No. 812,171. PATENTED FEB. 6, 1906.

G. GRÖNDAL.

MAGNETIC ORE SEPARATOR.

APPLICATION FILED NOV. 3, 1904.

FIG. 1.

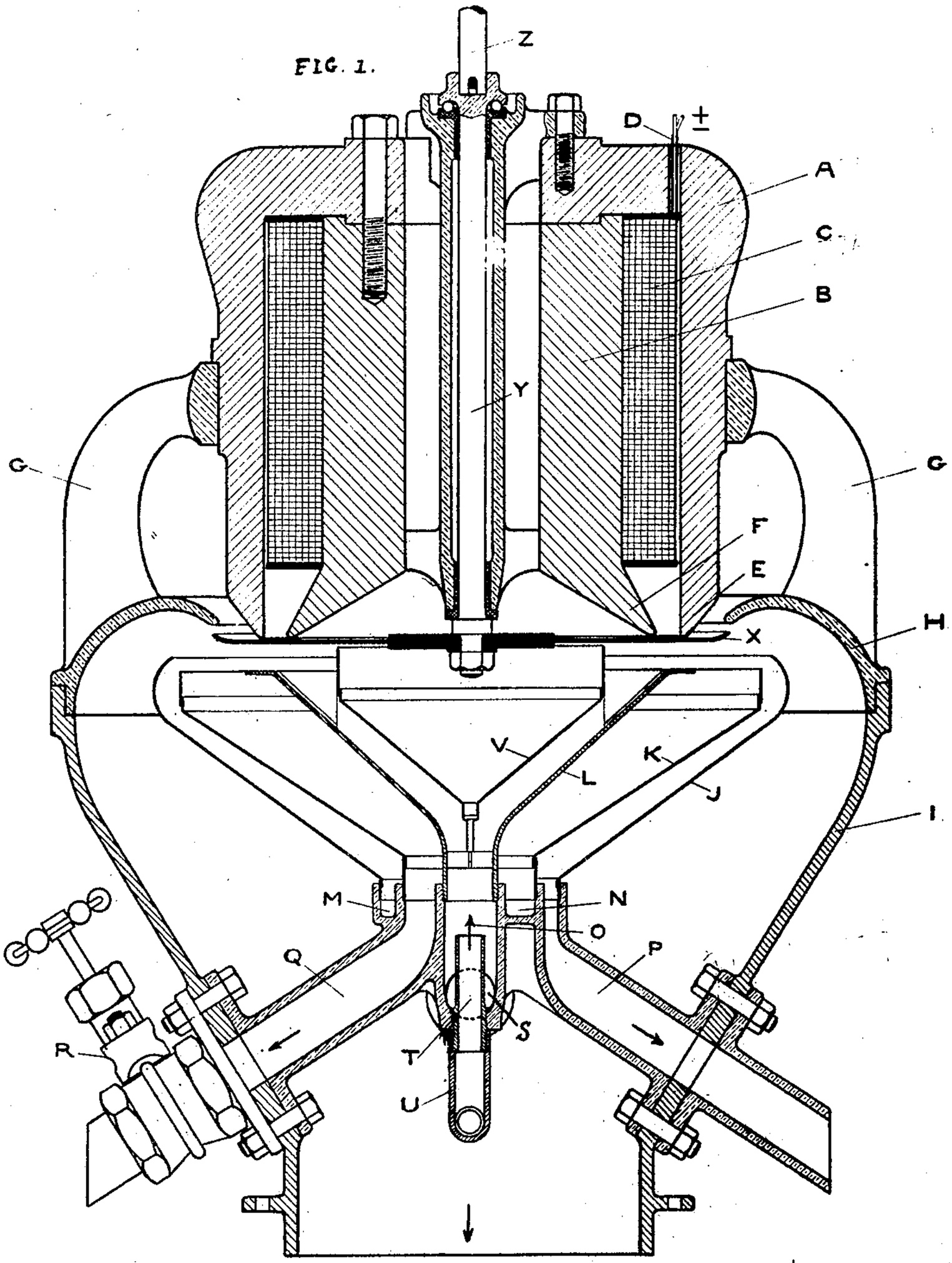
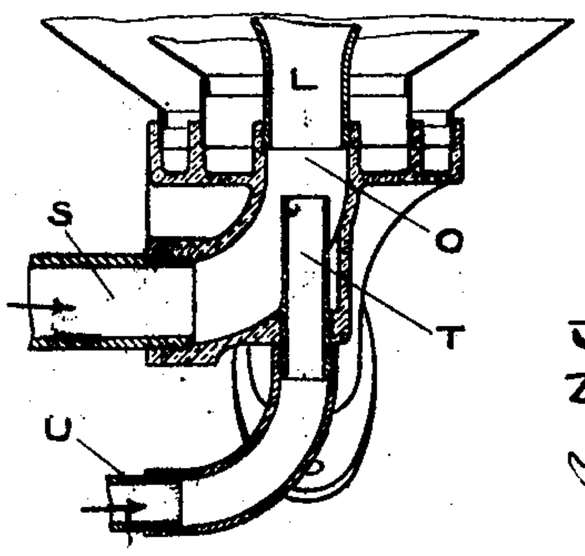


FIG. 2.



WITNESSES;
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GUSTAF GRÖNDAL, OF DJURSHOLM, SWEDEN.

MAGNETIC ORE-SEPARATOR.

No. 812,171. Specification of Letters Patent. Patented Feb. 6, 1906.

Application filed November 8, 1904. Serial No. 231,238.

To all whom it may concern:

Be it known that I, GUSTAF GRÖNDAL, a subject of the King of Sweden and Norway, and a resident of Djursholm, Sweden, have invented a new and useful Improved Magnetic Ore-Separator, of which the following is a specification.

The present invention refers to a magnetic ore-separator of the kind in which powdered ore suitable for magnetic separation, particularly magnetic iron ore, suspended in water, is led horizontally past the pole-piece of an electromagnet of such a power that it will pull the pure ore particles out of the stream of water, while the less pure particles gather close beneath the surface of the water and are carried away alone separately from the dead powder, which sinks down and is allowed to flow away.

My present invention is an improvement on the apparatus forming the subject-matter of my application for patent, Serial No. 180,904, filed November 12, 1903, and like that apparatus is adapted for carrying out the process forming the subject of my application for patent, Serial No. 235,394, filed December 3, 1904.

On the accompanying drawings there is shown a form of apparatus as an example.

Figure 1 represents a vertical longitudinal section of the apparatus, and Fig. 2 represents a section through the ore and water inlets at right angles to the section Fig. 1.

The apparatus consists of a cylindrical electromagnet having double walls A and B, connected with each other at the top, and the winding C, arranged between the walls. The conducting-wires enter and issue at D. The walls A and B extend downward beyond the winding C and end in tapering edges, which form two concentric pole-pieces E F. The electromagnet is supported on arms G, projecting from a vaulted cover H, resting on the hollow frame I, which is funnel-shaped at the top. In this funnel right below the magnet there are three stationary funnel-shaped vessels J, K, and L, one within the other, which are supported by a casting fixed to the frame I, the said casting ending at the top in two concentric annular troughs M and N, in which enter the lower ends of the funnels J and K, respectively. The lower end of the funnel L enters into the chamber or tube O inside the inner trough. The said funnel L is screwed in the opening of the chamber O, so as to be capable of adjustment for a purpose mentioned below. The casting which supports the funnels J K L is mounted on two tubular arms P and Q, fixed over holes on the inside of the frame, P forming the discharge from the trough M and Q the discharge from the trough N. The discharge through Q is provided outside the frame with a regulating-valve R. From the chamber O a tube S leads out through the wall of the frame. In the chamber O right below the bottom of the funnel L enters another tube T, communicating by a tube U with a water-supply outside the frame. V is a dispersing-cone inside the funnel L.

Beneath the pole-pieces E and F there is a disk X, fixed to a vertical shaft Y, mounted in bearings inside the cylindrical electromagnet, a sufficiently rapid rotation being imparted to the shaft by any suitable means. Z indicates the lower end of a driving-shaft.

The operation of the apparatus is as follows: After closing the valve R the water, with the suspended ore-powder, is led in through the tube S into the funnel L, and a water-jet is driven through the tube T in order to stir and assist in carrying the suspended material at a regulated rate over the outwardly-bent edge of the funnel L. After the funnel K has been filled the stream passes to the funnel J and from it out through the pipe P. The electromagnet is now excited, and the disk X is caused to rotate. By regulating the supply through the tubes S and U and the position of the valve R the suitable speed of the stream of suspended material flowing over the edge of the funnel L may be obtained, so that the magnet has time to pull away the most magnetic particles out of the water, which does not come into contact with the disk, and to cause the less magnetic particles to follow the stream into the funnel J to be discharged through the tube P, to be further enriched and giving the dead particles time to sink down in the funnel K, from which they flow off through the tube Q. The particles that are pulled out of the water and against the rapidly-rotating disk X are immediately flung away toward the sides against the vault H and fall down in the interior of the frame I, from the lower part of which they are removed. By lifting or lowering the funnel L the depth of the stream of suspended material flowing over the edge may be regulated.

It is not necessary that the vessels beneath the magnet should be funnel-shaped. They may have any other suitable form, if desired.

I claim as my invention—

1. A magnetic separator for ore suspended in water, comprising an electromagnet with its pole-pieces directed downward, a horizontal rotary disk beneath said poles and means for feeding ore suspended in water upward from below toward the disk and horizontally in close proximity thereto, but out of contact therewith, as and for the purpose set forth.

2. A magnetic separator for ore suspended in water, comprising an annular electromagnet with its pole-pieces directed downward, a rotary disk beneath said pole-pieces and beneath said disk two annular vessels, means for supplying ore suspended in water upward through one of said vessels and over the edge to the other, and in close proximity to, but out of contact with, the rotary disk.

3. A magnetic separator for ore suspended in water, comprising an electromagnet with its pole-pieces directed downward, a rotary disk beneath said pole-pieces, and beneath said disk two annular vessels, means for supplying ore suspended in water upward through one of said vessels and to the other, with an outer vessel to receive and collect the rich ore drawn out of the water and thrown off the disk by centrifugal force.

4. A magnetic ore-separator, comprising an upright cylindrical electromagnet having its pole-pieces directed downward in the shape of concentric rings, a rapidly-rotating disk beneath the pole-pieces, and beneath the said disk a funnel provided with a conical disperser inserted in it and with tubes for the suspended material and for water opening into the lower part of the funnel, another funnel surrounding the first funnel and having a discharge-tube adjustable by means of a valve, a third funnel surrounding the second funnel having a discharge-tube, and a collecting vessel surrounding the circumference of the disk.

5. A magnetic separator for ore suspended in water, comprising an electromagnet, a moving surface beneath the pole-piece, and above the water-level a vessel for receiving ore suspended in water below said moving surface, an inlet to the lower part of said vessel and a water-jet tube in the said inlet to press the water and ore upward.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GUSTAF GRÖNDAL.

Witnesses:
T. HARDING,
G. KARLSON.