This invention concerns a magnetic separator for recovering magnetic particles from liquids, and it is particularly designed for heavy liquid installations, utilizing a fine ground magnetic solid, as, for instance magnetite. In this art, in installations of this type, it has been proposed to either feed the liquid from above the rotating drum against the rotating direction, or to feed the same into a tank in which the rotating drum is submerged. In both cases the magnetic solids are attracted from the liquid to the drum and taken with the drum to be removed on the other downward moving side of the drum by adequate means such as scrapers or brushes. It is also known to dispose an endless belt around the drum and which belt carries the magnetic material and discharges it.

A disadvantage of this procedure is that the magnetic material takes up too much liquid, so that this material is obtained in a much too diluted form; thus special de-watering provisions become necessary.

On the other hand, according to this invention, the magnetic separator allows efficient de-watering during the drum movement, on the upper part of the drum. This procedure does not require any special devices for thickening the heavy liquids coming from the separator. On the other hand, it is possible to provide all the means necessary for carrying these heavy liquids after passing the separator, in troughs, pipes and tanks, therefore making the separator more compact, lighter and cheaper.

The separator, according to this invention, consists principally in providing a device acting with an elastic pressure from above and against the magnetic material carried upwards by the drum just before the material reaches the culmination point, that is, the high point of the arc of rotation described by the drum periphery.

The invention will now be particularly described with reference to the accompanying drawings illustrating three modifications and in which:

Figure 1 illustrates a cross section through an apparatus constructed in accordance with the first modification;

Figure 2 is a partial elevational view and partial sectional view looking from the right of Figure 1;

Figure 3 is a partial sectional view of an apparatus illustrating a second modification;

Figure 4 is a partial sectional and partial elevational view looking from the right of the modification shown in Figure 3; and

Figure 5 is a view similar to Figure 3 illustrating the third modification.

As illustrated in Figure 1 the liquid which contains the magnetic solids to be recovered is fed by means of a trough 1 to a relatively small conical reservoir 3. The reservoir has nearly the same width as the rotatable drum 2 mounted therebeneath and the cross sectional area of this reservoir narrows downwardly so that the liquid is issuing therefrom in a comparatively thin stream or sheet throughout substantially the width of the drum. Extending from the bottom of the reservoir 3 is a sheet 4 which as indicated is bent cylindrically to provide a liquid receiving surface over which the liquid and the magnetic solids therein flow toward a discharge lip at the terminal end of the sheet 4 in a path that is concentric with the drum. In this manner the liquid is exposed to the magnetic field while it is passing over the sheet. The magnetic solids are, thus, attracted first to the surface of the sheet 4, and, after passing the lip thereof, are attracted by drum 2 which is rotating in the direction of the arrow X, and carries this material upwards.

The material not attracted falls with the liquid into tank 5 in which liquid level is such that approximately half of the drum is submerged. Magnetic materials which reach this tank, are attracted by the lower part of the rotating drum and are likewise carried upwardly out of the tank. Cooperating with the opposite or downwardly moving side of the drum 2 there is mounted a scraper sheet 6 that removes the magnetic material cake and discharges the same into trough 7. The liquid together with the nonmagnetic material that is below the drum axis passes from the tank over an overflow wall 8. As shown in the drawing, the scraper sheet 6 is pivotally mounted and constitutes a pendulum scraper and connected to and depending from the scraper sheet 6 is a baffle sheet 9 of a length such that a portion of it is submerged in the liquid. This sheet 9 is disposed between the overflow wall 8 and the periphery of the drum 2 and functions to prevent magnetic material that might pass beneath the scraper sheet 6 from being carried out of the tank with the overflowing liquid and thus from passing behind the sheet 9. Any magnetic material which for one reason or another has not been removed by the scraper sheet 6 is constrained by the sheet 9 to pass close to the periphery of the drum 2 to be attracted thereby and carried therewith in its rotation for subsequent removal.

A roller 10, located above the drum, on the upwards moving side, slightly in advance of the culmination point, that is the high point of the arc of rotation described by the periphery of the drum, is the means for effecting by an elastic pressure from above the de-watering of the material carried upwards by the magnetic drum.

This roller 10 is located at a certain distance...
from the drum 2, thus forming a convergent throat between the periphery of the drum and the periphery of the roller 10. The shaft 11 of roller 10 is provided with friction wheels 12 contacting the magnetic drum, as shown in Figure 2. Thus the roller 10 turns in the opposite direction with regard to the direction of rotation of the drum 2, whereby the material which passes between the drum 2 and the roller 10 is de-watered. Preferably, the roller 10 should be made of soft rubber or can be constituted by a pneumatic balloon.

The solution according to Figure 3 contemplated, instead of the roller 10, a sheet 14, hinged on one side and inclined towards the drum 13 on the other side, at which end bolts 15 are disposed. These bolts 15 hold, with their heads 16, jackets 17. These jackets 17 are distributed along sheet 14 and are connected with screws 18 pivoted in a. This bolthead 16 allow a certain upward movement of sheet 14. The width of the throat, between drum 13 and sheet 14, can be regulated by turning jackets 17. When too much material enters the crevice, the sheet 14 yields in an upward direction.

The solution according to Figure 5 provides a means of de-watering by a spring sheet 19. This sheet, slightly inclined towards drum 20, is entirely fixed on one side and inclined towards the other, which is bent upwards. The width of the throat can be regulated by set screws 21, mounted in a bracket 22, and pushing against the sheet 19. This bracket 22 can preferably be used to mount the fixed side of spring sheet 19. The spring sheet 19 adjusts itself to the thickness of material surface passing through the crevice and effects an even de-watering even when the materials are unevenly distributed.

What I claim is:

1. A separator for recovering magnetic materials from liquids with solid materials in suspension comprising a magnetic drum rotating in a liquid tank against the liquid flow, means to introduce the liquid from one side of the drum, an overflow disposed on the opposite side of the drum, means for pressing elastically the cake of magnetic materials carried upwards, disposed just below the culmination point of the drum, thus de-watering the magnetic materials, means to be disposed to said drum as to provide a convergent throat to receive the cake of magnetic material, and a scraper disposed on the downwardly moving side of the drum discharging the magnetic materials, this scraper having on its underside a sheet immersed in the liquid before the overflow which prevents the drooping of magnetic pulp into the overflow and directs these particles towards the drum within the magnetic field.

5. A separator for recovering magnetic materials from liquids with solid materials in suspension comprising a magnetic drum rotating in a liquid tank against the liquid flow, means to introduce the liquid from one side of the drum, and an overflow disposed on the opposite side of the drum, means for pressing elastically the cake of magnetic materials carried upwards, disposed just below the culmination point of the drum, thus de-watering the magnetic materials, means to be disposed to said drum as to provide a convergent throat to receive the cake of magnetic material, and a scraper disposed on the downwardly moving side of the drum discharging the magnetic materials, this scraper having on its underside a sheet immersed in the liquid before the overflow which prevents the drooping of magnetic pulp into the overflow and directs these particles towards the drum within the magnetic field.

20. A device according to claim 3 in which said pressure applying means consists of a rotatable roller of yielding material.

25. A device according to claim 3 in which said pressure applying means consists of a rotatable roller having a covering of yielding material.

30. A device according to claim 3 in which said pressure applying means consists of a rotatable roller provided with means for rotating said roller in the direction opposite to the direction of rotation of said drum.

35. A device according to claim 3 in which said pressure applying means consists of a rotatable roller having one end hinged on said supplying means and its other end yieldingly mounted adjacent said drum.

40. A device according to claim 3 in which said pressure applying means is adjustable to vary the size of said throat.

45. A device according to claim 3 in which said pressure applying means consists of a resilient plate having one end fixed on said supplying means and its other end projecting adjacent said drum.

50. In a device for removing from a liquid magnetic particles in suspension therein, the combination of a liquid tank having an overflow lip; a magnetic drum rotatable about a horizontal axis inside said tank; said drum extending upwardly out of said tank; means to supply the liquid with the suspended particles, in an arcuate stream concentric with said drum, said stream flowing downwardly over the upwardly moving side of the rotated drum, to effect deposition of a layer of said particles on said drum; means for removing said layer from said drum; and a plate depending from said removing means and disposed between said drum and said overflow lip and depending below the said lip, whereby such particles of said layer as have not been removed by said removing means are prevented from escaping over said overflow lip and are directed toward said drum.

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