(No Model.)

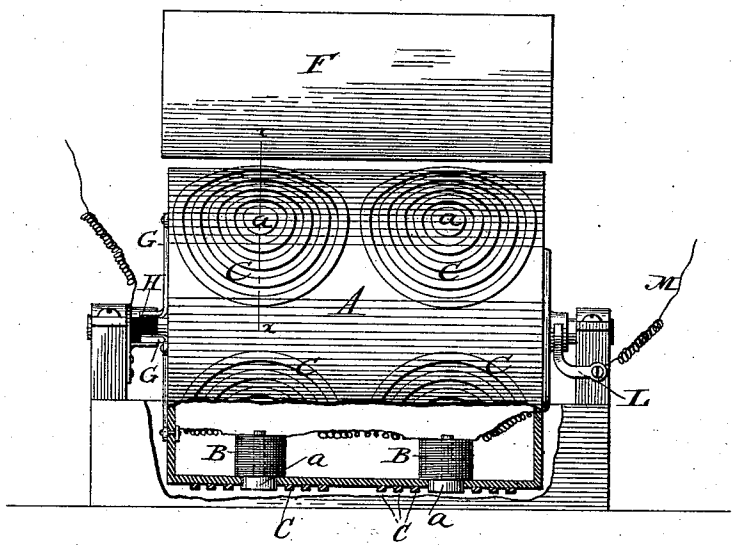
2 Sheets—Sheet 1.

S. E. ST. O. CHAPLEAU.

MAGNETIC ORE SEPARATOR.

No. 256,639. Patented Apr. 18, 1882.

Fig. 1.



Attest.

Sidney P. Hollingsworth.

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Inventor.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3

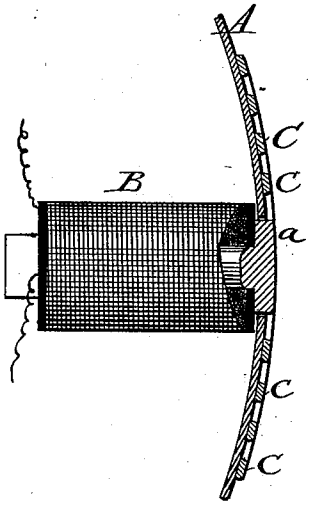


Fig. 4.

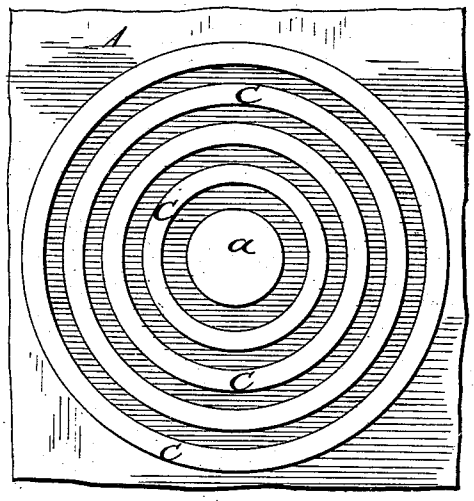


Fig. 2.

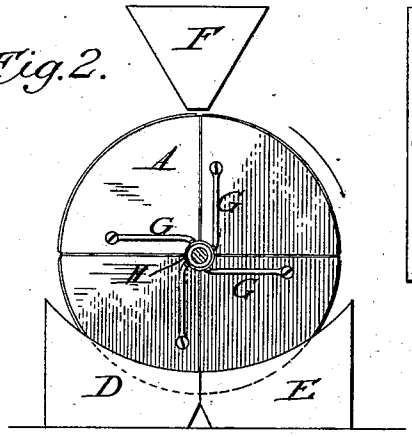


Fig. 5.

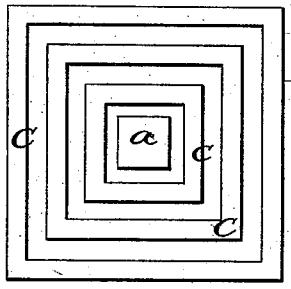


Fig. 6

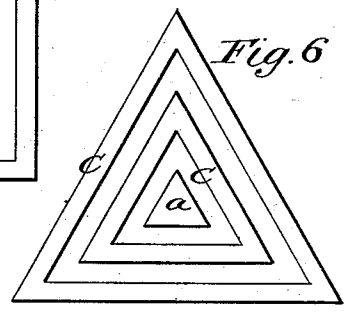
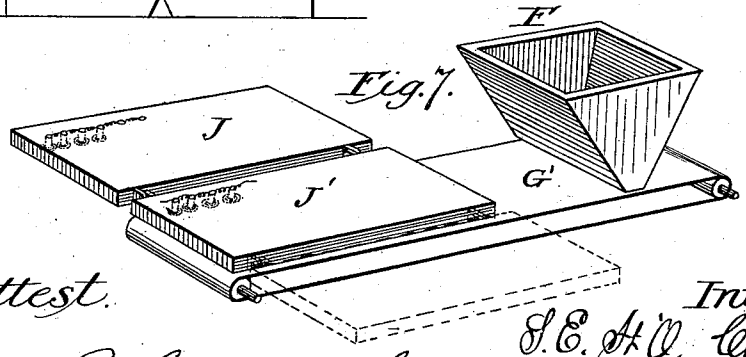


Fig. 7.



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UNITED STATES PATENT OFFICE.

SAMUEL E. ST. O. CHAPLEAU, OF OTTAWA, ONTARIO, CANADA.

MAGNETIC ORE-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 256,639, dated April 18, 1882.

Application filed January 26, 1882. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL E. ST. O. CHAPLEAU, of Ottawa, in the county of Carleton, Province of Ontario, Canada, have invented certain Improvements in Magnetic Ore-Separators, of which the following is a specification.

My invention relates to that class of separators designed more particularly for the treatment of sands or ores containing iron, and commonly denominated "magnetic ores," wherein the magnetic and non-magnetic substances are separated by means of an electro-magnet.

The invention consists in combining with the electro magnet or magnets supplemental attractive surfaces which are rendered attractive either by the inductive action of the magnet, without intermediate connections, or through the connection formed by the intermediate ore, or through small iron wires or other exceedingly narrow connections of magnetic material, whereby I am enabled by the use of a given magnet and current to produce a greatly-increased surface to which the magnetic ore will adhere.

I am aware that numerous machines have been constructed wherein electro-magnets and permanent magnets were employed in various arrangements and combinations to effect the separation of ores, and that in many cases the electro-magnets have been provided with flattened and extended ends or poles for the purpose of providing an increased surface to attract the ore.

I am also aware that in an ore-separator a cylinder has been provided with longitudinal iron bars, each having the poles of a number of magnets connected thereto, the bars becoming in such case the poles of the magnets.

In practical operations with the machines hitherto constructed it is found that the ore adheres mainly to the edge and center of the magnetic poles, and that therefore an increase in the size of the magnet is not accompanied by a corresponding increase in its efficiency. By my method of construction this difficulty is obviated and a magnet of given size caused to produce far greater results in practical operation. The form of the magnet and of the supplemental surfaces employed therewith may be varied as desired, provided their mode of action remains unchanged, and they may be mounted upon or used in connection with any suitable appliances for bringing them in proper relation to the ore to act thereon.

The accompanying drawings represent a machine of the preferred construction and also certain modifications in the form of the supplemental surfaces.

Referring to the drawings, Figure 1 represents a side elevation, partly in section, of a rotary machine having my improvements embodied therein. Fig. 2 is an end elevation of the machine. Fig. 3 represents a cross-section through one side of the cylinder on the line *x x* of Fig. 1. Fig. 4 represents a face view of one of the magnetic poles and the supplemental surfaces as applied to the surface of the cylinder. Figs. 5 and 6 are face views illustrating the supplemental attractive surfaces in modified forms. Fig. 7 is a perspective view, showing a modified construction of the machine.

Referring to Figs. 1, 2, 3, and 4, A represents a horizontal rotating cylinder, preferably constructed of wood or other non-magnetic material and mounted in suitable supports. This cylinder is provided with any suitable number of electro-magnets B, distributed uniformly around its interior, each with one pole, *a*, extending through the surface of the cylinder, as represented in Fig. 1.

For convenience of illustration I have represented a machine in which the surface of the cylinder is divided longitudinally into four equal sections, each having two magnets therein side by side. Around the pole of each magnet upon the surface of the cylinder I secure a series of annular rings, C, made of iron or other material capable of being magnetized. The rings C are insulated from each other and from the magnet—or, in other words, so arranged that there is no electrical or magnetic connection between them—but are arranged at such distances from the magnet and from each other that when the magnet is polarized the various rings will be magnetized by the inductive action familiar to all persons skilled in electricity.

In practice it is found that when the supplemental surfaces are thus magnetized and brought into contact with the ore, the magnetic ore will adhere to the surfaces and to the edges of the rings, as well as to the magnet, the adherence occurring mainly at the edges of the rings and at the magnet. The cylinder is mounted, as shown in Fig. 2, immediately over two hoppers or receptacles, D and E, one under each side. A hopper, F, is arranged above the cylinder to deliver the sand thereto, this hopper being of any suitable construction and being provided, if desired, with devices for feeding or regulating the flow of ore to the cylinder.

The coil of each electro-magnet is constantly connected at one end of the cylinder, through a conducting-finger, L, with a wire or conductor, M, extending to a battery or other electric generator. The opposite poles of the magnetic coils are connected through the opposite end of the cylinder with conductors G, which travel around and operate upon a stationary circuit-breaker or commutator, H, also in connection with the battery or generator. The fingers G travel around the circuit-breaker H and serve to throw each magnet into and out of circuit alternately, the various magnets being brought into action successively in pairs, which action is secured by connecting the coils of the two companion magnets and passing the current through both at once.

The circuit-breaker is adjusted in such manner that each magnet is thrown into circuit and magnetized during the time that it is passing beneath the hopper, and maintained in circuit until it has descended and been carried past the receptacle E and brought over the receptacle D, the result of this arrangement being that on turning the cylinder in the direction indicated by the arrow in Fig. 3, and delivering the ore from the hopper upon the upper surface of the cylinder, the magnetic ores are attracted and held by the magnets B and rings C, and carried downward past the receptacle E and discharged by the depolarization of the magnets and rings into the receptacle D, the non-magnetic substances falling directly and without interruption into the receptacle E.

The supplemental surfaces are rendered somewhat magnetic by the direct induction without intermediate connection, but their attractive strength is increased through the action of the magnetic ore bridging over the space between them.

It is found in practice that good results may be secured when very narrow metallic strips are used as connections between the magnet and the various rings or surfaces. The use of large connections is, however, inadmissible, and in practice it is found best to use the apparatus without permanent connections or conductors between the rings or surfaces.

The construction of the magnets and circuit-breaking devices may be modified as desired, devices of this character being well known in various forms to persons skilled in the art.

Figs. 4 and 5 represent the supplemental surfaces C in angular instead of annular form.

Fig. 6 represents a machine in which the magnet and supplemental attractive surfaces are arranged upon reciprocating instead of rotating surfaces.

F represents a feed-hopper; G′, an endless belt arranged beneath the hopper in such manner as to receive the ore therefrom and carry it forward upon its surface.

J J′ represent two insulated plates or frames arranged to reciprocate horizontally over the upper surface of the carrier-apron, in close proximity to the ore thereon, the reciprocating motion carrying the plates J and J′ over and away from the belt alternately. Each of the plates or carriers J J′ is provided with electro-magnets and supplemental surfaces arranged in connection therewith in the same manner as represented in Figs. 1, 2, &c., the magnetic poles and surfaces being arranged on the under side of the plates adjacent to the carrying-belt. The magnets of each plate are placed in circuit and magnetized while above the belt, but are demagnetized after being carried away from the belt. With the parts in the position represented in Fig. 6 the ore is carried by the belt beneath the plate J, and the magnetic portion attracted and held by the electro-magnets and supplemental surfaces on the under side of the plate. As soon as this action has taken place the two plates are shifted laterally, bringing plate J over the belt and carrying plate J′ to one side. The magnets of plate J′ being then depolarized, the iron ore is discharged therefrom into a receptacle located beneath the same, while at the same time the magnets of plate J will effect a separation of the ore brought thereunder by the belt. The belt being moved continuously or intermittently will carry the non-magnetic materials over its ends and discharge them, at the same time bringing fresh or unseparated ore forward beneath the plates.

Having thus described my invention, what I claim is—

1. In a magnetic ore-separator, the combination of an electro-magnet and a series of supplemental attractive surfaces separated from the magnetic pole and arranged in relation thereto, substantially as described and shown.

2. In an ore-separator, the combination of a magnet and a series of supplemental surfaces of magnetic material insulated and disconnected from the magnet, but arranged in relation thereto, substantially as shown.

3. In an ore-separator, the combination of a hopper, a magnet, and series of magnetic rings or plates encircling the pole of the magnet, as and for the purpose described.

4. The combination, substantially as de-

scribed, of the revolving cylinder provided with the series of electro-magnets and supplemental surfaces, as described, and means whereby the magnets are rendered active and inactive alternately.

5. The combination of the revolving cylinder, the electro-magnets and supplemental surfaces mounted thereon, the feed-hopper, the two receptacles, and means, substantially as described, for magnetizing and demagnetizing the magnets.

SAMUEL E. ST. ONGE CHAPLEAU,

Witnesses:
W. C. DUVALL,
NEWTON WYCKOFF.