April 8, 1930. W. VAN E. THOMPSON 1,753,841

SPRINKLER HAVING PROJECTABLE NOZZLE

Filed May 25, 1925 3 Sheets-Sheet 1

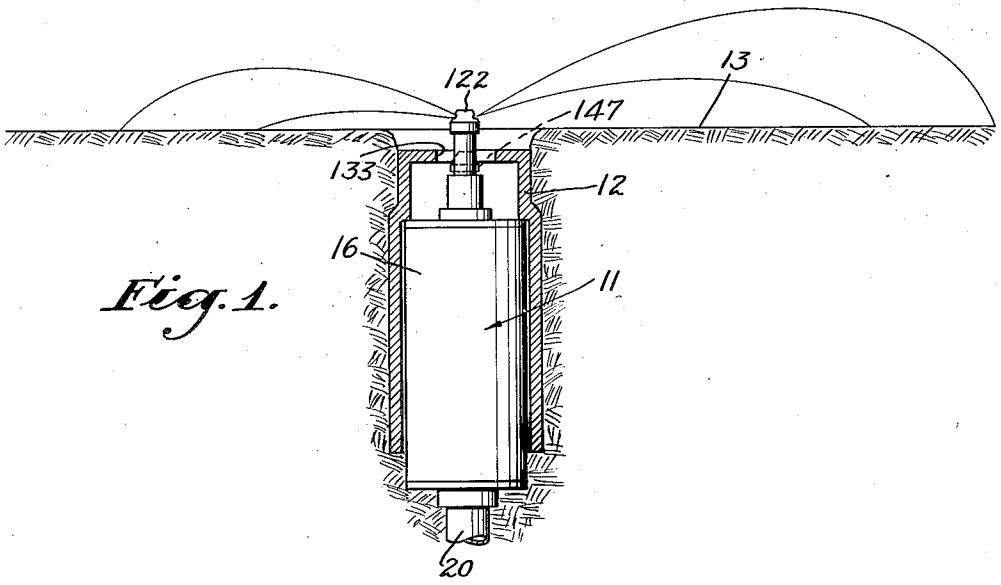


Fig. 1.

Fig. 8.

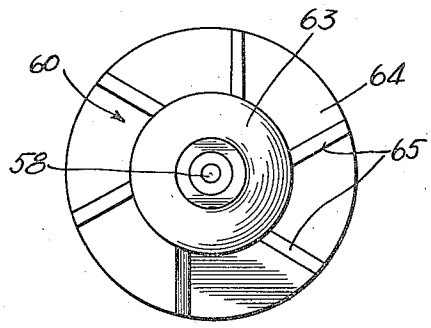
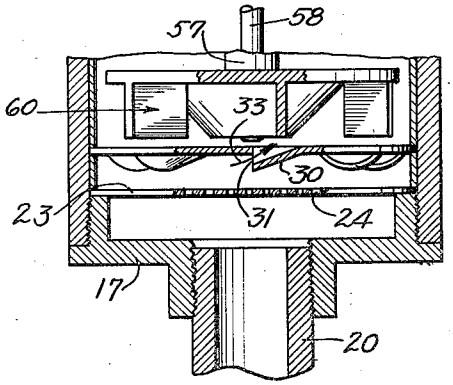


Fig. 7.



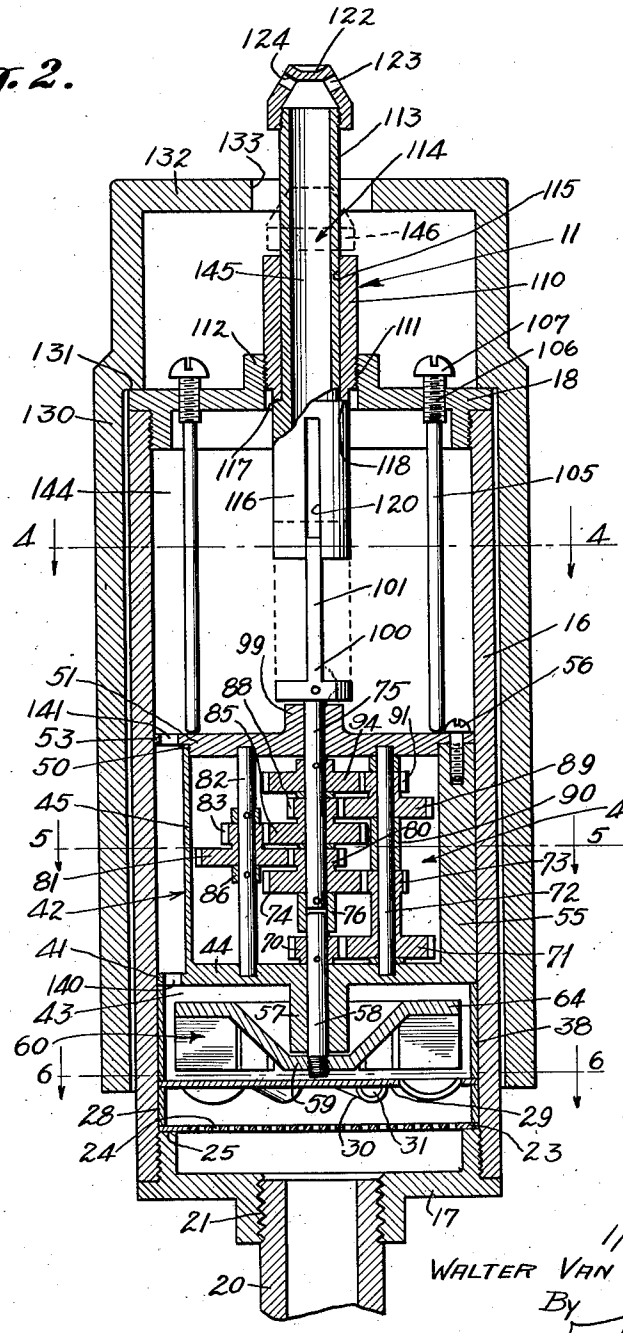
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SPRINKLER HAVING PROJECTABLE NOZZLE

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Fig. 2.



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Fig. 3.

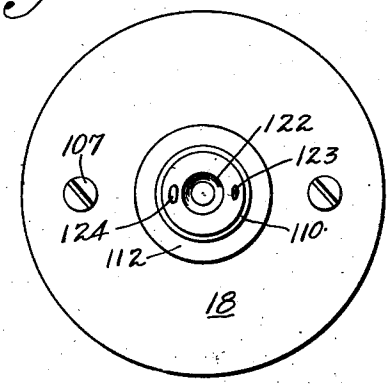


Fig. 4.

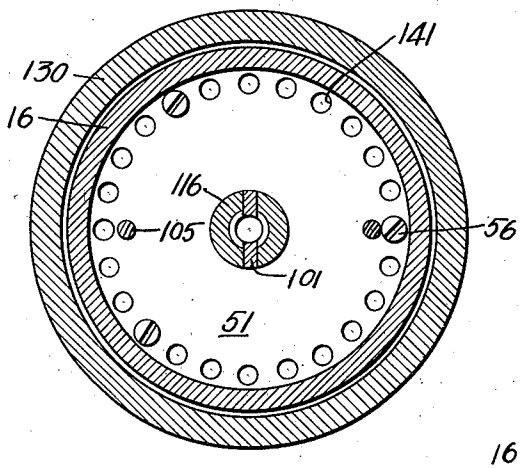


Fig. 5.

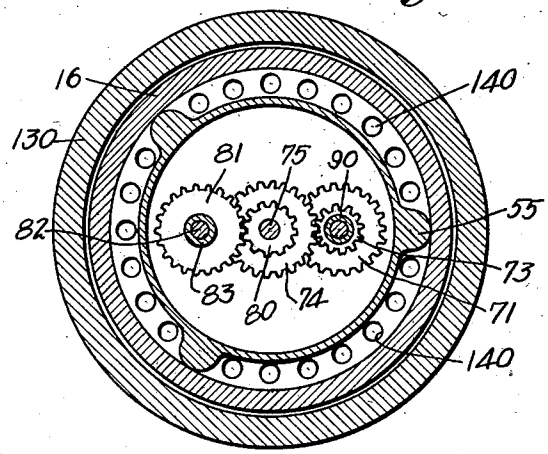
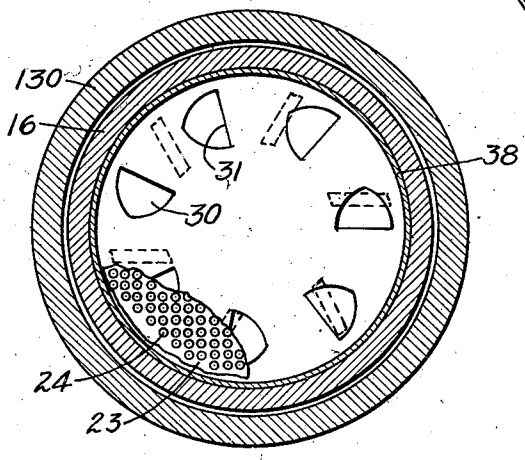


Fig. 6.



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Patented Apr. 8, 1930 1,753,841

UNITED STATES PATENT OFFICE

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SPRINKLER HAVING PROJECTABLE NOZZLE

Application filed May 25, 1925. Serial No. 32,621.

This invention relates to irrigation sprinklers, and relates particularly to a novel form of sprinkler having certain advantages over present forms of sprinklers of this character.

It is an object of my invention to provide a sprinkler which is adapted for use in irrigating lawns, golf courses, play grounds, etc. My invention has a nozzle which, when the sprinkler is not in operation, rests in a concealed position below the surface of the ground. When the sprinkler is brought into operation, the nozzle is automatically projected to a position above the surface of the ground so that it may spray water over an adjacent area.

It is another object of my invention to provide a sprinkler of this character having a novel means by reason of which the nozzle is projected when water is supplied thereto.

It is another object of my invention to provide a sprinkler of this character having a rotating nozzle. By such arrangement a circular area of considerable size may be irrigated by my sprinkler. The nozzle of my sprinkler may have a pair of jets or water passages, one of which is arranged to irrigate an outer annular area, and the other of which is arranged to irrigate the inner circular area. By providing only two streams which rotate it is possible to have considerable pressure so that the radius of the outer stream may be considerable and will be somewhat longer than other sprinklers employing a greater number of radially extending jets.

It is a further object of my invention to provide a novel means for rotating the nozzle.

It is also an object of my invention to provide a novel gear reduction unit which is situated between the driving means and the nozzle, whereby the rotation of the nozzle may be greatly diminished relatively to the driving means so that the radius of the streams flowing from the nozzle will not be reduced due to whipping action which occurs when a nozzle is rotated at an appreciable speed.

It is a still further object of my invention to provide a sprinkler having a unique assembly which permits an easy removing and adjustment of various departments thereof.

Other objects and advantages of my invention will be made manifest hereinafter.

Referring to the three sheets of drawings in which I illustrate a preferred form of my invention:

Fig. 1 is a view illustrating a use of my invention.

Fig. 2 is a vertical sectional view through a sprinkler embodying the features of my invention.

Fig. 3 is a plan view of the sprinkler of my invention with the casing thereof removed.

Fig. 4 is a section taken on the line 4—4 of Fig. 2.

Fig. 5 is a section taken on the line 5—5 of Fig. 2.

Fig. 6 is a section taken on the line 6—6 of Fig. 2.

Fig. 7 is a fragmentary detail of the driving means of my invention.

Fig. 8 is a bottom plan view of a rotor of the driving means of my invention.

As shown in Fig. 1, my invention provides a sprinkler 11 which is surrounded by a casing 12 and which is situated below the surface of the ground 13. As shown clearly in Fig. 2, the sprinkler 11 comprises a shell provided in the form of a cylindrical member 16 having a bottom plug 17 which screws into the lower end thereof and a cap 18 which screws into the upper end thereof. A supply pipe 20 is threaded into the plug 17 at 21 and is adapted to supply water into the shell. A strainer 23 having a multiplicity of openings 24 rests on a face 25 of the plug 17. Placed above the strainer 23 is a sleeve 28 which fits snugly within the cylindrical member 16. Supported on the upper face of the sleeve 28 is an impeller plate 29. As clearly shown in Figs. 2, 6 and 7 the impeller plate 29 has a series of semi-cylindrical depressions 30 which provide water passages 31. These water passages are so shaped that water flowing therethrough takes a direction indicated by an arrow 33 of Fig. 7. A cylindrical spacer 38 which fits snugly in the cylindrical member 16 is placed above the impeller plate 29.

Above the spacer 38 there is placed a reduction gear unit 40. The lower face of a flange 41 of a cup member 42 of the unit 40 engages the upper end of the spacer 38 providing a rotor chamber 43 between itself and the impeller plate 29. The cup member 42 provides a radial wall 44 and a cylindrical wall 45 which extends upwardly from the radial wall 44, this radial wall 44 being somewhat smaller in diameter than the inside of the cylindrical member 16. An annular shoulder 50 of a cover 51 extends inside the upper end of the cylindrical wall 45 of the cup member 42, the upper end of the wall 45 engaging an inner part of a flange 53 of the cover 51. Lugs 55, as shown in Figs. 2 and 5, are provided for strengthening the cylindrical wall 45 and for receiving screws 56 which clamp the cover 51 to the cup member 42.

Extending through a hub 57 which extends from the radial wall 44 is a rotor shaft 58. The lower end of the rotor shaft 58 is secured to a web 59 of a rotor 60 located in the rotor chamber 43. The web 59 is of the shape shown clearly in Figs. 2, 7 and 8 having a conical portion 63. Extending downwardly from the outer annular radial portion 64 are vanes 65 which extend tangentially as clearly shown in Fig. 8.

On the end of the rotor shaft 58 extending inside the gear unit box is a gear 70 which drives a gear 71 journaled on a countershaft 72 which is parallel to the rotor shaft 58 and is secured in place between the radial wall 44 and the cover 51. A gear 73 formed integral with the gear 71 rotates a gear 74 loosely mounted on the lower end of a drive-shaft 75. The drive-shaft 75 has a bearing sleeve 76 pinned to the lower end thereof into which the upper end of the rotor shaft 58 extends and in which it journals. A gear 80 formed integral with the gear 74 rotates therewith and imparts rotation to a gear 81 rotatably carried on a second countershaft 82 which is supported between the radial wall 44 and the cover 51. Formed integral with this gear 81 is a gear 83 which drives a gear 85 loosely carried on the drive-shaft 75. The integral gears 81 and 83 are retained in position by a pair of spacers 86. Formed integral with the gear 85 is a gear 88 which drives a gear 89 rotatably carried on the first countershaft 72 and retained in place by a spacer 90. A gear 91 integral with the gear 89 rotates a gear 94 which is pinned on the drive-shaft 75 below the cover 51. The shaft 75 extends through a hub 99 of the cover 51 and has a drive member 100 secured to the extending end thereof, this drive member 100 having a diagonal tongue 101.

The reduction gear unit 40, the spacer 38, the impeller plate 29, the sleeve 28 and the strainer 25 are assembled and clamped in place by clamp pins 105 which thread at 106 through the cap 18, these clamp screws 105 having heads 107 by which they may be advanced to clamp the parts tightly inside the shell.

A sleeve 110 is threadably secured at 111 to a flange 112 of the head 18 of the shell. A tube portion 113 of a nozzle plunger 114 extends through cylindrical opening 115 of the sleeve 110. A head 116 is formed at the lower end of the tube 113, this head having a shoulder 117 which engages a face 118 of the sleeve 110 when the nozzle plunger is in its uppermost position. A diametrical slot 120 is formed in the head 116 into which slot the tongue 101 extends. A nozzle 122 is secured at the upper end of the tube 115 having openings 123 and 124 for the spraying of water.

When the sprinkler is situated in position for use, the casing 12 is extended thereabout so that a cylindrical wall 130 thereof surrounds the shell and an annular face 131 thereof engages an upper face of the head 18. The casing has an upper radial wall 132 having an opening 133 therein through which the nozzle 122 is extended into sprinkling position.

When water is supplied to a sprinkler of my invention, it passes into the shell through the pipe 20. This water is preferably very carefully strained before it is given to the sprinkler system. It is again strained by the strainer 23 before it passes through the mechanism of the sprinker. The water passes through the passages 31 of the impeller plate 29, the water passing in a direction as indicated by the arrow 33 of Fig. 7, the water having a twirling motion. The water catches the vanes 65 of the rotor 62 and the rotor is thereby revolved. This revolves the rotor shaft 58 which rotates the gear 70. This rotation is transferred through the chain of gears 71, 73, 74, 80, 81, 83, 85, 88, 89, 91 and 94, thus rotating the drive-shaft 75. It will be noted from Figs. 2 and 4 that this chain of gears serves to reduce the speed of the drive-shaft 75 relative to the rotation of the rotor 60. The reduction of these gears in actual practice is about 250 to 1. The drive member 100 is rotated with the drive-shaft 75 and the tongue 101 thereof rotates the nozzle plunger 114 due to its engagement with the side wall of the slot 120.

During this time water flows through openings 140 in the flange 41 and upwardly around the cylindrical wall 45 of the cup member 42. The water then passes through openings 141 in the flange 53 and into a chamber 144 above the reduction gear unit. The water fills the chamber 144 and then flows through a passage 145 of the nozzle plunger 114 and it is then forced through the openings 123 and 124 of the nozzle 122. As the pressure builds in the chamber 114, a force is exerted against the head 116 of the nozzle plunger 114 which serves to project

this nozzle plunger from a position shown by dotted lines 146 in Fig. 2 and dotted lines 147 in Fig. 1 into the full line positions of these figures.

It is noted that before the nozzle is projected it rests below the radial wall 132 of the casing 12 and in a position below the surface of the ground 13. When it is projected, it rests in a position outside the casing 12 and above the surface of the ground 13. In projected position, the nozzle is in the open and there is no interference to the streams of water flowing through the openings 123 and 124.

From the description it should be noted that the nozzle plunger 114 is projected only when water is supplied to the sprinkler 11 and that at all other times the nozzle 122 rests in concealed position inside the casing 12 and below the surface of the ground. When the nozzle plunger and nozzle are in projected position, the pressure of the shoulder 117 engages the face 118 of the sleeve 110 and prevents leakage. The driving means of my invention does not in any way affect the efficiency of the sprinkler and is very suitable in this use. The feature of rotating the nozzle at a very slow rate of speed is quite desirable as it eliminates whipping of the streams of water which would reduce the radii of the streams and consequently reduce the sprinkling area of the sprinkler.

In the device shown the gear reduction between the rotor 60 and the nozzle plunger 114 is about 250 to 1 and the nozzle plunger will rotate at one or two revolutions per minute according to the pressure of the water and other conditions.

The mechanism of the sprinkler is designed so that it may be readily removed from the shell. By loosening the clamp pins 105 and removing the cover 18, access is given to the interior of the shell and the internal parts may be readily slid from place. The water flows around the gear reduction unit, as described, and offers no interference to the reduction gears in the reduction gear box. This gear box, if desired, may be packed with a suitable lubricant.

The reduction gear unit box is in communication with the interior of the shell only along the shafts 75 and 58, respectively, which are journaled in bearing openings in the upper and lower ends, respectively, of the box. As the water passing through the sprinkler is at substantially the same pressure at all points within the shell, it is readily seen that a balanced pressure is produced at the only two places where water might tend to enter the reduction gear unit box, or lubricant might tend to escape into the water chambers and the intrusion of either fluid into the chamber occupied by the other is effectively prevented.

I claim as my invention:

1. In a sprinkler, the combination of: a shell; means for supplying water to said shell; an impeller plate carried in said shell; a rotor arranged adjacent to said impeller plate; a rotor shaft carrying said rotor; a drive-shaft; gear mechanism connecting said rotor shaft with said drive-shaft; a drive member carried by said drive-shaft; and a projectable nozzle plunger carried by said shell, said nozzle plunger being driven by said drive member, but being axially movable relative thereto.

2. In a sprinkler, the combination of: a shell, a nozzle plunger projectably carried by said shell, said nozzle plunger being adapted to remain in projected position when sprinkling and in retracted position when idle; means for supplying water to said shell, said nozzle plunger being adapted to be projected by said water; a rotor in said shell adapted to be operated by said water as it flows through said shell to the nozzle plunger, and reduction ratio transmission means connecting said rotor with said nozzle plunger for rotating said nozzle plunger.

3. In a sprinkler, the combination of: a shell; a nozzle plunger projectably carried by said shell, said nozzle plunger being adapted to remain in projected position when sprinkling and to automatically return to retracted position when idle; means for supplying water to said shell, said nozzle plunger being adapted to be projected by said water; a rotor in said shell adapted to be operated by said water as it flows through said shell to the nozzle plunger; and reduction ratio transmission means connecting said rotor with said nozzle plunger for rotating said nozzle plunger.

4. In a sprinkler, the combination of: a shell; a nozzle plunger projectably carried by said shell, said nozzle plunger being adapted to remain in projected position when sprinkling and to automatically return to retracted position when idle; means for supplying water to said shell, said nozzle plunger being adapted to be projected by said water; a rotor in said shell operated by said water as it flows through said shell to the nozzle plunger and independently of the direction of flow of said water from said nozzle plunger, and reduction ratio transmission means connecting said rotor with said nozzle plunger for rotating said nozzle plunger.

5. In a sprinkler, the combination of: a shell; a nozzle plunger projectably carried by said shell; means for supplying water to said shell, said nozzle plunger being adapted to be projected by said water; a rotor in said shell adapted to be operated by said water as it flows through said shell to the nozzle plunger; and means connecting said rotor to said nozzle plunger.

6. In a sprinkler, the combination of: a shell; a nozzle plunger carried by said shell; means for supplying water to said shell, said

nozzle plunger being adapted to be projected by said water; a driving rotor adapted to be operated by said water; means connecting said rotor to said nozzle plunger for rotating said nozzle plunger; a box enclosing said last named means, said box having bearing openings communicating with the interior of said shell; and a lubricant in said box, said bearing openings being so located that water pressure in said shell will be balanced at said openings thus preventing intrusion of water into said box.

7. In a sprinkler, the combination of: a shell; a nozzle plunger carried by said shell; means for supplying water to said shell, said nozzle plunger being adapted to be projected by said water; a driving rotor adapted to be operated by said water; means connecting said rotor to said nozzle plunger for rotating said nozzle plunger, said means including shafts; a box enclosing said last named means, said box having bearing openings in which said shafts operate and through which they extend into said shell; and a lubricant in said box, said bearing openings being subjected to a substantially balanced water pressure whereby said lubricant is retained in said box, and intrusion of water is prevented.

8. In a sprinkler, the combination of: a shell; a nozzle plunger carried by said shell; means for supplying water to said shell, said nozzle plunger being adapted to be projected by said water; a driving rotor adapted to be operated by said water; means connecting said rotor to said nozzle plunger for rotating said nozzle plunger; a box enclosing said last named means, said box having bearing openings communicating with the interior of said shell; and a lubricant in said box, said box being so located that the water pressure in said shell will be substantialy equal on all sides thereof so that said lubricant will not be expelled from said box.

9. In a sprinkler, the combination of: a shell; a nozzle carried by said shell; means for supplying water to said shell; a driving rotor adapted to be operated by said water; means connecting said rotor to said nozzle for rotating said nozzle; a box enclosing said last named means, said box having openings communicating with the interior of said shell; and a lubricant in said box, said box being so located that the water pressure at said openings will be substantially equal so that said lubricant will not be expelled from said box.

10. In a sprinkler, the combination of: a shell; a nozzle carried by said shell; means for supplying water to said shell; a driving rotor adapted to be operated by said water; means connecting said rotor to said nozzle for rotating said nozzle; a box enclosing said last named means, said box having openings communicating with the interior of said shell; and a lubricant in said box, said openings being so located that water pressure in said shell will be balanced at said openings thus preventing intrusion of water into said box.

11. In a sprinkler, the combination of: a shell; a nozzle carried by said shell; means for supplying water to said shell; a driving rotor adapted to be operated by said water; means connecting said rotor to said nozzle for rotating said nozzle, said means including shafts; a box enclosing said last named means, said box having openings in which said shafts operate and through which they extend into said shell; and a lubricant in said box, said box being so located that the water pressure at said openings will be substantially equal so that said lubricant will not be expelled from said box.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 18th day of May, 1925.

WALTER VAN E. THOMPSON.

CERTIFICATE OF CORRECTION.

Patent No. 1,753,841. Granted April 8, 1930, to

WALTER VAN E. THOMPSON.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, line 127, claim 5, after the word "plunger" and before the period insert the words "for rotating said nozzle plunger"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 13th day of May, A. D. 1930.

M. J. Moore,
Acting Commissioner of Patents.

(Seal)