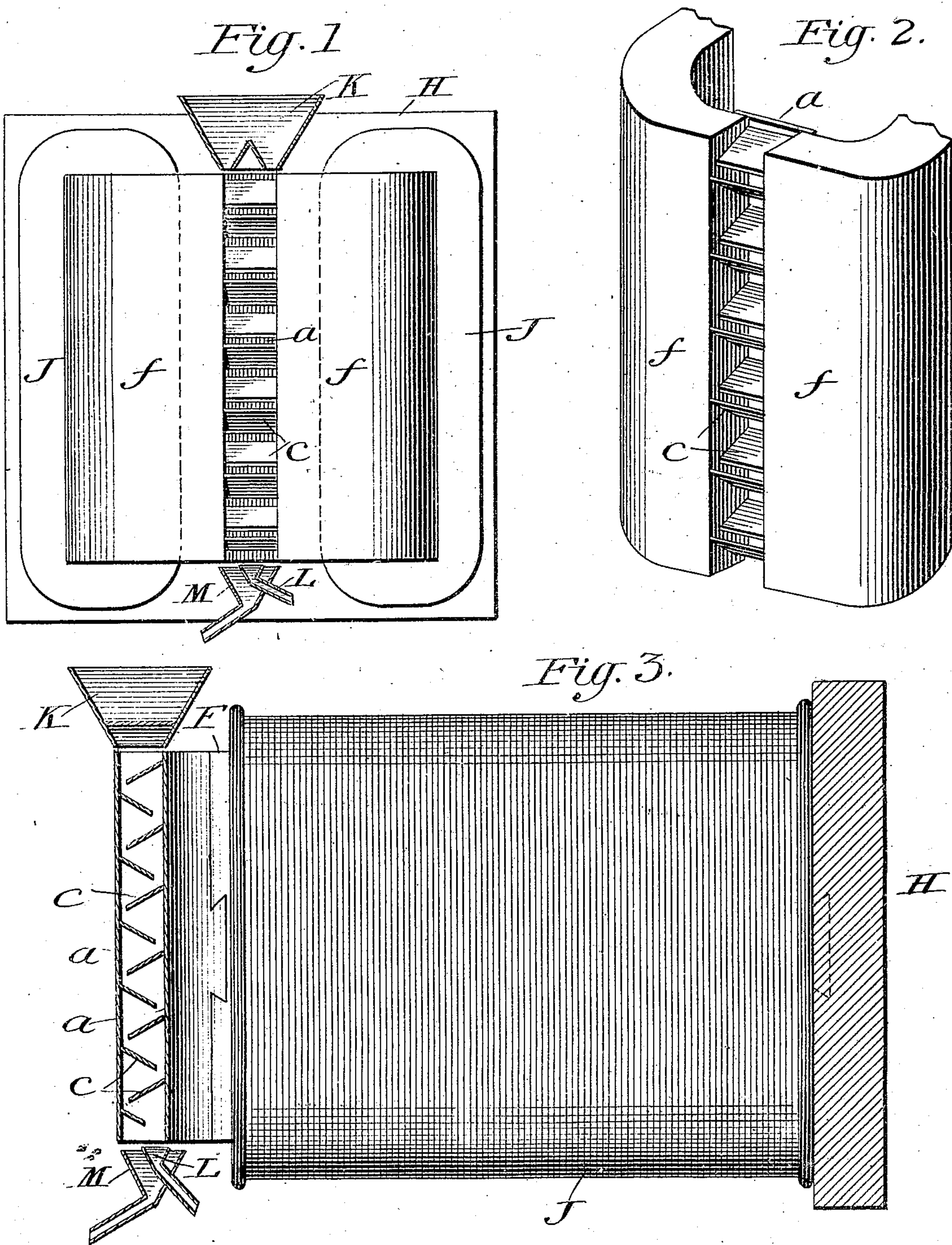


No. 731,035.

PATENTED JUNE 16, 1903.

E. GATES.  
DIAMAGNETIC SEPARATOR.  
APPLICATION FILED MAR. 1, 1900.

NO MODEL.



Witnesses:  
J. E. Hutchinson  
A. E. Grant

Inventor,  
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Atty.



# 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. 731,035, dated June 16, 1903.

Application filed March 1, 1900. Serial No. 6,946. (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, in the county of Montgomery and State of 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 appertains to make and use the same.

In a companion application of even date herewith, Serial No. 6,948, I have described and claimed a method of separating diamagnetic particles from a mixture containing them, or diamagnetic particles of varying susceptibility from each other, by establishing a long narrow interpolar space and feeding the material into said space in close proximity to the pole-faces, thereby leaving a central zone of lesser magnetic intensity into which move the diamagnetic particles to be separated, while the main body portion of the inert material remains in proximity to the polar faces or drops into inclined recesses, from which it is conveyed away by an outlet-channel to a separate collecting-hopper.

The present invention relates, broadly, to apparatus for practicing said method, and particularly to a specific form of such apparatus.

In the accompanying drawings, Figure 1 represents a front elevation of an apparatus adapted for the practice of the invention, the feeding and receiving hoppers being shown in section and the front boundary-plate of the interpolar space being omitted. Fig. 2 represents a perspective view of the pole-pieces and their adjuncts, the front plate being omitted. Fig. 3 represents a central vertical longitudinal section through the apparatus.

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

Referring to the drawings, H indicates the yokes, J the bobbins, F the cores, and *f* the pole-pieces, of a powerful electromagnet, said pole-pieces being preferably tapered, as shown in Fig. 2, so as to establish a highly-concentrated magnetic field across the long narrow intervening air-gap. The pole-pieces *f* may be made adjustable toward or from each other, if desired, by means of the dovetail joints,

(shown in dotted lines in Fig. 3,) whereby the cores are attached to the yokes H.

Within the long narrow interpolar space is preferably interposed a series of inclines *c*, of a width corresponding to the width of the air-gap. The purpose of these inclines, which should be of brass or other non-magnetic material, is to delay the descent of the material through the interpolar space, or rather to give it a longer path of travel therethrough, so as to subject it for a correspondingly longer period to the diamagnetic action. On opposite sides of the interpolar space are preferably arranged the brass or other non-magnetic strips *a*, which prevent the material from scattering.

Above the interpolar space is located a feed-hopper K, having two exit-openings so arranged that the material will be fed into the field in close proximity to the pole-faces and on opposite sides of the central zone. As a consequence the diamagnetic particles of higher susceptibility to be separated tend to move out from the pole-faces toward the central zone, while the inert sand or the like remains adjacent to the pole-faces. The material under the influence of gravity descends from one incline to another of the series until the lowermost incline is reached. During this time the diamagnetic particles, such as gold, of higher susceptibility have finally moved outward to such an extent into the central zone that they will fall into the receiving-hopper L as heads, and the inert material or sand will fall into the hopper M as tailings.

It will be understood that although great advantage is due to the employment of detaining means, such as the series of inclined planes in the interpolar space, yet these detaining means or their equivalent may be entirely omitted and the material permitted to drop directly through the interpolar space from the double hopper K, or the central portion of the incline planes may be omitted, as illustrated in my application hereinbefore referred to.

So far as I am aware it is broadly new to drop into a long and narrow interpolar space material to be separated by diamagnetic action, the feed for the material being in close prox-



imity to the face of the pole or poles whether the interpolar space be provided with detaining means or not. I therefore desire that my invention be given a correspondingly broad interpretation.

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

1. A diamagnetic separator, comprising an electromagnet having pole-pieces separated by a long narrow interpolar space, and means for feeding the material into that part of said space which is in close proximity to the pole-faces, thereby leaving a central zone of lesser magnetic intensity into which move the particles of higher diamagnetic susceptibility; substantially as set forth.

2. A diamagnetic separator, comprising an electromagnet having pole-pieces separated by a long narrow interpolar space, and means for feeding the material into said space in close proximity to the pole-faces, thereby leaving a central zone of lesser magnetic intensity into which move the particles of higher diamagnetic susceptibility, and inclined planes spanning the interpolar space; substantially as described.

3. A diamagnetic separator, comprising an electromagnet, having pole-pieces separated by a long narrow interpolar space, and means for feeding the material into said space in close proximity to the pole-faces, thereby leaving a central zone of lesser magnetic intensity into which move the particles of higher diamagnetic susceptibility, inclined planes spanning the interpolar space, and separate hoppers for the heads and tailings, substantially as set forth.

4. A diamagnetic separator, comprising an electromagnet having pole-pieces separated by a long narrow interpolar space, means of feeding the material into one end of said polar space immediately adjacent to the pole-faces, and a collector for the separated particles at the other end of said space, said collector being located in that part of said space farthest from the pole-faces.

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

ELMER GATES.

Witnesses:

JOHN C. PENNIE,  
J. E. HUTCHINSON, Jr.