Feb. 4, 1930. E. G. GRESHAM 1,745,536

SPRAYING APPARATUS

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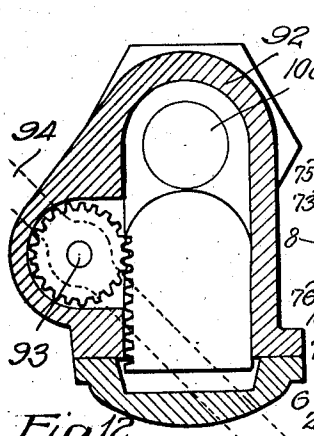

Fig. 12.

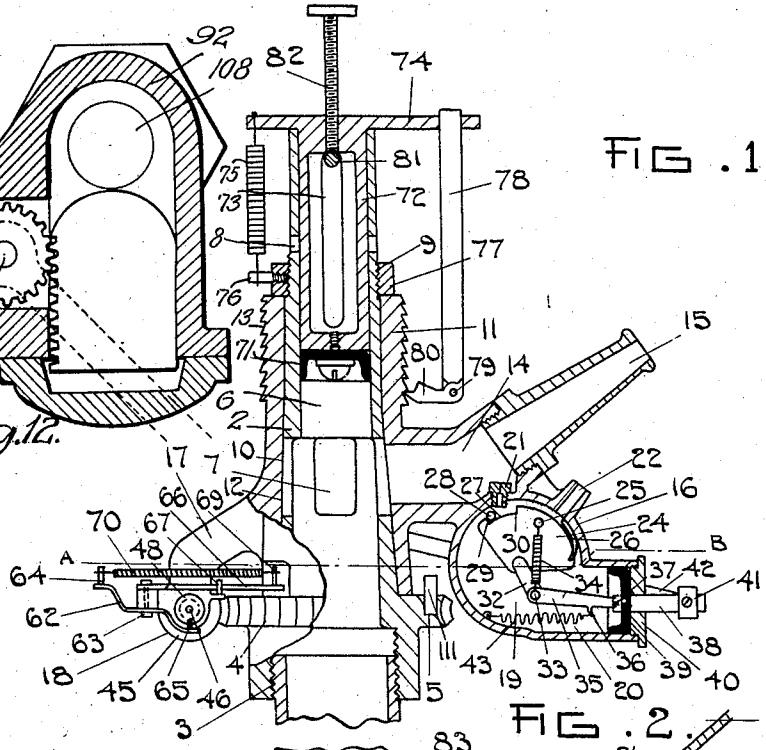

FIG. 1.

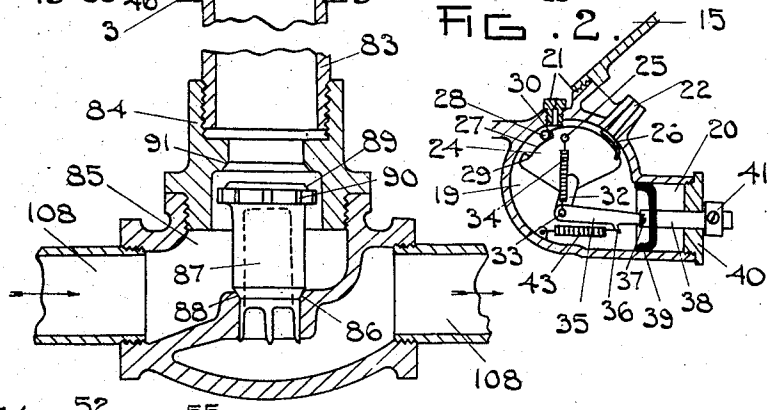

FIG. 2.

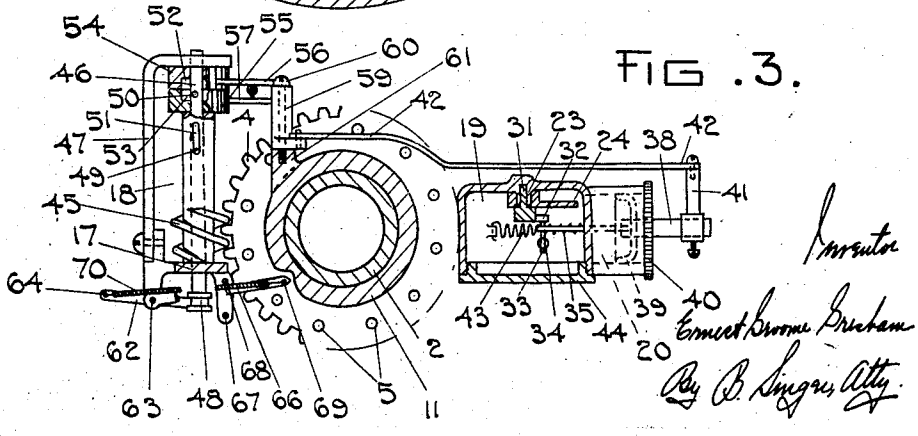

FIG. 3.

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FIG. 4.

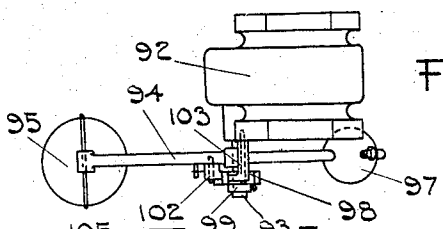


FIG. 5.

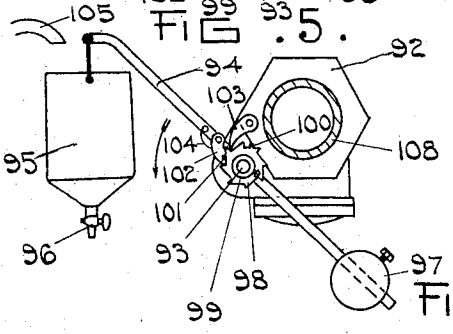


FIG. 7.

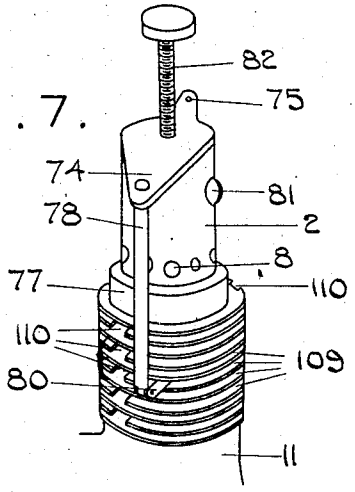


FIG. 8.

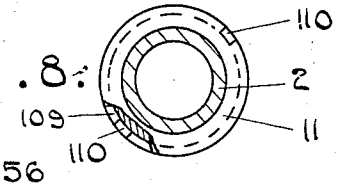


FIG. 6.

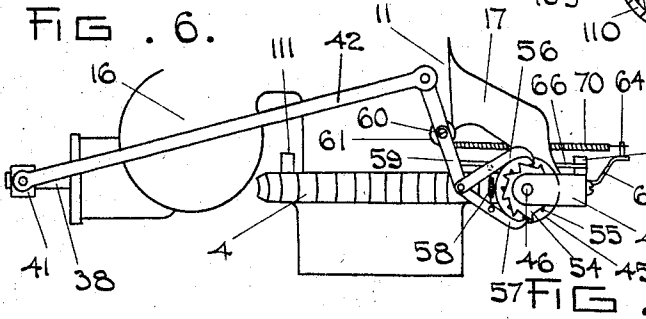


FIG. 9.

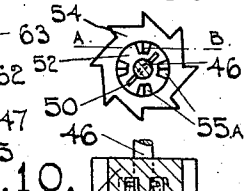


FIG. 10.

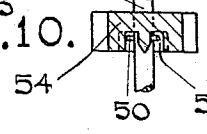


FIG. 11.

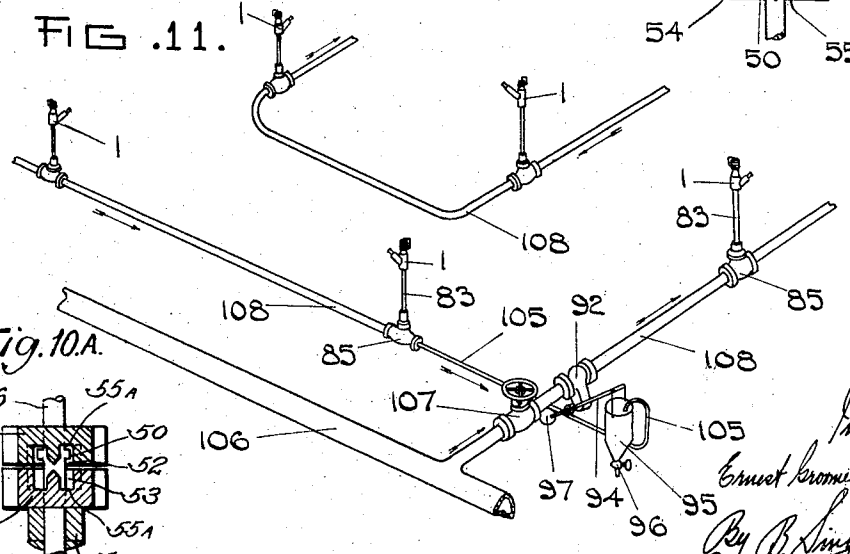
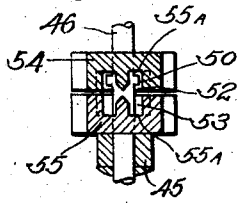


Fig. 10.A.



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UNITED STATES PATENT OFFICE

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SPRAYING APPARATUS

Application filed January 5, 1926, Serial No. 79,400, and in New Zealand February 5, 1925.

This invention relates to improvements in spraying apparatus. The object aimed at by this invention is to effect improvements in the construction of such apparatus whereby greater efficiency, economy and certainty of action are secured.

The invention comprises a timing gear complete, causing the uncovering of small ports which allow a sudden rush of water past a specially designed valve which is lifted and shuts off the water from that particular sprayer and opens the water to the next sprayer of the series, a rotation pulsator, a pulsator outlet so arranged that the exhaust water is directed on to the main stream from a jet so as to break it up sufficiently to water the ground between the sprayer and where the stream would naturally fall, levers by means of which the rotation of the sprayer is reversed, repeat mechanism by which the number of repeats is controlled and the water is finally shut off, and an arrangement of stops for the timing mechanism when a sprayer is used revolving only in semicircles.

In the accompanying drawings illustrating the invention, Figure 1 is a sectional elevation of a sprayer, Figure 2 is a sectional elevation of the pulsator at the "in" position, Figure 3 is a sectional plan view of Figure 1 on line A—B, Figure 1, Figure 4 is a plan view of the quick action valve shown on Figure 5, Figure 5 is an elevation of the quick action valve and the repeat mechanism, Figure 6 is a partial opposite side elevation to that shown in Figure 1, Figure 7 is a partial perspective view of notched portion which takes the place of spiral thread on the top of the jet body when reverse mechanism is used, Figure 8 is a sectional plan view of Figure 7, Figure 9 is an elevation of one of the rotating mechanism ratchets, Figure 10 is a sectional plan on line A—B of Figure 9, Figure 10^A is a detail sectional view of the same, Figure 11 is a perspective view showing how a single set of sprayers could be arranged in relation to the controlling mechanism. Figure 12 is a detail sectional view of the valve 92 and its connections.

The sprayers 1, see Figures 1, 2, 3, and 6, comprise a centre column 2 having:—an internal thread 3, a toothed portion 4, with stop pin holes 5, a bore 6, large ports 7, small ports 8, a thread 9, and a taper seat 10.

Fitting over the centre column 2 there is the jet body 11 provided with a taper bore 12 which fits on the taper seat 10 of the said column 2 in such a manner as to be rotatable thereon, the jet body 11 being provided with a spiral screw 13, a jet supply pipe 14, a removable jet 15, the jet body pulsator 16 and an extension 17 to support the jet body rotating mechanism 18.

The pulsator 16 comprises a cylindrical box 19 having a tangential cylinder 20, an inlet jet 21 from the supply pipe 14, and an outlet 22.

The cylindrical box 19 has a central boss 23, see Figure 3, on which free to turn thereon is a rocker 24 having attached thereto a pin 25 and a strip of flat flexible material such as leather 26 to act as a valve, a notch 27 being cut in the rocker 24 to allow a stop pin 28 fastened to the box 19 to limit the motion of the said rocker 24 by coming in contact with shoulders 29 and 30 formed by the notch 27.

A crankshaft 31 is fitted into the central boss 23 and is free to turn therein, the crank web 32 and pin 33 being placed over the rocker 24 but in no way connected thereto except by tension spring 34 connecting the crankpin 33 and the rocker pin 25.

A connecting rod 35 having a projection 36 passes between crank pin 33 and the pin 37 of a piston rod 38 on which is mounted piston 39 inside tangential cylinder 20.

The piston rod 38 passes out of the cylinder 20 through gland nut 40 the end having attached thereto a cross head 41 to which is fitted a connecting rod 42.

A tension spring 43 fastened between connecting rod projection 36 and the box 19 tends to keep the piston 39 at the "in" position as shown in Figure 2.

A cover 44 is fitted to the cylindrical box 19 enclosing the mechanism.

The rotating mechanism 18, see Figures 1, 3, 6, 9 and 10, comprises a double threaded

worm 45 in gear with the toothed portion 4 of the centre column 2, the said worm 45 being mounted on a shaft 46 slidably and revolvably mounted in the extension 17 of the jet body 11 and an extended support 47.

The shaft 46 has a grooved portion 48 and two pins 49 and 50 attached thereto the pin 49 passing into a slotted hole 51 of the worm 45 and the pin 50 into either recesses 52 or 53 of ratchets 54 and 55 respectively mounted on the shaft 46.

The ratchets 54 and 55, see Figures 9 and 10, have within their recesses 52 and 53 tapered notches 55A between which the pin 50 can pass.

The shaft 46 is so related to the worm 45 and the ratchets 54 and 55 that it is free to slide therein and the ratchets 54 and 55 free to rotate thereon except when the pin 50 is in their respective recesses 52 and 53 the pin 49 being able to slide within the slotted hole 51 of the worm 45 which is forced to always turn with the shaft 46.

Engaged in the ratchets 54 and 55 (which have their teeth facing in opposite directions) there are pawls 56 and 57 respectively pressed inwardly by a tension spring 58, the pawls 56 and 57 being attached to one end of a link 59 swivelled on a pin 60 attached to a boss 61 of the jet body 11, the connecting rod 42 passing between the cross head 41 and the opposite end of the link 59 to which the pawls 56 and 57 are fastened.

At the grooved portion 48 of the shaft 46 there is the mechanism for making the shaft 46 slide backwards and forwards so that the pin 50 will pass between recesses 52 and 53 of ratchets 54 and 55 and take up their opposite rotations.

This mechanism comprises a lever 62 swivelled on pin 63 having a spring pin 64 at its outer end and an engaging pin 65 at its other end passing into the grooved shaft portion 48.

Also swivelled on pin 63 there is another lever 66 (between stop pins 67 and 68) provided with a spring pin 69 from which a tension spring 70 passes to the spring pin 64 of the lever 62.

Fitting into the bore 6, see Figure 1, of the center column 2 there is a piston 71 with a hollow piston rod 72 with two oppositely placed slots 73 the upper end of the piston rod being extended as at 74 to take a tension spring 75 which passes down and is fastened to a lock pin 76 of collar 77 on the thread 9 of centre column 2.

The extension 74 also carries an arm 78 which passes downwardly and has secured thereto by pin 79 a small engaging lever 80 free to lift but unable to drop lower than the horizontal position.

A setscrew 81 is fastened near the top of the centre column 2 and passes through the slots 73 of the hollow piston rod 72.

An adjustment setscrew 82 passes through the top of the hollow piston rod 72 and comes in contact with the setscrew 81.

A piece of pipe 83 is screwed into the internal thread 3 of the center column 2 and passes down and is attached to an upper seat casting 84 screwed into the top of a check valve body 85.

The check valve body 85 has the usual valve seat 86 and a valve 87 provided with a lower seating surface 88 and an upper seating surface 89 and notches 90 the upper seat casting 84 having a seat 91 for the upper seating surface 89.

The repeat control mechanism, see Figures 4 and 5, comprises an ordinary quick action stop valve 92 having a side spindle 93 which opens and closes the valve 92 by being turned a few degrees.

To this spindle 93 is fastened a lever 94 having an open topped bucket 95 (provided with a drain cock 96) attached at one end and a balance weight 97 at the other, the tendency being for the latter to keep the bucket 95 when empty in the "up" position which is also the "open" position of the valve 92.

Mounted on the spindle 93 and free to turn thereon there is a ratchet 98 prevented from working off the said spindle 93 by a collar 99.

The ratchet 98 has a raised projection 100 between two of the teeth, the projection 100 being of such a size that a notch 101 of a pawl 102 attached to lever 94 will fit neatly thereon.

A pawl 103 attached to the body of the valve 92 also engages in the ratchet 98. A strip spring 104 presses the lever pawl 102 into the ratchet 98.

A small pipe 105 supplies water from the last sprayer 1 of the series to the quick action valve 92 control bucket 95, see Figure 11, and the main 106 supplies water through main valve 107 to the sprayer pipe line 108.

For a reversing sprayer working in semicircles instead of a spiral screw 13 on the jet body 11 there is a series of grooves 109, see Figure 7, which have slots 110 left at opposite sides of each alternate groove 109.

Pins 111 are placed as desired in the stop pin holes 5 to come in contact with the lever 66 of the rotating mechanism 18.

In operation the main valve 107 is turned on, see Figure 11, and the water from the main 106 passes through the open quick action valve 92 to the first of the sprayers 1.

The water flows into the check valve body 85 forcing the valve 87 down, see Figure 1, water flowing through:—the notches 90 of valve 87, the upper seat casting 84, the pipe 83, the centre column ports 7, the jet supply pipe 14 and out at the jet 15.

Water in the jet supply pipe 14 flows through the inlet jet 21 to the cylindrical box

19 of the pulsator 16 pressure increasing in the said box 19 forcing the piston 39 out against the tension of spring 43.

The piston rod 38 being forced out draws the connecting rod 35 which moves the crankpin 33 radially until the line of the spring 34 between the pin 25 on the rocker 24 and the crankpin 33 is past the centre of the crankshaft 31, the spring 34 then pulls the rocker 24 round until rocker shoulder 29 comes in contact with the stop pin 28, the pulsator being then in the position shown in Figure 1.

The rocker 24 being in this position with shoulder 29 against stop pin 28 the outlet valve 26 is clear of the outlet pipe 22 which being of much larger bore than the inlet jet 21 allows the water under pressure in box 19 to escape quickly, the pressure on the piston 39 then not being sufficient to resist the tension of the spring 43, the latter draws the piston 39 back again, the connecting rod 35 forcing crankpin 33 round radially to its original position, the spring 34 having passed the crankshaft 31 center, the rocker 24 is turned back to its original position with rocker shoulder 30 against the stop pin 28, the valve 26 covering the outlet pipe 22.

The pulsator 16 is then in the position as shown in Figure 2 allowing the pressure in the box 19 to again accumulate and move the piston 39 again and so on.

This continual reciprocating motion of the piston rod 38 is conveyed through crosshead 41 and connecting rod 42 to link 59 of the rotating mechanism 18.

This link 59 rocks backwards and forwards on pin 60 and the pawls 56 and 57 also rock likewise but being engaged in ratchets 54 and 55 respectively, on the forward strokes of the pulsator 16 the pawl 56 turns ratchet 54 one tooth in a clockwise direction and pawl 57 turns ratchet 55 in an anti-clockwise direction.

Considering Figure 3 the pin 50 of shaft 46 being in the recess 53 of the ratchet 55 (between notches 55A, see Figures 9 and 10) the anti-clockwise rotation of the ratchet 55 is conveyed to the shaft 46 and the pin 49 in the latter causes the worm 45 to also turn which being in gear with the toothed portion 4 of the centre column 2 the jet body 11 and all its attached parts are forced to turn round on the center column 2.

Pressure of water inside the bore 6 of the center column 2 tends to force the piston 71 upwardly but is prevented from so doing by the engaging lever 80 being engaged in the spiral thread 13.

As the jet body 11 with spiral thread 13 is rotating and the center column 2, piston 71, piston rod 72, extension 74, arm 78 and engaging lever 80 stationary, as the jet body 11 turns the engaging lever 80 screws higher up the spiral thread 13 the piston 71 also getting higher up the bore 6 until engaging lever 80 is clear of the spiral thread 13 the piston is forced up the bore 6 uncovering the ports 8 allowing water to flow therefrom.

As the increase of flow through the pipe 83 due to uncovering of ports 8 has resulted in a drop of pressure but an increase of velocity through the notches 90 of the valve 87 the latter is raised by the flow of water, until the upper seating surface 89 of the valve 87 comes in contact with the seat 91 of the upper seat casting 84 the water being then cut off from the jet 15 but able to flow through the check valve body 85, and the pipe line 108 to the next sprayer 1.

This next sprayer works in exactly the same manner as above described one sprayer 1 stopping and the following one connecting until all the sprayers have stopped and the water is opened to the pipe 105, see Figure 11.

This pipe 105 allows water to flow into the bucket 95, see Figures 4, 5 and 11 and the weight of water in the bucket 95 becoming greater than the balance weight 97 the bucket 95 descends and the lever 94 turns spindle 93 and the quick action valve 92 is closed. Just prior to the closing of the stop valve 92 all the valves 87 of the sprayers 1 are in the "up" position with their seatings 89 on seats 91 kept in this position by the pressure of water.

As each jet 15 is cut off from the pressure the tension spring 75 between extension 74 and the lock pin 76 draws the piston rod 72 and piston 71 downwardly into the bore 6 the levers 80 lift over the spiral threads 13 until the piston 71 is right down according to the adjustment of setscrew 82 which can control the number of revolutions of the jet body 11 until the relieving of pressure by the piston 71 uncovering ports 8.

Thus the timing mechanism is again in position for a number of revolutions of the jet body 11.

At the closing of the quick action valve 92 the pressure in the pipe line 108 drops and the valves 87 in the sprayers 1 drop and the water flowing into the bucket 95 ceases.

As the water is slowly flowing out of the bucket 95 through the open cock 96 the weight of the balance weight 97 becomes greater than the bucket 95 and the latter ascends turning the spindle 93 back and again opening the quick action stop valve 92 the water again flowing to the first sprayer 1 of the series and so on until the water again flows from the small pipe 105 to the bucket 95.

This cycle of operation can be repeated as often as desired and then stopped by means of the ratchet 98 fitted to the quick action valve 92 spindle 93.

At each down stroke of the bucket 95 the pawl 102 on lever 94 turns the ratchet 98 one tooth and on the up stroke of the bucket 95 the ratchet 98 is prevented from turning back by the pawl 103 attached to the valve body 92

engaging in a tooth of the ratchet 98 the lever pawl 102 slipping over the teeth.

Each tooth represents one cycle of operation of the sprayers and the ratchet 98 is turned round until at one of the down strokes of the bucket 95 the pawl 102 is engaged in the tooth with the projection 100 between it and the next tooth.

As this projection 100 fits into a notch 101 in the pawl 102, on the bucket 95 attempting to ascend it is unable to do so because the pawl 102 is unable to slip over the ratchet 98 teeth and attempts to turn the ratchet 98 back but is unable to do so because of the pawl 103.

Thus the bucket 95 is kept locked down and the quick action valve 92 closed until the pawl 102 is again released by the operator who can control the number of cycles of spraying by turning the ratchet 98 back the desired number of teeth.

The operation above described is for a sprayer revolving continually in the one direction and the stop pins 111 are not used.

For a sprayer 1 to spray in a semi-circle two pins 111 are fitted into the holes 5 opposite each other and in place of the spiral thread 13 there are a series of grooves 109, see Figure 7.

The sprayer 1 operates the same as before described except that when the jet body 11 is revolving around the center column 2, see Figure 3, the lever 66 comes in contact with one of the pins 111 which gradually forces it radially away from the stop pin 68 against the tension of spring 70 until the line of the said spring 70 between spring pins 64 and 69 is past the center of the swivel pin 63 and the tension of the spring 70 pulls the lever 66 against stop pin 67 and the lever 62 towards that side of the swivel pin 63.

This movement of the lever 62 causes the engaging pin 65 in the grooved portion 48 of shaft 46 to slide the latter inwardly and the pin 50 passes from the recess 53 of ratchet 55 to the recess 52 of ratchet 54 and as the latter is turning in the opposite direction to the ratchet 55 the shaft 46 and worm 45 also take up this reversed rotation so that the jet body 11 commences to revolve in the opposite direction until the lever 66 comes in contact with the other pin 111 which forces it away from stop pin 67 over to stop pin 68 the shaft 46 being caused to slide out again to the position shown in Figure 3 the rotation thus being again reversed and so on.

With this type of sprayer when the jet body 11 has turned half a revolution the engaging lever 80 comes under one of the slots 110 in the grooves 109, see Figure 7, and the pressure on the piston 71 causes the lever 80 to jump through the slot 110 to the next groove up around which it moves during the return half revolution and jumps through the slot 110 in the groove at the opposite side to the previous slot 110 the reversing of the jet body taking place when the engaging lever passes out of the uppermost slot 110 and the piston 71 is free to lift and uncover the ports 8 the operation of the sprayer being then just as previously described.

I claim:

1. A sprayer arranged for rotation, mechanism to rotate the sprayer, and pressure actuated means connected to the sprayer and arranged to actuate said mechanism, said means comprising a body forming a chamber and a cylinder and connected to and communicating with the interior of the sprayer, a piston in said cylinder to which the rotating mechanism is connected, a member arranged for oscillation in said chamber and provided with a valve, a crank mounted at the axis of oscillation and of said oscillating member and for movement independently thereof, a connecting rod between said crank and said piston, a spring connected to said oscillating member and said crank and shiftable to opposite sides of the center of oscillation of said oscillating member and a spring exerting its tension to impart instroke to said piston.

2. A sprayer including a central column and having a timing mechanism comprising a jet body mounted for turning movement on said column and provided with spiral threads, a piston valve in said column movable in one direction by pressure of water in said column, a spring to move said piston valve in the reverse direction when the water pressure diminishes at the end of the stroke of said piston valve, and a member engageable with the threads and connected to said piston valve to retard the movement of the latter by water pressure.

3. A sprayer including a central column and having a timing mechanism comprising a jet body mounted for turning movement on said column and provided with spiral threads, a piston valve in said column movable in one direction by pressure of water in said column, a spring to move said piston valve in the reverse direction when the water pressure diminishes at the end of the stroke of said piston valve, and a member engageable with the threads and connected to said piston valve to retard the movement of the latter by water pressure and means to predetermine the extent of movement of said piston valve.

In testimony whereof I affix my signature.

ERNEST GROOME GRESHAM.