E. ROBERTS & A. H. GIBSON.

APPARATUS FOR WASHING SUGAR.

APPLICATION FILED MAY 20, 1913.

1,224,095.

Patented Apr. 24, 1917.

3 SHEETS—SHEET 1.

Fig. 2.

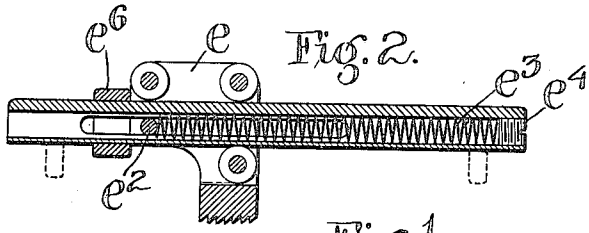



Fig. 3.

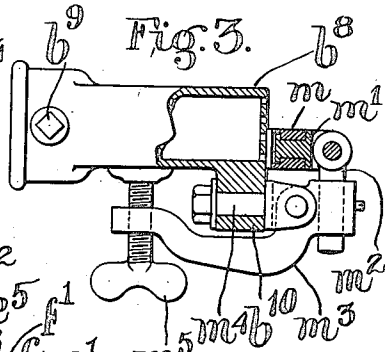



Fig. 1.

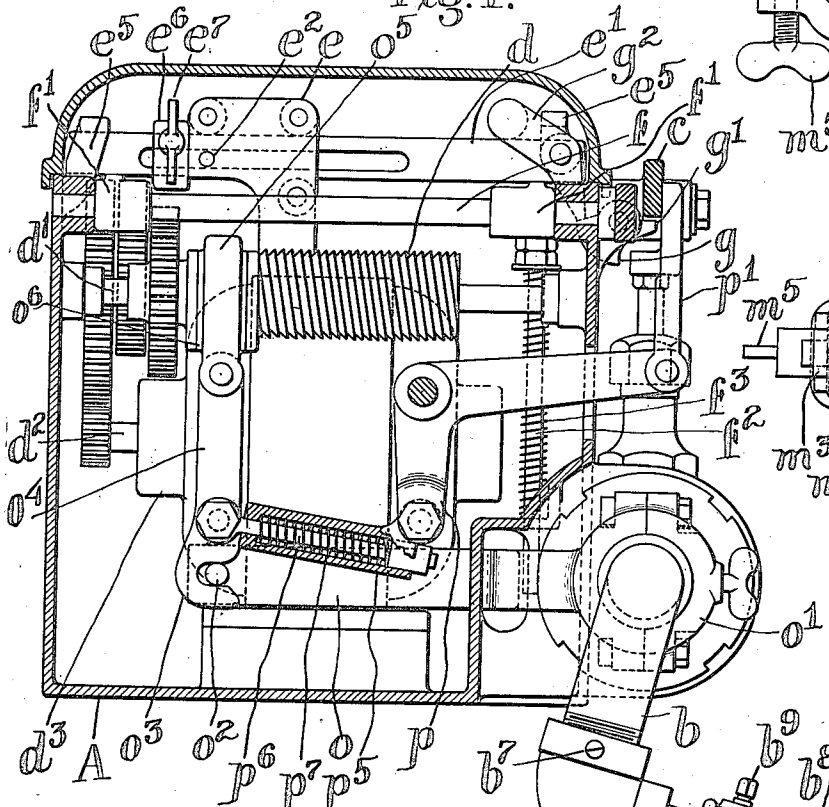
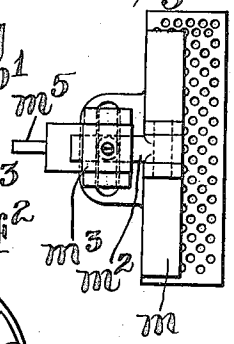
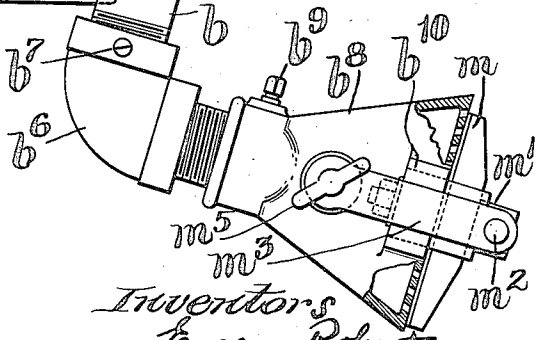



Fig. 4.




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3 SHEETS—SHEET 2.

Fig. 5.

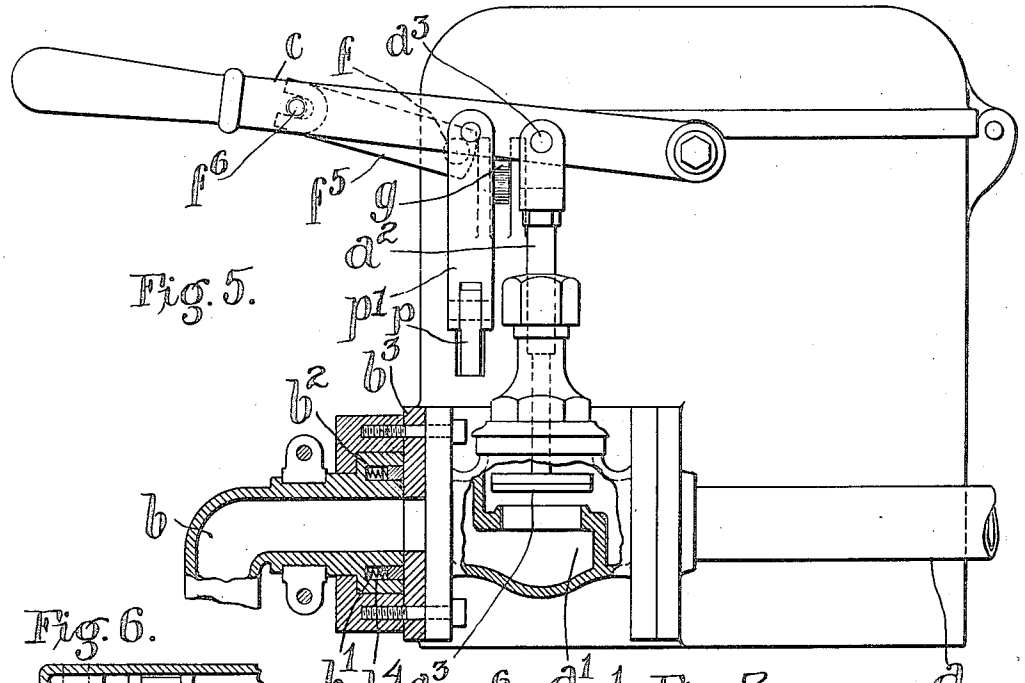



Fig. 6.

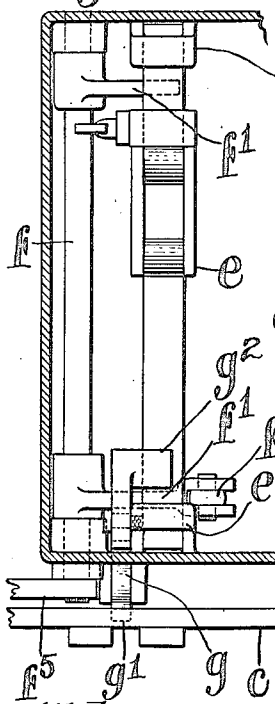
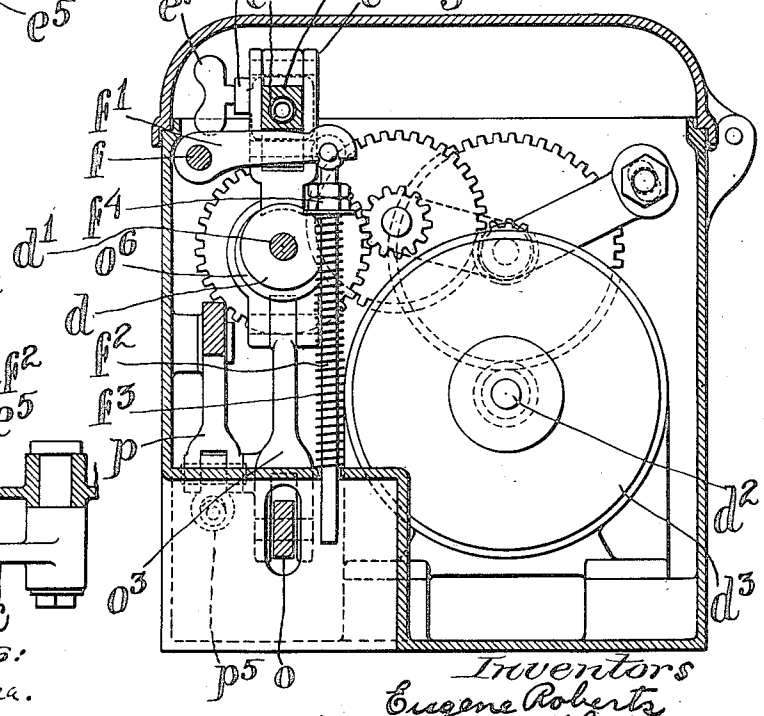



Fig. 7.




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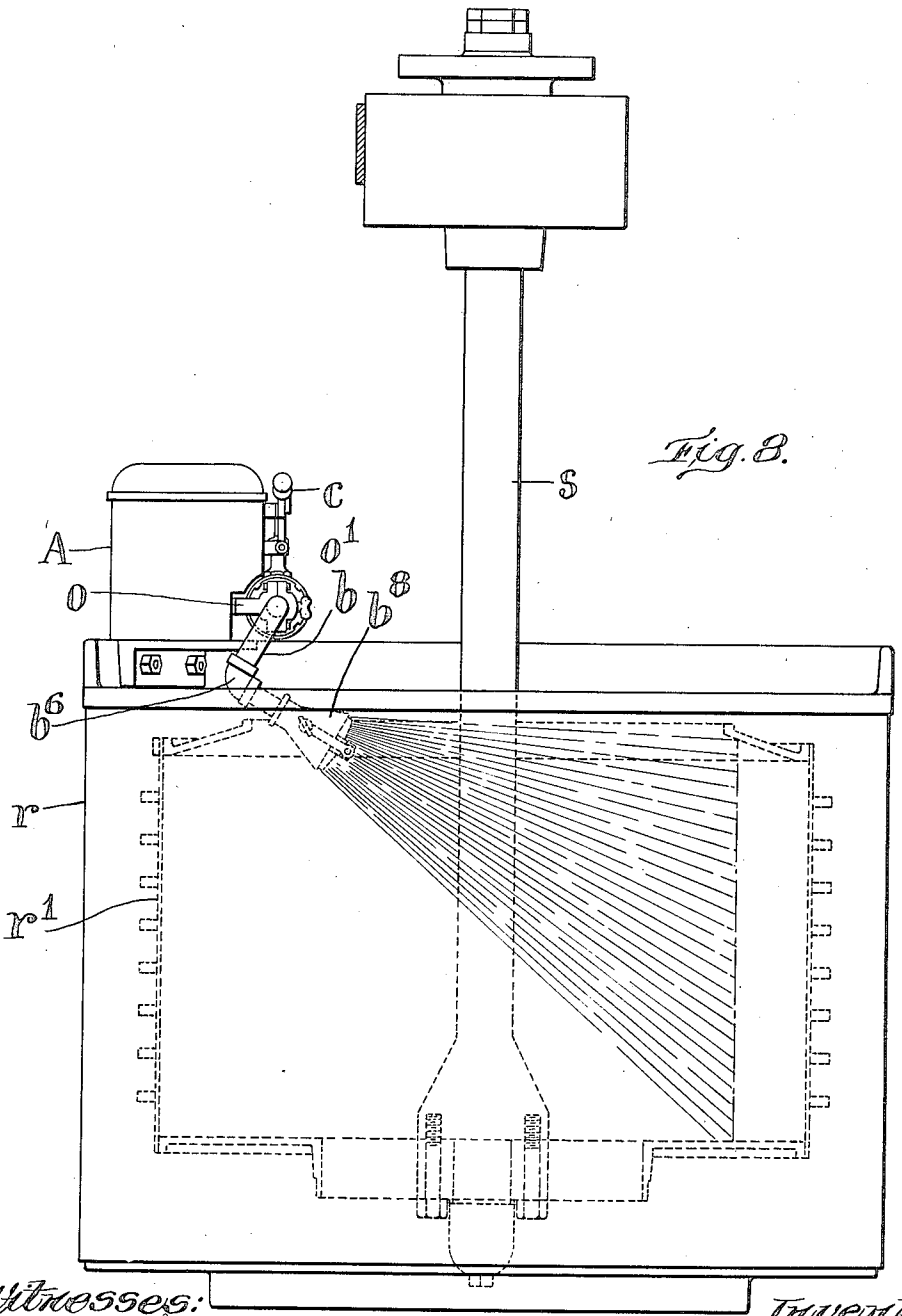
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3 SHEETS—SHEET 3.

Fig. 8.




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# UNITED STATES PATENT OFFICE.

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## APPARATUS FOR WASHING SUGAR.

1,224,095. Specification of Letters Patent. Patented Apr. 24, 1917.

Application filed May 20, 1913. Serial No. 768,767.

*To all whom it may concern:*

Be it known that we, EUGENE ROBERTS and ANGUS H. GIBSON, citizens of the United States, and residents of Lehi, county of Lehi, State of Utah, have invented certain new and useful Improvements in Apparatus for Washing Sugar, of which the following is a specification.

This invention relates to apparatus for washing sugar in centrifugal machines previous to discharging the sugar therefrom and is particularly intended to afford an efficient means whereby precisely the requisite amount of liquid is properly distributed over the wall of sugar for a predetermined length of time, the work being accomplished uniformly and automatically without the attendance of the operator.

The prevailing practice of washing the sugar in the centrifugal basket by means of a hand-hose held by the operator, commonly results in an uneven distribution of the spray over the surface of the sugar and results in waste because of lack of precision in amount of the fluid supplied and in the duration of the time of the washing operation.

Our present invention comprises generally speaking a spray nozzle combined with mechanism for giving the nozzle an even and uniform movement in the proper position of adjustment by automatic means, and also involves as a characteristic feature a valve cut-off combined with timing mechanism by which the duration of the washing period can be accurately regulated and controlled.

These and other features of the invention will be hereinafter described in detail and defined in the claims annexed hereto.

In the accompanying drawings is illustrated the preferred form of embodying the principles of this invention.

Figure 1 is a side elevation partly in section showing the working mechanism of our device;

Fig. 2 is a detail view in central section showing the relation of the supporting bar of the traveling member or carriage;

Fig. 3 is a plan view partly in section of our novel construction of nozzle and its regulating closure;

Fig. 4 is a front elevation of the same device shown in Fig. 3;

Fig. 5 is a front or end elevation showing the controlling lever and the valve mechanism;

Fig. 6 is a plan view showing the traveling member or carriage and the coöperating mechanism for lifting its supporting bar;

Fig. 7 is an end elevation partly in section on a plane at right angles to the plane of Fig. 1, the valve and nozzle being omitted;

Fig. 8 shows the relation of the nozzle to the basket.

It will be understood from the explanation hereinafter given that this device is started in operation by the lifting of the controlling handle by the operator which acts to bring a moving member into engagement with the rotary feed shaft for a predetermined number of revolutions, at the end of which the valve controlling the supply of fluid to the nozzle is automatically closed, and the reciprocation or oscillation of the nozzle being no longer required is terminated.

In practice the main part of the working apparatus is inclosed in a casing A which forms a support for the mechanism and forms a protection for such parts. The washing fluid is supplied through supply pipe $a$ leading to valve chamber $a'$ and delivery pipe $b$. The valve $a^3$ is of the reciprocating type and is controlled by the vertical valve stem $a^2$ which raises it from and lowers it to its seat in the valve chamber $a'$. The upper end of said valve stem is pivotally and adjustably connected with the main hand lever $c$ whose downward movement closes the valve and whose upward movement opens it.

The main actuating member comprises the rotary feed screw $d$ mounted on the main shaft $d'$ of the machine, which shaft is rotated at a constant speed by means of suitable gearing connecting it with the driving shaft $d^2$ of a small motor $d^3$.

The feed screw or member $d$, when the machine is in operation, is in engagement with a horizontally movable traveler or carriage $e$, which is mounted to travel along a vertically movable supporting bar $e'$ with which it has engagement preferably through the medium of anti-friction rollers. The supporting bar or guide-rail $e'$ is preferably tubular in order to receive a compression spring $e^3$ whose thrust at one end is sustained by an adjustable plug or screw $e^4$. The bar $e'$ is slotted to admit a cross pin $e^2$

secured to the carriage $e$ and projecting through the slot in position to engage the free end of said spring $e^3$ and compress the same as the carriage moves to the right. It is the function of this spring to automatically return the carriage to its initial position after it has performed its function of releasing the valve-controlling mechanism. The downwardly projecting portion of the traveler $e$ is notched or threaded to engage the thread of the feed screw $d$.

When the bar or guide rail $e'$ is in its lowermost position the threaded downwardly directed extension of the traveling member $e$ is in operative engagement with the feed screw, which causes said member to move toward the right. Each end of the guide bar $e'$ rests loosely in vertical guideways formed in the guide members $e^5$. The guide bar $e'$ is normally held in its raised position by means of the arms $f'$ which are secured to the rock shaft $f$, one of said arms being engaged by a vertical plunger rod $f^2$ (Fig. 7), which is normally pressed upward by means of a compressed spring $f^3$ engaging an adjustable thrust nut $f^4$ on the plunger rod. At one end of the rock shaft $f$ is secured an oppositely extended arm $f^5$ whose forked free end engages a pin $f^6$ on the hand lever $c$. The action of the spring $f^3$ is to lift the arms $f'$ and the guide rail $e'$ and to depress the free end of the arm $f^5$ and the hand lever $c$, the parts in this position keeping the releasing carriage $e$ out of engagement with the rotary feed screw $d$. In this position the parts, and also the valve stem $a^2$, will be depressed and the valve closed to cut off the supply of washing fluid.

To start the machine in action the operator raises the lever $c$, which through its connection with the rock shaft, by means of arm $f^5$, depresses the supporting arms, $f'$, thereby compressing the spring $f^3$ and at the same time allowing the guide rail $e'$ to drop down with the traveler $e$ in position to engage the feed screw. The lever $c$ is prevented from dropping by means of the pivoted gravity dog $g$, whose projecting tooth $g'$ is in position beneath the lever $c$ to engage it and hold it up against the action of the compressed spring $f^3$. The dog $g$ is held positively against turning by means of the gravity latch $g^2$, which is pivotally supported on front of one of the guide members $e^5$ in position to engage the dog, as best shown in Fig. 1. The free end of the latch $g^2$ extends into the path of the traveling member $e$, so that the traveler at the end of its movement forces the latch out of locking engagement with the dog $g$, so that the dog is free to yield to the pressure of the lever $c$ and allow said lever to descend, thus automatically closing the controlling valve and at the same time disengaging the nozzle-operating mechanism, as will be later explained, and also allowing the guide rail $e'$ to be raised by the arms $f'$, so as to detach the carrier from its engagement with the feed screw. The carrier when so detached is returned to initial position by the spring $f^3$, that position being determined by the position of the adjustable stop member $e^6$ on the guide bar $e'$, which stop is provided with a set screw for allowing it to be set to any desired position of adjustment. As the adjustable stop member $e^6$ is set nearer the latch $g^2$ it, of course, shortens the time required for the traveler to reach said latch, and in this manner the variation of the interval of time elapsing between the starting of the machine and the cutting off of the washing fluid may be varied at will.

There are three important points to be considered in connection with the action of the nozzle. First, it must be given a uniform movement to properly distribute the washing spray over the surface of the sugar, second the amount which it will deliver through any predetermined period should be capable of proper regulation and third it should be capable of being so adjusted with reference to the distance and extent of the surface of the sugar to be washed as to properly cover each portion of the surface exposed, since these elements vary according to the dimensions of the different centrifugal baskets employed in the refinery.

We will first describe the mechanism by which the nozzle is automatically moved to and fro. The delivery pipe $b$ is provided with a flanged head $b'$ having formed in its flat face an annular groove to receive an annular packing ring $b^2$, which is normally pressed against the face of the opposite flange $b^3$ of the valve chamber by means of springs $b^4$. The flanged head $b'$ is held in swiveled connection with the valve chamber by means of an internally rabbeted ring or cap $b^5$ which surrounds the flanged head and is bolted firmly to the valve $b^3$ of the valve chamber or casing. In this way the pipe $b$ is permitted to oscillate, while its connecting joint is provided with a packing to prevent leakage. The delivery pipe is provided with an elbow connection $b^6$ which is held in any desired angular adjustment by means of the set screw $b^7$.

The nozzle member $b^8$ has a flat perforated delivery wall with the perforations inclined to a common center, so as to deliver a fan-shaped spray. The nozzle is screwed onto the threaded nipple of the elbow $b^6$, and is held in any desired angle of adjustment by set screw $b^9$. To control the amount of water delivered, as well as its distribution, we have provided a plate or closure $m$, whose central part is bored, to hold a swivel-post $m'$, which post is pivotally supported by an eye-bolt $m^2$ adjustably held in the horizontally bored boss of the arm $m^3$. The sup-

porting arm $m^3$ is pivotally held in an adjustable clamping member $m^4$ which passes through the vertical slot formed in the lug $b^{10}$ on the side of the nozzle. A clamping nut $m^5$ serves to quickly set the closure-plate $m$ firmly against the perforated face of the nozzle in whatever position of adjustment it may be placed. The above described joints and connections make it possible to move the plate $m$ laterally across the face of the nozzle, or longitudinally thereof, besides making provision for its angular adjustment, so as to cover such portions of the holes as the operator may desire. It will be observed that the perforations at the top of the nozzle are made closer together than elsewhere in order to deliver slightly more water at this point than through any other corresponding like area of the nozzle. The size of the holes in proportion to the nozzle is exaggerated for the sake of a clear illustration, but those skilled in the art will understand that fine perforations should be used.

Any suitable mechanism may be employed for imparting an oscillatory movement to the nozzle in order to spread the spray over the surface of the sugar wall. The mechanism illustrated in the drawings for this purpose comprises the arm $o$, which is adjustably clamped around the delivery pipe $b$ by means of the split clamping member $o'$, so as to give any desired angular adjustment of the arm in relation to the nozzle. At its free end the arm is provided with a pin $o^2$ which is operatively engaged by a hook $o^3$ which is connected by a link $o^4$ to the ring $o^5$ encircling the eccentric cam $o^6$, secured to the rotary shaft $d'$. This eccentric raises and lowers the hook member, and thus so long as the hook member engages the pin $o^2$, serves to oscillate the lever $o$ and the nozzle $b^8$.

The movement of the nozzle is, of course, needful only during the actual time of washing the sugar, hence provision has been made for disengaging the lever $o$ from its connection with the hook when the valve is closed. This is accomplished by means of a bell-crank lever $p$, one end of which is connected by means of a link $p'$ with the hand lever $c$, while the other end is engaged by a spring extension connection with the link $o^4$. When the hand lever is depressed the bell crank lever $p$ is turned and thus throws the hook to the left out of engagement with the pin $o^2$. When the hand lever is raised to start the machine in operation, the hook is swung to the right. To prevent any possibility of breaking the parts in case the hook should abut against the pin $o^2$ when they are being operatively connected, we have made the connecting member in two telescoping parts $p^5$ $p^6$, with the compression or tension spring $p^7$ interposed, by which the longitudinal yielding of this extension member is permitted until the hook slips into place. This yielding extension feature is a mere safeguard to avoid accident and does not affect the essential operation of the mechanism.

We have shown in Fig. 8, the washing apparatus located on top of the curb surrounding the basket, with the nozzle carried downward into the basket. It will be seen that by adjusting the clamping collar $o'$ of the oscillating lever $o$ on the delivery pipe $b$, the nozzle can be given any desired angle of elevation or depression. Furthermore, by turning the elbow $b^6$ on the pipe $b$ as an axis, the nozzle may be adjusted laterally so that the spray will cut across a longer or a shorter chord of the basket in order to vary the distance between the line of impact of the spray on the sugar wall and the nozzle, the object being, by this adjustment, to make it possible to set the nozzle in proper position for the fan-shaped spray to completely cover the entire vertical width of the sugar wall whatever may be the diameter or the depth of the basket. The torsional adjustment of the nozzle $b^8$ on its supporting nipple makes it possible to adjust the plane of the fan-shaped spray toward or away from an exact vertical plane.

It will be understood that the washing apparatus is inoperative during the period of separating the syrup from the sugar, the hand lever being in the depressed or lowermost position, until such time as the machining of the sugar is completed. All that is required then is for the attendant to raise the hand lever, thus bringing the traveling member $e$ into operative engagement with the constant speed-controlling shaft $d$, from which point the whole washing operation is under absolute automatic control, and is regulated as to time by the setting of the stop member $e^6$, and as to the distribution of the water by the adjustment of the spray nozzle and of the damper or stop plate $m$.

The adjustability of the spray nozzle, both as to vertical width and lateral direction, is important in order to adapt it to baskets of different dimensions. The adjustability of the damper or plate $m$ is important because it makes it possible not only to vary the flow of the fluid through the nozzle, but also makes it possible to deliver a greater or less amount of fluid at either the top or bottom of the sugar wall, as may be desired. In cases where the sugar is machined at relatively slow speed, the sugar instead of walling-up on a vertical line will wall up obliquely, leaving the wall of sugar much thicker at the bottom than at the top. In such case the damper plate may be adjusted obliquely over the face of the perforated nozzle so as to expose a wider area of perforated nozzle at the bottom than at

the top, thus delivering the least quantity of water to the thinnest portion of the sugar wall and increasing the quantity delivered gradually, according to the increase in the thickness of the sugar wall. On the other hand where the sugar is machined at full speed and builds up in a vertical line, the part walled-up immediately underneath the upwardly sloping rim of the basket, where there are no perforations to allow the centrifugal escape of the sugar, the damper may be set to leave the whole or the greater part of the width of the perforated area at the top uncovered, to direct a greater amount of fluid at the sugar walled-up in this blind pocket of the basket. It will, therefore, be seen that the various adjustments of the damper give complete flexibility in properly distributing the supply of washing fluid to the various parts of walled-up sugar, according to particular conditions.

Since the only attention required from the operator is the moving of the hand lever to start the washing apparatus in operation, it is possible for one attendant to take care of many more machines than heretofore, besides regulating and controlling with absolute uniformity, in each case, the application and distribution of water in order to secure perfect washing without the waste incidental to excessive washing at any particular point.

In Fig. 8 the relative arrangement of the apparatus to the curb or casing $r$, and the centrifugal basket $r'$, supported by its gyratory shaft $s$, is shown in order that the various adjustments in relation to the basket may be made clear.

What we claim is:

1. An apparatus for washing sugar in centrifugal baskets, embracing in its construction a spray nozzle arranged to direct a liquid spray against the sugar collected on the inside wall of the basket, a spray pipe for conducting the washing liquid to said nozzle, a cut-off valve, a hand lever for opening said valve, an actuating shaft operating independently of the flow of the liquid, a valve closing device arranged to be operatively connected with said shaft by the valve opening movement of said lever, substantially as described.

2. An apparatus for washing sugar in centrifugal baskets, embracing in combination an oscillatory spraying nozzle, a liquid supply pipe leading thereto, a cut-off valve, a constantly rotating shaft, a valve controlling mechanism operatively connected with said shaft by the operation of opening the valve and oscillating mechanism for oscillating the spray nozzle, said oscillating mechanism being operatively connected with, and driven by said shaft, substantially as described.

3. In an apparatus for washing sugar in centrifugal baskets, the combination of an oscillatory spray nozzle arranged to direct a fan-shaped spray of liquid against the vertically walled sugar in the basket, a liquid supply pipe in communication therewith, a cut-off valve for said pipe, a controlling lever for operating said valve, a continuously rotating actuating shaft, a timing device for said valve, and an oscillating mechanism for oscillating said spray nozzle, said timing device and said oscillating mechanism being driven by said shaft when said valve is opened and being disconnected therewith when said valve is closed, substantially as described.

4. In an apparatus for washing sugar in centrifugal baskets, the combination of an oscillatory spray nozzle mounted to oscillate in a fixed substantially vertical plane, a supply pipe therefor, a cut-off valve for said supply pipe, a timing mechanism for controlling the closing of said valve, oscillating mechanism for oscillating said spray nozzle, a constantly running actuating member for operating said timing mechanism and said cut-off valve when said valve is open, both mechanisms being operatively engaged with said common actuating member by the valve opening means, substantially as described.

5. In an apparatus for washing sugar in centrifugal baskets, the combination of a liquid supply pipe, an oscillatory nozzle pivotally mounted upon said pipe in position to direct a substantially vertical fan-shaped spray against the sugar wall on the inside of the basket, means for automatically oscillating said spray nozzle in a substantially vertical plane, said spray nozzle being angularly adjustable to either side of said vertical plane in order to vary the vertical extent of said spray where it impinges against said wall of sugar, substantially as described.

6. In an apparatus for washing sugar in centrifugal baskets, the combination of a liquid supply pipe, a spray nozzle swiveled thereon, to oscillate in a substantially vertical plane, and arranged to deliver a vertical fan-shaped spray of liquid against the sugar collected on the inside wall of the basket, said nozzle being angularly adjustable in a vertical plane and in a direction transverse to said vertical plane, whereby the area of contact of impingement of said spray upon said sugar wall may be varied according to need, substantially as described.

7. In a sugar washing apparatus, the combination of a supply pipe, a cut-off valve for cutting off the supply of liquid, an oscillatory spray nozzle in communication with said supply pipe, valve controlling mechanism, a rotary shaft, means operated by en-

gagement with said shaft for actuating the valve controlling mechanism to control the valve after a predetermined interval, mechanism operatively connected with said rotary shaft and with said spray nozzle to oscillate said nozzle while said valve is open, substantially as described.

8. In a sugar washing apparatus, the combination of a spray nozzle, a supply pipe therefor, a cut-off valve, a hand lever for opening said valve, valve closing means, a continuously driven actuating member operated independently of the liquid supply, and a timing member operatively connected with said actuating member when the valve is open, and acting after a predetermined interval, to put into operation the valve closing means, substantially as described.

9. In a sugar washing apparatus, the combination of an oscillatory spray nozzle, a liquid supply pipe, therefor, an automatic cut-off valve for said supply pipe, a rotary shaft, a traveling carriage arranged to be operatively connected with said shaft by the operation of opening said valve, valve closing mechanism arranged to be set in operation by means of said traveling carriage at a predetermined point in its traverse, substantially as described.

10. In a sugar washing apparatus, the combination of an oscillatory spray nozzle, a liquid supply pipe therefor, a cut-off valve in communication with said pipe, a continuously rotating screw shaft, a movable timing device actuated by said screw shaft when the valve is open, to travel into position to cause the closing of said valve, after a predetermined interval, an adjustable stop device for varying the length of traverse of said movable timing device, and means independently connected with said shaft for causing said nozzle to oscillate while the valve is open.

11. In an apparatus for washing sugar in centrifugal baskets, the combination of a liquid supply pipe, an oscillatory spray nozzle connected therewith, a cut-off valve for said pipe, means for opening and closing said valve, automatic mechanism for controlling the valve closing means and for oscillating said spray nozzle, said automatic mechanism embracing a constantly running actuating shaft, and suitable connecting mechanism for operatively connecting the valve operating, and the nozzle oscillating means with said actuating shaft, automatically, by the operation of opening the valve.

12. A valve controlling mechanism embracing a lever connected with the valve stand, a constantly rotating screw shaft forming an actuating member, means for closing said valve, a traveling carriage arranged to be operatively connected with said actuating shaft by the valve opening movement of said lever, said carriage acting at the end of its traverse to set in operation the valve closing means, substantially as described.

13. A valve controlling mechanism embracing in combination with the valve and its valve stand, a rotary actuating shaft, a movable supporting bar mounted adjacent thereto, a timing member mounted on said supporting bar to be intermittently engaged and disengaged with said rotary shaft by the movement of said bar, automatic valve closing means, a detent for preventing the normal operation of said valve closing means, said detent being arranged to be disengaged from the valve closing means by the operation of said timing member, substantially as described.

14. In an apparatus for washing sugar, the combination with a supply pipe and its controlling valve, of an oscillatory spray nozzle pivotally connected with said pipe, to permit it to oscillate in a vertical plane, a rotary actuating shaft, driving means therefor, link and lever connection for operatively connecting said rotary shaft with said oscillatory spray nozzle, a timing mechanism operatively engaged with said shaft, and means whereby the operative connection between the oscillatory nozzle and its actuating connections are automatically interrupted by the agency of said timing mechanism, substantially as described.

In witness whereof, we have subscribed the above specification.

EUGENE ROBERTS.
ANGUS H. GIBSON.

In the presence of—
GEORGE A. ROCKWELL,
GEO. N. GODDARD.