

Nov. 28, 1944.

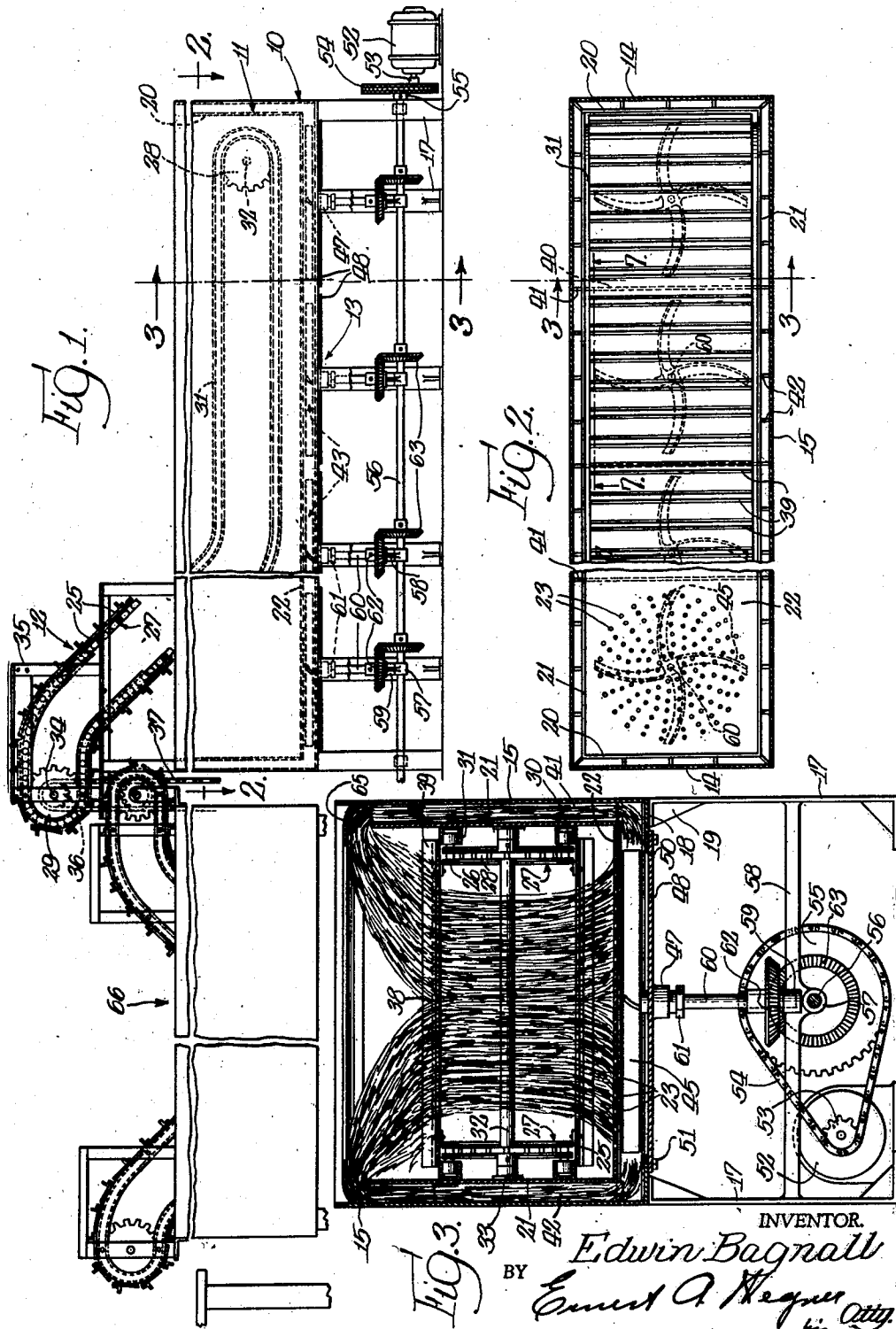
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2,363,491

COMMERCIAL WASHER

Filed Dec. 26, 1941

2 Sheets-Sheet 1



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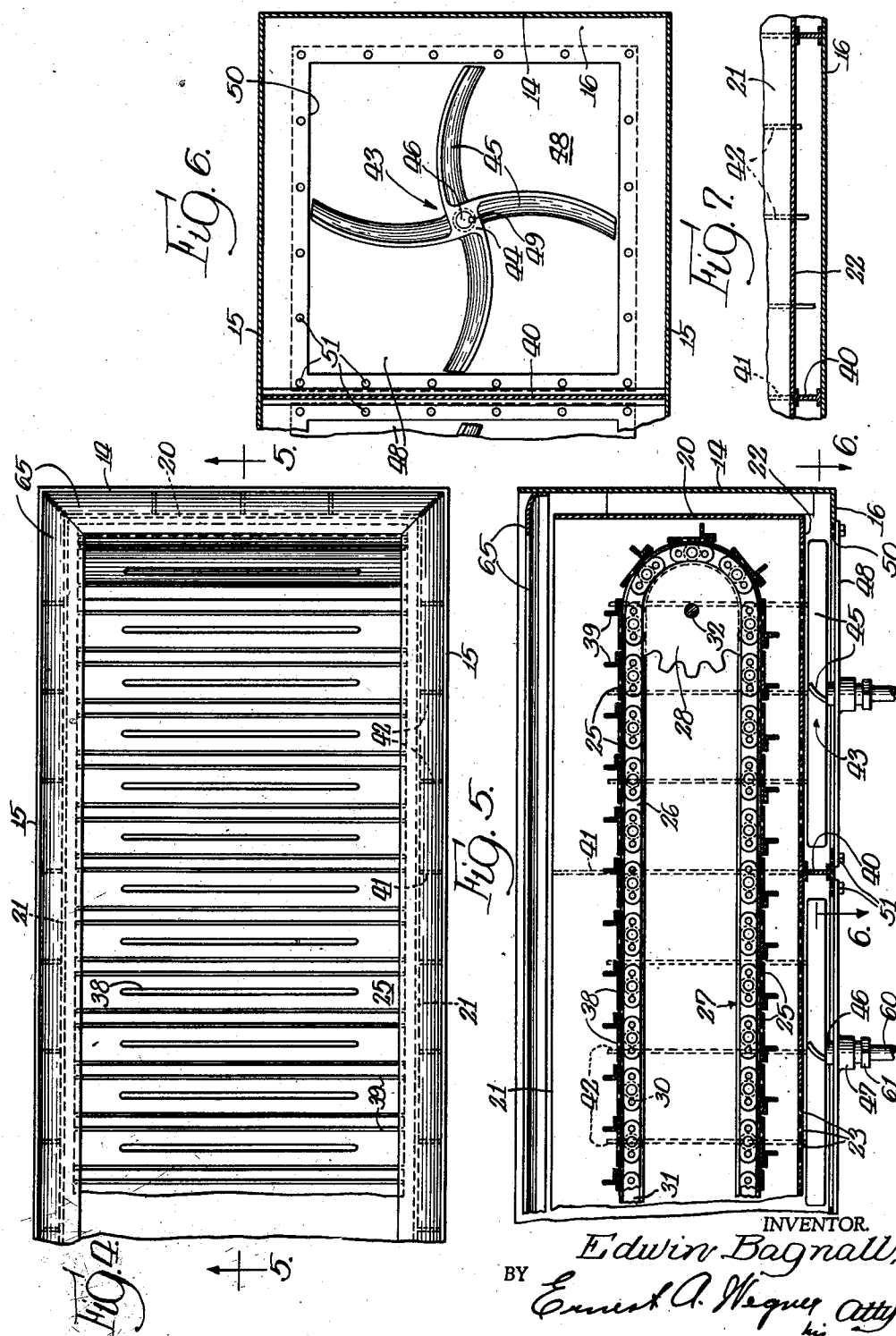
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UNITED STATES PATENT OFFICE

2,363,491

COMMERCIAL WASHER

Edwin Bagnall, Chicago, Ill.

Application December 26, 1941, Serial No. 424,411

8 Claims. (Cl. 141—1)

The invention relates generally to a washer and more particularly to a continuous or conveyor type washer for machine parts or the like.

Generally the things or parts to be cleansed by a washer of the type described are coated with grease or with other materials, the removal of which is most difficult. To cut the grease or other material, it is necessary to employ a cleansing fluid, thus limiting the quantity of liquid that can be employed in the washing process to that which can be held in the washer. In order that the cleansing may be efficiently effected, the operation should be continuous, that is, it should not be necessary to place the articles or parts in the washer, operate the same for a period of time, and then interrupt the operation of the washer to remove the parts. In the past, continuous or conveyor type washers have been ineffective because, limited as they are to the reuse of the cleansing fluid, they have been unable to obtain a sufficient volume of fluid flowing over the parts to be cleansed. Moreover, they have been unable to obtain sufficient force in the fluid to enable it to have a mechanical action in loosening the grease or other dirt particles.

It is a general object of this invention, therefore, to provide a new and improved washer of the character described.

A more particular object of the invention is to provide a washer of the character described capable of discharging large quantities of fluid over the parts and of discharging the fluid at such force that in combination with the large quantity of fluid it acts mechanically to dislodge the grease or other dirt particles.

Another object is to provide a washer having an elongated tank free of transverse partitions, so as to permit employment therein of a conveyor extending longitudinally of the washer.

Another object is to provide a washer having an elongated tank and a conveyor extending longitudinally thereof and new and improved means for discharging large quantities of cleansing fluid onto the top of the conveyor from both sides of the tank.

Still another object is to provide a washer having an elongated, partition-free inner tank, an elongated outer tank in which the inner tank is received in spaced relation and partitions between the bottoms of said tanks equally spaced longitudinally to divide the space into a plurality of individual impeller blade chambers.

A further object is to provide a washer having elongated inner and outer tanks in spaced relation, partitions between the bottoms of said tanks

to divide the space into a plurality of individual impeller blade chambers, an impeller blade in each chamber, and a removable plate for each chamber forming part of the bottom of the outer tank closing an opening through which the blade is removable.

Still a further object is to provide a washer having an impeller chamber in the bottom thereof, an opening through which the impeller may be inserted or withdrawn and a removable plate closing the opening, the plate having a bearing forming a journal for the impeller shaft and making the impeller removable as a unit with the plate.

Other objects and advantages will become apparent from the following detailed description taken in connection with the accompanying drawings, in which:

Fig. 1 is a side elevational view of a pair of washers embodying the features of this invention, arranged in end to end relationship and assembled to form a complete washing system.

Fig. 2 is a horizontal sectional view taken approximately along the line 2—2 of Fig. 1.

Fig. 3 is an enlarged transverse sectional view taken approximately along the line 3—3 of Figs. 1 and 2.

Fig. 4 is a fragmentary top plan view drawn to the same scale as Fig. 3.

Fig. 5 is a fragmentary longitudinal sectional view taken along the line 5—5 of Fig. 4.

Fig. 6 is a horizontal sectional view taken approximately along the line 6—6 of Fig. 5.

Fig. 7 is a fragmentary sectional view taken approximately along the line 7—7 of Fig. 2.

While the invention is susceptible of various modifications and alternative constructions, it is herein shown and will hereinafter be described in a preferred embodiment and as adapted for a preferred use. It is not intended, however, that the invention is to be limited thereby to the specific construction disclosed. On the contrary, it is intended to cover all modifications or alternative constructions or uses, as indicated by the scope and spirit of the appended claims.

Though the washer herein disclosed and claimed might be employed for a variety of uses, it will hereinafter be described as adapted for a preferred use, namely, the cleansing of machine parts or the like. Referring now to the drawings, particularly Fig. 1 thereof, the washer comprises an outer, long and comparatively narrow tank, generally designated 10, an inner, long and narrow tank 11, conveyor means 12, and fluid circulating or pumping means, generally designated

13. The outer tank 10, as stated, is long and narrow, having imperforate end and side walls 14 and 15, respectively, and a bottom wall 16. The tank is adapted to be supported a suitable distance above the floor and to that end there are provided at the ends and at suitably spaced intervals, legs 17 depending from the tank 10 and secured (see Fig. 3) as by welding of a flange 18 to the bottom wall 16 of the outer tank. Preferably strengthening the flange 18 is a web 19.

The second or inner tank is also long and narrow and is just slightly smaller in dimensions than the outer tank so as to be receivable within the outer tank in slightly spaced relation thereto. Like the outer tank, the inner tank 11 has end and side walls 20 and 21, respectively, which, as here shown, also are imperforate. Preferably the walls are imperforate though some perforations may be provided in the walls near the top edge thereof. The tank 11 also has a bottom wall 22 which is provided with perforations 23. While these perforations may take any configuration, they preferably are formed as groups of concentric circles of increasing diameter; each group of circles having its center point on the longitudinal center line of the tank with the center points equally spaced longitudinally. The purpose of this particular arrangement will become more apparent as the disclosure proceeds.

With the washer constructed in accordance with this invention, the inner tank 11 may be completely free of partitions, thus lending itself for the mounting therein of the conveyor 12. The conveyor 12 may take any well known form and will not be described in detail. Suffice it to say, therefore, that it is composed of a plurality of boards or plates 25 secured to links 26 forming parallel chains 27 running over suitable pairs of sprocket wheels 28 and 29. Projecting outwardly from each link of the chain is a pin bearing a roller 30 received in channel members 31 secured on the side walls 21 of the tank 11 to provide guides and supports for the conveyor. The sprocket wheels 28 are fixed on a freely rotatable shaft 32 extending transversely of the washer and journaled at its ends in bearings 33 secured to the side walls of the inner tank so that the sprockets are located well within the inner tank. The sprocket wheels 29 are fixed on a shaft 34 journaled in a frame 35 extending above and to the left of the tanks, as seen in Fig. 1. Also fixed on the shaft 34 is a drive sprocket 36 engaged by a drive chain 37.

It is desirable that the cleansing operation be as nearly automatic and continuous as possible, with a minimum handling of the articles being cleaned. It is for the accomplishment of that end that the sprocket wheels 29, and hence one end of the conveyor, are here shown as disposed well above both tanks, as well as beyond the end of the outer tank 10. Parts carried by the conveyor will by this arrangement be carried outwardly and beyond the tank where they may be automatically discharged onto some other conveyor or table. Each plate 25, as best seen in Fig. 4, is formed with an elongated slot 38 to permit the fluid discharged onto the carrier readily to pass therethrough. Each plate is also formed along its trailing edge, as best seen in Fig. 5, with an angle iron 39 to hold the articles in position as the conveyor passes upwardly from within the tank around the sprocket wheels 29.

It is desirable and one of the objects of this

invention to provide means for discharging cleansing fluid over the articles on the conveyor with such force and in such quantities as to cause the fluid to act mechanically as well as chemically on the grease and other dirt, and thereby aid in the removal thereof. To obtain such discharge of cleansing fluid in large quantities throughout the entire length of both sides of the washer, novel means are employed. The importance of this means is best appreciated if it is remembered that the large quantity of fluid discharged must be obtained by recirculation, since the fluid is too expensive to be used but once. As previously stated, the inner tank 11 is just slightly smaller in all dimensions than the tank 10 so as to be received within the tank 10 in spaced relation thereto. Accordingly, as best seen in Figs. 3 and 5, the side walls and end walls of the inner tank 11 are spaced from the side and end walls of the outer tank 10 so as to form therebetween and throughout the entire circumference of the tanks a narrow space extending from the bottom wall of the outer tank 10 upwardly above the top run of the conveyor, but short of the upper edge of the tank 10. The inner tank 11 is supported so that its bottom also is in spaced relation to the bottom of the outer tank, the spacing between the bottoms being preferably slightly greater than the spacing between the walls.

Extending transversely of the outer tank 10 in the space between the bottom thereof and the bottom of the inner tank are a plurality of partitions 40, best seen in Fig. 5. The partitions are equally spaced longitudinally of the outer tank so as to divide the space between the bottoms of the tanks into a plurality of approximately square chambers for the reception of pump or impeller means, as will presently be described. The partitions 40 also serve the additional purpose of supporting the inner tank in the proper spaced relation to the bottom of the outer tank, and to that end are preferably given an I-beam cross section to provide a plurality of areas on which the inner tank rests. Preferably, the partitions are welded or otherwise secured to both the bottom wall of the outer tank and the bottom wall of the inner tank, though the inner tank may merely rest upon the partitions without being rigidly secured thereto. Extending upwardly from each partition 40, in the space between the side walls of the inner and outer tanks, are dividing members 41 (see Figs. 2 and 3) which terminate with their upper ends flush with the upper edge of the side walls of the inner tank. These members 41 with the partitions 40 thus complete the division of the space between the tanks into separate units or compartments. Additionally interposed in the space between the side walls of the tanks are a plurality of vanes or fins 42, which at their upper ends may, and preferably do, terminate short of the upper edge of the side walls of the inner tank. As here shown, three such vanes or fins 42 are provided on each side for each unit, that is, between adjacent dividing members 41. At their lower ends, the vanes terminate at progressively lower points, considered in the direction of rotation of the impeller means. This is shown in Fig. 7, wherein the first of the three vanes 42 projects just slightly below the bottom of the inner tank with the second or intermediate vane projecting about half way of the space between the bottoms of the tanks, and the third vane projects

downwardly to the extent of being spaced from the bottom wall of the outer tank approximately the same distance that the first of the vanes projects beneath the bottom wall of the inner tank. An equal number of vanes is interposed in the space between the end walls of the tanks. These vanes, however, unlike the vanes between the side walls of the tank, all project the same distance below the bottom wall of the inner tank, that distance being about one-half the space between the tanks. The function of these vanes will presently become more apparent.

The impeller means, herein generally designated 43, comprises a hub 44 from which project a plurality, herein four, blades 45. These blades are curved in a direction receding from the direction of rotation of the impeller, that is, the tips of the blades trail the blades at their connection with the hub. The leading face of each blade is concave and each blade, moreover, is so disposed that its upper edge leads the lower edge. Thus, as the impeller is rotated, the blades create at the center of the impeller a reduced pressure drawing fluid from the inner tank through the perforations in the bottom thereof into the impeller chamber or space between the bottoms of the tanks and then force the fluid outwardly against the walls of the impeller chamber. With the fluid thus forced outwardly against the walls of the impeller chamber, the vanes 42 will cause the fluid to rise upwardly in the space between the walls of the tanks. Inasmuch as in all of the units except the two endmost units fluid can be discharged only from two sides, it is preferable to have the vanes 42 so arranged that the distribution of the fluid will be uniform rather than having all of the fluid from one of the inoperative sides intercepted by the first vane on the adjacent side. Hence the variation in length of the blades 42, as previously described.

The impeller need not, and preferably does not, have actual contact with either the bottom of the inner tank or the bottom of the outer tank, nor need it have, and it preferably does not have, any contact with the walls of the impeller chamber. The impeller is, as a matter of fact, as readily seen in Figs. 2, 3 and 6, of a diameter smaller even than the width of the inner tank. The impeller is, of course, located concentrically with respect to the circles of perforations 23 in the bottom of the inner tank.

In order that the impeller may be driven, it is formed with a bore in which is received the end of a stub shaft 46 journaled in a bearing 47 formed integral with a closure plate 48. The impeller is non-rotatably secured on the shaft 46 by means such as a key 49. Herein ready insertion or withdrawal of the impeller for inspection, repair or replacement is effected. To that end, the bottom wall of the outer tank is formed with a plurality of square openings 50, one for each impeller chamber. This opening is large to permit the ready insertion and withdrawal of the impeller and is closed by the plate 48 secured in position by means such as bolts 51. It is understood, of course, that a gasket (not shown) will be interposed between the plate 48 and the bottom wall of the outer tank in order to effect a fluid-tight joint between the plate and the bottom wall of the tank. It is also to be understood that the bearing 47 will contain suitable packing material to prevent leakage of the fluid outwardly along the shaft 46. With this construction, the impeller is remov-

able as a unit with the plate 48 facilitating repair or replacement.

All of the impellers are here shown as driven from a common source of power. This drive means includes an electric motor 52 connected through a sprocket 53 on the end of the motor shaft and a chain 54 with a driving sprocket 55 rigid on one end of a shaft 56 extending longitudinally of the washer. This shaft is journaled in the spaced bearings 57 provided in cross members 58 extending between each pair of legs 17. Each of these cross members 58 also provides a bearing 59 for one end of a shaft 60 adapted to be connected by a coupling 61 to the stub shaft 46. Non-rotatably mounted on each of the shafts 60 is a bevel gear 62 meshing with a bevel gear 63 non-rotatably secured on the shaft 56. The shaft 56 may also be adapted to drive the conveyor 12 through the chain 37.

The fluid issuing from the space between the walls of the inner and outer tanks, as a result of the rotation of the impeller, is directed inwardly onto the conveyor and the articles mounted thereon by means of an annular ring or flange 65 which is supported on the outer tank near the top edge thereof and extends inwardly somewhat beyond the walls of the inner tank, and maintains with the edge of the walls of the inner tank a spacing approximately equal to the spacing between the walls of the tanks. Preferably, the ring is slightly concave so as to facilitate the changing in the course of the fluid directing it inwardly and downwardly onto the conveyor.

It is believed apparent from the foregoing, first of all, that the invention permits the employment of an inner tank free of partitions, thus adapting it for reception of a conveyor enabling the cleansing operation to be made continuous and without necessity of handling of the articles, and without shut-down necessitated by such handling. At the same time, provision is made for the employment of a plurality of the impellers, making possible the discharge of such a large quantity of fluid at a considerable force. This discharge of fluid is uniform throughout the entire length of the washer and is in such volume and force as to give mechanical aid in the dislodgement and removal of the dirt or grease, as well as the chemical action produced by the compound in the fluid. Provision is also made for the ready removal or replacement of the impellers and for the uniform discharge of fluid throughout the entire length of the washer, as well as at the ends thereof.

In composite Fig. 1, there is shown a second washer, generally designated 66, which is in all respects the same as the washer just described save that the conveyor projects out of the inner tank at both ends. Such a washer is usually employed in conjunction with one like that described in detail, being arranged in end to end relationship therewith so as to receive from the conveyor 12 the articles being cleansed. Usually the washer 66 contains a rinsing solution or plain water. The conveyor of washer 66 may be driven from the chain 37, the same as the conveyor 12, so as to travel at the same speed.

I claim as my invention:

1. A washer comprising an elongated outer tank having bottom, end and side walls, an elongated and undivided inner tank having bottom, end and side walls, said inner tank being smaller in dimension than said outer tank to be received in the outer tank with the walls of the tanks in

spaced relation, a conveyor in said inner tank for conveying the articles to be washed, said conveyor having two courses both of which are in said inner tank, a plurality of partitions extending transversely of said outer tank in the space between the bottom walls spaced longitudinally of said outer tank to divide the space into a plurality of impeller chambers, perforations in the bottom wall of said inner tank, an impeller in each chamber operable when rotating to draw fluid into the impeller chamber through the perforations and discharge fluid through the space between the side walls of the tanks, and means for driving said impellers and said conveyor.

2. A washer comprising an elongated outer tank having bottom, end and side walls, an elongated inner tank having end and side walls and a perforate bottom wall, said inner tank being undivided so as to permit operation therewithin of a conveyor and being smaller in dimension than said outer tank to be received in the outer tank with the walls of the tanks in spaced relation to form fluid conducting passages, a plurality of partitions extending transversely of said outer tank in the space between the bottom walls and spaced longitudinally of said outer tank to divide the space into a plurality of impeller chambers, vertically disposed members extending upwardly from the top edge of each partition at each end thereof in the space between the side walls of said tanks, an impeller in each chamber operable when rotating to draw fluid into the impeller chamber through the perforations in the bottom wall of said inner tank and discharge fluid upwardly through the space between the side walls of the tanks, and means for driving said impellers.

3. A washer comprising an elongated outer tank having bottom, end and side walls, an elongated inner tank having end and side walls and a perforate bottom wall, said inner tank being undivided so as to permit operation therewithin of a conveyor and being smaller in dimension than said outer tank to be received in the outer tank with the walls of the tanks in spaced relation to form fluid conducting passages, a plurality of partitions extending transversely of said outer tank in the space between the bottom walls and spaced longitudinally of said outer tank to divide the space into a plurality of impeller chambers, a dividing member extending upwardly from each end of said partitions between the side walls of said tanks to the top edge of said inner tank, vertically disposed vanes positioned in the space between the side walls of said tanks, said vanes being spaced longitudinally and at their lower ends projecting into the impeller chamber but short of the bottom wall of said outer tank, and at their upper ends terminating short of the top edge of said inner tank, an impeller in each chamber operable when rotating to draw fluid into the impeller chamber through the perforations in the bottom wall of said inner tank and discharge fluid upwardly through the space between the side walls of the tanks, and means for driving said impellers.

4. A washer comprising an elongated outer tank having bottom, end and side walls, an elongated inner tank having end and side walls and a perforate bottom wall, said inner tank being undivided so as to permit operation therewithin of a conveyor and being smaller in dimension than said outer tank to be received in the outer tank with the walls of the tanks in spaced rela-

tion to form fluid conducting passages, a plurality of partitions extending transversely of said outer tank in the space between the bottom walls and spaced longitudinally of said outer tank to divide the space into a plurality of impeller chambers, a dividing member extending upwardly from each end of said partitions between the side walls of said tanks to the top edge of said inner tank, vertically disposed vanes positioned in the space between the side walls of said tanks, said vanes being spaced longitudinally and at their lower ends projecting into the impeller chamber but short of the bottom wall of said outer tank, and at their upper ends terminating short of the top edge of said inner tank, a flange extending inwardly from the side walls of said outer tank spaced above the top edge of said inner tank, an impeller in each chamber operable when rotating to draw fluid into the impeller chamber through the perforations in the bottom wall of said inner tank and discharge fluid upwardly through the space between the side walls of the tanks, and means for driving said impellers.

5. A washer comprising an elongated outer tank having bottom, end and side walls, an elongated inner tank having end and side walls and a perforate bottom wall, said inner tank being undivided so as to permit operation therewithin of a conveyor and being smaller in dimension than said outer tank to be received in the outer tank with the walls of the tanks in spaced relation to form fluid conducting passages, a plurality of partitions extending transversely of said outer tank in the space between the bottom walls and spaced longitudinally of said outer tank to divide the space into a plurality of impeller chambers, a dividing member extending upwardly from each end of said partitions in the space between the side walls of said tanks to the top of said inner tank, an impeller in each chamber operable when rotating to draw fluid into the impeller chamber through the perforations in the bottom of said inner tank and to discharge fluid upwardly through the space between the side walls of said tanks, means for driving said impellers, and vertically disposed vanes in the space between the side walls of said tanks with the vanes for each impeller chamber projecting progressively farther into the impeller chamber considered in the direction of rotation of the impeller.

6. A washer comprising an elongated outer tank having bottom, end and side walls, an elongated inner tank having end and side walls and a perforate bottom wall, said inner tank being undivided so as to permit operation therewithin of a conveyor and being smaller in dimension than said outer tank to be received in the outer tank with the walls of the tanks in spaced relation to form fluid conducting passages, a plurality of partitions extending transversely of said outer tank in the space between the bottom walls and spaced longitudinally of said outer tank to divide the space into a plurality of impeller chambers, an impeller in each chamber operable when rotating to draw fluid into the impeller chamber through the perforations and discharge fluid upwardly through the space between the side walls of said tanks, an opening for each impeller chamber large enough for the flatwise passage therethrough of said impeller formed in the bottom wall of said outer tank, a removable plate secured over said opening and having a

bearing for the impeller shaft, and means for driving said impeller.

7. A washer comprising an elongated outer tank having bottom, end and side walls, an elongated inner tank having side walls and a perforate bottom wall, said inner tank being undivided so as to permit operation therewithin of a conveyor and, in width at least, being smaller than said outer tank to be received in the outer tank with the bottom wall spaced from the bottom wall of the outer tank and with the side walls of the tanks in spaced relation to form fluid conducting passages, a plurality of partitions extending transversely of said outer tank in the space between the bottom walls and spaced longitudinally of said outer tank to divide the space into a plurality of impeller chambers, vertically disposed members extending upwardly from the top edge of each partition at each end thereof in the space between the side walls of said tanks, an impeller in each chamber operable when rotating to draw fluid into the impeller chamber through the perforations in the bottom wall of said inner tank and discharge fluid upwardly through the space between the side walls of the tanks, and means for driving said impellers.

8. A washer comprising an elongated outer tank having bottom, end and side walls, an elongated inner tank having side walls and a perforate bottom wall, said inner tank being undivided so as to permit operation therewithin of a conveyor and, in width at least, being smaller than said outer tank to be received in the outer tank with the bottom wall spaced from the bottom wall of the outer tank and with the side walls of the tanks in spaced relation to form fluid conducting passages, a plurality of partitions extending transversely of said outer tank in the space between the bottom walls and spaced longitudinally of said outer tank to divide the space into a plurality of impeller chambers, vertically disposed members extending upwardly from the top edge of each partition at each end thereof in the space between the side walls of said tanks, vertically disposed vanes positioned in the space between the side walls of said tanks, an impeller in each chamber operable when rotating to draw fluid into the impeller chamber through the perforations in the bottom wall of said inner tank and discharge fluid upwardly through the space between the side walls of the tanks, and means for driving said impellers.

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