopper L. At the base of the incline is  
 50 located a receiving-hopper M for the heads.

The material to be separated is fed by the hopper K into the magnetic field in close proximity to the face of the inclined pole-piece containing the pockets. Inert material, such as sand or the like, is unaffected by the magnetic field, and on its way down the incline enters the series of pockets *b* and is conveyed by said pockets into the discharge-chute *c* common to them all, and thence passed into the tailings-hopper L. The diamagnetic material of higher diamagnetic susceptibility, such as gold or the like, moves outwardly from the face of the pole-piece toward the central neutral zone of the interpolar space. This outward movement is progressive and is favored by the fact that the material is constantly becoming disembarassed of the sand and because the inclination of the pole-pieces causes the pole-face, from which the diamagnetic particles are receding, to follow, in effect, the outwardly-moving particles, thereby giving them a wider and cleaner separation from the main mass of the material to be treated.

In the particular form of apparatus shown in the drawings I necessarily feed the material upon one of the pole-pieces only; but despite this lessened capacity of the magnet, in comparison with those forms of apparatus wherein I feed the material along both of the polar faces, I obtain an increased effect because of the uniform strength of the magnetic field from top to bottom of the interpolar space.

It is apparent that the advantage of the series of pockets in the polar faces along which the material is fed is not limited to constructions wherein said pole-piece faces another pole-piece, but is present in those instances wherein the pole provided with the pockets is a free pole separated by any desired distance from the magnet-pole or contrary sign. I desire, therefore, that my broad claims on this feature shall have a correspondingly generic interpretation.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A diamagnetic separator, provided with a downwardly-inclined pole-piece, means for

- feeding the material to be separated upon the upper portion of the incline, said incline crossing the path of gravital descent of the material, and said pole-piece being provided with pockets; substantially as described. 5
2. A diamagnetic separator, provided with a downwardly-inclined pole-piece, means for feeding the material to be separated upon the upper portion of the incline, said incline crossing the path of gravital descent of the material, and said pole-piece being provided with pockets, and a hopper at the bottom of the incline, and extending outwardly therefrom, for the heads, substantially as described. 10
3. A diamagnetic separator, provided with a downwardly-inclined pole-piece, means for feeding the material to be separated upon the upper portion of the incline, said incline crossing the path of gravital descent of the material, and said pole-piece being provided with pockets, a common chute or channel with which the pockets communicate, a hopper for receiving the tailings from the chute or channel, and a hopper at the bottom of the in- 20
- cline, and extending outwardly therefrom, for the heads, substantially as described. 25
4. A diamagnetic separator, comprising an electromagnet, having pole-pieces separated by a long narrow diagonal interpolar space, and means for dropping into said space the material to be separated, one of said pole-pieces being provided with pockets; substantially as described. 30
5. A diamagnetic separator, comprising an electromagnet, having pole-pieces separated by a long narrow diagonal interpolar space, and means for dropping into said space the material to be separated, one of said pole-pieces being provided with pockets, said pockets communicating with a common exit- 35
- passage; substantially as described. 40
- In testimony whereof I affix my signature in presence of two witnesses.
- ELMER GATES.
- Witnesses:  
EDWIN S. CLARKSON,  
JOHN C. PENNIE.