

No. 731,044.

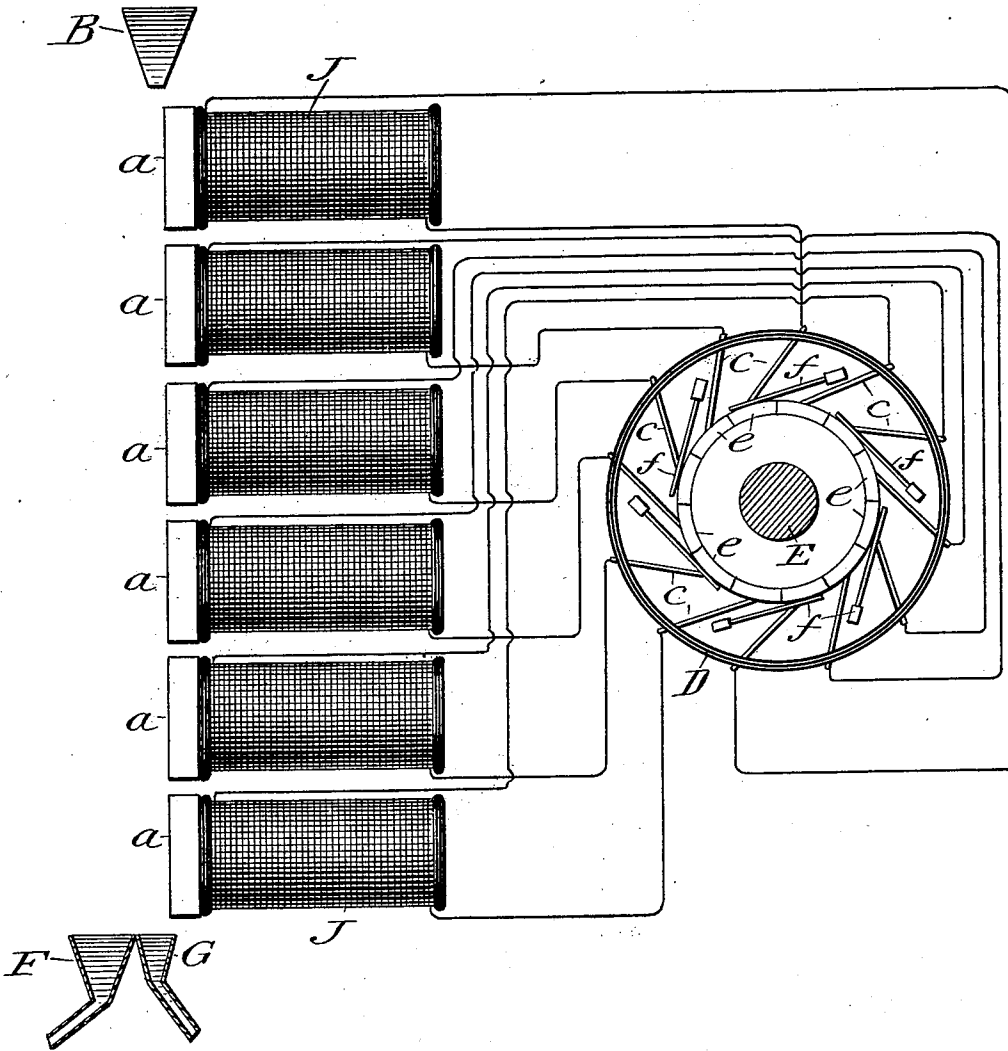
PATENTED JUNE 16, 1903.

E. GATES.

DIAMAGNETIC SEPARATION.

APPLICATION FILED APR. 14, 1900. RENEWED JAN. 13, 1903.

NO MODEL.



Witnesses:

D. W. Edelin.
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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 SEPARATION.

SPECIFICATION forming part of Letters Patent No. 731,044, dated June 16, 1903.

Application filed April 14, 1900. Renewed January 13, 1903. Serial No. 138,826. (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 Diamagnetic Separation; 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 an application for Letters Patent of the United States filed by me March 19, 1900, Serial No. 9,267, I have described an apparatus for diamagnetic separation wherein the number of magnetic lines of force cut by the falling particles is multiplied for a given unit of time by causing the electromagnet to move rapidly in a direction opposed to the fall of the material.

The purpose of my present invention is to obtain a similar result without rotating or otherwise moving the magnet itself. To this end I arrange a series of magnets one above the other and connect the ends of the magnet-windings to opposite segments of a rapidly-rotating circuit maker and breaker of such a character that a succession of correspondingly-rapid energizations of the magnets will take place, succeeding each other from one end of the series to the other. The arrangement is such that alternate magnets of the series are energized in rapid succession in manner comparable to a succession of waves of electromagnetic energy meeting the material as it falls.

In the accompanying drawing is shown a series of magnets arranged one above the other, each having an energizing-coil J and presenting a pole-face *a* to the material which is fed by gravity from the hopper B. The ends of the magnet-coils extend to a series of brush-terminals *e*, mounted upon an insulating stationary ring or support D and making contact with a series of metallic strips *e*, insulated from each other and mounted upon a rotatory shaft E. A second series of brushes *f* also make contact with the strips *e* and are connected in opposite pairs to the negative and positive terminals of the source of elec-

tric supply for energizing the coils J—as, for instance, a dynamo-electric machine.

It will be evident that by rapidly rotating the shaft E and the strips *e*, carried thereby, at one instant the first, third, and fifth electromagnets of the series will be energized and at a succeeding instant the second, fourth, and sixth magnets will be energized, and that these energizations will follow each other successively at a speed determined by the velocity of the rotation of the shaft E. By this means the number of lines of magnetic force through which the material will pass as it falls along the magnetic faces may be correspondingly varied and increased or diminished in accordance with the requirements of the particular material treated. Moreover, the fact that alternate magnets of the series are energized instead of the entire series at once permits me to obtain the succession of wave-like energizations which are of advantage in this form of apparatus. In consequence the particles of diamagnetic metal move outwardly from the pole-faces to an increased degree and with a clearer separation from the particles of sand with which they were originally associated and drop into the hopper F, while the sand drops into the hopper G, the latter being practically unaffected by the magnetic field.

Having thus described my invention, what I claim is—

1. The method of separating diamagnetic material from mixtures containing it or from diamagnetic material of different diamagnetic susceptibility, which consists in feeding the mixture into a relatively intense part of a magnetic field, continuing it in said field until the diamagnetic particles of greater susceptibility have moved into a relatively less intense part of the magnetic field, and intensifying the magnetomotive force acting upon the particles to be separated, by causing the field to move in a direction opposed to the feed of the mixture through the field; substantially as described.

2. The method of separating diamagnetic material from mixtures containing it, or from diamagnetic material of different diamag-

netic susceptibility, which consists in feeding the mixture into a relatively intense part of a magnetic field, continuing it in said field until the diamagnetic particles of greater
 5 susceptibility have moved into a relatively less intense part of the magnetic field, and intensifying the magnetomotive force acting upon the particles to be separated, by causing the field to move in a succession of wave-

like impulses in a direction opposed to the feed of the mixture through the field; substantially as described.

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

ELMER GATES.

Witnesses:

J. E. HUTCHINSON, Jr.,
 A. E. GRANT.