Feb. 15, 1927. 1,617,833

J. J. ARMSTRONG

MACHINE FOR WASHING SUGAR TRAYS

Filed April 27, 1925 4 Sheets-Sheet 1

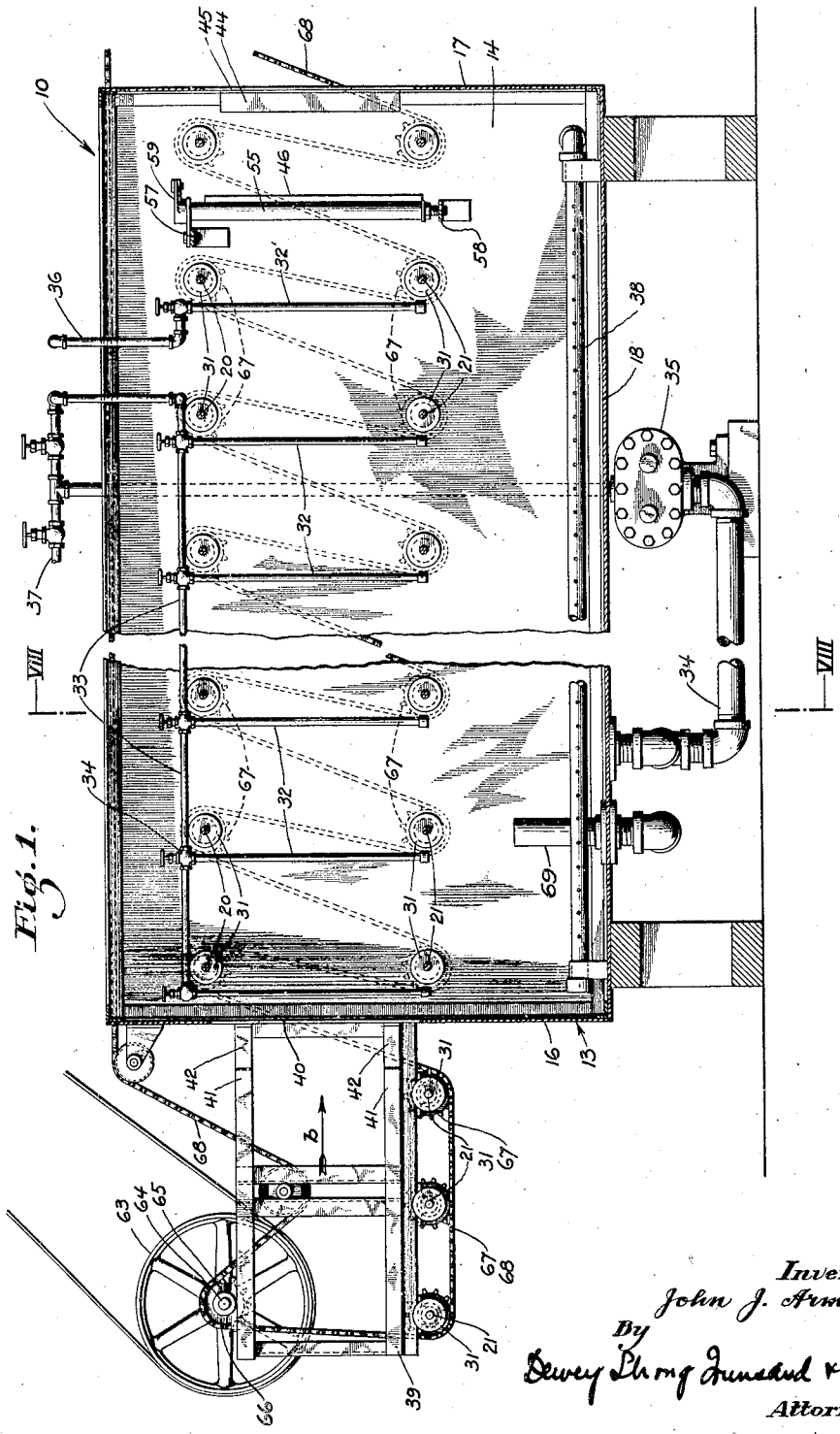


Fig. 1.

Inventor.
John J. Armstrong.
By
Dewey Strong Gunsaul & Loftus
Attorneys.

Feb. 15, 1927. 1,617,833

J. J. ARMSTRONG

MACHINE FOR WASHING SUGAR TRAYS

Filed April 27, 1925 4 Sheets-Sheet 2

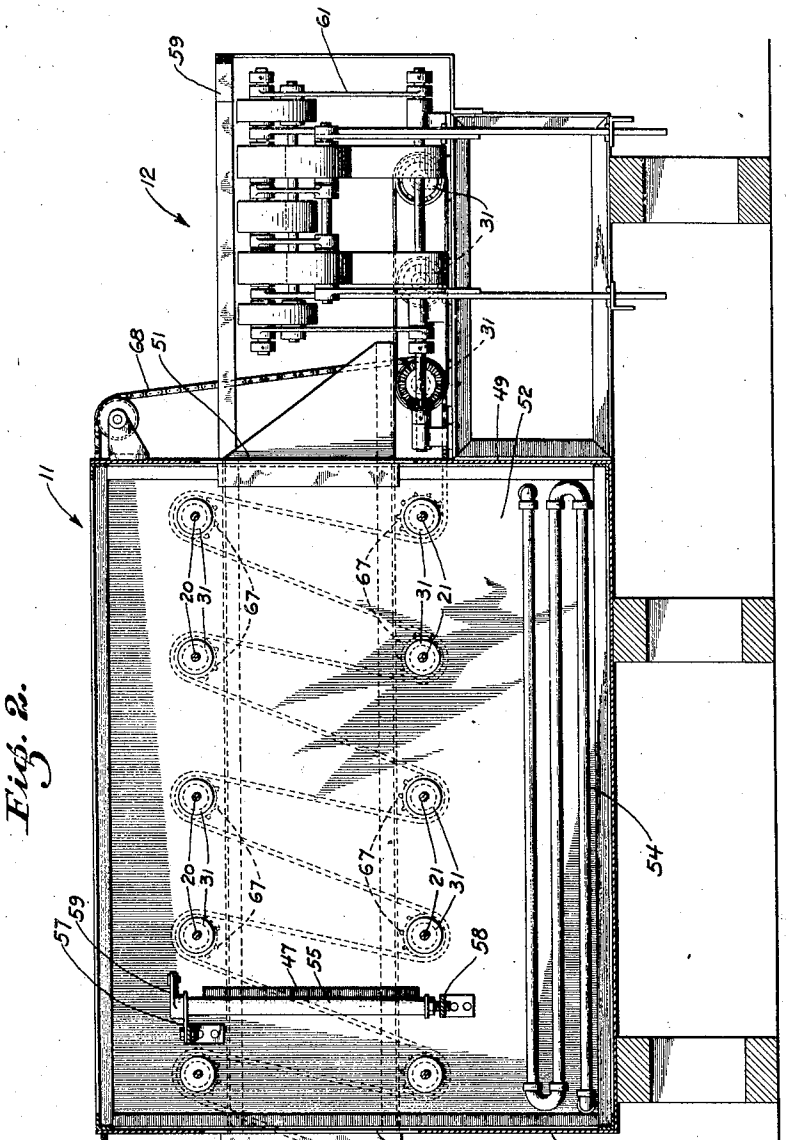


Fig. 2.

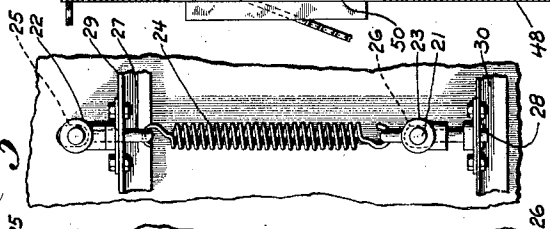


Fig. 4.

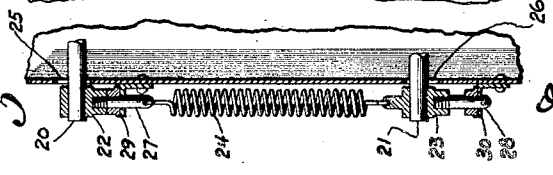


Fig. 3.

Inventor.
John J. Armstrong.
By
Dewey, Strong, Jaenicke & Colton
Attorneys.

Feb. 15, 1927. 1,617,833

J. J. ARMSTRONG

MACHINE FOR WASHING SUGAR TRAYS

Filed April 27, 1925 4 Sheets-Sheet 3

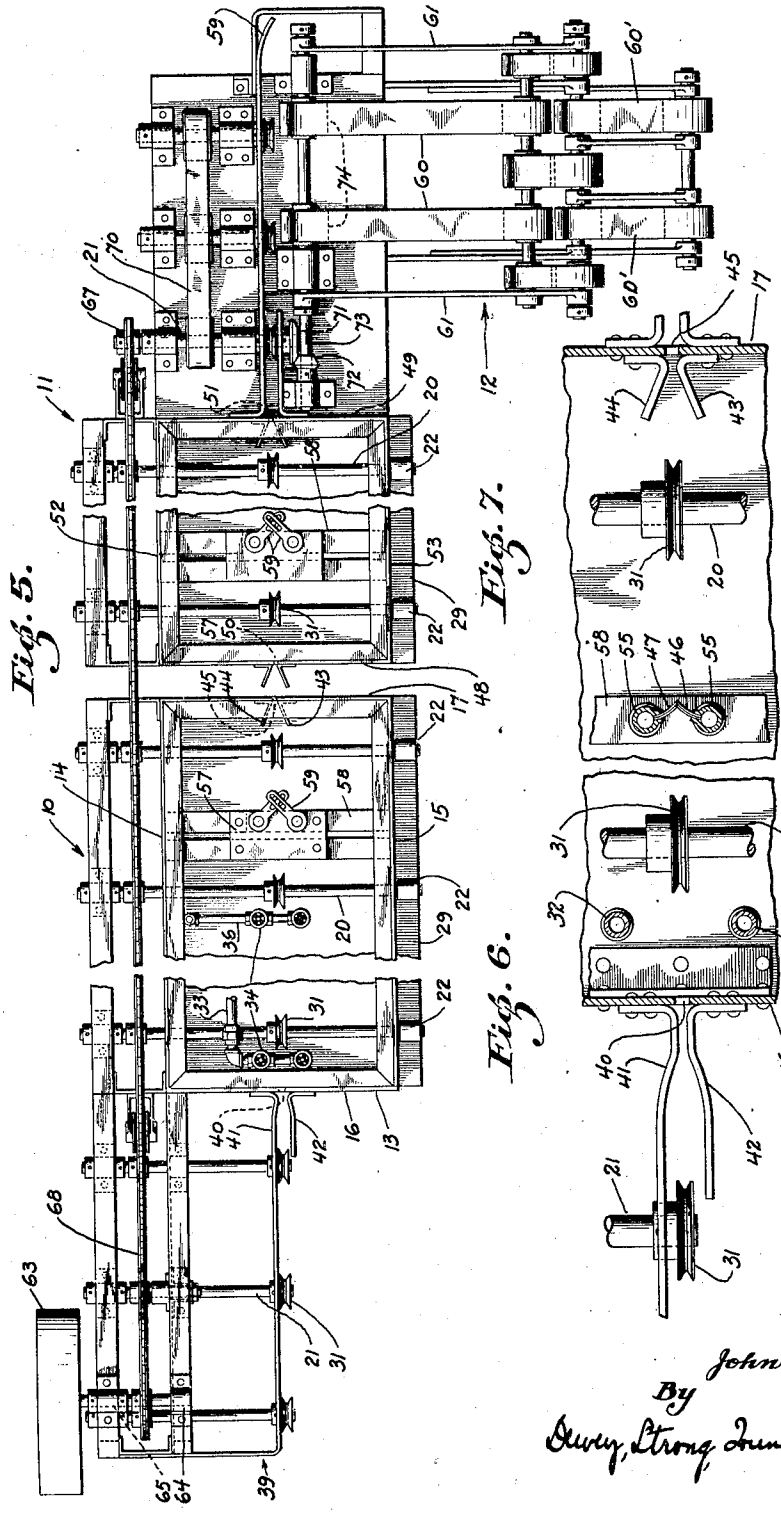


Fig. 5.

Fig. 7.

Fig. 6.

Inventor.
John J. Armstrong.
By
Dewey, Strong, Townsend & Lyttle
Attorneys.

Feb. 15, 1927. 1,617,833

J. J. ARMSTRONG

MACHINE FOR WASHING SUGAR TRAYS

Filed April 27, 1925 4 Sheets-Sheet 4

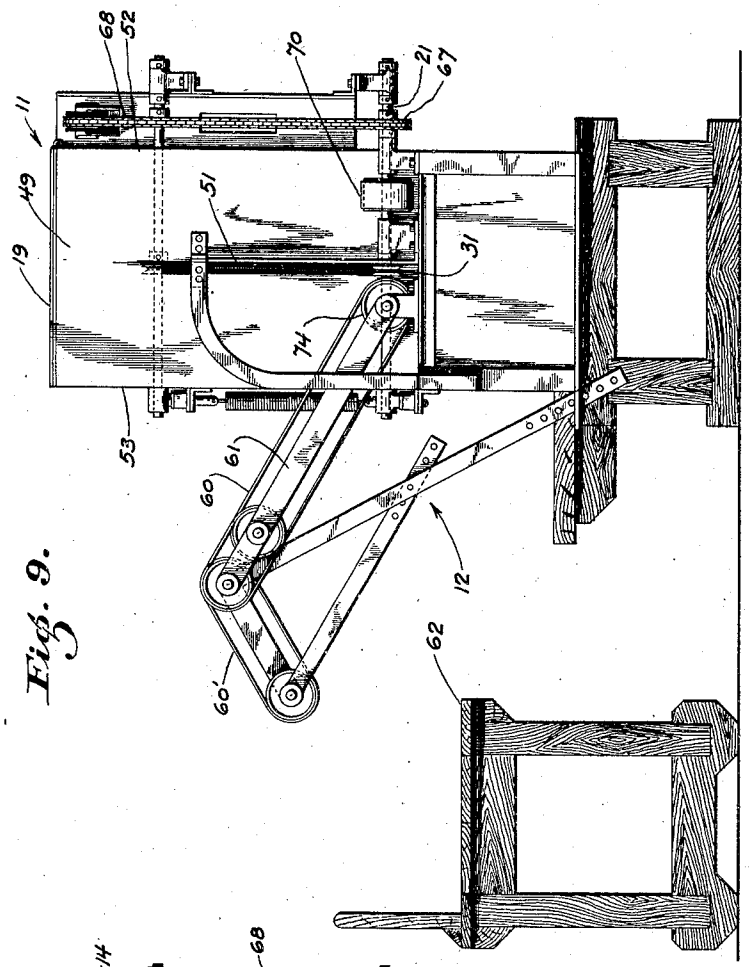


Fig. 9.

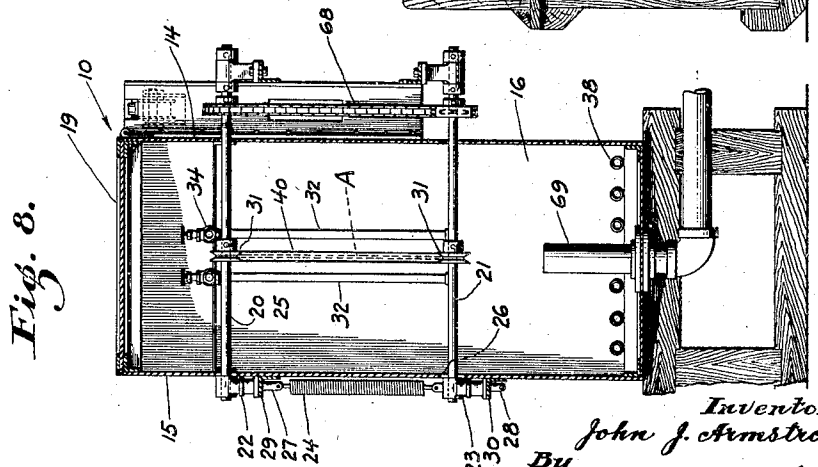


Fig. 8.

Inventor.
John J. Armstrong.
By
Dewey, Strong, Jansen & Loftus
Attorneys.

Patented Feb. 15, 1927. 1,617,833

UNITED STATES PATENT OFFICE.

JOHN JAMES ARMSTRONG, OF CROCKETT, CALIFORNIA.

MACHINE FOR WASHING SUGAR TRAYS.

Application filed April 27, 1925. Serial No. 26,060.

This invention relates to automatic washing devices, and particularly pertains to means for washing and drying sugar trays.

During the manufacture of cube sugar, it is common practice to form the sugar cubes and deposit the freshly formed cubes upon flat metal trays, after which the sugar is carried through baking ovens while deposited on the trays and is then packed into cartons for shipment.

During this operation the sugar trays accumulate a thin deposit of loose sugar crystals. The presence of these crystals on the trays is objectionable in that it prevents sharply formed cubes to be made, and it is the principal object of the present invention to provide means whereby the emptied trays may be automatically fed through a machine which will thoroughly wash and dry the trays and prepare them for immediate further use in the manufacture of cubes.

The present invention contemplates the use of a sugar washing structure, through which the trays are fed while standing vertically, and which washer delivers a spray of wash water to the surface of the trays on both sides and uniformly throughout the height of the trays as they move through the machine in an edgewise position, after which they are wiped substantially dry and then passed through an air dryer.

The invention is illustrated by way of example in the accompanying drawings, in which:

Fig. 1 is a view in longitudinal section and elevation showing the construction of the washing unit.

Fig. 2 is a view in longitudinal section and elevation showing the construction of the dryer.

Fig. 3 is a fragmentary view in vertical section and elevation showing the manner in which the upper and lower feed roller shafts are yieldably mounted.

Fig. 4 is a fragmentary view in side elevation showing the structure disclosed in Fig. 3.

Fig. 5 is a view in plan with parts broken for the sake of clearness showing the general arrangement and relation of the parts of the entire mechanism with which the present invention is concerned.

Fig. 6 is an enlarged fragmentary view in horizontal section showing the inlet structure of the washer.

Fig. 7 is an enlarged view in horizontal section showing the outlet structure of the washer.

Fig. 8 is a view in vertical section through the washer as seen on the line 8—8 of Fig. 1.

Fig. 9 is a view in end elevation showing the dryer and the stacking arrangement.

Referring more particularly to the drawings, 10 indicates a tray washing structure disposed alongside a tray drying structure indicated at 11 and in communication with which dryer a tray stacker 12 is mounted. The tray washer comprises a rectangular housing 13 having parallel side walls 14 and 15 and opposite end walls 16 and 17. The structure is fitted with a bottom 18 and a hinged cover 19.

Extending transversely from side wall to side walls and therethrough are disposed a plurality of upper and lower feed roller shafts 20 and 21. These shafts are arranged in pairs vertically aligned, and as more clearly shown in Figs. 3 and 4, are fitted with floating bearings 22 and 23 yieldably connected by springs 24 for a purpose which will be hereinafter described. The shafts pass through slotted openings 25 and 26 respectively in the side walls 14 and 15, which openings permit the shafts to have limited vertical movement.

The bearings are guided for movement by extensions 27 and 28 which project through angle bars 29 and 30 secured along the sides of the walls 14 and 15 and reciprocate through said angles while guiding the movement of the bearings.

The shafts 20 and 21 carry feed rollers 31. These rollers as more clearly shown in Fig. 8, are formed with a V-shaped groove extending around their circumferential faces and with said grooves lying in the same vertical plane, so that a washing tray indicated by dotted lines at A in Fig. 8 may fit between the feed rollers and into the grooves while being advanced through the machine by frictional contact with the rollers as they revolve. It will be understood that this frictional engagement is insured by the tension of the springs 24 which

tend to draw the upper and lower shafts 20 and 21 toward each other.

Disposed upon opposite sides of the path of travel of the trays along and between the rollers are sets of vertically extending spray pipes 32. These pipes are formed with spray openings substantially throughout their lengths so that they will spray water or other cleansing liquid against the entire face of the tray as the tray passes by the spray pipes. Any number of pipes may be used, as will be understood, and these pipes are here shown as being connected to a header 33 and separately controlled by valves 34. The bottom of the housing 13 forms a tank or receptacle for the wash water which drains off of the trays after it has been sprayed onto them from the spray pipes 32. This wash water is reused and is preferably drawn off through a pipe 34 in the bottom of the tank, which pipe is in communication with a pump 35 delivering the water to the header 33 for reuse. Attention is directed to the fact, however, that the last one of the spray pipes 32 is not in communication with this reused water, but is directly connected with a fresh water pipe 36, and that a draw-off pipe 37 is in communication with the feed line from the pump 35 to carry away a desired amount of the liquid from the bottom of the tank to suitable means for recovering its sugar contents.

It will be understood that a single washing of the trays in fresh water would not add a sufficient amount of sugar to the water to make its recovery worth while, but after continued reuse of this water the contents of the liquid will increase in gravity due to the addition of sugar removed from the trays until its recovery is of importance. For that reason the water is reused while drawing off a certain amount of the liquid through the pipe 37 and replenishing the liquid with fresh water through the pipe 36.

In order to maintain the liquid in a condition so that it will readily flow through the system an open steam heater 38 is mounted in the bottom of the housing 13 and is submerged with the liquid draining from the trays. This heater consists of one or more lengths of pipe in communication with a supply of steam and formed with perforations throughout its length to permit steam to be delivered into the body of liquid accumulated in the tank.

Disposed directly ahead of the washer is a feed device comprising a frame structure 39 carrying shafts 21 and feed rollers 31. These shafts, as well as all of the others similarly designated, are simultaneously driven by means which will be hereinafter described.

Suffice it is to say that the rotation of the shafts 21 carried by the frame 39 and in the direction of the arrow —*a*— will tend to feed the trays through slotted opening in the end 16 in the washer housing and into frictional engagement with the upper and lower driving rollers 31. The trays are guided through this opening which is indicated at 40 by means of guide rails 41 and 42, shown in detail in Fig. 6.

The trays after being washed are passed between guide fingers 43 and 44 which insure that they will be propelled by the rollers to move outwardly through a slotted opening 45 in the end 17 of the washer housing. During the travel of the trays through the washer each tray will be forced between devices known as squeegees. These structures are in face flexible rubber blades indicated at 46 and 47, which wipe over the faces of the trays and tend to scrape the water from the trays

The dryer to which the washed and wiped trays are delivered comprises a rectangular housing having end walls 48 and 49 formed with vertically extending slotted openings 50 and 51 respectively. The side walls 52 and 53 of the dryer housing carry the same type of bearing structures as indicated in Figs. 3 and 4 of the drawings, and which bearings afford rotary support for upper shafts 20 and lower shafts 21. These shafts, as in the case of the washer, are each fitted with V-grooved feed rollers 31, between which the trays may pass and by which they are fed forwardly. A suitable heating coil 54 is mounted within the rectangular housing of the dryer below the path of travel of the trays, while a set of squeegees 46 and 47 are mounted within the dryer to operate in further removing moisture from the trays.

As shown in Figs. 2, 5 and 7, the squeegees comprise rubber plates supported on sleeves 55 and rotating on shafts 56. These shafts extend vertically and are carried by upper and lower bearings 57 and 58 as shown in Fig. 2. The upper ends of the shafts are each fitted with swinging arms 59 which are pivoted in relation to each other so that the two shafts may be adjustably set to hold the squeegee blades in desired angular relation to the path of travel of the tray which is to be forced between said blades.

After a tray has been dried, it is passed through opening 51 in the end wall 49 of the dryer housing and is carried forwardly along lower feed rollers 31 until its upper edge encounters the curved end 59 of a guide track as shown in Fig. 5. This end of the guide track tends to swing the upper end of the tray outwardly and to cause it to fall onto an inclined belt 60 which leads upwardly over pulley wheels carried by an adjustable frame structure 61. This plate will receive the tray and carry it away from the machine and deliver it onto a stacking table 62. As the height of the stack increases the adjustable frame 61 may be changed to

insure that the trays will be delivered onto the top of the stack.

The shafts 20 and 21 carrying the feed rolls are driven from a suitable source of supply through the medium of a pulley 63 carried on a shaft 64. This shaft is mounted in suitable bearings 65 and is supported by the frame extension 39 at the forward end of the washer. Mounted on shaft 64 is a sprocket wheel 66. Mounted on each of the shafts 20 and 21 are sprocket wheels 67, all being in vertical alignment and around all of which is roved a sprocket chain 68, by which the shafts are simultaneously driven, the shafts 20 rotating in a counter-clockwise direction, and the shafts 21 rotating in a clockwise direction. In this manner complementary vertical aligned pulleys will act to frictionally engage trays and pass them consecutively from one set of pulleys to another until they have completely traveled throughout the lengths of the washer and dryer.

In operation of the present invention, the pulleys 31 are driven as previously described and trays are fed into the machine by being placed vertically edgewise with their lower edge resting in the grooves of the lower pulleys 31, the lower pulleys are carried by the projecting frame structure 39. These pulleys will frictionally engage the trays due to the weight of the trays in the groove on the pulleys and will feed the trays in the direction of the arrow —*b*—, through opening 41 in the end wall 16 of the washer housing.

Immediately upon entering this housing, the trays will pass between complementary spray pipes 31 and will be subjected to a series of water jets acting throughout the full height of the edgewise positioned tray and upon both sides thereof. Due to the continuous action of these jets and the continuous advance movement of the trays, they will be thoroughly washed on both sides and from end to end. The sweet water washing off of the trays will fall to the reservoir in the bottom of the housing 13 and will there accumulate. An overflow pipe 69 will limit the height which the lever of the accumulated liquid may reach.

This accumulated liquid will then be withdrawn through pipe 34 and pump 35, and will thereafter be returned to the header 33 from which it will again be distributed to all of the spray pipes 32, save the last pair of spray pipes indicated in Fig. 1 as 32′. This pipe is in direct connection with fresh water, and in this manner after the trays have been washed with sweet water and the bulk of the accumulated sugar removed, they will be finally rinsed in fresh water, and this fresh water will then fall to the reservoir in the housing, where it will mix with the sweet water. Pipe 37 insures that a like quantity of sweet water will be drawn off.

By this method it is possible to use and reuse the liquid in the tank for washing purposes until its sugar content has reached sufficient gravity to make it worth while to recover the sugar from the liquid. This recovery is made from the liquid being drawn off through pipe 37. It will be evident that the sweet water accumulating within the reservoir at the bottom of the housing 13 must be of considerable density in order to make sugar recovery profitable, and in order to maintain the sweet water in a flowing condition live steam is injected into the body of the accumulated liquid through steam pipe 38.

After the trays have passed between the rinsing pipes 32′, they will be forced between the blades 46 and 47 of the wiping device. This will practically remove all of the water on the surface of the trays and will insure that the trays will advance to the dryer without carrying an accumulation of water on their surfaces.

Feed rolls 31 will then force the trays between guide members 43 and 44 and through opening 45 in the end wall 17 of the washer housing, after which the trays will be forced through opening 50 in the end wall 48 of the dryer housing and then will proceed through the dryer. The temperature in the dryer is controlled by steam pipes 45, and while the tray passes through this compartment it will be completely dried. After it has passed through the drying compartment, it then passes out through an opening 51 in the end 49 of the dryer and onto the lower feed rollers 31. As shown in Fig. 5, these rollers are driven by a belt 70 from the sprocket chain 67. On the end of the first shaft 21 on the outside of the dryer a bevel gear 71 is fastened and is in mesh with a pinion 72 on a jack shaft 73. This shaft carries pulleys 74 driving the stacker belts 60.

The trays as they continue to advance, will strike the curved end rail 59 and will be tilted from their vertical aligned position so that they will fall on the inclined belt 60 and will thereafter be carried upwardly and over these belts onto supplemental belts 60′, after which they will be automatically deposited on a suitable stacker table 62.

It will thus be seen that the device here disclosed insures that trays may be thoroughly washed and dried by simple automatic means, and that in the particular application of the invention here shown, it is possible to recover all of the waste sugar accumulating on the trays.

While I have shown the preferred form of my invention as now known to me, I wish it understood that various changes may be made in its construction without departing from the spirit of the invention as claimed.

Having thus described my invention, what

I claim and desire to secure by Letters Patent is:

1. A washing device of the class described comprising a tank having vertically extending slots through the opposite ends thereof and in alignment with each other, a plurality of rollers within the tank disposed with their axles in a single horizontal plane, said axles being parallel to each other and to the ends of the tank, said rollers being spaced a lesser distance from each other than the length of a flat tray or plate adapted to rest thereupon and to roll thereover, a complementary set of rollers disposed in a superposed horizontal plane and adapted to rest upon the upper edges of plates or trays which are being advanced on the lower rollers and cooperating with said lower rollers to maintain the tray in a vertical position as it is being conveyed, and spray members disposed upon opposite sides of the path of travel of the tray adapted to project jets of water against the surface of the tray as the tray advances, and means for simultaneously driving all of the rollers to advance the tray through the slotted opening at one end of the tank, through the tank and out through the slotted opening at the opposite end of the tank.

2. A washing device of the class described comprising a tank, the opposite ends of which are each formed with an opening through which a plate or relatively flat tray may pass while said tray extends vertically, a plurality of grooved rollers disposed with their axes parallel to each other and to the ends of the trays and arranged in spaced relation to each other in a horizontal plane across the tank, a second set of grooved rollers disposed in a plane parallel to the first set and arranged thereabove and between the rollers of said sets, a tray or flat plate member adapted to be advanced through the tank thereby, means for simultaneously driving all of the rollers to advance a tray through the tank, means for producing yieldable pressure of the rollers upon the upper and lower edges of the trays, and means for applying a spray of water to the opposite sides of the trays as they are advanced through the tank.

3. A washing device of the class described comprising a tank, the opposite ends of which are each formed with an opening through which a plate or relatively flat tray may pass while said tray extends vertically, a plurality of grooved rollers disposed with their axes parallel to each other and to the ends of the trays and arranged in spaced relation to each other in a horizontal plane across the tank, a second set of grooved rollers disposed in a plane parallel to the first set and arranged thereabove and between the rollers of said sets, a tray or flat plate member adapted to be advanced through the tank thereby, means for simultaneously driving all of the rollers to advance a tray through the tank, means for producing yieldable pressure of the rollers upon the upper and lower edges of the trays, means for applying a spray of water to the opposite sides of the trays as they are advanced through the tank, and squeegee members positioned upon opposite sides of the exit opening in the end of the tank for wiping the opposite sides of the tray as it is ejected from the tank.

4. A washing device of the class described comprising a tank, the opposite ends of which are each formed with an opening through which a plate or relatively flat tray may pass while said tray extends vertically, a plurality of grooved rollers disposed with their axes parallel to each other and to the ends of the trays and arranged in spaced relation to each other in a horizontal plane across the tank, a second set of grooved rollers disposed in a plane parallel to the first set and arranged thereabove and between the rollers of said sets, a tray or flat plate member adapted to be advanced through the tank thereby, means for simultaneously driving all of the rollers to advance a tray through the tank, means for producing yieldable pressure of the rollers upon the upper and lower edges of the trays, means for applying a spray of liquid to the trays during the initial part of their advance whereby the trays will be washed, and means for supplying rinse water to the trays at the final part of their travel whereby the trays will be rinsed.

5. A washing device of the class described comprising a tank, the opposite ends of which are each formed with an opening through which a plate or relatively flat tray may pass while said tray extends vertically, a plurality of grooved rollers disposed with their axes parallel to each other and to the ends of the trays and arranged in spaced relation to each other in a horizontal plane across the tank, a second set of grooved rollers disposed in a plane parallel to the first set and arranged thereabove and between the rollers of said sets, a tray or flat plate member adapted to be advanced through the tank thereby, means for simultaneously driving all of the rollers to advance a tray through the tank, means for producing yieldable pressure of the rollers upon the upper and lower edges of the trays, means for applying a spray of liquid to the trays during the initial part of their advance whereby the trays will be washed, means for supplying rinse water to the trays at the final part of their travel whereby the trays will be rinsed, and means for wiping the water from the trays as they are ejected from the tank.

JOHN JAMES ARMSTRONG.