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MAGNETIC SEPARATOR

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2 Sheets-Sheet 1

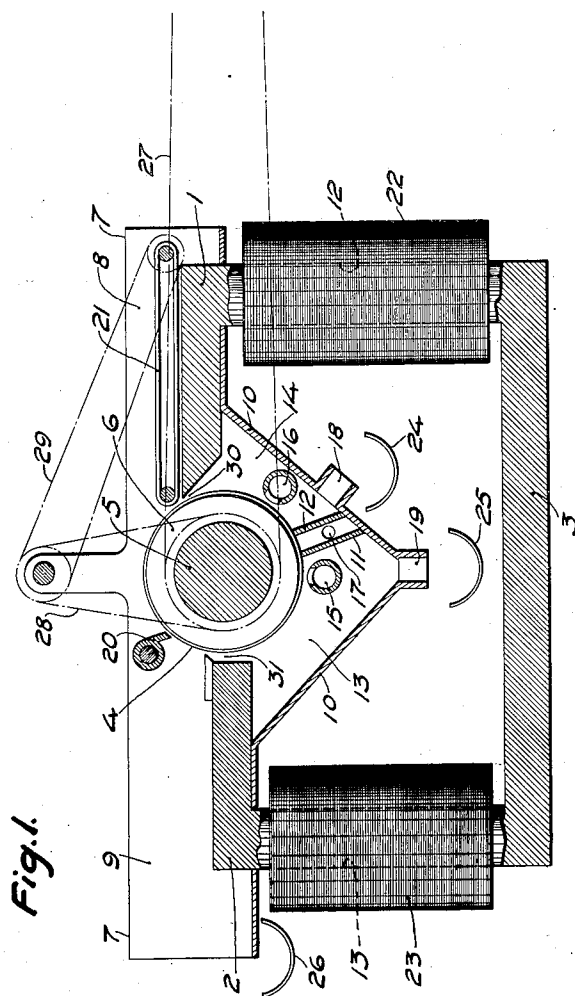


Fig. 1.

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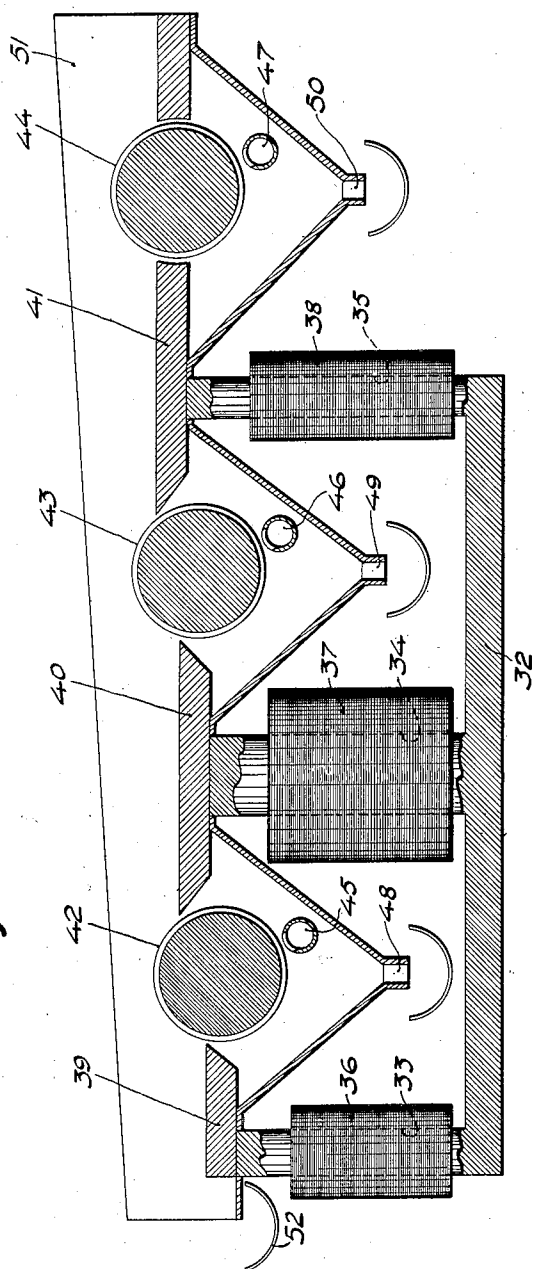
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Fig. 2.



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MAGNETIC SEPARATOR

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This invention relates to devices for separating pulverous ore or material containing other stuffs, which are influenced by magnetism by which, also the separation of weak magnetic stuff is rendered possible by the wet process, which hitherto has been considered impossible.

The present improvement comprises apparatus in which a current of water with stuff suspended therein is caused to pass over the upper part of a drum rotating around a horizontal axis, the said drum attracting the magnetic constituents of the stuff by means of magnetic influence and carrying the same down out of the path of current in order to let them down into a collecting device at a certain point where the magnetic field of the drum is weakened.

The accompanying drawings show diagrammatically two embodiments of devices for carrying out the abovementioned process.

Figure 1 shows a vertical section of such a separating device and

Figure 2 shows a cross section of a device comprising a plurality of separating apparatus placed one after the other.

In the device shown in Figure 1, 3 indicates an electromagnet, the pole-pieces 1 and 2 of which magnetize a rotatable drum 4 located between them. The said drum consists preferably of a core 5, surrounded by discs 6, separated from each other. The pole-pieces 1 and 2 are tapered towards or embrace the drum according as a field of a rather small or great intensity or extension is wanted. Further the pole-pieces tighten against side plates 7, by which troughs 8 and 9 are formed for supplying and letting out the stuff to be separated. The ends of the pole-pieces turned towards the drum 4 may preferably be adapted to be replaced and the upper sides of the same are coated with wood, rubber or the like. Between the pole-pieces and under the drum, a chamber is formed by the plates 10 and the side plates 7, the drum rotating between the last mentioned plates. The said chamber, in which the drum is partly immersed, is divided into two sections 13 and 14 by the partitions 11 and 12. The partitions tighten against the periphery of the drum. 15, 16 and 17 indicate supplies for water and 18 and 19 outlets for the stuff. An adjustable distributor 20 for the stuff rests against the drum and a conveyer 21 is located in the trough 8 for feeding the stuff to the drum 4. 22 and 23 indicate the wire windings of the electromagnet. 24, 25 and 26 indicate grooves thru which the magnetic and non-magnetic stuff is carried away after the separation. The conveyer 21 and the drum 4 are driven by means of the belt drives 27, 28 and 29.

The apparatus operates in the following manner:

The material to be separated, which is suspended in water, flows in the trough 8 over the pole-piece 1 towards the drum 4. Thereby the magnetic portion of the material will flow closer to the bottom of the trough than the rest of the material, partly on account of the magnetic attraction, partly on account of the greater specific gravity of the magnetic material. In order to secure a conveying of the material without using a disturbing inclination of the trough and of the pole-piece the conveyer 21 is used. The material proceeds further across the drum, the magnetic portion being intercepted on the mantle of the drum and carried on the same, according to the direction of rotation of the drum, either to and thru the opening 30 located between the pole-piece 1 and the drum or to and thru the opening 31 located between the pole-piece 2 and the drum. In the said openings the material is met by a current of water ascending from the chamber 13 and 14 respectively, preventing the non-magnetic part of the material from following in the direction of rotation of the drum.

If the drum rotates against the direction in which the material is carried in the trough 8 the magnetic material is caught by the drum and brought thru the opening 30 down into the chamber 14, which is filled with water all the time, and flows out thru the outlet 18 and the groove 24.

The non-magnetic material is carried by the water ascending thru the opening 30 across the drum to the pole-piece 2 and is carried away either thru the trough 9 and the groove 26, the opening 31 being then kept closed, or is allowed to flow down thru the opening 31 into the chamber 13, the remaining magnetic material being in the latter case intercepted on the drum in the strong magnetic field in the opening and carried back to the opening 30. The supply of water to the drum 13 and 14 must always be larger than the quantity of water, which leaves thru the outlets 18 and 19 in order that water may flow up thru the openings 30 and 31. The pole-piece 1 is preferably located a little higher up than the pole-piece 2.

If the drum rotates with the direction in which the material is carried forward and if the opening 30 has been closed by means of a rubber plate or in some other way, or that so much water ascends thru the opening 30 that the material cannot come down into the room 14 this way, the material to be separated is brought over to the opening 31 by the water and by the drum 4, the magnetic material being carried down thru the said opening and let out thru the outlet 19 and the groove 25. The non-magnetic material is carried away by the water, ascending from the chamber 13, and leaves thru the

trough 9 and groove 26. During the passage of the material across the drum the same is distributed along the drum by the distributor 20.

The drum 4 may rotate with such a great speed that some water containing non-magnetic material is thrown away by the centrifugal force, while another part of the water is retained on the drum along with magnetic material intercepted on the same.

A separation may be obtained also in the magnetic field between the pole-piece 1 the drum rotating with the current of material, by a current of water being conducted upwards from the chamber 14 thru the opening 30, the said current of water being adapted in such a manner, that the non-magnetic material sinks down into the chamber 14, from where it is removed thru the outlet 18. The magnetic material is intercepted by the drum and brought to the opening 31 by same, where the separation proceeds in the manner as described above.

The device shown in Figure 2 consists of three separating devices mounted one after the other. The magnet cores 33, 34 and 35 are placed on a common abutment 32. 36, 37 and 38 indicate the wire windings of the magnets, winding 37 being twice as large as the two others. The drums 42 and 43 rotate between the pole-pieces 39, 40 and 41. The drum 44 rotates in the same direction as the flow of material and obtains a sufficient quantity of magnetism from the pole-piece 41 as to be able to intercept strong magnetic material. For the rest the device is constructed in the same way as the one described above, except that the dividing of the chamber located under the drum, which is at hand in the above described device, is not to be found in the last mentioned device. Hereby it will be sufficient to have only one supply and one outlet for the water for each chamber, in addition to the two openings between drum and pole-pieces. The supplies are indicated by 45, 46 and 47 and the outlets by 48, 49 and 50.

The mode of operation is as follows:

The suspended material enters the trough 51. Strong-magnetic material is intercepted by the drum 44 and weak-magnetic material is conducted on the pole-piece 41 to the drum 43, after which the material not intercepted by the said drum is conducted on the pole-piece 40 to the drum 42. The material which is not taken care of at the said drum is carried away over the pole-piece 39 to the groove 52. The function of the single parts of the device might be clear from the device described above and shown in Figure 1.

Having now described our invention, what we claim as new and desire to secure by Letters Patent is:

1. Apparatus for separating pulverous ore or other materials containing stuffs which are acted upon by magnetism, comprising a magnetic drum rotating on a horizontal axis, a trough extending close to one side of the drum for leading in a current of water with said stuffs suspended therein, an outlet trough extending close to the other side of the drum, which troughs are shaped as pole pieces in order to magnetize the drum, said drum rotating toward one of said troughs and means provided for maintaining a supply of water under pressure acting from below in the intermediate space between the drum and the trough toward which the drum is rotating.

2. In an apparatus according to claim 1 means for maintaining a supply of water under pressure acting from below in two adjacent intermediate spaces between the drum and the inlet and outlet troughs.

3. Apparatus according to claim 1, wherein the troughs which are shaped as pole pieces partially surround the drum.

4. Apparatus according to claim 1, wherein the troughs which are shaped as pole pieces are tapered in vertical section towards the drum.

5. Apparatus for separating pulverous ore or other materials containing stuffs which are acted upon by magnetism, comprising a magnetic drum rotating on a horizontal axis, a trough extending close to one side of the drum for leading in a current of water with said stuffs suspended therein, an outlet trough extending close to the other side of the drum, there being one or more magnets provided below the inlet trough so as to cause the magnetic constituents of the supplied stuffs to mainly flow onward close to the bottom of the trough, and which troughs are shaped as pole pieces in order to magnetize the drum.

6. Apparatus for separating pulverous ore or other materials containing stuffs which are acted upon by magnetism, comprising two parallel magnetic drums located close to and laterally of each other and rotating around horizontal axes, one of the said drums being more magnetized than the other, said other drum being relatively less magnetized, an inlet trough for a current of water with said stuffs suspended therein extending close to one side of the other drum which is less magnetized, and an outlet trough extending close to the drum which is more magnetized, which troughs are shaped as pole pieces for magnetizing the drums, and means provided for maintaining a supply of water under pressure acting from below in the intermediate space between the drums.

7. Apparatus for separating pulverous ore or other materials containing stuffs which are acted upon by magnetism, comprising the combination of a magnetic drum rotating on a horizontal axis, an external electromagnetic pole piece disposed at each of the opposite sides of the drum in order to magnetize the same and extending close to said drum so as to present slits between the pole pieces and the periphery of the drum, while the uppermost portion of said periphery remains free and unobstructed, means for leading a current of water with aforesaid stuffs suspended therein to the drum over one of the pole pieces at one side of the latter, means for leading separated material away from the drum over the other of said pole pieces at the other side of said drum, and means for maintaining a supply of water under pressure acting from below the drum in at least the one slit located at the outlet side of the latter.

8. An apparatus according to claim 7, having a charging trough, and wherein at least one of the magnetic pole pieces cooperates with said trough in order to form means for subjecting the material supplied to said trough to influence of a magnetic field in order to draw magnetically attracted particles to the bottom of said trough.

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