No. 767,105. PATENTED AUG. 9, 1904.

M. DINGS.

MAGNETIC SEPARATOR.

APPLICATION FILED AUG. 7, 1903.

NO MODEL.

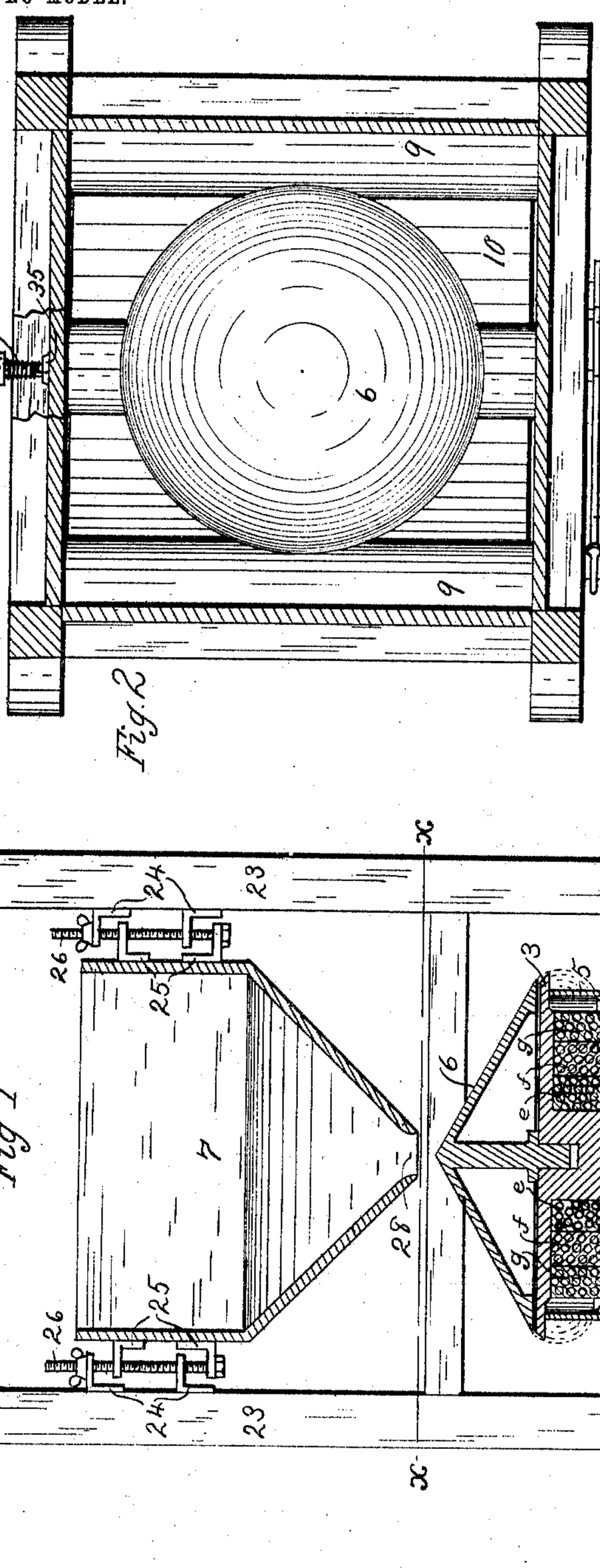

Fig. 2.

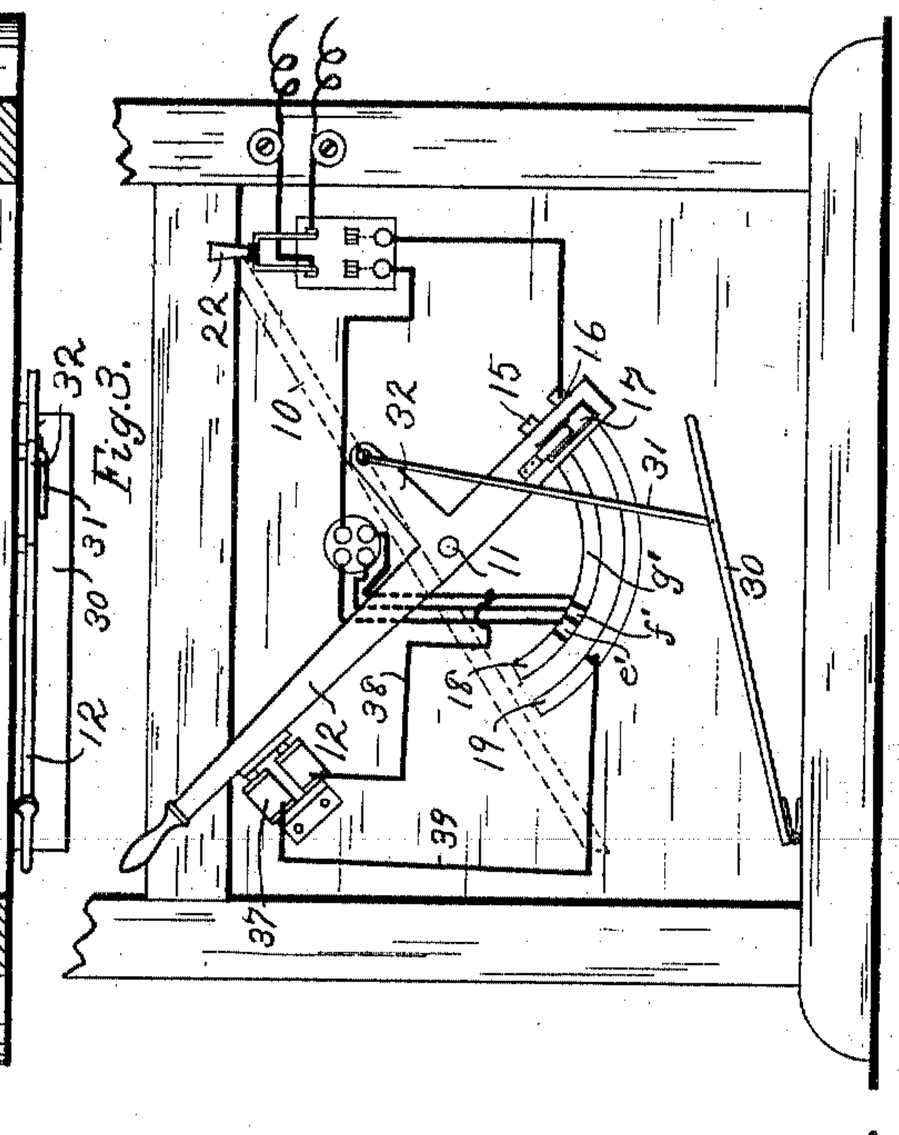

Fig. 3.

Fig. 1

Witnesses
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UNITED STATES PATENT OFFICE.

MYRON DINGS, OF MILWAUKEE, WISCONSIN.

MAGNETIC SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 767,105, dated August 9, 1904.

Application filed August 7, 1903. Serial No. 168,581. (No model.)

To all whom it may concern:

Be it known that I, MYRON DINGS, a citizen of the United States, residing at Milwaukee, county of Milwaukee, and State of Wisconsin, have invented new and useful Improvements in Magnetic Separators, of which the following is a specification.

My invention relates to improvements in magnetic separators.

The object of my invention is to provide a form of apparatus especially adapted for occasional use and for the magnetical separation of comparatively small quantities of material or material containing but little iron, insufficient to justify the maintenance or operation of machine-driven mechanism.

My invention therefore contemplates the provision of apparatus which can be manually controlled and operated, the magnet and its pole-pieces being stationary and intermittingly energized.

In the following description reference is had to the accompanying drawings, in which—

Figure 1 is a central vertical sectional view of my invention. Fig. 2 is a cross-sectional view drawn on line *x x* of Fig. 1. Fig. 3 is detail side view of the lower portion of the machine, showing the lever for oscillating the slide and controlling the energizing-current.

Like parts are identified by the same reference characters throughout the several views.

1 is the coil of a stationary electromagnet, of which 2 is the core, provided with flanged pole-pieces 3 and 4, respectively. The pole-piece 3 is in the form of a disk flange covering the winding of the magnet. The pole-piece 4 comprises a disk flange *a* and a cylindrical flange *b*, the latter projecting upwardly from the rim of the flange *a* and partially inclosing the magnet-winding, as shown in Fig. 1. The pole-piece is provided with a depending non-magnetic cylindrical flange 5, which laps over the upper edge of the flange *b*.

6 is a distributing-cone of non-magnetic material, and 7 is a hopper arranged to discharge material upon the cone, from which it is distributed over the surfaces of the cone and permitted to fall past the outer edges of the pole-piece 3.

The magnetite is collected in the magnetic field and drawn inwardly against the flange 5, the direction of the magnetic lines of force being indicated by dotted lines in Fig. 1. Stationary slides 9 are used for concentrating the material underneath the magnet, whereby the same is delivered to a tilting slide 10, mounted upon a shaft 11 and operated by means of a lever 12, secured to one outer end of the shaft. When the magnet is energized, the slide 10 is adjusted, as shown in Fig. 1, and discharges the non-magnetic material into a receiver 13. When the magnet is deënergized, the slide 10 is adjusted to the position in which it is indicated by dotted lines in Fig. 1, when it discharges into the receiver 14.

It will be observed, Fig. 3, that the lever 12 controls the energizing-current. This is accomplished by providing suitable contact-segments 15 and 16, respectively, the latter representing terminals of an electrical current which includes the magnet. When the lever 12 occupies the position in which it is shown in Fig. 3, a contact-shoe 17, carried by the lever, bears resiliently on the contact-segments 15 and 16 and electrically connects them to close the circuit through the electromagnet. The contact of the shoe 17 with the terminal segments 15 and 16 is maintained when the lever is oscillated until the latter has nearly completed its movement, when the contact-shoe 17 passes upon the insulated sections 18 and 19, thus breaking the circuit through the electromagnet and deënergizing the latter, the slide 10 being then in position to discharge the material into the receiver 14.

22 is an ordinary switch for cutting out the entire apparatus when not in use.

It will be observed that the hopper 7 is supported from the frame-post 23 through the medium of frame-brackets 24 and hopper-brackets 25, connected by adjusting-bolts 26, the latter having thumb-nuts at their upper ends, whereby they may be adjusted manually. As the mouth 28 of the hopper 7 is directly over the apex of the distributing-cone 6, it is obvious that by raising or lowering the hopper the feed of the material will be regulated by the cone, which serves as a valve.

Reviewing the operation of the device, the apparatus is first connected up with a source

of electrical energy through the medium of the switch 22. The lever 12 is then swung to the position in which it is shown in Fig. 3, the slide 10 being thereby adjusted to the position in which it is shown in Fig. 1 and the electromagnet energized by closing the circuit through the magnet by means of the contact-shoe 17 moving on the terminal segments 15 and 16. The material to be separated is then fed into the hopper 7, from which it is distributed by the cone 6 through the magnetic field, and the magnetite collected on the edge of pole-piece 3 and flange 5. The non-magnetic material passes downwardly to the slide 10, which feeds it into the receiver 13. When the hopper is empty, the lever 12 is oscillated to remove the contact-shoe 17 from the terminals 15 and 16 to the insulated segments 18 and 19 and simultaneously reverse the slide 10 to the position in which it is shown in dotted lines in Fig. 1. The electromagnet being deënergized by breaking the circuit between terminals 15 and 16, the magnetite is permitted to drop upon the slide and pass to the receiver 14.

On one end of shaft 11 is a spring 34, one of which is attached to set collar 36 and the other end to the box-bearing 35, thus maintaining a twist tension on shaft 11, so that when the lever 12 is released the tilting slide 10 is thrown back into position, as shown by dotted lines in Fig. 1.

By providing the electromagnet with independent series of concentric windings, as indicated at e, f, and g, and connecting the winding e severally with an insulated section e' of the contact-segment 15, while both windings e and f are connected with a section f' and all three with the main section g', the magnet may be energized and deënergized more gradually than if a single winding were used, thus avoiding excessive arcing or flashing.

Where it is desired to leave the machine unattended during its operation, a holding-electromagnet 37 is provided, the lever serving as an armature for the holding-magnet. The holding-magnet retains the lever with the slide, as shown in Fig. 1 and by dotted lines in Fig. 3, and when the holding-magnet is deënergized the lever is released, and the spring 34 then operates to reverse the slide. The holding-electromagnet is energized, through conductors 38 39, from the same source from which the energizing-current of the separator-magnet is received, so that any interruption of the current causes the instant release of the lever and reversal of the slide, whereby the magnetized materials are discharged into the proper receiver.

In some cases it is desirable to operate the lever 12 by foot-power. This is accomplished by a treadle 30 and link 31, connected to an arm 32 of the lever 12, as shown in Fig. 3. Usually, however, where the treadle is used the holding-magnet is disconnected and the tension of spring 34 reversed, so that the treadle-pressure operates in opposition to the spring tension.

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

1. In a magnetic separator, the combination of an electromagnet having a substantially vertical axis; a cup-shaped lower pole-piece partially inclosing the magnetic winding; an upper pole-piece covering the magnet and projecting marginally therefrom; a non-magnetic ring of less diameter than the upper pole-piece, but connected to the latter and arranged to cover the upper edge of the lower pole-piece; and a conical distributing-shield covering the upper pole-piece except at its marginal edges.

2. In a magnetic separator, the combination of an electromagnet having a substantially vertical axis; a cup-shaped lower pole-piece partially inclosing the magnetic winding; an upper pole-piece covering the magnet and projecting marginally therefrom; a non-magnetic ring of less diameter than the upper pole-piece, but connected to the latter and arranged to cover the upper edge of the lower pole-piece; and a conical distributing-shield covering the upper pole-piece except at its marginal edges; together with a tilting slide of greater dimensions than the diameter of the magnet and having a pivot-shaft located substantially across the axial line of the magnet.

3. The combination of a tilting slide arranged to oscillate over a central pivot-rod with opposing edges crossing the horizontal plane of said rod when the slide is tilted; an actuating-lever connected with said slide; an electromagnet of less diameter than either the length or width of the slide, located with its central axis extending in a substantially vertical direction above the pivot-shaft of the slide; and a distributing-cone located above said magnet; together with means for feeding material to the apex of the cone.

4. The combination of a tilting slide arranged to oscillate over a central pivot-rod, with opposing edges crossing the horizontal plane of said rod when the slide is tilted; an actuating-lever connected with said slide; an electromagnet of less diameter than either the length or width of the slide, located with its central axis extending in a substantially vertical direction above the pivot-shaft of the slide; and a distributing-cone located above said magnet; together with means for feeding material to the apex of the cone, and a circuit-closer connected with the slide-actuating lever and included in the energizing-circuit of said magnet.

5. In an electromagnetic separator the combination with an electromagnet of a pivotal

receiving-slide; a spring arranged to normally hold the slide in one position of adjustment; a lever for reversing the position of the slide; and a holding-magnet energized from the same source of electricity as that which supplies the separator, and arranged to hold said lever against the tension of said spring when the latter is adjusted in proximity to it and pending the duration of the energizing-current.

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

MYRON DINGS.

Witnesses:

CHAS. B. PERRY,

LEVERETT C. WHEELER.