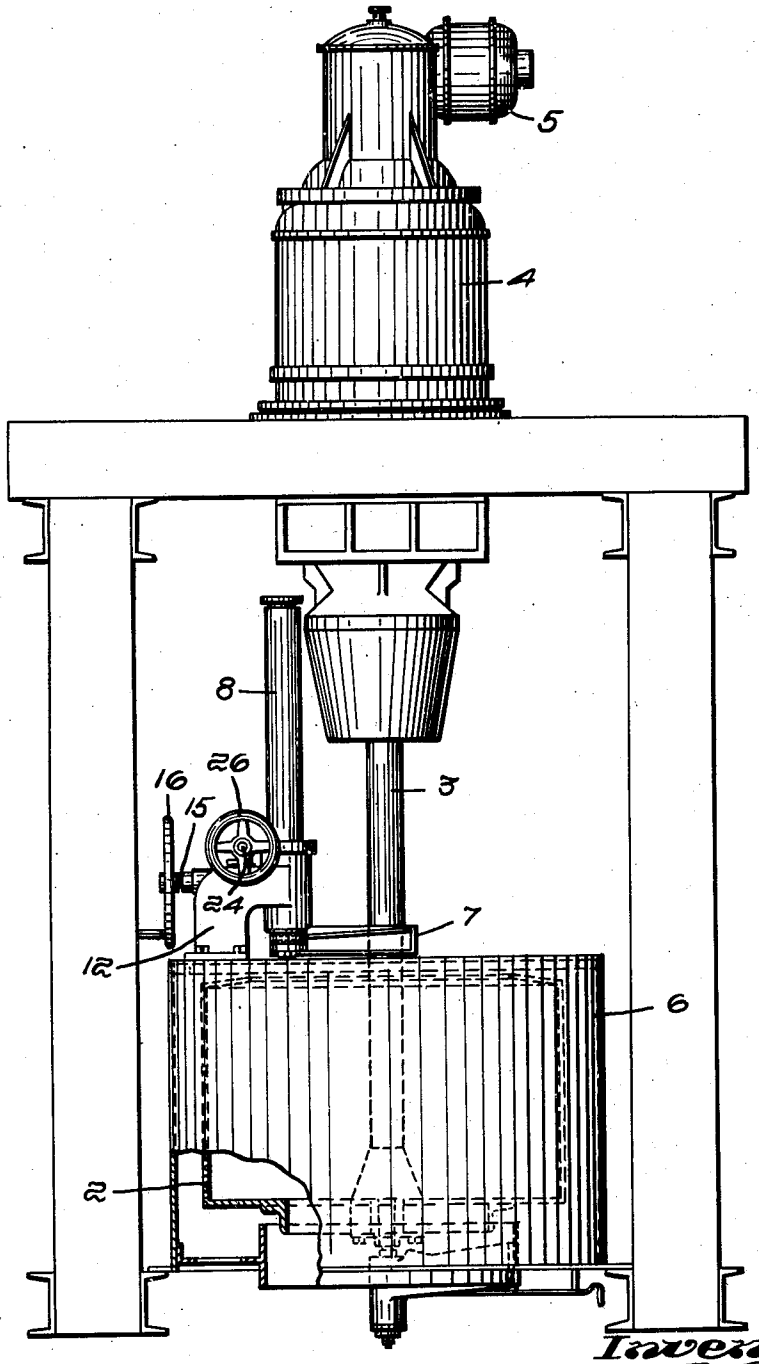
Oct. 18, 1949. J. E. THOLL 2,485,465

DISCHARGER FOR CENTRIFUGAL SEPARATORS

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Fig. 1.



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DISCHARGER FOR CENTRIFUGAL SEPARATORS

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Fig. 2.

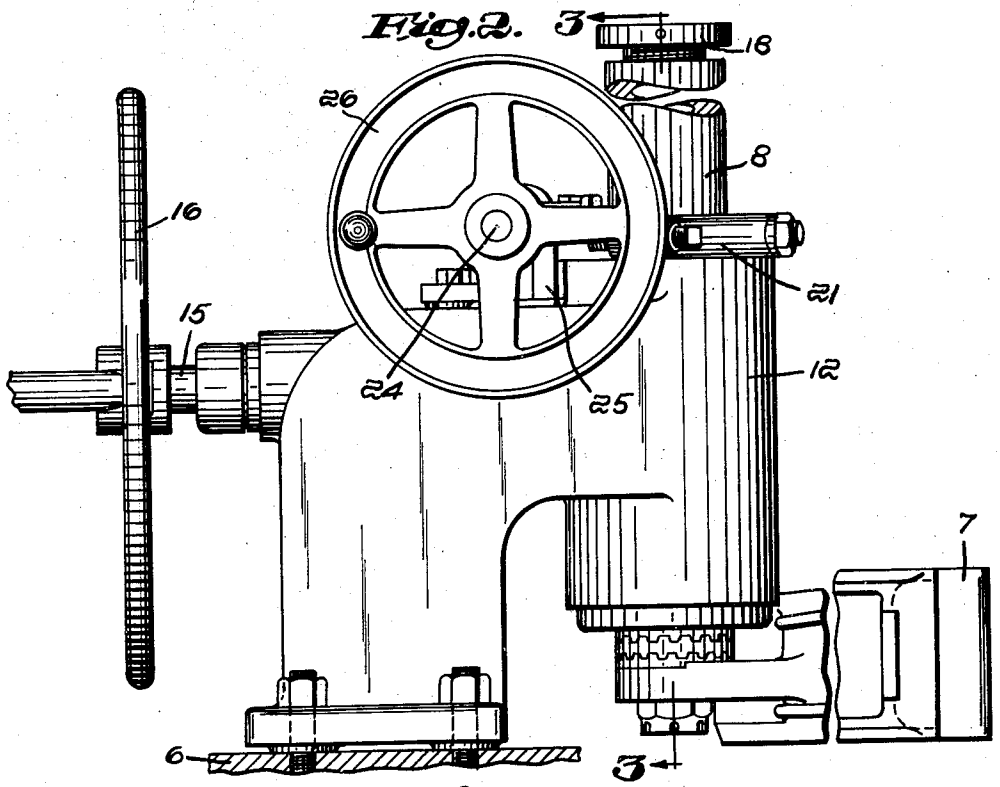
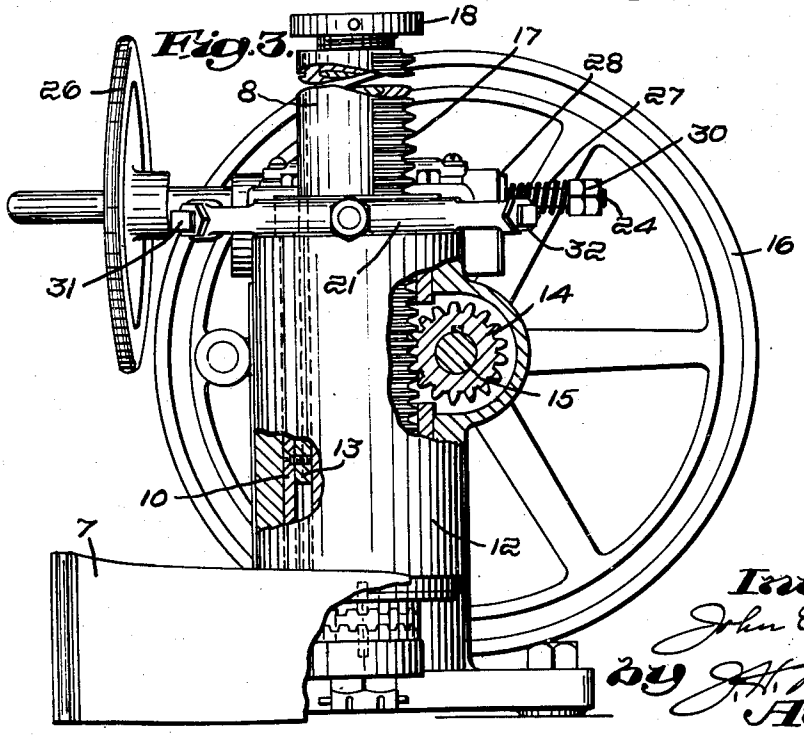


Fig. 3.



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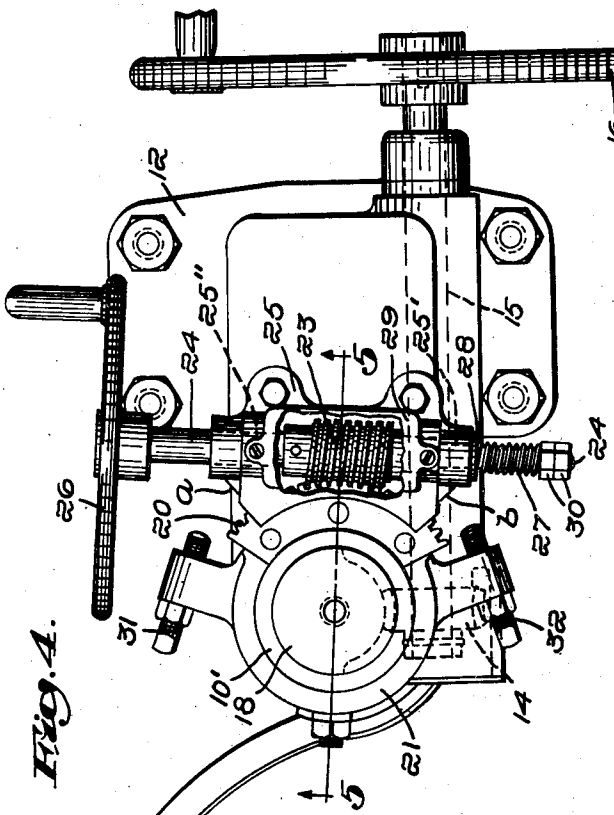


Fig. 4.

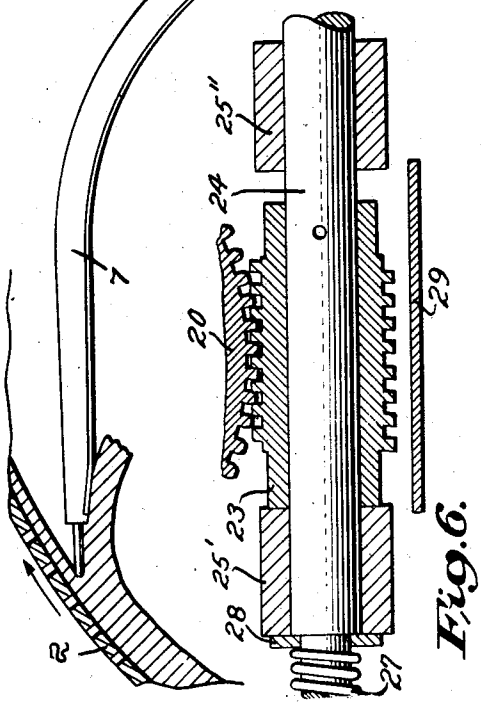


Fig. 6.

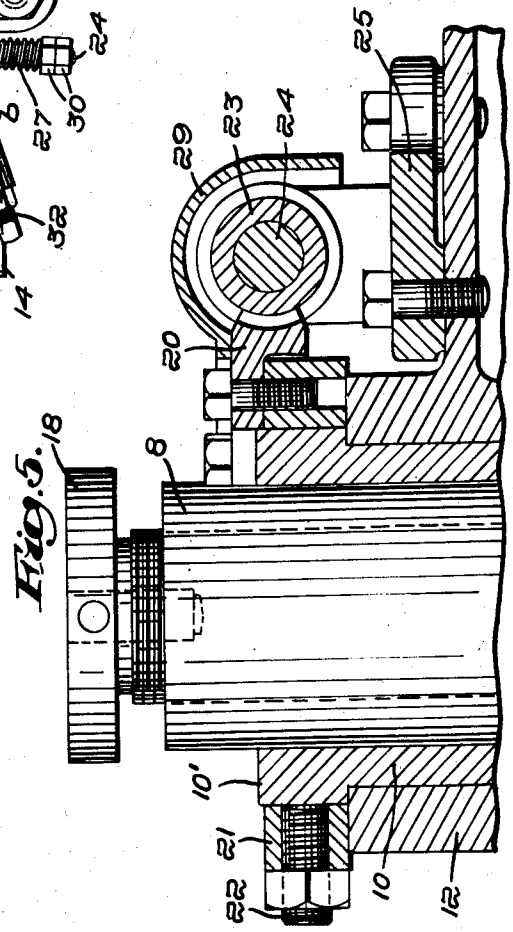


Fig. 5.

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UNITED STATES PATENT OFFICE

2,485,465

DISCHARGER FOR CENTRIFUGAL SEPARATORS

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Application October 16, 1945, Serial No. 622,573

3 Claims. (Cl. 210—70)

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This invention relates to centrifugal separators, and is more especially concerned with the unloading or discharging mechanism for machines of this type.

As is well understood by those skilled in this art, a considerable percentage of the centrifugal separators such, for example, as those used in the sugar refining industry, are equipped with a scraper, plow or "shoe" so mounted that, after the conclusion of the separating action, the scraper can be moved down into the basket and its edge can be forced into the accumulation of solids on the basket wall in such a manner that, while the basket is rotated slowly, the solid material will be dislodged and will drop through the bottom of the basket.

The operation of such a scraper involves movement in two directions, one outwardly or toward the wall of the basket, and the other a traversing movement parallel to said wall, and the operator must produce these two movements simultaneously. For this purpose a gear mechanism customarily is employed to create the traversing motion, but the movements of the scraper toward and from the basket wall are produced by operating a hand lever. This involves considerable strength and skill, particularly if the consistency of the solids varies, so that some spots are much harder than others, thus creating a tendency for the scraper to dig too deeply at certain points and to bounce away from the load of solids at other areas.

The present invention is especially concerned with the problem presented by the foregoing considerations, and it aims to devise a mechanism by means of which the movements of the scraper can be produced with much less effort and controlled far more accurately.

The nature of the invention will be readily understood from the following description when read in connection with the accompanying drawings, and the novel features will be particularly pointed out in the appended claims.

In the drawings,

Fig. 1 is a side elevation of a centrifugal separator, with some parts broken away, showing the machine equipped with a discharging apparatus embodying this invention;

Fig. 2 is an elevation of the operating mechanism for the discharger on a larger scale than in Fig. 1;

Fig. 3 is a sectional view taken approximately on the line 3—3, Fig. 2;

Fig. 4 is a plan view of the operating mechanism with some of the casing parts broken away;

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Fig. 5 is a sectional view taken substantially on the line 5—5, Fig. 4; and

Fig. 6 is a horizontal, sectional view of the mounting for the worm shaft by means of which the discharger plow or scraper is controlled.

The machine shown in the drawings comprises a centrifugal basket 2 suspended on a vertical shaft 3 which may be driven either at high speeds by the motor 4, or at a lower discharging speed by the motor 5. The basket is enclosed in the usual casing or curb 6, all of the foregoing parts being of a well known construction.

The discharger comprises a scraper 7 secured to the lower end of an upright shaft 8 which is mounted for vertical sliding movement in a bushing 10, Figs. 3 and 5, the latter being supported in a bracket 12 bolted to the top of the casing 6. At its upper end the bushing 10 is flanged, as shown at 10' in Fig. 5, and this flange rests on the top of the adjacent portion of the bracket 12. Thus the bushing is mounted to rotate in the bracket and it carries a key or spline 13, Fig. 3, running in a key-way in the shaft 8, which compels the shaft to revolve with the bushing but permits vertical movement of the former relatively to the latter.

Axial traversing movement of the shaft 8 is produced by a pinion 14 keyed to a horizontal shaft 15 which is supported in bearings in the bracket 12 and has a hand wheel 16 secured to it. This pinion meshes with arcuate rack teeth 17 cut in the side of the shaft 8, as best shown in Figs. 3 and 4, the arrangement being similar to that shown in my earlier Patent No. 2,036,974. Secured to the upper end of the shaft 8 is a stop 18, the shank of which is threaded into the shaft so that it is adjustable relatively to the latter, and the head of this member is made larger in diameter than the shaft so that when the latter is lowered, the head 18 will engage the top of the flange 10' and limit such lowering movement.

The mechanism provided by this invention for adjusting the scraper toward and from the basket wall comprises a worm gear or sector 20, bolted to a collar 21, which closely encircles the flange 10' of the bushing 10 and is secured to said flange by a set screw 22, Fig. 5. Meshing with the teeth of this sector is a worm 23, Figs. 4 and 5, pinned to a shaft 24 which is supported in bearings formed in a supplemental bracket or housing 25 bolted to the main bracket 12. A hand wheel 26 is secured to one end of this shaft. By revolving the shaft, the worm 23 acts through the gear 20, the bushing 10 and key 13, to rock the shaft 8 around its axis, together with the scraper 7 which is se-

cured to it. In this manner the scraper may be positively moved into contact with the solid material on the inner wall of the basket.

Encircling the end portion of the worm shaft 24 where it projects beyond the housing 25, is a coiled spring 27 which is confined between a loose washer 28 and the stop nuts 30. Thus, while this entire shaft is free to slide endwise through its bearings, it is normally urged forward by the spring 27, and this movement is limited by the abutment of the front end of the worm 23 against the inner end of the bearing 25', Fig. 4. But the shaft can be moved backwardly, against the pressure of the ring, until the rearward end of the worm strikes the bearing 25''.

In using this apparatus to discharge the load in the basket after the centrifuging operation has been stopped, the workman first operates the hand wheel 16 to lower the scraper 7 down into the basket and then, by revolving the hand wheel 26, he swings the scraper outward into engagement with the layer of solids supported on the basket wall. Because the worm 23 and the sector which it engages form an irreversible mechanism, the movement of the scraper just described is performed positively. If, therefore, the rotation of the hand wheel 26 is stopped when the scraper has been adjusted to the desired position, it will remain in that position while the operator traverses the scraper by operating the other hand wheel 16.

This is a great convenience from the standpoint of the workman because at the start of a traversing movement of the scraper, either up or down, he can set the scraper to take the desired depth of cut and then leave the hand wheel 26 in its adjusted position while he operates the other hand wheel to make the complete traverse. In other words, he can adjust his depth of cut at the beginning of each traversing stroke, but need pay no attention to it at other times, knowing that the scraper will remain in that position.

Should the scraper strike some part of the load which tends to make it swing outward and dig into the solids too deeply, any such movement of it is positively prevented by the engagement of the forward end of the worm with the bearing 25'. On the other hand, if the scraper strikes a hard area, such as a seam on the inner wall of the basket, which tends to force the scraper inwardly toward the axis of the basket, such movement is yieldingly permitted if the force is sufficiently strong to overcome the pressure of the spring 27. The sliding movement of the worm and its shaft so created, and which is permitted by the small lost motion which the worm is allowed to have in its housing, is backward, toward the hand wheel, and is limited by the engagement of the worm with the bearing 25''. It is purely a transient action, but the construction providing for it is valuable in preventing breakage of some of the parts when the scraper meets a hard obstruction. The spring, of course, operates through its connections with the scraper to return the latter to its original position of adjustment as soon as it has passed the obstruction.

Preferably the collar 21 is provided with two arms carrying stop screws 31 and 32 adjustable to engage parts *a* and *b* on the casing 25 and serving as stops to determine both the inner and outer limits of movement of the scraper. That is, the stop 32 can be set to limit positively the depth of cut, as above described where the bearing 25' does not stop the scraper at the desired point. In other words, the limits imposed on the sliding movement of the worm 23 by the stops 25' and 25'' work within extreme limits determined by the stop screws 31 and 32. It may be observed that in Fig. 4 the scraper is shown in an abnormal position in order to provide space for Fig. 5. Usually it is located at about an angle of 30°, in a counter-clockwise direction away, from the position there shown. A removable cover 29 for the worm 23 is secured to the supplemental bracket 25.

This invention provides an organization with which the entire discharging operation can be performed more easily, rapidly and accurately than with the prior art mechanisms of this character. It should be noted that the shafts on which the two hand wheels are secured are located, one slightly above the other, but at right angles to each other, and that the hand wheels themselves are positioned closely adjacent to each other where they can be operated conveniently and simultaneously by a single workman. They are located at fixed levels and in substantially fixed positions suited to the convenience of the workman and are unaffected by the changes in position of the scraper. For these reasons, and because of the nature of the mechanism, the unloading operation is made positive, without sacrificing safety of the parts, and is made easy for the workman while securing great accuracy and smoothness of operation.

While I have herein shown and described a preferred embodiment of my invention, it will be evident that the invention may be embodied in other forms without departing from the spirit or scope thereof.

Having thus described my invention, what I desire to claim as new is:

1. In a centrifugal separator, the combination with a centrifugal basket supported for rotation around a vertical axis, a curb in which it is mounted, a discharger including a scraper, a vertical shaft on the lower end of which said scraper is secured and a rack and pinon mechanism operable to raise and lower said shaft; of a gear connected with said shaft to rotate therewith about the axis of the shaft, a driving worm meshing with said gear, a housing in which said worm is mounted, a second shaft on which said worm is fixed, bearings supporting said shaft with its worm for both rotative and axial sliding movement in said housing, a hand wheel on said shaft for revolving it, said bearings limiting said sliding movement, a spring loaded means on said shaft yieldingly holding it normally against one of said bearings, where its connection with said scraper prevent further movement of the latter toward the inner wall of the basket except as such movement may be produced by rotation of said worm, the worm when so positioned being spaced from the other stop whereby a limited inward movement of said scraper away from said wall is permitted against the tension of said spring, and means on said curb supporting both said pinion and said housing in substantially fixed positions on the curb.

2. In a centrifugal separator according to preceding claim 1, a construction in which said shaft supporting the worm is mounted on a horizontal axis, a horizontal shaft supporting the pinion of said rack and pinion mechanism, a hand wheel on the latter shaft, said means on the curb for supporting said pinion and worm comprising a stationary bracket in which both said horizontal shafts are mounted, said hand

wheels being supported closely adjacent to each other at approximately right angles to each other and close to the edge of said curb whereby they can be operated simultaneously by a single workman.

3. In a centrifugal separator, the combination with a centrifugal basket supported for rotation around a vertical axis, a curb in which it is mounted, a discharger including a scraper, a vertical shaft on the lower end of which said scraper is secured and a rack and pinion mechanism operable to raise and lower said shaft; of a gear connected with said shaft to rotate therewith about the axis of the shaft, said shaft having adjustable stops connected thereto, a driving worm meshing with said gear, a housing in which said worm is mounted, a second shaft on which said worm is fixed, bearings supporting said shaft with its worm for both rotative and axial sliding movement in said housing, a hand wheel on said shaft for revolving it, said bearings limiting said sliding movement, a spring loaded means on said shaft yieldingly holding it normally against one of said bearings where its connections with said scraper prevent further movement of the latter toward the inner wall of the basket except as such movement may be produced by rotation of said worm, the worm when so positioned being spaced from the other bearing whereby a limited inward movement of said scraper away from said wall is permitted against the tension of said spring, said stops acting to limit the extreme inward and outward movement of the scraper, and means on said curb supporting both said pinion and said housing in substantially fixed positions on the curb.

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