R. WOOD.

FORCE FEED LUBRICATOR.

APPLICATION FILED MAR. 8, 1917. RENEWED AUG. 28, 1920.

1,371,289. **Patented Mar. 15, 1921.**

2 SHEETS—SHEET 1.

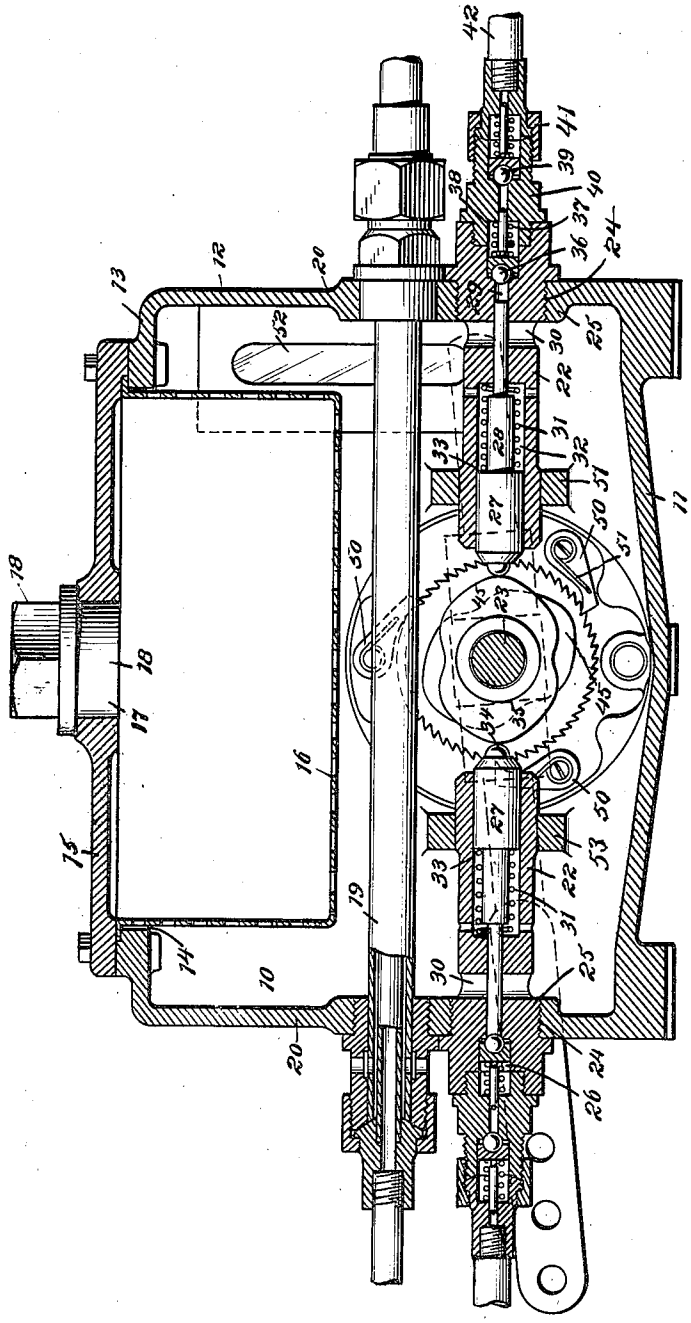


Fig. 1.

WITNESS

INVENTOR

Robert Wood

BY Hillary C. Messmer.

ATTORNEY

R. WOOD.

FORCE FEED LUBRICATOR.

APPLICATION FILED MAR. 8, 1917. RENEWED AUG. 28, 1920.

1,371,289. **Patented Mar. 15, 1921.**

2 SHEETS—SHEET 2.

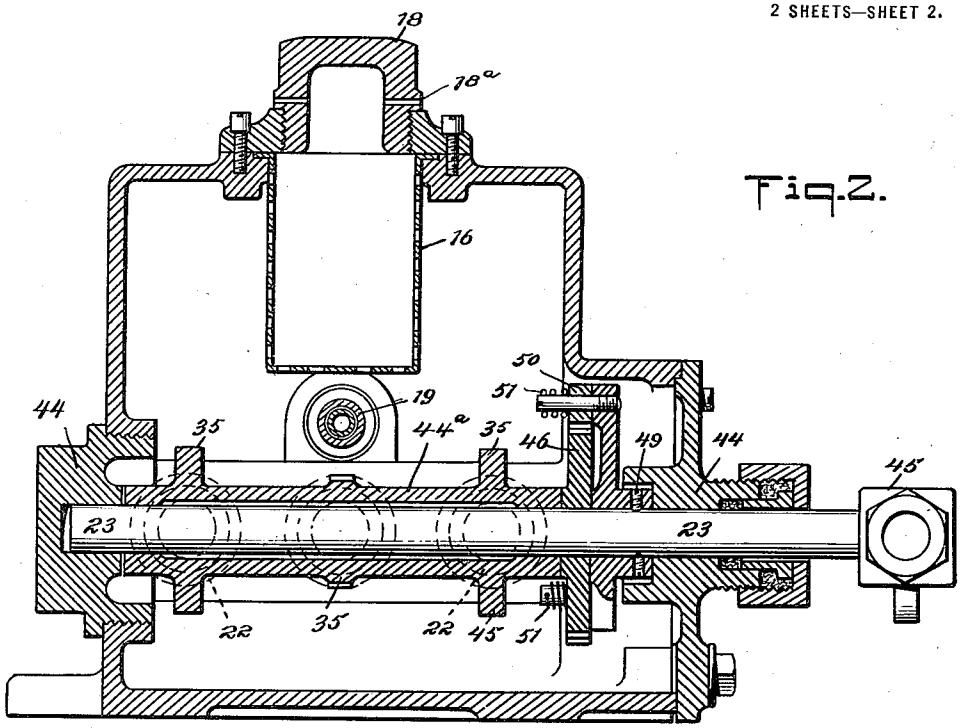


Fig. 2.

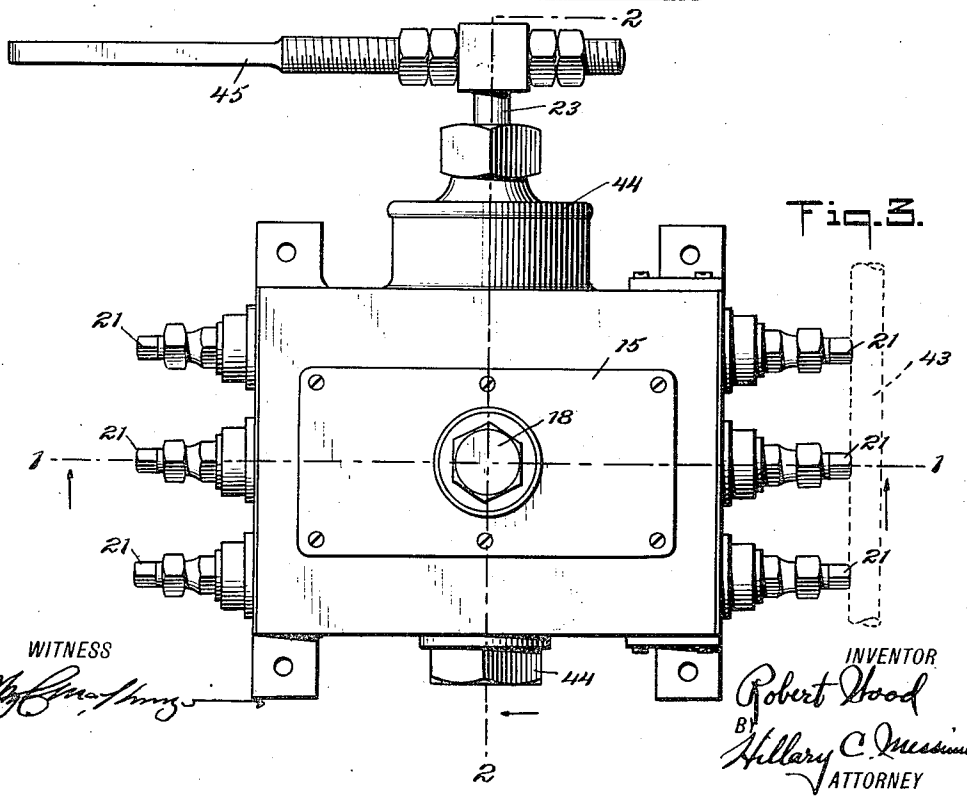


Fig. 3.

WITNESS

INVENTOR

Robert Wood

By Hillary C. Messimer

ATTORNEY

UNITED STATES PATENT OFFICE.

ROBERT WOOD, OF NEW YORK, N. Y.

FORCE-FEED LUBRICATOR.

1,371,289. Specification of Letters Patent. Patented Mar. 15, 1921.

Application filed March 8, 1917, Serial No. 153,265. Renewed August 28, 1920. Serial No. 406,728.

To all whom it may concern:

Be it known that I, ROBERT WOOD, a subject of the King of England, and resident of New York city, in the county of Kings and State of New York, have invented certain new and useful Improvements in Force-Feed Lubricators, of which the following is a specification.

This invention relates in general to a pump or ejecting device substantially without valves or valvular mechanism for forcing liquid, such as a lubricating oil from a receptacle containing the same and particularly relates to a force feed lubricator by means of which a lubricant may be forced from the receptacle under pressure into a closed space, as is found in some engine parts, especially superheated locomotives even against high pressure conditions in said space. In some situations the external resistance to the passage of the liquid from the storage receptacle, in devices of the class described, is frequently quite high so that there is a necessity for an ejecting mechanism of sufficient rugged construction to withstand the strains incidental to high pressure work. Further in one approved type of such devices the ejecting element is in the form of a ram positioned within a body of the liquid to be ejected, and coupled to move in harmony with the actuation of some selected moving part of the engine lubricated.

Accordingly one of the objects of this invention is to provide a simple form of ejecting device of the submerged type designed to withstand the strains of high pressure work and with the moving parts so designed and the pressure forces so balanced that the lubricator may be actuated with high ejecting capacity and at the same time will work economically with the least possible consumption of power and with a minimum load on the engine.

One means for attaining this object is to provide a plunger type of ejector similar to the type of such devices described in my Patents No. 1,171,825, Feb. 15, 1916 and No. 1,192,253, July 25, 1916 and No. 1,207,355, Dec. 5, 1916, but with the moving parts arranged and assembled with the plungers disposed in oppositely positioned pairs so that they may be actuated simultaneously from one power means and at all times will be in mutually balanced relation so as to minimize shocks on the containing casing and other parts.

Another object of the invention is to provide a simple and compact form of device of the class described in which the parts most likely to become worn or distorted, such as the plungers, may be removed readily as a unit from the casing for repair and substitution of parts.

Various other objects and advantages of the invention will be in part obvious from an inspection of the accompanying drawings and in part will be more fully set forth in the following particular description of one form of mechanism embodying my invention, and the invention also consists in certain new and novel features of construction and combination of parts hereinafter set forth and claimed.

In the accompanying drawings:—

Figure 1 is a longitudinal vertical section taken centrally through a preferred embodiment of my invention and taken on the line 1—1 of Fig. 3;

Fig. 2 is a transverse sectional view taken on the line 2—2 of Fig. 3; and

Fig. 3 is a plan view looking down upon the device.

In the drawings there is shown a containing receptacle or storage reservoir 10 of general rectangular form and including a bottom 11, sides 12, and a top 13 provided with an inlet 14. The inlet is closed by a cover 15 which acts to clamp a strainer 16 in place between the top 13 and the cover and covering the inlet. The cover is provided with a supply inlet 17 designed to be connected with a source of liquid supply when it is desired to recharge the receptacle but when in active operation, the inlet is closed by a plug 18 which may be provided with one or more small air vents 18ª.

When the receptacle is to be used in connection with the feeding of oil or other liquid which should be heated a heating device 19, such as more fully described in my Patent No. 1,192,253, may be mounted. The opposite walls 12 of the receptacle which may be referred to as end walls 20 have a plurality of ejecting devices 21 demountably positioned therein and within the well of oil at the bottom of the receptacle. Referring to Fig. 3 it will be noted that there are three such devices in each wall 20 disposed opposite each other to form three

pairs of alined ejecting devices, but it is of course to be understood, that any number of pairs or even any odd number of these ejecting devices may be mounted within the one receptacle.

The ejecting devices are each complete units, preferably castings, any one of which may be demounted, the opening therefor closed and the device as a whole may be actuated provided only that at least one ejecting device is in position. As the most perfect working of the device requires the pressure of at least two oppositely disposed ejecting devices, the devices will be described with particular reference to Fig. 1. The device there shown constitutes a pair of plugs 22 demountably fitted in the sides 20 of the receptacle and disposed in axial alinement transversely of the receptacle and on opposite sides of a power shaft 23. As the plugs and their associated parts are similar in construction, a detailed description of any one will be sufficient for all. Each of these plugs is formed of a one-piece member threaded at intermediate lengths, as shown at 24 to fit within a threaded opening formed in a boss 25 and which acts to strengthen the connection of the plug with this portion of the side 20. The plug is provided with a bore drilled and counterdrilled axially therethrough, the outer end of which bore extends beyond the outline of the receptacle and constitutes an outlet 26 for the liquid ejected from the receptacle. The inner end of the bore is enlarged to form a bearing for an enlarged cylindrical portion 27 of a piston mounted for reciprocatory movement in the plug. The piston includes a reduced end portion 28 constituting a plunger having a close fit in a reduced liquid measuring chamber 29 constituting part of the outlet portion 26 of the bore.

Just within the inner face of the outlining wall 20 the plug is provided with a transversely disposed passageway 30 drilled entirely therethrough of relatively large cross-section opening from both the top and bottom of the plug into the inner end of the chamber 29. This passageway is preferably vertically inclined so as to facilitate an easy and quick filling of the chamber when free of the plunger.

The piston is moved in one direction so as to open the chamber 29 by means of a coil spring 31 housed within the plug with one end bearing on an end wall of the housing space 32 and the other end bearing upon the shoulder 33 of the enlarged portion 27. The inner end of the piston is defined by a spherical head 34 mounted for universal movement and designed to provide a rolling contact between the piston and an actuating cam 35 carried by the shaft 23.

The flow from the outlet is controlled by a spherical headed valve 36 normally maintained in seated position closing the outlet through the agency of a relatively weak spring 37 housed within an enlarged portion 38 of the outlet. In order to insure positively against leakage through the outlet the flow intercepting action of the valve 36 is reinforced by an additional valve 39 mounted in a coupling 40 screwed into the outer end of the plug. Each of the couplings are connected by means of a sleeve 41 with a pipe 42 which leads to the space to be supplied with the liquid. It may be desired in some situations to utilize the supply from a plurality of the ejecting devices and to conduct the same to one point of the space supplied in which case several of the pipes 42 may be united to supply a main 43 as shown at the right of Fig. 3.

The shaft 23 is journaled within spaced bearings 44 in the form of plugs or plates demountably inserted in opposite ends of the receptacle. One end of the shaft projects through its bearings and extends externally of the receptacle in position to be engaged by some suitable power member 45 adapted to rotate or reciprocate the shaft. This power member is designed to be connected with some suitable moving part of the engine lubricated by the device so as to feed the lubricant in unison with the movement of the engine parts.

The shaft 23 constitutes a bearing for the cams 35 and are connected to work in unison by means of a sleeve 44^a loose on the shaft (see Fig. 2). The cams are of the double throw type with the bulges 45′ of one disposed circumferentially in advance of the bulges of the next adjacent cam as shown in Fig. 1, whereby as one cam is acting on its pair of ejecting devices another cam is inactive and even receiving power from the springs of its ejecting devices. The sleeve 44 is rotated intermittently from the shaft 23 by a one-way pawl and ratchet feed which includes a ratchet wheel 46 loose on the shaft and demountably fixed to one end of the sleeve. A driving disk 47 is fixed to the shaft by means of pins 49. The disk is provided with a plurality of spaced apart pawls 50 held in engagement with the periphery of the ratchet wheel by springs 51. The receptacle is provided with a sight glass 52 so as to view the interior of the receptacle and ascertain the liquid level therein. As the plug is relatively long and the action of the cam across the axis thereof is very apt to spring the connection of the plug with the wall of the receptacle, an inner support 53 is provided preferably in the form of a pair of apertured plates paralleling the shaft on opposite sides thereof and constituting internal braces for the receptacle.

In operation and with the receptacle charged so as to have a liquid level above

the inlet passageway 30, the power shaft 23 is reciprocated or rotated. The power is transmitted through the pawl and ratchet feed to rotate the cam sleeve. Considering any one cam in position with its bulges disposed from its coacting piston ends, the springs 31 will act on the cam to assist in rotating the same and to move the plunger across the passageways 30 and out of the chambers 29. The liquid in the receptacle will flow through opposite ends of the passageway 30 and rapidly fill the chambers 29. By the time the chambers are filled the bulges on the cam will have come into pressing engagement with the pistons and rapidly act thereon to move the plungers from their inoperative position into the chambers to force the charge of liquid therefrom, past the valves and into the pipes 42.

The continued actuation of the shaft causes the bulges on the cams under consideration to move away from their pistons and at the same time to move another set of bulges into pressing engagement with their pistons. It is apparent that with a sufficient rapidity of cam movement and a sufficient number of ejecting devices practically a continuous flow from the pump may be attained.

As there is an equalizing of pressures on opposite sides of the power shaft the possibility of distorting the same is minimized. As there is less wear on the bearings with this balancing of parts, the life of the device is prolonged and an easier actuation attained. Even if one of the plungers should become inoperative for any reason the piston spring thereof would act on the cam and thus tend to balance the action of the opposite spring.

The passageway 30 is made relatively large compared to the small volume of the chamber 29 and is provided with as many openings as possible from the receptacle so that the chamber may be filled rapidly. The passageway 30 is preferably contained within the body of the plug rather than at the end of the plug as in one form disclosed in my patents so that the small and relatively weak plunger may be contained and guided along its entire length of movement.

The moving parts are mounted within the receptacle thus economizing in space occupied by the device and maintaining the same inclosed free from dust and accidents without the necessity of providing inclosing casings for this purpose.

When the pump is used as a lubricating device, the moving parts will be submerged in the oil thus insuring a constant lubricating of the parts.

The cam sleeve, ratchet and disk hub mounted on the shaft coact to provide a close fit therefor between the shaft bearings thus eliminating end play and further insuring an easy noiseless actuation of the device.

While I have shown and described, and have pointed out in the annexed claims, certain novel features of my invention, it will be understood that various omissions, substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention.

Having thus described my invention, I claim:

1. In a device of the class described, the combination with a liquid containing reservoir, of a plug inserted in through one side of said reservoir and terminating therein, means for supporting the inner end of said plug, said plug provided with a bore constituting an outlet from said reservoir, a normally closed valve for controlling the flow through said bore and a plunger mounted for reciprocatory movement in said bore, and adapted to act on the liquid in said bore to force the liquid therefrom past said valve, said plug, valve and plunger being demountable as a unit from said casing.

2. In a device of the class described, the combination with a liquid containing reservoir, of a plug inserted in through a side of said reservoir, said plug provided with a bore constituting an outlet from said reservoir, said plug provided with a plurality of liquid inlets from the reservoir opening directly into said bore, a normally closed valve for controlling the flow through said bore, and a plunger mounted for reciprocatory movement in said bore past said inlet, and adapted to act on the liquid in said bore to force the liquid therefrom past said valve, said plug, valve and plunger being demountable as a unit from said casing.

3. In a device of the class described, a plug in the form of a single casting provided with means for mounting the same in position and having a bore extending longitudinally therethrough, one end of said bore constituting an outlet, said plug having a passageway extending transversely therethrough and through the bore adjacent the outlet end, a piston mounted for reciprocatory movement in the opposite end of the bore and having a liquid ejecting plunger movable across said transverse passageway to force the liquid through the outlet end of the bore.

4. In a device of the class described, an article of manufacture comprising a plug provided with means for mounting the same and having a bore extending therethrough, a valve contained within and normally closing one end of said bore, a passageway extending transversely through said plug and opening into said bore, the portion of the bore between the passageway and the valve forming a liquid measuring chamber, a piston slidably mounted in said bore and pro-

vided with a reduced end constituting a plunger guided in the bore and adapted to be moved across said passageway to close the same and movable into the chamber to eject the contents of the chamber therefrom and past said valve.

5. In a device of the class described, an article of manufacture comprising a plug provided with means for mounting the same and having a bore extending therethrough, a valve contained within and normally closing one end of said bore, a passageway extending transversely through said plug and opening into said bore, the portion of the bore between the passageway and the valve forming a liquid measuring chamber, a piston slidably mounted in said bore and provided with a reduced end constituting a plunger guided in the bore and adapted to be moved across said passageway to close the same and movable into the chamber to eject the contents of the chamber therefrom and past said valve, a coupling open to said bore and a valve carried by said coupling and normally coacting with the first named valve to insure against a leakage through the bore.

6. In a device of the class described, the combination with a liquid containing reservoir, of a plug inserted in through a side of said reservoir, said plug provided with a bore constituting an outlet from said reservoir, a normally closed valve for controlling the flow through said bore, a plunger mounted for reciprocatory movement in said bore, and adapted to act on the liquid in said bore to force the liquid therefrom past said valve, said plug, valve and plunger being demountable as a unit from said casing and a support for the inner end of said plug.

7. In a device of the class described, the combination with a liquid containing reservoir, of a plug inserted in through a side of said reservoir, said plug provided with a bore constituting an outlet from said reservoir, a normally closed valve for controlling the flow through said bore, a plunger mounted for reciprocatory movement in said bore, and adapted to act on the liquid in said bore to force the liquid therefrom past said valve, said plug, valve and plunger being demountable as a unit from said casing and a support for the inner end of said plug, said support connecting opposite sides of said casing and constituting a reinforcement therefor.

8. In a device of the class described, the combination of a reservoir, means positioned within the reservoir for ejecting liquid from said reservoir, said means including a pair of reciprocating plungers disposed in alinement, a single power means mounted in said reservoir for actuating said plungers, said power means including a cam disposed between the adjacent ends and operatively connected to both of said plungers to reciprocate the same from the same power means.

9. In a device of the class described, the combination of a reservoir, means for ejecting liquid from said reservoir, said means including a spring pressed piston, a cam engaging one end of the piston to move the same in one direction, resilient means bearing on the side of the cam opposite the side engaged by the spring pressed plunger, said plunger and resilient means tending to balance each other and a pawl and ratchet feed for periodically actuating said plunger and for placing said resilient means under tension.

10. In a device of the class described, the combination of a reservoir, means for ejecting liquid from said reservoir, said means including a plurality of spring pressed pistons, a sleeve provided with a plurality of cams fixed thereto and each engaging one end of the piston to move the same in one direction, resilient means bearing on a side of the sleeve opposite the side engaged by the spring pressed plungers, said plungers and resilient means tending to balance each other and means for rotating said sleeve about an axis at right angles to the direction of action thereon of said resilient means.

11. In a device of the class described, the combination with a reservoir provided with two pairs of means for ejecting liquid from the reservoir, the elements of each pair being disposed in alinement, a power shaft extending between the adjacent ends of each pair, a sleeve loose on said shaft, two similar peripheral cams mounted on said sleeve to turn therewith, one for actuating each pair of means, the bulge of one cam being advanced circumferentially of the shaft relative to the bulge on the other cam whereby one pair is actuated in advance of the other pair of ejecting means and a one-way driving connection between the shaft and sleeve.

12. In a device of the class described, the combination of a reservoir, means for ejecting liquid from said reservoir, said means including a pair of reciprocating plungers disposed in alinement, a single power means for actuating said plungers, said power means including a cam disposed between the adjacent ends and operatively connected to both of said plungers to reciprocate the same from the same power means and a conduit for receiving the discharge from said ejecting means.

13. In a device of the class described, a receptacle adapted to contain a well of oil, a reciprocating ejecting device demountably positioned in the wall of the receptacle and with its intake end positioned below the level of the oil, mechanism for reciprocating said ejecting device, said mechanism housed within the receptacle and disposed below the level of the oil and means external

of the receptacle for actuating said mechanism.

14. In a device of the class described, a plurality of reciprocating plungers and means for actuating the same comprising a shaft, a cam sleeve loosely mounted thereon and provided with a plurality of cams adapted to be moved into bearing engagement with the plungers to move the same in one direction and a pawl and ratchet feed connected to the sleeve to actuate the cams in unison and connected to the shaft to be actuated thereby.

15. In a device of the class described, a pair of liquid ejecting devices provided with reciprocating plungers and means for moving the same in unison in one direction, said means comprising a single power member, a cam driven from the power member and operatively connected to both of said plungers to actuate the same in unison and means for receiving the discharge from said ejecting devices.

16. In a device of the class described, the combination of a liquid containing receptacle with threaded openings in opposite sides thereof, a pair of plugs threaded into said openings and provided with reciprocating plungers, means for moving the same in unison in one direction, said means comprising a single power member adapted to be positioned below the liquid level in said receptacle and a cam driven from the power member and operatively connected to both of said plungers to actuate the same in unison and a pair of spaced apart spring means adapted to be positioned below the liquid level in the receptacle independent of each other and each acting on its correlated plunger to move the same in the opposite direction.

17. In a device of the class described, the combination with a plurality of ejecting plungers, and means for actuating the same comprising a shaft, a cam sleeve and a ratchet fixed to the sleeve and loose on the shaft, an actuating disk operatively connected to the shaft to be actuated thereby, a plurality of spaced apart pawls carried by the disk and engaging the ratchet to form a pawl and ratchet feed between the shaft and cam sleeve.

Signed at New York, in the county of New York and State of New York this 3rd day of March A. D. 1917.

ROBERT WOOD.