April 6, 1937. E. ROBERTS 2,076,516

DISCHARGER FOR CENTRIFUGAL MACHINES

Filed April 14, 1934

Fig. 1.

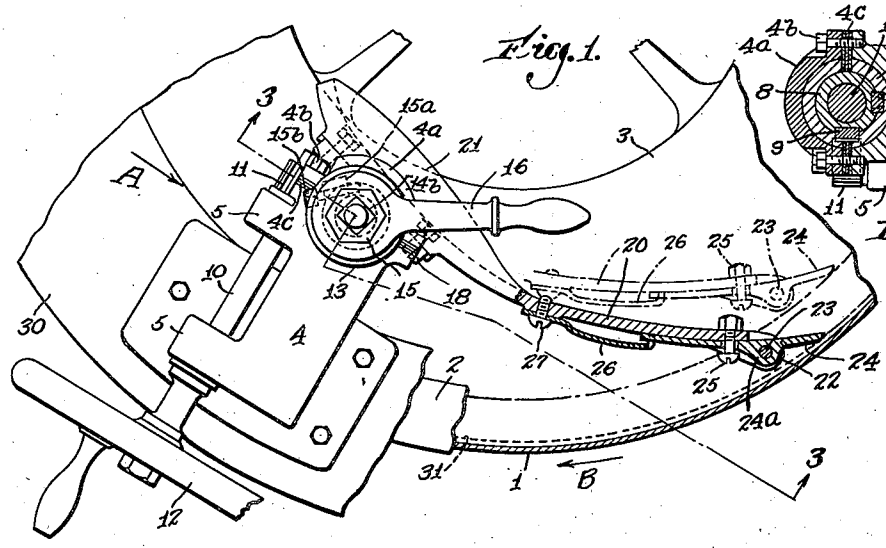


Fig. 5.

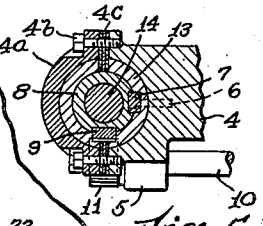


Fig. 6.

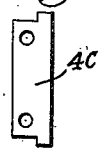
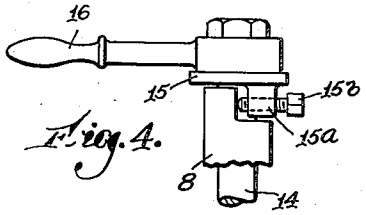


Fig. 4.



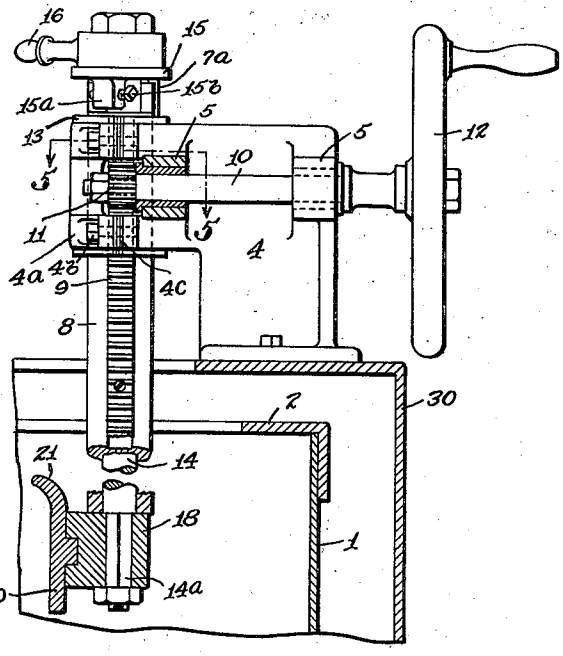


Fig. 3.

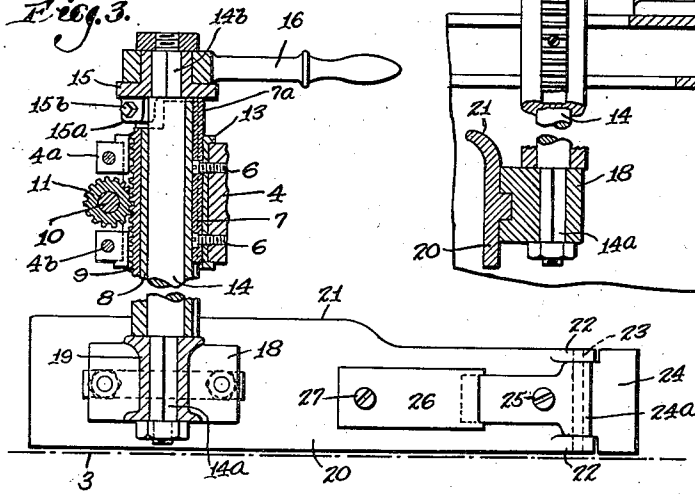


Fig. 2.

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DISCHARGER FOR CENTRIFUGAL MACHINES

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Application April 14, 1934, Serial No. 720,613

12 Claims. (Cl. 210—70)

This invention relates to dischargers such as are used in the unloading of centrifugal baskets of the sugar mill type, in which the liquid is centrifugally expelled through the foraminous peripheral wall of a centrifugal basket, leaving the solid grains or particles built up in an annular wall around the inside of the basket, which is then unloaded through a central open spider in the bottom of the basket.

This type of centrifugal basket discharger is shown in Roberts and Gibson Patent No. 957,715 first introduced commercially in 1907 and still in use under various forms at the present time. At first wooden plow scrapers were secured to the forward end of the plow shoe or blade, but as these wooden scrapers were objectionable they were superseded by scrapers of vulcanized fiber about 3/8 inch thick, such as shown in Roberts and Gibson Patent No. 1,015,510 which have continued to be used in all sugar refineries since that time. While the fiber discharger scraper has been universally used in sugar centrifugals throughout a long period of years, it was never fully satisfactory because of its rapid wear, which required frequent replacements and the damage which it was likely to cause in contact with fine filter screens.

The thrust or pressure of the revolving sugar wall against the scraper, after the scraper had penetrated the wall of sugar, tended to cause considerable outward pressure of the scraper against the rather delicate basket lining, thus producing heavy friction or rubbing against the lining. This resulted not only in rapid wear of the fiber scraper but the pressure or outward thrust of the scraper against the basket lining resulted in forcing the revolving basket off center, so that the vertical face of the basket wall and its filter lining was thrown out of plumb line so that only the lower corner of the scraper maintained contact with the basket lining and therefore the wear on the scraper concentrated at that point. This lack of parallelism between the edge of the scraper and the surrounding basket wall also tended to increase the likelihood of damage to the lining and also led to very imperfect cleaning of the inside face of the lining, thus leading to impairment of that perfect filtration or escape of the liquid that is highly desirable in order to secure efficient and satisfactory operation of the centrifugal.

Not only was it necessary for the operator to stop the centrifugal after only several hours' use to cut off with a rasp or a chisel the uneven edge of the scraper or to reverse the scraper, but the bluntness of the scraper acted to create a strong resistance to the rotation of the basket and required an unnecessary power to keep the basket in rotation. In spite of these defects it was quite obvious that the fiber scraper served the purpose better than anything else that had been tried. A thin hard scraper of metal was obviously out of the question because no lining would last more than a few hours when working against such a scraper and serious damage and injury was likely to result from any attempt to use such scraper.

Nevertheless, the present invention is founded upon a principle of construction that makes it possible to use a metal scraper while at the same time maintaining parallelism between the vertical edge of the scraper and the interior wall of the basket or basket lining and to avoid outward pressure or thrust against the basket structure or lining that tends to throw the basket off center, destroy the parallelism between the vertical edge of the scraper and the inside face of the lining, while at the same time facilitating the discharge of sugar from the basket in less time and with less expenditure of power than has heretofore been possible.

By the present principle of construction I provide a discharger plow construction that is capable of being set with such precision that the scraper is maintained against the outward thrust of the sugar wall and yet preserves such light contact with the basket lining that the revolving basket is not thrown off center and therefore the parallelism between the scraper edge and the basket lining is always preserved so that the filter lining is scraped clean from top to bottom and there is no necessity of filing or cutting the edge from time to time as has heretofore been the case. These and other features of the invention will be particularly described in the following specification and will be defined in the claims hereto annexed.

In the drawing—

Fig. 1 is a plan view showing a portion of a centrifugal basket with the overhead discharger plow in its normal operating position, while showing in dotted lines the position of the forward portion of the discharger plow when it first contacts with the inside face of the walled up sugar or other solid.

Fig. 2 is a vertical elevation of the discharger as viewed in the direction of the arrow A in Fig. 1.

Fig. 3 is a vertical section on the angular plane indicated by broken line 3—3 of Fig. 1.

Fig. 4 is a detail view showing in elevation

the set screw stop by which the outward swing of the plow is limited to an exactly predetermined point.

Fig. 5 is a detail view showing the supporting bracket and parts on the plane 5—5 of Fig. 2.

Fig. 6 is a detail view illustrating one of the shim plates used in the split head and bushing.

In the drawing I have omitted the usual filter lining and the perforations in the basket wall, both of which are so well known and universally used in the prior art that detail illustration is unnecessary, but it will be understood that in practice any suitable filter screen or lining is located around the inside of the basket wall against which it is supported, the inside line of which is indicated at 31.

The centrifugal basket 1, provided with its usual top rim or ring 2 and its bottom ring 3, is as usual suspended inside a surrounding casing 30, which collects the juice or liquid centrifugally expelled from the material being spun with the basket. On the top rim of the curb or casing 30 is mounted a supporting bracket 4 for carrying the movable discharger parts, the inner end of said bracket overhanging the inside edge of the curb top and of the basket top to permit the lowering of the plow into the basket for unloading purposes.

To facilitate demounting of the suspended plow the bracket 4 is made in two semi-circular sections 4 and 4^a bolted together by screws 4^b passing through vertical attaching flanges to provide a take-up space normally filled by thin leaves or plates 4^c forming shims between the two flanges. These shims also extend through the split bushing 13 so that as the vertical movable rack sleeve becomes worn, the wear may be taken up by a removal of one pair of shim plates and a tightening of the connecting bolts 4^b. This is important in order to preserve the plumb line position of the plow spindle.

According to the form of the discharger herein illustrated, the supporting bracket 4 is provided with a pair of aligned horizontal bearings 5, which rotatably support the lifting shaft 10 which carries at its outer end a pinion 11 meshing with a vertical rack bar 9 secured on one side of the tubular sleeve 8, which is slidably mounted in a vertical bushing 13, which bushing is held against rotation by a pair of screws 6 passing through the wall of the bracket 4 and tapped into a vertical feather or spline 7 which fits into a keyway or groove formed in the adjacent outside face of the tubular sleeve 8. The sleeve can be raised and lowered in the bearing bracket by rotating the shaft 10 and the pinion 11 but is held by the spline 7 and the screws 6 against any angular rotation. The plow carrying spindle 14 projects from the upper and the lower ends of its supporting sleeve 8 and has its upper end 14^b square or non-circular to receive a hexagonal flanged nut 15, which is fastened in place by an overhead nut after the handle 16, provided with an opening or passage to fit over the hexagonal nut, is placed in position. The nut 15 is provided with a downwardly projecting lug 15^a overlapping an upwardly extending shoulder of the sleeve 8 and provided with a stop screw 15^b which can be set to any desired position to limit the rotative movement of the spindle when the plow is moved in an outward or clockwise direction. The lower end 14^a of the plow spindle 14 is also square to form a spline engagement with a vertical passage in the boss 19 that is integral with the plow attaching plate 18.

The plow shoe 20 is a strong cast metal blade which is fastened to the connecting hub plate 18 by a pair of horizontal fastening screws. Preferably the upper edge of the plow shoe 20 is provided with an overhanging lip to deflect the sugar or material away from the bearing spindle joint and to further increase rigidity of construction the plow 20 has a tongue and groove connection with the plate 18.

The main portion of the plow projects forwardly toward the advancing wall of sugar, assuming the basket to rotate in the direction of rotation indicated by the arrow B in Fig. 1. At its forward end the plow shoe is provided with upper and lower aligned perforated bosses 22 on its outer face and between these bosses is mounted a thin metallic blade 24 provided intermediate of its ends with a vertical bore for the reception of the pivot pin 23 to permit a limited rocking movement of the thin plate 24 which forms the scraper of the plow. An adjustable stop screw 25 is carried by the forward end of the shoe with its head extending outwardly and its inner end engaged by a jam nut for locking it against accidental displacement.

It will be noted that the scraper 24 is normally pressed against the exterior of the shoe by a leaf spring 26 pressing against its rear or inner end, which spring is secured to the plow by screw 27. For setting purposes the stop screw 15^b is set so as to limit the outward swing of the plow 20 to that position where bare contact is established with the basket lining, when the tail end of the scraper is moved out about ⅛ inch with its cutting edge, due to its shorter radius, moved inward about half as much. The stop screw 25 is then adjusted and secured in proper position to allow a very limited swing or movement inward of the forward end of the scraper. Obviously it is impossible for the plow to be swung beyond this point to cause undue pressure of the thin metallic scraper against the filter lining and yet the scraper is allowed to yield a bit inwardly when first contacting the wall of sugar and also readily yields to any slight bulge in the surface of the basket lining without tending to throw the basket off its center.

It is important, in order to secure thoroughly satisfactory operation of the device, that the plow spindle 14 should stand in an exactly vertical position in all planes and that the pivotal axis 23 of the scraper should also be absolutely vertical. By securing this vertical and parallel arrangement of these two axes, the scraper will always travel with the full length of its edge in contact with the interior of the basket structure at all vertical heights of the plow, as it is being lowered from top to bottom to unload the material. With proper setting, extremely fine filter screens, such as would not have been practicable before, can be used without injury; the resistance to the shearing action of the scraper is largely diminished, thus involving the use of much less power in the discharging operation, beside shortening the time of unloading.

By proper attention to the above described details of construction and arrangement it becomes possible for the first time in the history of the art to use a metallic scraper with all the advantages attendant upon the use of such a scraper and without the disadvantages resulting from the use of the hitherto universally used fiber scraper, provided the stop 15^b limiting the outward swing of the plow shoe or blade is accurately set so that when moved to its outermost position for unload-

ing, the scraper, slightly spaced from its outward limiting stop, shall barely contact with the inside of the basket lining from which position it is capable of yielding slightly in either direction. The pressure of the spring **26** allows the forward edge of the scraper to yield slightly to absorb the shock of impact when the tip first contacts with the inside of the sugar wall, as indicated by dotted lines in Fig. 1, but the spring has no effect in forcing the cutting edge of the scraper in to the sugar wall, since only a very heavy spring could accomplish that purpose. After the slight initial yield at this point, the scraper then encounters the stop **25**, which limits its inward movement, and hence the scraper is forced positively in to the sugar wall as the plow shoe is forced outward. This construction provides what is to all practical intents and purposes a rigid structure of plow for forcing the scraper into the sugar wall, while at the same time permitting the desired yielding action. With the light spring here used the scraper always rides snugly against the basket lining without disturbing the axis of the basket and forcing the basket off center. Although its pivotal movement is extremely limited it is sufficient to follow any unevenness in the filter lining and, as the basket load has been perfectly balanced by the previous high speed rotation during the purging of the sugar, there is no appreciable sway of the basket so long as the plow does not disturb or displace the basket from its centralized position, which is maintained by the universally used centralizing buffer in the suspension head of the basket. In consequence of the light contact and of the parallelism between the cutting edge of the scraper and the inside wall of the lining, the sugar is cleanly removed from the lining and in actual practice it is found that the metallic blade or scraper will last indefinitely without repair or dressing, while the life of the delicate linings is very greatly prolonged.

To secure satisfactory results it is necessary to be able to set the plow limiting stop **15b** to precisely the right position, as above explained. The discharger is of course mounted on the outside casing or curb surrounding the basket and no provision is made for exactly centralizing the curb with the suspended basket and, indeed, in view of the fact that the basket is suspended from an overhead support while the curb rests on the floor or operator's platform, any arrangement for centralizing or recentralizing these two separately mounted elements would be expensive and difficult of restoration when once disturbed by the demounting and removal of the basket, which sometimes becomes necessary. The take-up means provided for maintaining the plow spindle against displacement from a plumb line vertical position insures continued parallelism between the basket wall and the cutting edge of the scraper.

In order to facilitate the lifting of the plow above the level of the curb two expedients may be utilized. One consists in turning the upper portion of the plow, as shown at **21**, inward so that it will be inwardly offset in relation to the inner surface of the plow supporting bracket **4** and the other provision consists in making the attaching hub **18**, that connects the plow with the lower end of the spindle **14a**, considerably offset inwardly, as shown in Fig. 2, so that the outer face of the plow is offset inwardly from the vertical line of the inner face of the bracket **4**, **4a**.

Heretofore it has been the practice to form the plow with the rear portion of its upper edge, where the plow is attached to the hub plate, cut away or reduced in height to permit the plow to be lifted high enough to swing beneath the overhanging bracket when it is swung over the top of the curb. Such arrangement however, allows the sugar or other material to work in to the lower bearing end of the hollow rack bar and makes it harder to manipulate the plow. By offsetting the outer face of the plow shoe inwardly from the vertical plane of the bracket member **4a** this portion of the plow can be made high enough to eliminate this trouble without interfering with swinging the plow to idle position above the curb.

From the explanations above given it will be seen that with my construction and arrangement it is now possible and highly advantageous to use a thin metallic blade for a scraper having a thin durable cutting edge, which can be maintained in correct parallelism with the basket wall and the filter lining and be kept in close contact with the filter lining, so that not only is the lining scraped thoroughly but it actually lasts much longer than was the case when fiber scrapers were used, while the loss, trouble and expense of frequent replacement of the scraper is eliminated and the unloading is effected more rapidly and with less expenditure of power than was heretofore possible.

What I claim is:

1. In a discharger for unloading centrifugal baskets, the combination with a rigid plow shoe secured to a vertically movable pivotal lifting spindle carried by an overhead support, of a scraper attached by a vertical pivot joint to the forward end of said shoe and yieldingly pressed into engagement with a stop on the shoe limiting its outward movement about its pivotal joint, and an oppositely acting stop on said shoe and permitting only a slight inward movement about said joint when the scraper contacts with the wall of material to be discharged and acting thereafter to sustain the thrust of the material against the scraper, thereby causing the scraper to penetrate said material.

2. In a discharger for unloading centrifugal baskets, the combination with a plow shoe rigidly secured to a vertical pivoted lifting spindle carried by an overhanging support, of a scraper attached to the forward end of said shoe by a vertical pivotal joint, the pivotal movement of said scraper being limited to a small arc by oppositively acting positive stop means on the shoe, and a spring arranged to oppose a yielding resistance to the inward movement of said scraper sufficiently light to avoid forcing the basket from its normal centralized position when the scraper is in normal operating position.

3. In a discharger for unloading centrifugal baskets, the combination with a plow shoe secured to a vertically movable pivotal lifting spindle mounted in an overhead support, of a scraper attached to the forward end of said shoe by a vertical pivotal joint, and a stop member on said shoe arranged to permit a slight inward movement of the scraper from normal position outward and then afford a positive resistance to further inward movement of the scraper, thereby insuring penetration of the scraper into the wall of material to be discharged.

4. In a discharger for unloading centrifugal baskets, the combination with a plow shoe secured to a vertically movable pivotal lifting spindle mounted in an overhead support, of a scraper attached to the forward end of said shoe by a vertical pivotal joint, a stop member arranged on said shoe to permit slight inward move-

ment of the scraper on said joint from normal outward position and then afford positive resistance to further inward movement of the scraper, and means for adjusting said stop member to vary the inward limit of pivotal movement of the scraper.

5. In a discharger for unloading centrifugal baskets, the combination with a vertically movable plow-supporting spindle mounted in an overhead support to permit oscillation about a fixed vertical axis and movable up and down inside of the basket, a variable but positive stop for limiting the pivotal movement of the spindle and plow to a predetermined point, a plow shoe secured to the lower end of the spindle, a scraper attached to the forward end of the shoe by a pivotal joint whose axis is in complete parallelism with the axis of said spindle, stop means for positively limiting the movement of the scraper about said joint to a narrow arc, said scraper being normally pressed toward its outward limit of movement on said joint by yielding means insufficient to force the basket from its centralized position.

6. In a discharger for unloading centrifugal baskets, the combination with a vertically movable plow-supporting spindle mounted in an overhead support and having limited oscillation about a fixed axis between the center and the periphery of the basket, a set screw arranged to limit the pivotal movement of the spindle and plow to a predetermined outward position of the plow, a plow shoe secured to the lower end of the spindle, a scraper pivotally attached to the forward end of the shoe, stop means for positively limiting the inward and the outward movement of the scraper about its pivot, and a spring for yieldingly pressing the scraper toward its outward limiting stop with a yielding pressure insufficient to disturb the centralized position of the basket.

7. A discharger plow for the discharger of a centrifugal embracing a rigid plow shoe adapted for attachment to a supporting spindle, a metallic scraper blade pivotally attached to the forward end of said shoe to permit slight oscillation between two positive limiting stops on said shoe, and a spring arranged to lightly press the scraper against the stop limiting the outward movement of the scraper.

8. A discharger plow for a centrifugal basket discharger embracing a rigid plow shoe adapted for attachment to a supporting spindle, a metallic scraper blade pivotally attached to the forward end of said shoe to permit slight oscillation between an outward limiting stop formed by said shoe and an inward limiting stop on said shoe, the latter stop being adjustable to vary its limiting position, and a spring acting normally to oppose a yielding resistance to the movement of the scraper toward the inward stop.

9. A discharger plow for unloading a centrifugal basket comprising a rigid shoe adapted to be secured to a vertical lifting and supporting spindle and capable of rotative movement outward about the axis of the spindle to a predetermined but variable stop position, a relatively thin metallic scraper blade pivotally mounted on the end of said shoe and having slight rotative movement between two oppositely limiting stops on said shoe about a vertical axis and a spring normally pressing said scraper outward toward one of said limiting stops.

10. In a discharger for unloading centrifugal baskets, the combination of a bracket overhanging the interior of the basket, a vertical bearing sleeve supported therein, a vertically slidable tubular rack bar element, a discharger plow supported thereby for movement toward and away from the bottom of the basket, said sleeve and said rack bar element being splined together by a fixed vertical key, the upper end of said key being located at a predetermined height to form a stop positively limiting the downward movement of the rack bar and plow to prevent contact of the plow against the bottom of the basket.

11. In a discharger for unloading centrifugal baskets, the combination of a plow and its attached scraper, a vertically movable plow supporting and lifting element mounted to slide through an overhung bracket, and a plow attaching hub member rigidly secured to the plow supporting member and projecting inwardly therefrom to present a plow attaching face having a splined joint with the plow and to which the plow is secured in a plane inwardly offset from the inner face of the overhanging bracket.

12. In a discharger for unloading centrifugal baskets, the combination of a pivotal plow-shoe, means for supporting, raising and lowering it in the basket, means for swinging it in and out, a scraper attached to the forward end of the plow-shoe by a vertical pivotal joint, the shoe having stop surfaces limiting the pivotal movement of the scraper about its joint to a narrow arc of movement in and out, one of said stops sustaining the scraper against the initial thrust of the walled up material in the basket and forcing the scraper to penetrate said material, the other stop sustaining the scraper against undue outward movement on its joint against the outward thrust of the material after the scraper has penetrated the walled up material, and means for positively limiting the outward movement of the plow-shoe with its scraper to a predetermined position with relation to the inside of the basket wall.

EUGENE ROBERTS.