

March 9, 1926.

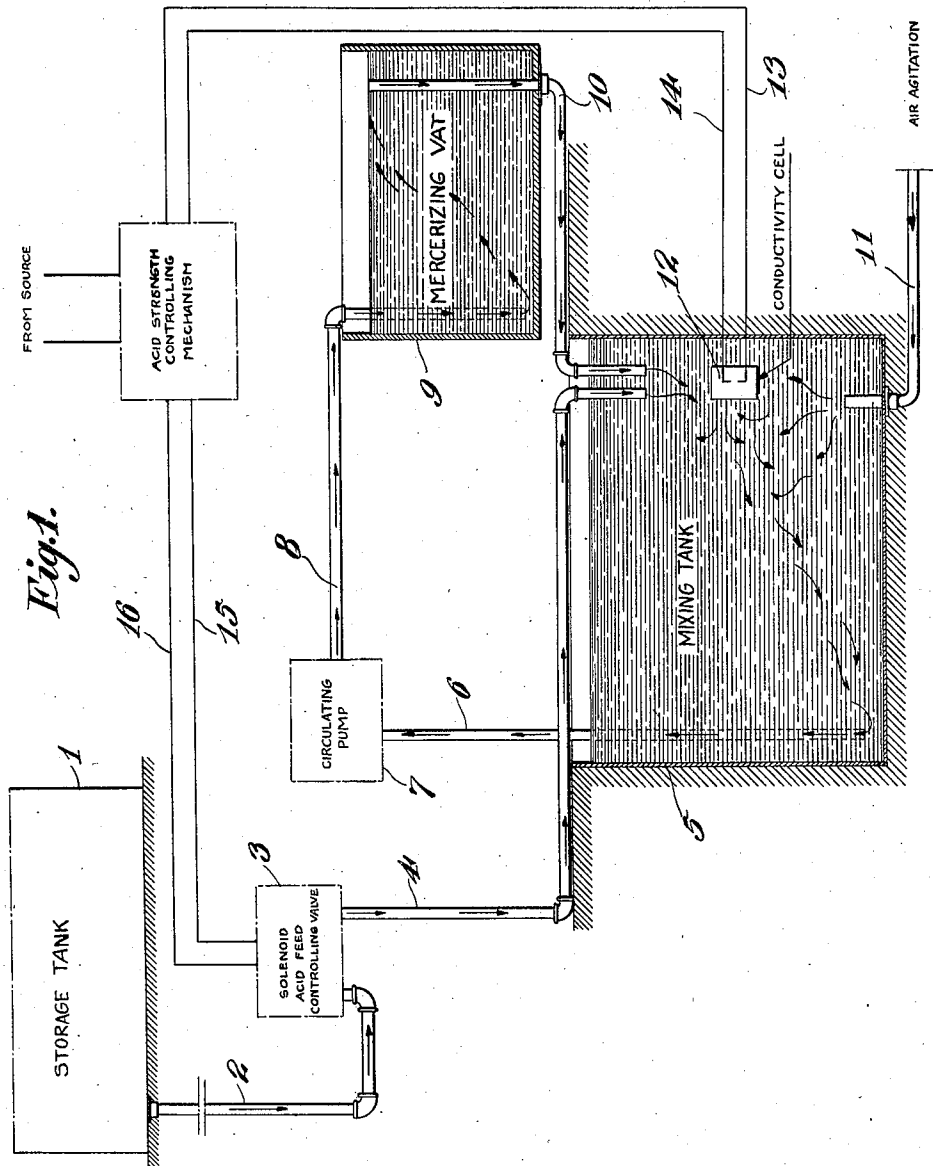
1,576,001

F. H. OLDEN

ACID STRENGTH MAINTAINING APPARATUS

Filed August 1, 1924

4 Sheets-Sheet 1



Witnesses:

Virgil L. Mares

George A. Eruss

Inventor

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By Joshua R. H. Foltz

His Attorney

March 9 , 1926.

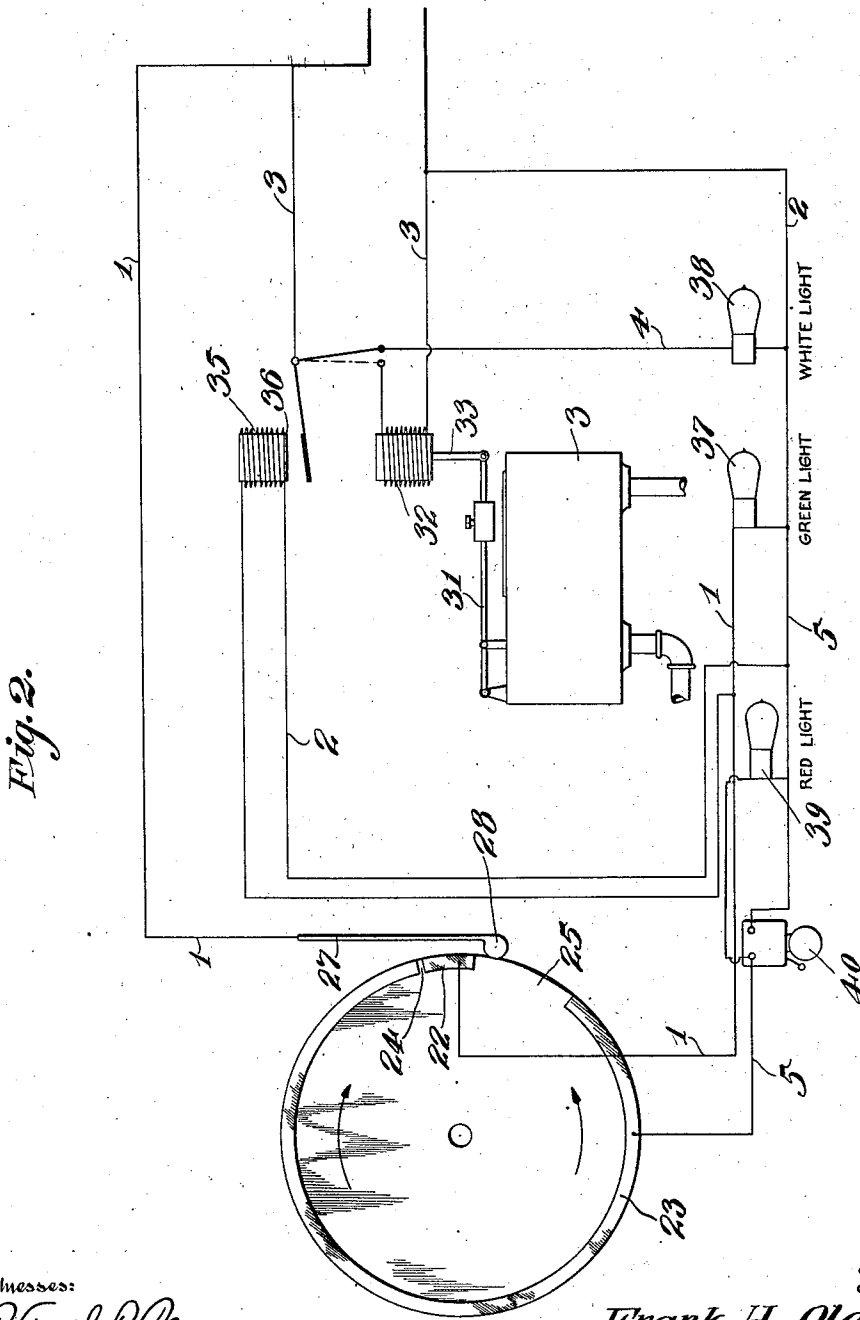
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4 Sheets-Sheet 2



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4 Sheets-Sheet 3

Fig. 5.

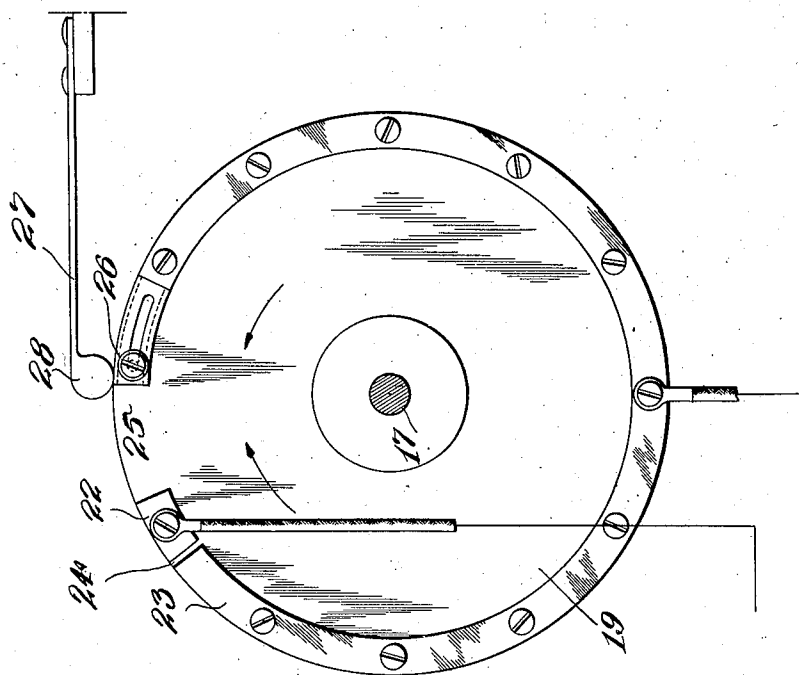
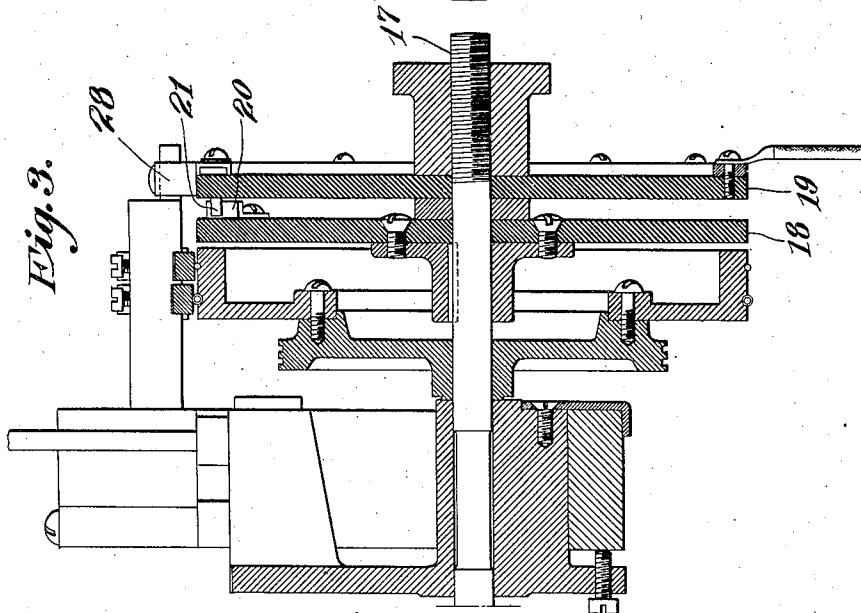


Fig. 3.



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4 Sheets-Sheet 4

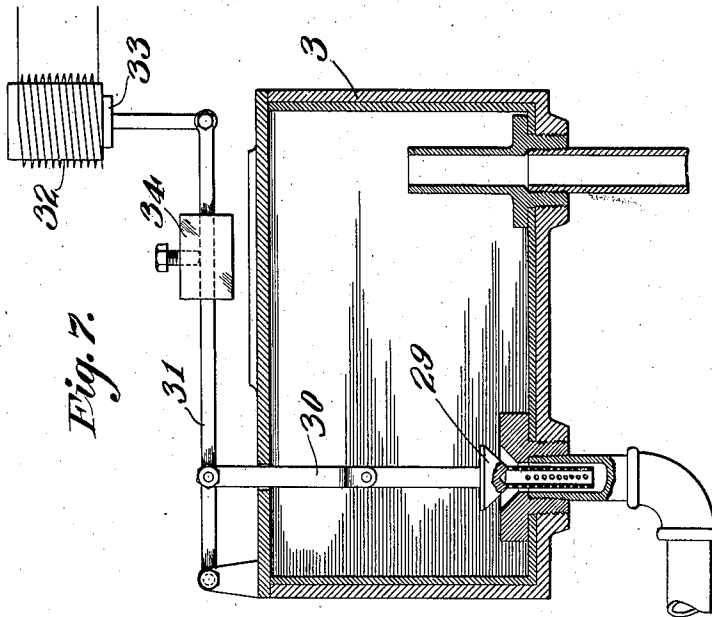


Fig. 7.

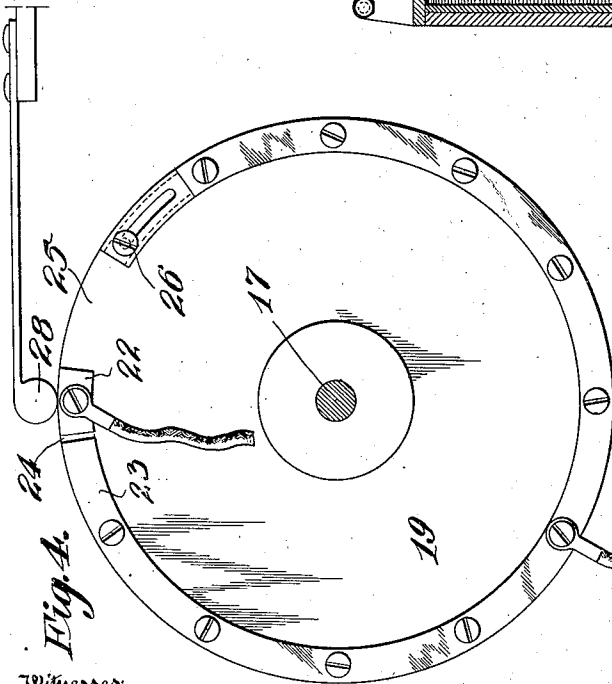


Fig. 4.

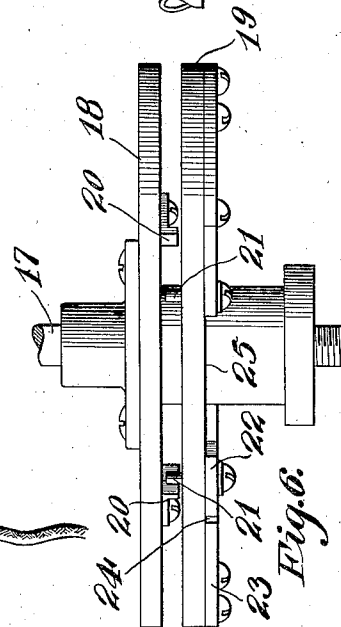


Fig. 6.

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Patented Mar. 9, 1926.

1,576,001

UNITED STATES PATENT OFFICE.

FRANK H. OLDEN, OF CHESTER, PENNSYLVANIA.

ACID-STRENGTH-MAINTAINING APPARATUS.

Application filed August 1, 1924. Serial No. 729,441.

To all whom it may concern:

Be it known that I, FRANK H. OLDEN, a citizen of the United States, residing at Chester, in the county of Delaware and State of Pennsylvania, have invented certain new and useful Improvements in Acid-Strength-Maintaining Apparatus, of which the following is a specification.

In mercerizing cotton yarn, the yarn is immersed in a caustic solution then washed in an acid solution to neutralize the caustic. To get the best results the acid solution in the mercerizing vats must be maintained at a practically constant strength. Sulphuric acid is generally used. Neutralization reduces the strength of the acid solution and, as the work proceeds, more acid must be introduced. Under the usual practice, constant, careful and intelligent attention has been required and, even with the utmost care, the results have been unsatisfactory. The objects of my invention are to provide mechanism whereby the acid solution is automatically supplied and withdrawn from the mercerizing vats; mechanism whereby the strength of the acid solution in the vats is automatically controlled and maintained, and mechanism whereby, in case the automatic controlling mechanism for any reason fails to function, a visible or audible signal, or both, will be automatically actuated.

These objects, and other advantageous ends which will be described hereinafter, I attain in the following manner, reference being had to the accompanying drawings in which

Figure 1 is a diagrammatic view showing mercerizing apparatus embodying my invention,

Figure 2 a like view showing the electrical connections and signaling mechanism,

Figure 3 a sectional view of the recording and actuating mechanism,

Figure 4 an end elevation of the same looking toward the left of Figure 3 showing one active position of the mechanism,

Figure 5 a like view showing another active position of the mechanism,

Figure 6 a side elevation of part of the actuating mechanism, and

Figure 7 a vertical longitudinal section of the feed controlling valve.

In the drawings the numeral 1 indicates a storage tank for acid, 2 a pipe leading therefrom to a feed-controlling valve 3, 4 an over-

flow pipe leading therefrom to a mixing tank, or well 5, 6 a pipe leading from the mixing tank to a circulating pump 7, 8 a pipe leading from the circulating pump to a mercerizing vat 9 and discharging near the bottom of the tank, 10 an overflow pipe leading from the upper part of the mercerizing vat into the mixing tank, 11 a pipe leading into the mixing tank through which air is driven under pressure to agitate the contents of the tank, 12 a conductivity cell in the mixing tank, 13 and 14 leads from the conductivity cell to an acid strength controlling and recording mechanism and, 15 and 16 leads from the controlling and recording mechanism to the acid feed-controlling valve.

The controlling mechanism is actuated by a shaft 17 (see Figures 3 and 6) to which an intermittent rocking motion is imparted through the agency of a member, movable in response to a change, such as a galvanometer needle. The mechanism which actuates the shaft may be of the well known type manufactured by the Leeds & Northrup Co. of Philadelphia, Pa., under Letters Patent of the United States, No. 965,824, granted M. E. Leeds, July 26, 1910 for recorder. To this shaft is fixed a member 18 of insulating material such as fibre, and preferably of disk form which co-operates with a disk 19, of like material, loosely mounted on the same shaft. Member 18 is provided with opposed lugs 20 adapted to engage pins 21, projecting from disk 19, and thereby impart a limited motion upon its axis to disk 19. The disk carries on its outer face segmental plates 22 and 23, of electrically conducting material separated by air gaps 24 and 25, the latter being the wider and preferably adjustable as indicated at 26. An electrically conducting arm 27, mounted upon a stationary part of the frame, carries a contact member 28 which engages with the periphery of disk 19. In its idle or neutral position this contact member engages with that part of the disk which includes the air gap 25 as indicated in Figure 2. As the acid solution in the system falls below the required strength, the conductivity cell in co-operation with the controlling mechanism imparts motion to rock shaft 17 and fixed member 18 which in turn imparts a partial rotation in clockwise direction to disk 19 thereby bringing contact member 28 into contact with segmental plate 22 which is in electrical connection with the

acid feed-controlling valve, the arrangement being such that the valve is opened when the circuit is closed. When the strength of the acid in the mixing tank exceeds a predetermined limit the direction of movement of shaft 17 is reversed and a partial rotation in contraclockwise direction, imparted to disk 19, thereby freeing contact member 28 from engagement with plate 22, breaking the circuit and closing the feed valve.

Lugs 20 are spaced a greater distance apart than pins 21 and the adjustment is such that when a contact is broken one of the lugs on member 18 will continue to actuate disk 19 until the segmental plate is sufficiently removed from contact member 28 to prevent sparking and, when member 18 rocks in the reverse direction, its other lug 20 will not engage the corresponding pin until member 18 has traveled a part of its movement in that direction.

If the mechanism is so adjusted that the contact making member is actuated by an infinitesimal change in the strength of the acid, contacts will be made in very rapid succession and there will be a rapid disintegration of the contacting parts. With the double disk arrangement with the lugs spaced more widely than the pins, the acid weakens somewhat below the required degree before disk 19 begins to move in one direction, and strengthens somewhat above the required degree before the movement of the disk is reversed, but the slight deficiency or excess of strength need not be sufficient to have any practical effect upon the mercerizing process.

The inflow of acid to the mixing tank 5 is regulated by a valve 29 connected by a link 30 with a lever 31 which is connected with an armature 32 of a solenoid switch 33. Lever 31 carries a counterweight 34 slidable thereon which is adapted to counterbalance the pressure of the acid coming in from the storage tank and thereby permit the valve to be actuated by a minimum of power. 35 indicates a second solenoid switch and 36 its armature. 37 indicates a green light, 38 a white light, 39 a red light and 40 an audible signal such as a bell.

An electric circuit 1 leads from a generator, not shown, through arm 27, segment plate 22 and green light 37 to the generator. A shunt circuit 2 leads through solenoid switch coil 35 and actuates its armature 36 to close a circuit 3, of higher voltage, leading through solenoid switch coil 33 and adapted to actuate armature 32 to open valve 29. A circuit 4 leads through white light 38 and is closed when armatures 32 and 36 are released.

If, for any reason, the mechanism fails to function properly, the movement of disk 19 in either direction will continue until contact member 28 engages segmental plate 23

when an alarm circuit 5, including bell 40 and red light 39, will be closed.

The green light indicates that contact member 28 is in engagement with segmental plate 21 and that circuit 1 is closed. The white light alone indicates that contact member 28 is in neutral, or inoperative, position and the switch functioning properly. The red light and the bell indicate trouble.

The circulating pump, in co-operation with overflow pipe 10, maintains a constant circulation of acid between the mixing tank and the mercerizing vat, the acid solution in the mercerizing vat being maintained at a constant level by the overflow pipe. The acid feed pipe 4 and overflow pipe 10 preferably enter the mixing tank at adjacent points in order that the strong acid coming from the storage tank and the weak acid coming from the mercerizing vat may be at once intermingled.

The air pipe preferably enters the mixing tank at a point below the discharge ends of pipes 4 and 10 in order that the agitation of the contents may be most effective where the strong and the weak acid streams meet.

In the normal operation of the device, when the strength of the acid solution in the mixing tank falls materially below the desired strength, the controlling device, influenced by the conductivity cell, operates to impart movement to rock shaft 17 and thereby to disk 19 which moves rotatably to bring plate 22 into contact with member 28 which closes a circuit by which valve 29 is opened and strong acid discharged into the mixing tank. When the strength of the acid solution in the mixing tank rises to a predetermined limit, the rotary movement of disk 19 is reversed and the circuit broken thereby closing valve 29 and stopping the inflow of liquid from the storage tank to the mixing tank. If, for any reason the switch or the valve fails to function and the strength of the acid in the mixing tank rises above or falls below the normal limits, disk 19 continues to rotate until one end of segmental plate 23 is moved into engagement with contact member 28, the alarm circuit is closed, bell 40 caused to ring and the red signal lamp lighted thereby summoning an attendant.

While I have described my invention as taking a particular form, it will be understood that the various parts of my invention may be changed without departing from the spirit thereof, and hence I do not limit myself to the precise construction set forth, but consider that I am at liberty to make such changes and alterations as fairly come within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. Acid strength controlling apparatus in-

cluding a feed-controlling valve; an electric circuit whereby the valve may be actuated; a rock shaft; a disk of non-conducting material loosely mounted thereon; a plate of conducting material carried by the disk; a conducting member in the valve circuit, engaging the disk and normally out of contact with the plate, and a member fixed to the rock shaft and adapted to impart movement to the disk to make or break contact between the conducting plate and the conducting member thereby closing or opening the valve circuit.

2. Acid strength controlling apparatus including a feed-controlling valve; an electric circuit whereby the valve may be actuated; a rock shaft; a disk of non-conducting material loosely mounted thereon; a segmental plate of conducting material carried by the disk; a conducting member engaging the disk, normally out of contact with the segmental plate, and adapted when the segmental plate is moved into contact therewith to close the valve circuit, and a member fixed to the rock shaft adapted to impart movement to the disk to move the segmental plate into or out of contact with the conducting member to make or break the valve circuit.

3. Acid strength controlling apparatus including a feed-controlling valve; an electric circuit whereby the valve may be actuated; a rock shaft; a disk of non-conducting material loosely mounted thereon; a member fixed to the rock shaft; a segmental plate of conducting material carried by the disk; a conducting member in the valve circuit, engaging the disk and normally out of contact with the segmental plate, and co-acting elements on the fixed member and the disk whereby the fixed member may impart movement to the disk to move a segmental plate in or out of contact with the conducting member thereby closing or opening the valve circuit.

4. Acid strength controlling apparatus including a feed-controlling valve; an electric circuit whereby the valve may be actuated; a rock shaft; a disk of non-conducting material loosely mounted thereon; a member fixed to the rock shaft; a segmental plate of conducting material carried by the disk and a conducting member in the valve circuit engaging the disk, but normally out of contact with the conducting plate; pins projecting from the disk; lugs carried by the fixed member adapted to engage the pins and impart movement to the disk, the lugs being more widely spaced than the pins, and a conducting member in the valve circuit, adapted when the conducting plate is moved in or out of contact therewith to make or break the valve circuit.

5. Acid strength controlling mechanism including an acid feed-controlling valve; a

rock shaft; a disk of non-conducting material loosely mounted upon the shaft; a segmental plate of conducting material carried by the disk; electrical connections between the segmental plate and the feed-controlling valve, and a conducting member engaging the disk and adapted, when the segmental plate is moved into contact therewith, to close an electric circuit through the feed controlling valve and open the valve.

6. In acid strength controlling mechanism including a feed-controlling valve and means whereby the valve will be opened as the strength of the acid decreases, and closed as the strength of the acid increases, a safety device comprising a signal device; a rock shaft; a disk of non-conducting material loosely mounted upon the shaft; a segmental plate of conducting material carried by the disk; electrical connections between the segmental plate and the signal device, and a conducting member engaging the disk and adapted, when the segmental plate is moved into contact therewith, to close an electric circuit through the signal device and actuate the signal.

7. Acid strength controlling apparatus including a solenoid; a feed valve; a lever connected with the armature of the solenoid and with the valve; a counterweight on the lever adapted to neutralize the pressure of the incoming acid, and connections between the controlling device and the solenoid whereby the valve will be opened as the strength of the acid in the mixing tank decreases and closed when the acid reaches a predetermined strength.

8. Acid strength controlling mechanism including an acid feed-controlling valve; a signal device; a rock shaft; a disk of non-conducting material loosely mounted upon the shaft; segmental plates of conducting material carried by the disk and spaced apart; electrical connections between one of the segmental plates and the feed-controlling valve; electrical connections between the other segmental plate and the signal device, and a conducting member engaging the disk and adapted, when one of the segmental plates is moved into contact therewith, to close a circuit through the feed-controlling valve, and, when the other contact plate is moved into contact therewith, to close a circuit through the signal device.

9. Acid strength controlling apparatus including a feed-controlling valve; an electric circuit whereby the valve may be actuated; a storage tank; a mixing tank; a rock shaft; a disk of non-conducting material loosely mounted thereon; a member fixed to the rock shaft and adapted to impart movement to the disk; a segmental plate of conducting material carried by the disk; a conducting member engaging with the disk and adapted, when the segmental plate is moved into con-

tact therewith, to close the valve actuating circuit; a conductivity cell in the mixing tank, and means, controlled by the conductivity cell, for imparting movement to the rock shaft.

10. Acid strength controlling apparatus including a feed-controlling valve; an alarm signal; electric circuits whereby the feed valve and the alarm circuit may be actuated; a rock shaft; a disk of non-conducting material loosely mounted thereon; segmental plates of conducting material carried by the disk and spaced from each other; a conducting member engaging the disk, normally out of contact with the plates and adapted, when one of the segments is moved into contact therewith, to close the valve actuating circuit and, when the other plate is moved into contact therewith, to close the alarm circuit, and means on the rock shaft to actuate the disk to make and break the contact.

11. Acid strength controlling apparatus including a feed-controlling valve; a visible alarm signal; an audible alarm signal; an electric circuit adapted to actuate the valve; an electric circuit adapted to actuate the alarm signals; a rock shaft; a disk of non-conducting material loosely mounted thereon; segmental plates of conducting material carried by the disk and spaced from each other; a conducting member engaging the disk, normally out of contact with the plates and adapted, when one of the plates is moved into contact therewith, to close the valve actuating circuit and, when the other plate is moved into contact therewith, to close the alarm circuit, and means on the rock shaft to actuate the disk to make and break the contact.

In testimony whereof I have signed my name to this specification.

FRANK H. OLDEN.