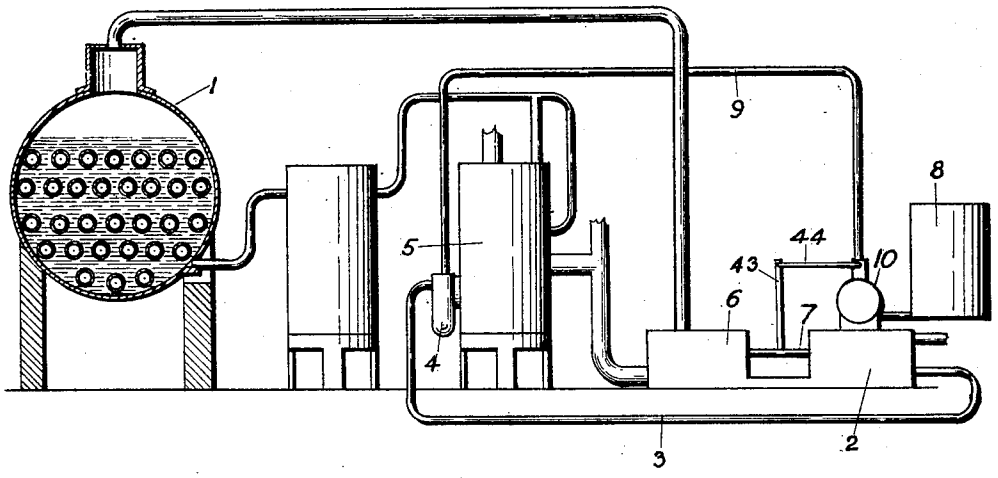
Nov. 8, 1932. V. L. HOLLINGSWORTH 1,886,679

SOLUTION FEED FOR BOILERS

Filed April 12, 1930 3 Sheets-Sheet 1

FIG. 1.



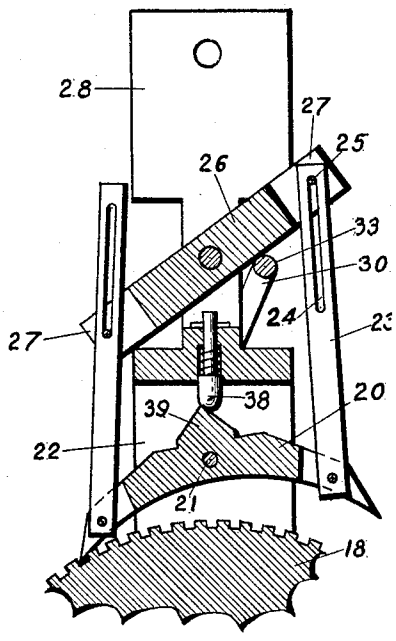


FIG. 6

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SOLUTION FEED FOR BOILERS

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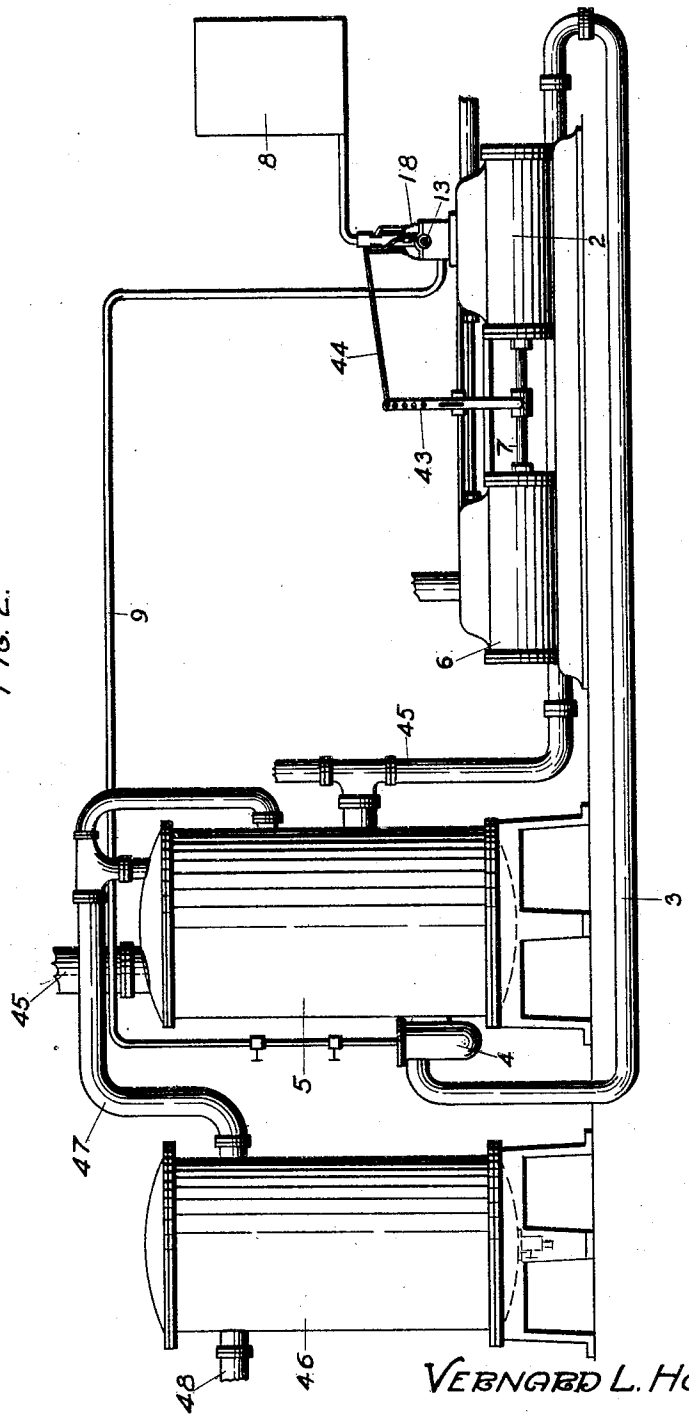


FIG. 2.

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SOLUTION FEED FOR BOILERS

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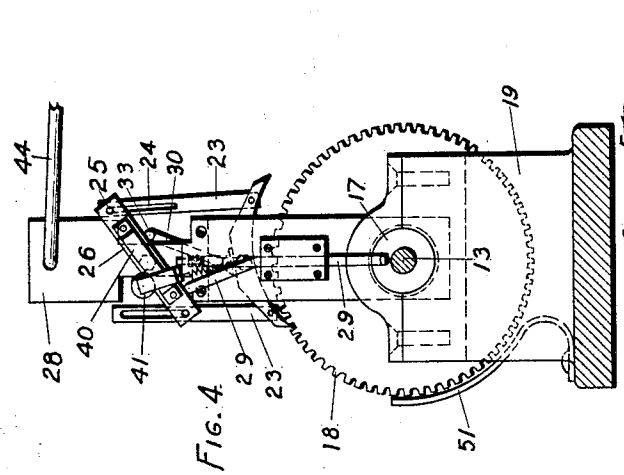


FIG. 4.

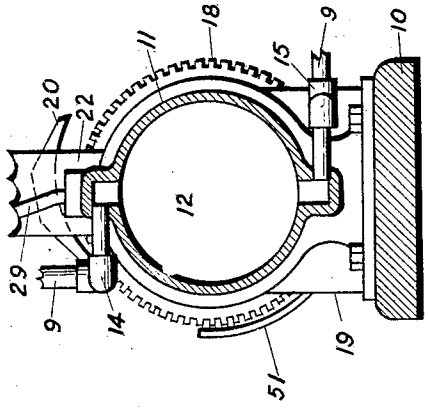


FIG. 5.

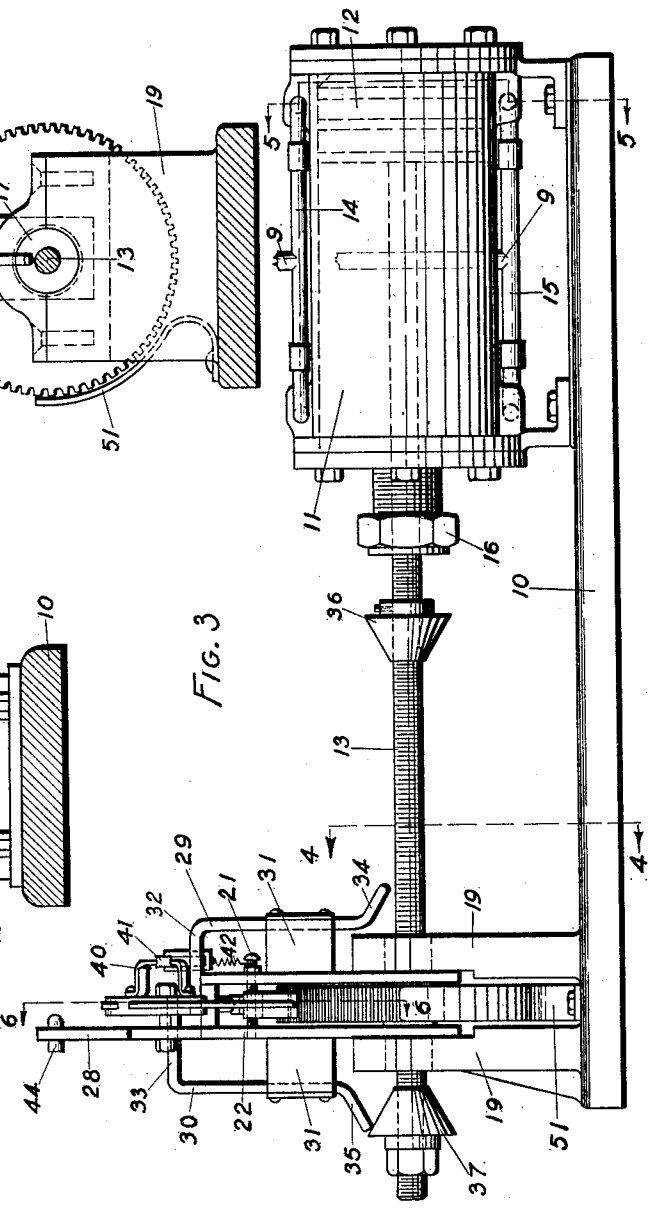


FIG. 3.

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Patented Nov. 8, 1932

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UNITED STATES PATENT OFFICE

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SOLUTION FEED FOR BOILERS

Application filed April 12, 1930. Serial No. 443,894.

This invention relates to a solution feed means for boilers or the like, and one feature of the invention is the provision of means for discharging uniform quantities of the solution into the water while feeding to the boiler.

A further feature of the invention is the provision of means for forcing the solution into commingled relation with the water.

A further feature of the invention is the provision of means for operating the force feed mechanism from the water pumping mechanism.

A further feature of the invention is the provision of means for automatically reversing the operation of the force feed mechanism for the solution.

A further feature of the invention is the provision of means for heating the commingled water and solution before being discharged into the boiler.

A further feature of the invention is the provision of a filtering medium through which the commingled water and solution is passed before being entered into the boiler and in which the foreign particles removed from the water by the solution are collected.

Other objects and advantages will be hereinafter more fully set forth and pointed out in the accompanying specification.

In the accompanying drawings which are made a part of this application,

Figure 1 is a diagrammatic view of a boiler construction with a solution feeding mechanism associated therewith.

Figure 2 is a side elevation of the solution feeding mechanism in operative position.

Figure 3 is an enlarged detail elevation of the solution feeding mechanism proper.

Figure 4 is a sectional view thereof as seen along line 4—4, Fig. 3.

Figure 5 is a detail sectional view as seen along line 5—5, Fig. 3, and,

Figure 6 is a detail sectional view as seen along line 6—6, Fig. 3.

Referring to the drawings in which similar reference numerals designate corresponding parts throughout the several views, the numeral 1 designates a boiler construction, such as is used in producing steam for various purposes and may consist of a single boiler or a battery of boilers.

In steam boilers of this nature, lime is extracted from the water when heated and adheres to the walls of the boiler to such an extent as to retard the heating of the contents of the boiler and also injures the walls thereof, unless the boiler is frequently cleansed, said cleansing operation being arduous as well as expensive, incident to the closing down of the boiler and blowing the same out.

To obviate these objectionable features, except possibly at infrequent intervals, a solution or compound is fed into the water feeding to the boiler so as to separate the lime forming properties from the water before it is entered into the boiler.

To this end the water is conveyed from the water pump 2, through a pipe 3, to a mixing chamber 4 and thence into a heating chamber 5, the pump 2 being operated by means of an engine 6, connected to the pump by means of a common piston rod 7. A tank 8 is suitably mounted adjacent the pump 2 for containing a supply of solution or compound to be fed into the water before it is entered into the heating chamber 5, the solution being conveyed from the tank to the mixing chamber through a pipe line 9.

In order to provide a uniform feed of the solution from the tank 8 to the mixing chamber 4, the solution is passed through a solution pump 10, preferably mounted over the water pump 2, said solution pump comprising a cylinder 11, in which is mounted a piston 12, which is in turn connected to an operating shaft 13. The solution is fed from one section of the pipe line 9, into the opposite ends of the cylinder 11 through a cross pipe 14 and is discharged from the opposite ends of the said cylinder into the remaining section of the pipe line 9 through a cross pipe 15, the end of the cylinder from which the solution is discharging depending upon the direction of travel of the piston 12.

The piston 12 is moved from end to end of the cylinder 11, by the shaft 13, said shaft extending through a suitable packing box 16, at one end of the cylinder and is threaded

throughout its length and extends through the threaded hub 17 of an operating gear 18, said gear being mounted between standards 19, extending upwardly from the base of the solution pump structure 10, so that when the gear 18 is rotated, the shaft 13 and piston 12 will be moved lengthwise of the cylinder 11.

The gear 18 is rotated by means of a pawl 20, which is pivotally mounted on a bearing pin 21 extending transversely of the gear 18 and through the arms of a yoke 22, the lower ends of the arms of the yoke being pivoted on the shaft 13, so that the yoke may be swung back and forth, carrying the pawl therewith and so long as one end of the pawl is in engagement with the teeth of the gear 18, said gear will be rotated intermittently as the yoke is swung on its pivot. By pivoting the pawl 20 at its longitudinal center and pointing both ends thereof, the pawl may be rocked on its pivot and either end thereof engaged with the teeth of the gear 18 for controlling the direction of rotation of the gear. In order to automatically operate the pawl 20 for reversing the rotation of the gear 18, as when the piston 12 has moved to one end of the cylinder 11, and elongated link 23 is pivoted to each end portion of the pawl 20, the upper end portions of the links having elongated slots 24, through which take pins 25 at the ends of a rocking beam 26, the ends of the rocking beam having slots 27 for the reception of said links.

The rocking beam 26 is pivotally mounted to the lever portion 28 of the yoke 22, so that by rocking the beam until one or the other of the pins 25 engages with the upper end of its respective slot 24, the engaging end of the pawl will be raised out of engagement with the teeth of the gear 18 and the opposite end thereof engaged with the teeth of the gear, thus reversing the rotation of the gear.

The beam 26 is rocked on its pivot by means of plungers 29 and 30, which are vertically slidable through blocks 31 attached to opposite faces of the yoke 22, the upper ends of the plungers having inwardly extending fingers 32 and 33 respectively, which extend beneath the rocking beam 26, on opposite sides of the pivotal point thereof, while the lower ends of the plungers terminate in inclined extensions 34 and 35, respectively, for engagement with the cone faces of trip blocks 36 and 37, respectively, and adjustably attached to the shaft 13, on opposite sides of the gear 18.

The pawl 20 is normally held in its tilted position in any suitable manner, as by means of a spring pressed pin 38, the free end of which is preferably rounded for engagement with a tapered shoulder 39 on the pawl 20 and by so tapering the faces of the shoulder 39, that the apex thereof will swing past the axial line of the pin 38, the pin will direct lateral pressure against the shoulder and thus normally hold the pawl against undue swinging action. To provide a sufficient yielding action of the pawl 20, so that the point thereof contacting with the teeth of the gear 18 may ride over the teeth, on the back stroke of the yoke 22, and to assist the pin 38 in directing the ends of the pawl into engagement with the gear teeth, a track forming member 40 is attached to one face of the rocking beam 26 and on said track is mounted a roller 41, to which is attached one end of a tension spring 42, the opposite end of the spring 42 being attached to any suitable anchoring point on the yoke 22, in this instance the bearing pin 21. The tilt of the track 40 is such that the roller will ride past the longitudinal center of the rocking beam 26, the tension of the spring 42 thus aiding the spring controlled pin 38 in retaining the operating end of the pawl in engagement with the teeth of the gear 18.

The yoke 22 is rocked back and forth by the action of the piston rod 7, to the longitudinal center of which is fixed a standard 43, to the upper end of which is adjustably attached a pitman 44, the opposite end of said pitman being attached to the lever portion 28 of the yoke 22, so that when the piston rod moves into the cylinder 11, the yoke will be swung in one direction and will be swung in the opposite direction on the return stroke of the piston rod.

In order to heat the commingled water and solution, the exhaust steam from the engine 6 is carried through the interior of the heating chamber 5, through the medium of an exhaust pipe 45 and this heated product is then carried into a filter 46, through the medium of a pipe 47 and thence through a pipe 48 into the boiler structure 1, the lime forming products in the water being separated from the water and retained within the filter 46, from whence it may be drained in any suitable manner and without passing through the boiler. The steam is conducted from the boiler 1 to the engine 6, through a pipe 49 and the water is conducted to the pump 2, from any suitable source, through a pipe 50.

The operation of the feeding device is as follows, the piston 12 having reached its maximum stroke in one direction and the extension 35 having ridden upwardly on the inclined face of the trip block 37, the pawl 20 will be tilted to the position shown in Figs. 4 and 6, so that with each stroke of the piston rod 7 towards the pump 2, the gear 18 will be rotated clockwise a prescribed distance and the piston 12 moved a corresponding distance toward the opposite end of the cylinder 11 and when the piston rod 7 is moved toward the engine 6, the pawl 20 rides over the teeth of the gear 18 and posi-

tions for further rotating the gear, when the piston rod again moves toward the pump 2. This operation continues until the cone shaped block 36 engages the extension 34 and forces the same upwardly a sufficient distance to rock the beam 26 on its pivot a sufficient distance to cause the pin 38 to snap over the apex of the shoulder 39 and the roller 41 to move to the opposite side of the center of the beam 26, thus lowering the opposite end of the pawl into engagement with the teeth of the gear 18 and reverse the rotation of the gear or to cause the same to rotate counter-clockwise and cause the piston 12 to begin its movement towards the opposite end of the cylinder 11. Any suitable means, such as a spring brake 51, may be utilized for preventing undue rotation of the gear, incident to the movement of the pawl in either direction.

By means of the present structure, a uniform feed of the solution will result, as a prescribed amount of the solution is fed into the water with each impulse of the piston 12 in either direction.

It will likewise be seen that the impulses of the piston are continued throughout the operation of the engine and pump, and by intermittently feeding the solution into the water, the last injection of solution will have had time to perfect its object before a new supply of solution is injected into the water, thus greatly conserving the supply of solution and at the same time supplying just the right quantity to properly separate the lime forming properties from the water before being entered into the boiler construction.

It has heretofore been the practice to inject successive quantities of boiler compounds into the feed water line of a boiler system by means of a small-volume reciprocating pump the unit capacity of which is such that a complete piston stroke, timed with relation to the stroke of the feed water pump, will deliver into the feed water a properly proportioned volume of boiler compound. There are certain efficient boiler compounds now on the market, however, which, when subjected to the unavoidable relatively rapid action of such reciprocating pumps become so much floculated and otherwise less fluid that the usual type of small-volume rapid-movement pump soon becomes ineffective for the delivery of the compound and the compound becomes inefficient when introduced into the boiler. Such compounds also develop gases during the feeding operation and these gases are likely to interfere with the accurate proportioning of successive charges of the compound into the feed water.

I have found in practice that, to properly handle compounds of this character, it is desirable that the automatic movement of the compound from its supply tank into and from the pumping mechanism and from thence into the boiler shall be relatively very slow and to this end the pump cylinder 12, instead of having a unit capacity equal to or less than the required unit volume of compound, is so proportioned as to have a capacity very greatly in excess of the unit volume of compound and means is then provided by which the compound cylinder piston will, during each period of delivery of feed water by the feed water pump, be moved relatively very slowly through a comparatively short distance, relative to the total range of movement of the piston, so that the flow of the compound from its storage tank to and through the pumping mechanism and into the feed water will be without deleterious agitation, and the action of the piston against the compound will always be sufficiently slow to prevent injury to the compound.

What I claim is:

1. The combination with a steam boiler, its water supply system and a container for boiler compound, of a compound-feeder comprising a cylinder having a capacity largely in excess of a desired unit charge of compound, a piston mounted in said cylinder, an induction conduit leading from the compound container to each end of said cylinder, means for preventing flow through said conduit from the cylinder to the container, an eduction conduit leading from each end of said cylinder into the boiler water supply system, means for preventing flow in said last-mentioned conduit from the water supply system into the cylinder, means synchronized with the water supply system for moving said piston a relatively small fraction of its total stroke range per unit of water delivery into the water supply system, and means for automatically reversing the movement of said piston.

2. The combination with a steam boiler, its water supply system and a container for boiler compound, of a compound-feeder comprising a cylinder having a capacity largely in excess of a desired unit charge of compound, a piston mounted in said cylinder, an induction conduit leading from the compound container to each end of said cylinder, means for preventing flow through said conduit from the cylinder to the container, an eduction conduit leading from each end of said cylinder into the boiler water supply system, means for preventing flow in said last-mentioned conduit from the supply system into the cylinder, a threaded piston rod for said piston, an axially-confined nut on the threads of said piston rod, reversible ratchet mechanism associated with said nut, means carried by the piston rod for automatically reversing the ratchet mechanism at terminations of the piston stroke, and means synchronized with the water supply

system for actuating the ratchet mechanism to produce rotation of the nut per unit of water delivery an amount sufficient only to advance the piston a distance equal to a small fraction of its total range of movement.

3. The combination with a water pump, a boiler compound supplying cylinder, a piston for said cylinder, a threaded piston rod for said piston, an axially-confined ratchet nut on the threads of said piston rod, reversible pawl mechanism associated with said nut, means carried by the piston rod for automatically reversing the pawl mechanism at the completion of the piston strokes, and means synchronized with the working parts of the water pump for actuating the ratchet mechanism to produce rotation of the nut per unit of water delivery an amount sufficient only to advance the piston a distance equal to a small fraction of its total range of movement.

4. In combination with an engine having a piston rod, a water pump the piston rod of which is operated by the engine piston rod, of a boiler solution containing and feeding cylinder, a piston in said cylinder, means associated with said piston for causing the same to expel solution from said cylinder, means driven by said engine piston rod for moving said cylinder piston a fractional amount of its stroke to each complete stroke of said pump, and means for automatically reversing the direction of travel of the cylinder piston at the end of its stroke.

5. The combination with a threaded shaft, of an internally threaded gear on said shaft, means for rotating said gear for moving said shaft longitudinally, consisting of a ratchet means which serves to engage the teeth of said gear and pawl same around in either direction, and means to reverse the pawling direction automatically of the ratchet means at the end of the shaft's stroke.

6. The combination with a threaded shaft, of an internally threaded gear on said shaft, means for rotating said gear for moving said shaft longitudinally, consisting of a ratchet means which serves to engage the teeth of said gear and pawl same around in either direction, a member pivoted co-axially with said gear, to which said ratchet means is pivoted, means to oscillate said member to swing said ratchet means in the pawling operation, and means to reverse the pawling direction automatically of the ratchet means at the end of the piston shaft's strokes.

7. The combination with a boiler supplying water pump having a pumping piston and a piston rod, and boiler communications, of means for gradually and smoothly injecting a purifying solution in the water enroute from the pump to the boiler, comprising a cylinder, means for conveying a solution into or out of each end of said cylinder alternatively and out of one end into the enroute water in immediate succession to the solution discharge from the other end of said cylinder into the enroute water, a solution piston in said cylinder serving to fill the cylinder from one end while the opposite end thereof is discharging, a shaft for operating said solution piston, a gear threaded on said shaft, means for rotating said gear for moving said shaft and solution piston longitudinally of said cylinder, means operated by the piston rod of the water pump concurrently with the strokes of said pump for imparting rotating impulses to said gear, for gradually screwing said solution piston along in said cylinder, whereby the solution piston is moved sufficiently slower than the pump pistons to prevent agitation of the solution in the pumping operation, and means for automatically reversing the direction of rotation of said gear.

In testimony whereof, I have hereunto set my hand on this the 18th day of March, 1930.

VERNARD L. HOLLINGSWORTH.