June 27, 1939. J. D. FERRY 2,163,977

MATERIAL TREATING AND HANDLING APPARATUS

Filed Nov. 23. 1936 3 Sheets-Sheet 1

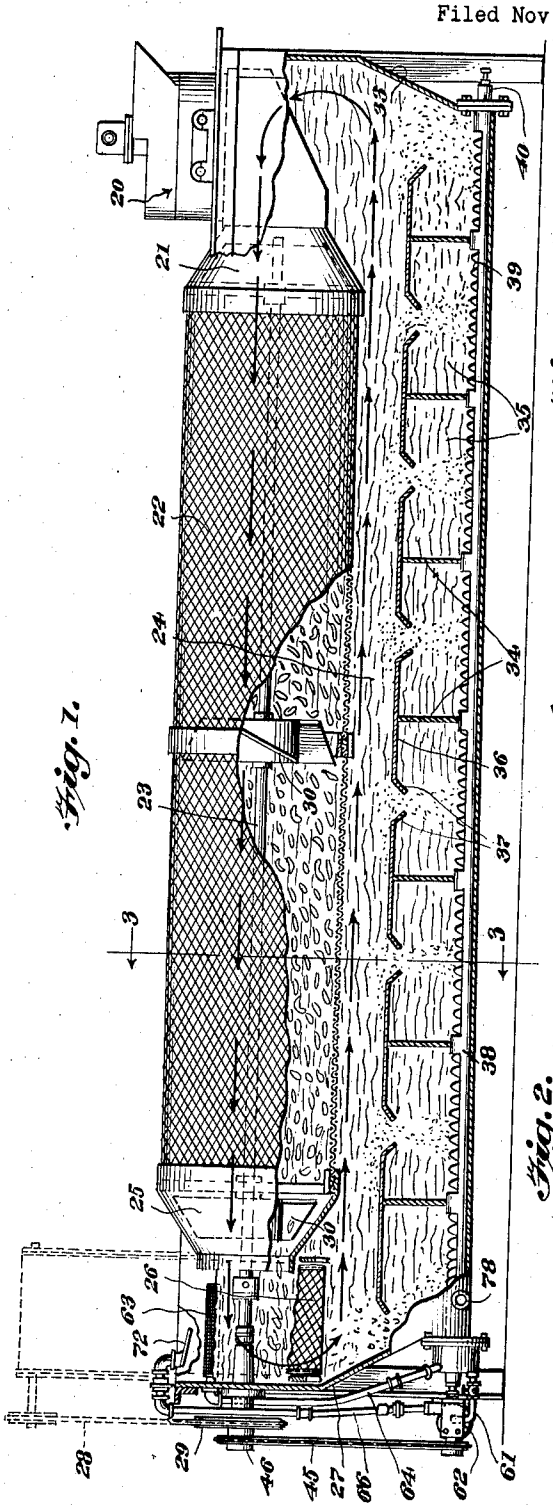


Fig. 1.

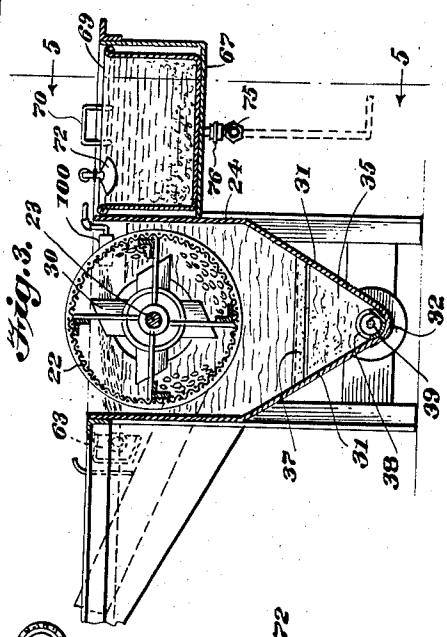


Fig. 3.

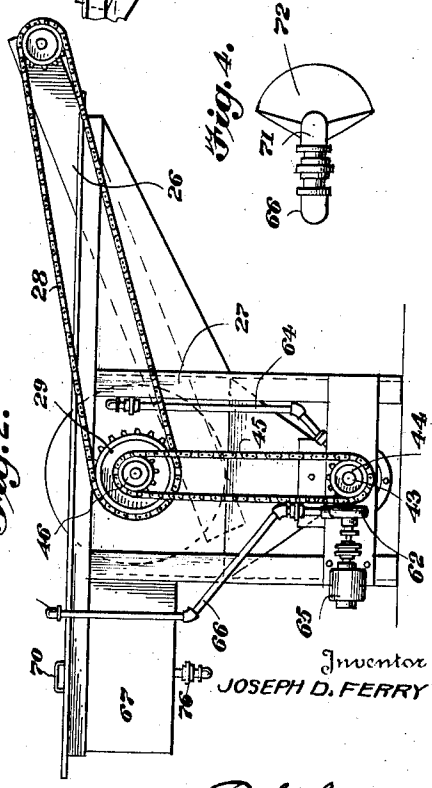


Fig. 2.

Fig. 4.

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MATERIAL TREATING AND HANDLING APPARATUS

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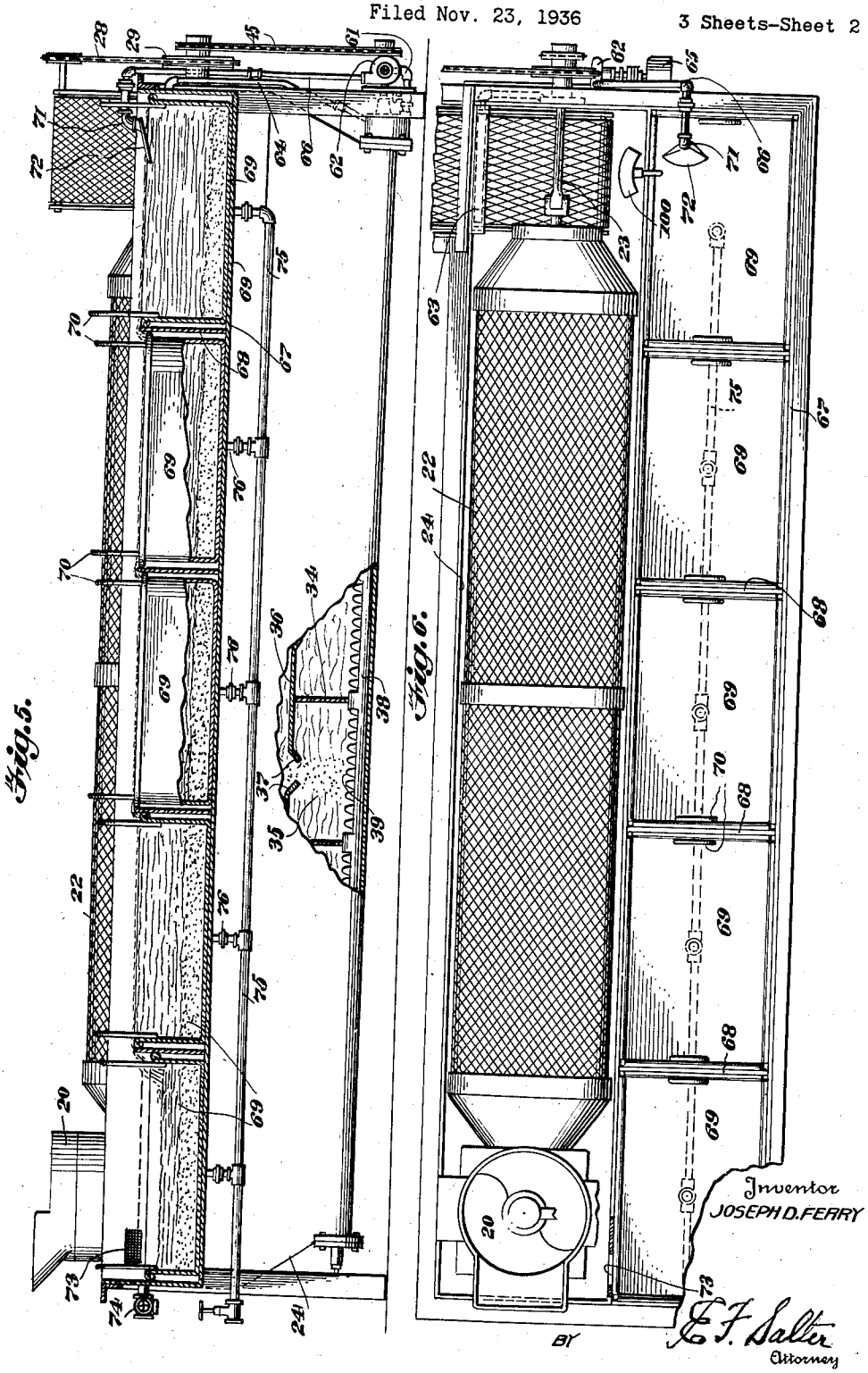


Fig. 5.

Fig. 6.

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MATERIAL TREATING AND HANDLING APPARATUS

Filed Nov. 23, 1936 3 Sheets-Sheet 3

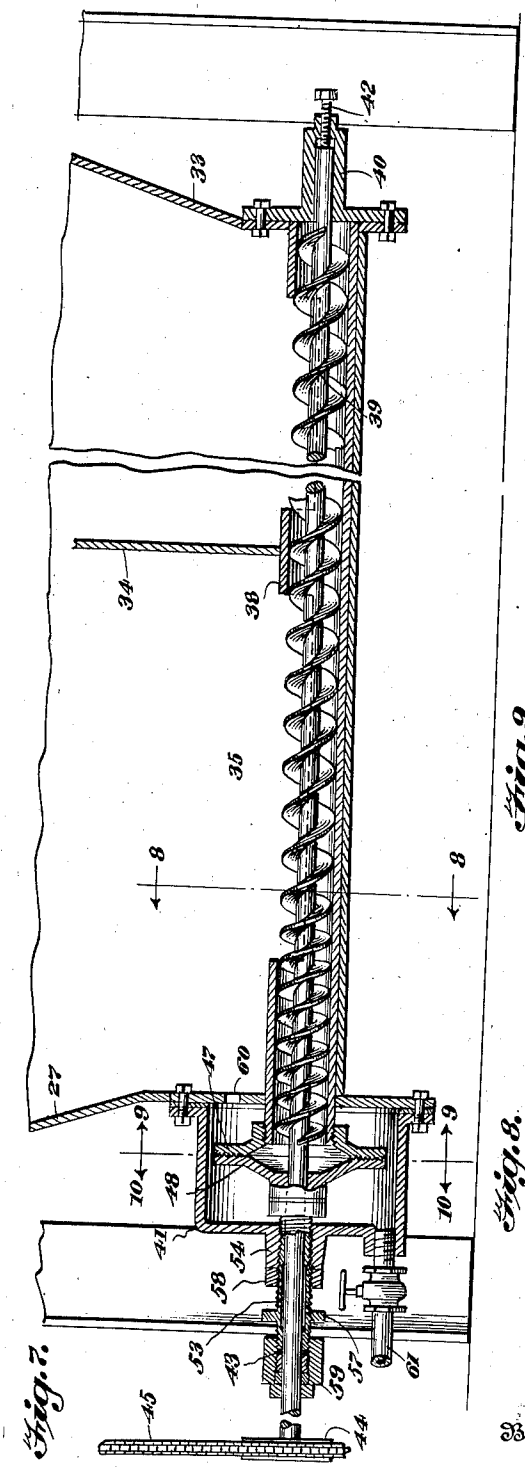


Fig. 7.

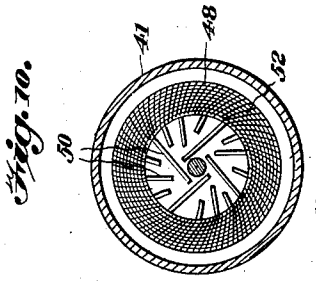


Fig. 10.

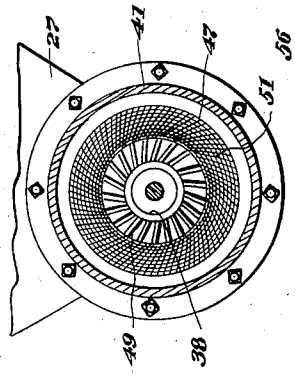


Fig. 9.

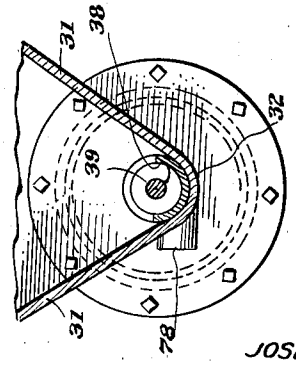


Fig. 8.

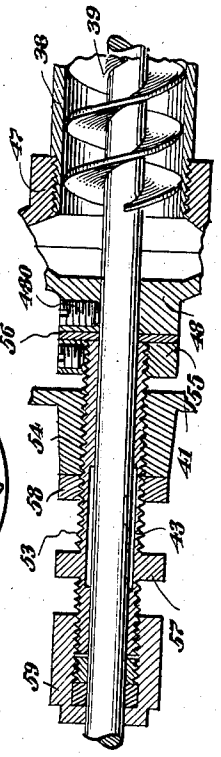


Fig. 11.

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UNITED STATES PATENT OFFICE

2,163,977

MATERIAL TREATING AND HANDLING APPARATUS

Joseph D. Ferry, Harrisburg, Pa.

Application November 23, 1936, Serial No. 112,396

5 Claims. (Cl. 146—194)

This invention deals in general, with machines for the preparation, including washing, of sliced or otherwise divided or comminuted vegetables, such as potatoes, having a substantial starch content and in which, during the course of treatment, a considerable proportion of small slices and broken portions of vegetables must be disposed of in addition to accumulated free starch.

More particularly, the invention finds an important application in the washing of potato slices or chips preliminary to a cooking operation and to a washing machine such as described and claimed in my Patent No. 2,091,675, granted August 31, 1937, with the primary objects,

First, to provide a self-cleansing washing machine, the efficiency of which, in its normal operation, will be materially enhanced by reason of the constant elimination of small slices and broken pieces of potatoes and accumulations of free starch derived from the potato slices during the washing operation, and

Second, the recovery of the starch in a gradual accumulation apart from the washing operation and in a manner admitting of its ready removal as a valuable by-product of the washing operation.

While capable to a considerable extent of general application, I have in the present adaptation of the invention had primarily in mind its application to a washing machine of the character disclosed in my above mentioned application, and hence, with the above general objects in mind, the further and more detailed objects as well as the means by which they are attained, and the beneficial results obtained thereby, will be better understood and more thoroughly appreciated from the following description and by reference to the accompanying drawings, which form a part of this specification.

In the detailed description to follow, it is understood that the specified embodiments of the invention constitute merely the best so far devised for carrying the same into practical use and that the invention is not to be thereby limited nor construed except where justified by its obvious essentials and the terms of the claims.

In the drawings in which like numerals represent like parts throughout the several figures,

Figure 1 is a longitudinal sectional view substantially through a vegetable washing machine of the general type of my above mentioned application, with the addition of my present improvements.

Figure 2 is an end view showing in elevation the discharge end of the machine.

Figure 3 is a vertical cross sectional view taken substantially on line 3—3 of Figure 1.

Figure 4 is a detail plan view of the nozzle discharging into the receiving end of the settling tank.

Figure 5 is a vertical longitudinal sectional view through the settling tank, taken substantially on line 5—5 of Figure 3.

Figure 6 is a fragmentary top plan view of the complete machine.

Figure 7 is an enlarged sectional view taken centrally and longitudinally through the base of the washing tank.

Figure 8 is a detail vertical transverse sectional view taken through the base of the washing tank substantially on line 8—8 of Figure 7.

Figures 9 and 10 are similar views taken through the sediment receiver on lines 9—9 and 10—10, respectively, of Figure 7, and

Figure 11 is an enlarged detail sectional view along a portion of the conveyor shaft.

As will best be seen in Figures 1, 2 and 6, it is contemplated that the sliced or otherwise divided or comminuted vegetables may be fed directly from a slicing or cutting machine indicated generally at 20 into the receiving end 21 of a foraminous or reticulated rotatable washing drum 22. The same arrangement of these parts may prevail as in my former application above referred to, the drum 22 being rotated by a longitudinal drive shaft 23 extending centrally through the drum which is disposed within and lengthwise of the washing tank generally indicated at 24.

The other end 25 of drum 22 outlets above and discharges the washed vegetable slices upon a laterally extending conveyor 26 for their transportation to a suitable frying or cooking apparatus with which the present invention has, otherwise, no connection. The conveyor 26, as seen by a comparison of Figures 1 and 2 extends both laterally and upwardly from the tank 24 at a point adjacent to the discharge end 27 of the latter and may be driven by a sprocket chain 28 extending from a sprocket wheel 29 on that portion of the drum shaft 23 projecting exteriorly of the tank end 27. Any suitable means for rotating shaft 23 and drum 24 may be applied to this end of the shaft.

It is further contemplated in this instance, as in my previous application above mentioned, that water for the washing operation, supplied in any suitable manner to tank 24, will attain a level above the drum shaft 23 and will, during rotation of the latter, circulate through the drum and endwise of the tank by reason of im-

pellers 30 within the drum and rotating therewith. During this circulation, small slices and broken bits of vegetable matter as well as the starch given off by the vegetables during the cleansing thereof gradually permeate the water to such an extent as to materially reduce the efficiency of the cleansing unless removed from the water or unless the latter is frequently replenished, usually with loss of the starch or a major portion thereof.

The present invention, therefore, contemplates among other things that the tank 24 have a lower V-shaped portion entirely therealong as plainly seen in Figure 3, the lower portions 31 of its side walls inclining toward one another to form a lower, central trough 32 preferably inclined downwardly from the receiving end 33 of the tank to its discharge end 27. This trough-like lower portion of the tank is divided, by a series of longitudinally spaced transverse plates or baffle walls 34 having the upper edges thereof terminating below the drum 24 and forming a longitudinal series of settling spaces or chambers 35 which, while in open communication with the interior of the tank, and without substantially disturbing the circulation of fluid therein along the line indicated by the arrows in Figure 1, provide for a comparatively quiescent state of the fluid therein so that the free starch and small slices and broken pieces of vegetables will readily settle to the bottom of the tank.

The spaces or chambers 35 may have partial covers in the nature of horizontal plates 36 resting on the baffle walls 34 and the converging side walls 31 of the tank to aid in establishing the quiescent state of the tank liquid in the region of the settling chambers 35. The plates 36 may be of different shapes but for the purpose of illustration are herein shown as being flat and provided with downwardly deflected adjacent edges 37 in spaced apart relation as best seen in Figure 1. While the plates 36 may serve to improve the general efficiency, such plates are not essential to the operation.

Within the lower bight portion of the trough-like base 32 of the washing tank 24, a conveyor tube 38 is fixed, it being seen in Figures 1 and 7 that the upper portion of this tube is cut away along substantially the full length of each of the spaces or chambers 35 so that the settling material will readily find its way into the convolutions of a helical or screw conveyor 39 which operates within tube 38.

The rear end of screw conveyor 39 projects into a bearing box 40 secured to the rear wall 33 of the washing tank 24 and at its forward end the conveyor 39 has a portion the convolutions of which are pitched to a greater angle and more closely disposed for creation of a proportionately increased feed pressure within the forward end of tube 38, the latter of which extends slidably through an opening in the end wall 27 of the tank 24 and projects into a grinder housing 41. The rear end of conveyor 39 is axially engaged by an adjusting screw 42 threaded through the end of bearing box 40.

As clearly shown in Figure 7, the grinder housing 41 is bolted to the end wall 27 of the tank 24 and the forwardly extending shaft 43 of the screw conveyor 39 projects therethrough and forwardly therebeyond, its extreme forward end having a sprocket wheel 44 connected by a sprocket chain 45 with a sprocket wheel 46 on the drum shaft, see Figure 2. The grinder within housing 41 consists of a pair of circular grinding plates or disks 47 and 48, the former of which is stationarily secured to the forward end of tube 38 and the latter of which is locked by a screw 480 on conveyor shaft 43. The central portions of these disks have opposing guide ribs 49 and 50, respectively, the angular disposition of which tends to guide the material forced between the grinding plates, outwardly between the flat annular grinding surfaces of the plates best seen at 51 and 52, respectively, in Figures 9 and 10.

Around the conveyor shaft 43 is a sleeve 53 which is threaded through a bearing 54 of the front wall of grinder housing 41. On the inner end of sleeve 53 is a fixed collar 55 between which and the grinding plate 48 is a hard metal washer 56 and thus by means of sleeve 53, adjusted by its intermediate nut 57, and the adjusting screw 42, before mentioned, the screw conveyor may be adjusted lengthwise to regulate the effective spacing of the grinding plates 47 and 48, the sleeve 53 solidly backing the adjustable grinding plate 48 at all times and being secured by a lock nut 58. At its forward end, sleeve 53 carries a packing gland 59 surrounding the shaft 43.

It is intended that means corresponding to that disclosed in my aforementioned application shall be employed for removing the starch matter which accumulates in the nature of foam or froth in the immediate region of the surface of the liquid in the washing tank 24 at the outlet portion thereof. As generally disclosed herein, such means includes a spray head 100 for directing a spray of water toward and into the slotted, screen covered receiver or overflow member 63 and the starch along with the water from the spray head entering the receiver is conducted to the grinder housing 41 through a pipe 64.

Material settling into the screw conveyor 39 is forced thereby into the grinder housing 41 between the grinder plates 51 and 52 by which it is finely reduced and such ground material together with the foamy starch and liquid entering the housing through the pipe 64 and the additional liquid entering the housing through a small opening 60 in the lower portion of the end wall 27 of the washing tank discharges through a valve controlled outlet pipe 61 into a centrifugal pump 62. The suction of the pump also aids in drawing the surface starch into the housing 41 through the pipe 64 and the receiver 63.

The pump 62 may be driven by a separate motor 65 as seen in Figure 2, and its discharge pipe 66 is extended upwardly and laterally to the opposite side of tank 24 with respect to the discharging conveyor 26, and angled rearward over the forward end of a settling tank 67 which, as seen in Figures 2, 3, 5 and 6, is mounted lengthwise of the upper portion of the washing tank and is generally of the rectangular form shown. From its front to its rear this settling tank has a series of stepped transverse partition walls 68 dividing the same into a series of spaces for the reception of individually removable settling trays 69 of progressively less height or depth from front to rear so that the material flows from pump discharge pipe 66 into the deepest forward tray and gradually overflows from one tray to the other throughout the series.

Each of the settling trays has handles 70 whereby it may be conveniently removed for discharging its collected contents. To prevent over agitation of the liquid in the forward tray by the discharge from pipe 66, a discharge nozzle 71 seen in Figures 4, 5 and 6 is preferably used, with an

outstanding flaring deflector 72 below the discharge orifice.

Thus in the course of its overflow, all material of a nature to settle from the pump discharged material ground in the manner previously described, finds its way to the bottom of one of the series of stepped settling trays 69.

As shown particularly in Figures 5 and 6, there is provided in the wall between the settling tank 67 and the washing tank 24 adjacent the rear end thereof a screened overflow opening 73 establishing communication between the settling tank 67 and the washing tank 24, such opening being arranged above the level of the liquid in the washing tank so as to allow the liquid, free of settlings, to flow back into the washing tank.

Such material as collects on the surface of the liquid in the settling tank 67 adjacent the screened opening 13 may be skimmed off from time to time.

It is also illustrated in Figure 5 that a valve controlled pipe 74 communicates with the rear end of the settling tank 67 at a point below the screened opening 73 so that if desired or preferred the water may be piped to the sewer as distinguished from being returned to the washing drum tank 24 through the screened overflow opening 73.

A drain pipe 75 having branches 76 leading from the bottom of the several tray compartments is provided for periodically cleaning the entire settling tank 67. This is shown particularly in Figure 5, and from Figures 1 and 8 it will be observed that the lower trough 32 of the washing tank 24 has a normally closed lateral outlet 78 which is similarly employed as a drain during periodical cleaning of the tank.

It is obvious from the foregoing that provision is made to effectively remove from the fluid of the washing tank all materials of a nature capable of settling and, after grinding, these materials are permitted to settle in a manner permitting of convenient ease recovery from time to time so that greatest attention may be confined to the operation of the washer and its effectiveness and efficiency considerably enhanced by reason of constant removal of such matter from the circulation of the washing fluid. It is equally obvious that the desired results are obtained by the use of means capable of achieving the same in an economical practical way as well as by means which are themselves of a strong durable nature.

Having thus described the invention, what is claimed is:

1. In a machine for washing cut potatoes, including a perforated washing drum and a tank for holding the drum and a fluid circulating through the drum, means forming a series of settling chambers in the tank below and opening upwardly into the circulating fluid beneath the drum, a conveyor also in the tank below and communicating with said chambers for constantly discharging settled solids therefrom, a grinder housing, a grinder therein discharging into the housing and receiving the material at the discharge end of said conveyor, a settling tank, and means for conveying the material from said grinder housing into the settling tank, said settling tank having a fluid overflow opening into the washing tank.

2. In a machine for washing cut potatoes, including a perforated washing drum and a tank for holding the drum and a fluid circulating through the drum, means forming a series of settling chambers in the tank below and opening upwardly into the circulating fluid beneath the drum, a conveyor also in the tank below and communicating with said chambers for constantly discharging settled solids therefrom, a grinder housing, a grinder therein discharging into the housing and receiving the material at the discharge end of said conveyor, a settling tank, and means for conveying the material from said grinder housing into the settling tank, said settling tank having a plurality of settling trays and a fluid overflow opening into the washing tank.

3. In combination with a washing tank for washing cut potatoes in a washing fluid, means in said tank for continuously settling solids out of the washing fluid, means in said tank for continuously conveying the solids with portions of the fluid out of the tank, means for grinding the solids so conveyed from the tank, a settling tank adjacent the washing tank, means for conveying the ground material and fluid from the grinder into said settling tank, and means for overflowing fluid from the settling tank into the washing tank.

4. In a machine for washing potato slices, a tank for the reception of a liquid to wash the potato slices and to form a vehicle therefor, a rotatable perforated drum in the tank and the liquid therein and having inlet and outlet ends for tank liquid and the potato slices carried thereby, said drum being provided with means inducing a circulation of the liquid through the drum from the inlet to the outlet ends thereof and in the reverse direction below the drum to extract starch from the potato slices, and means for creating a quiscent area in the liquid below the drum and for forming a plurality of settling chambers in the lower portion of the tank for receiving the settling starch extracted from the potato slices, means communicating with said chambers for discharging the settled starch from the tank, and means for receiving and discharging from the tank the starch accumulating in the immediate region of the surface of the liquid.

5. In a machine for washing cut potatoes, a tank for the reception of a washing liquid, a rotatable perforated drum in the upper portion of said tank and the liquid therein, a conveyor tube in the bottom portion of said tank and extending lengthwise thereof, a plurality of longitudinally spaced substantially T-shaped baffle members extending entirely across the tank and supported upon said conveyor tube and the side walls of said tank to define settling chambers below the drum for receiving starch extracted from the potatoes and under-sized potato cuts screened out of the perforated drum into the tank, the upper portion of said conveyor tube being cut away at spaced points to establish communication between the settling chambers and the interior of the tube, and a screw conveyor in said tube for discharging the settled matter from the tank.

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