

(No Model.)

R. R. MOFFATT.
MAGNETIC SEPARATOR.

No. 449,610.

Patented Mar. 31, 1891.

Fig. 1.

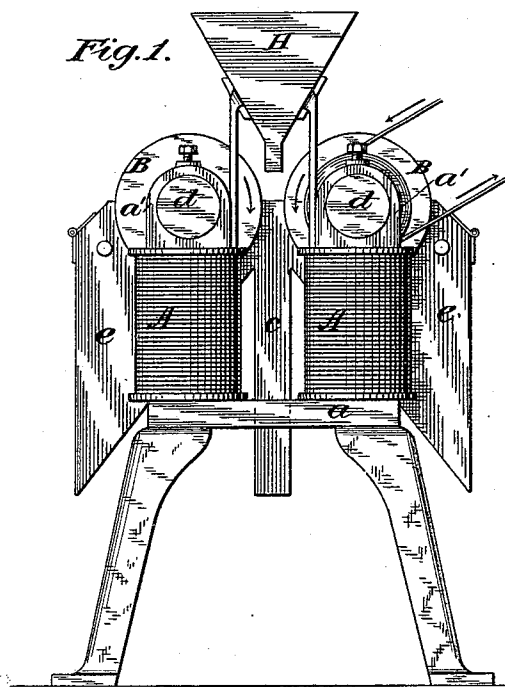


Fig. 2.

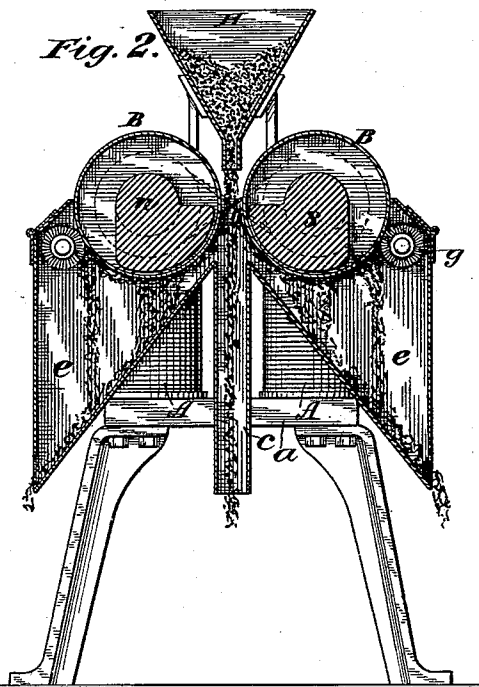
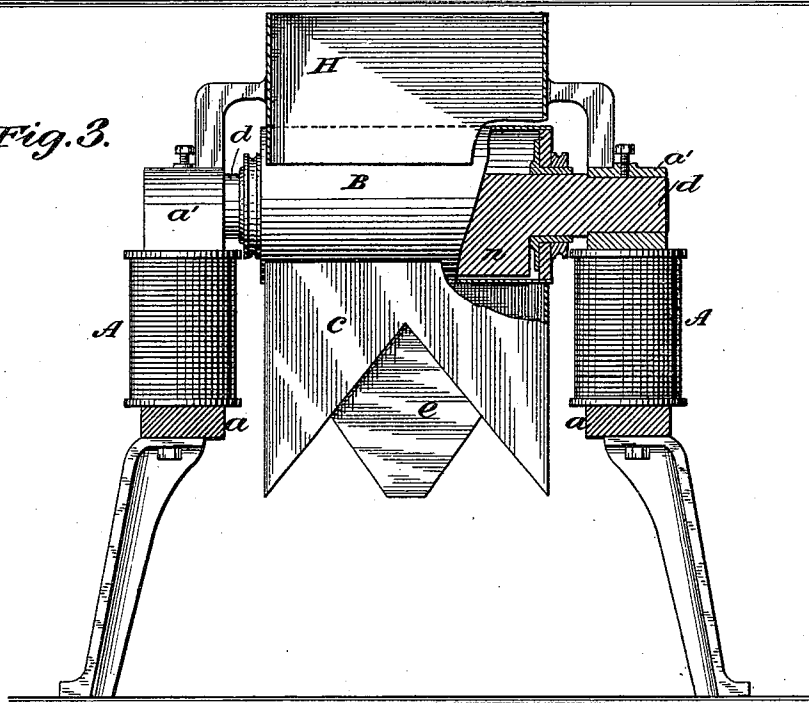


Fig. 3.



Witnesses:-
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UNITED STATES PATENT OFFICE.

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MAGNETIC SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 449,610, dated March 31, 1891.

Application filed August 25, 1890. Serial No. 363,019. (No model.)

To all whom it may concern:

Be it known that I, RICHARD R. MOFFATT, a citizen of the United States, residing in the city, county, and State of New York, have invented a new and useful Electro-Magnetic Apparatus for Separating Magnetic from Non-Magnetic Particles, of which the following is a specification, reference being had to the annexed drawings.

My invention relates to that class of mechanism known as "magnetic separators," and is especially adapted for the separation of magnetic or magnetic oxide of iron from the gangue with which it occurs in nature, particularly that kind of iron ore known as "apatite," wherein the magnetic oxide or magnetic is associated with lime phosphate.

My invention consists in a novel combination of an electro magnet (or magnets) the poles of which are located in a stationary position within rotating drums, the arrangement being such as to produce a strong concentration of the magnetic lines of force (or field) between the drums at their lower half, being strongest at their nearest point, and receding in strength as the distance between the poles increases, by which means all magnetic particles fed into the field of force are attracted toward the periphery of the drums adhering thereto, and are conveyed out from the field by the rotating drums to a point where they pass into a suitable receptacle separate from that into which the non-magnetic particles pass. The latter being in no wise affected by the magnetic action, fall in a direct line, as will be understood.

The accompanying drawings illustrate a simple method of carrying out my invention.

Figure 1 represents an end view in elevation of the apparatus. Fig. 2 shows an end view in section, and Fig. 3 is a side view through the center showing a portion in section.

Similar letters of reference in the several figures indicate like or corresponding parts.

In the drawings, the letters A A are the helix-coils of a compound electro-magnet. These coils are connected together in such a manner that when an electric current is active therein consequent poles of opposite nature will be produced in the iron pieces.

The magnet-cores *ns* are suitably connected by means of the yokes *a*, to which the legs that support the apparatus are secured. The pole-pieces *ns* are each provided with a cylindrical projection or trunnion *d* at their ends, by which means they are connected with the magnet passing into the core-heads *a'*, as shown. The trunnions *d* also serve as axles upon which are mounted drums B B, arranged to rotate in opposite directions, as indicated by the arrows. Preferably I construct the drums from sheet-iron, or having a layer of iron wire wound upon their periphery; but this is not absolutely necessary, as any non-magnetic metal or other material, such as canvas, will answer the purpose.

H is a hopper for receiving the material to be treated and for feeding the same into the magnetic field. Preferably it is located above the apparatus, as shown, to enable the particles to pass into and through the machine by gravitation. Receptacles *e*, *c*, and *e* are provided, as shown, for the purpose of receiving these separated particles. A brush or scraper *g*, acting upon the surface of each drum, insures the removal of any particle as the drums rotate.

The operation of my invention is as follows: The electro-magnet being energized by means of a dynamo or other electric source, a powerful magnetic field is produced between the pole-pieces *ns*, the lines of force being more intense at the upper part, where the space between the poles is least, decreasing as the distance between increases to a point where they are weak or *nil*, at or near which point the brush or scraper *g* may be located. The drums are rotated, and the material to be treated is placed in hopper H in a granulated condition, from which it passes by gravitation, and in a regulated flow enters the magnetic field between the rotating drums, as shown in Fig. 2. The attractive force of the magnet-poles *ns* will cause all magnetic particles in the material entering the field to be drawn against the surface of the rotating drums, to which it clings with sufficient magnetic force until it is conveyed out of the magnetic field, or to a point where the attractive power of gravity is greater than that of magnetism, when it falls into the receiver *e*.

All particles entering the field that are not magnetic are in no wise affected by the magnetic forces and fall in a direct line into the receiver *c*.

5 It is evident that the elements of my invention may be modified and embodied in various ways without departing from its principle.

10 Having thus described the construction and operation of my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a magnetic separator, the combination of two rotating drums with a stationary electro magnet or magnets located outside of the drums and having pole pieces or extensions
15 within the drums, substantially as specified.

2. In a magnetic separator, the combination of two rotating drums mounted horizontally and having an open space between them with
20 a stationary magnet or magnets located outside of the drums and having pole-pieces or pole-extensions within the drums, substantially as specified.

3. In a magnetic separator, the combination
25 of two rotating drums with an electro magnet or magnets located outside of the drums and having a stationary pole-piece within each drum, said pole-piece being magnetically connected with the magnet-core through the axis
30 of the drums, substantially as specified.

4. In a magnetic separator, the combination of two rotating drums with a stationary electro magnet or magnets located outside of the drums and provided with pole-pieces within
35 the drums, with which they make magnetic contact through the axis of the drums, said pole-pieces extending from the axis of the drums toward each other; reducing the space

between them to produce a strong magnetic field, substantially as specified. 40

5. In a magnetic separator, the combination of two rotating drums with a stationary electro magnet or magnets located outside of the drums and provided with a pole-piece in each drum, which is constructed in such a
45 manner as to serve as an axle or shaft upon which the drums are mounted and rotate, substantially as specified.

6. In a magnetic separator, the combination of two rotating drums mounted horizontally
50 and having an open space between them, with a stationary electro magnet or magnets located outside and having a pole-piece of opposite polarity within each drum, said pole-piece arranged in a manner so as to produce
55 a condensation of lines of force in the lower part of the drums, being most intense at a point where the surfaces of the drums are nearest each other, substantially as herein specified. 60

7. In a magnetic separator, the combination of two rotating drums having an open space between them with a stationary compound electro-magnet, the helix-coils of which are
65 located on the outside of the drums with their consequent poles located within the drums in such a manner that the pole in each drum will be of an opposite nature to that in the other, so as to produce a magnetic field in the open space between the drums, substantially as
70 herein specified.

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