July 24, 1934. G. LARSEN. 1,967,580

PUMP

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Fig. 2.

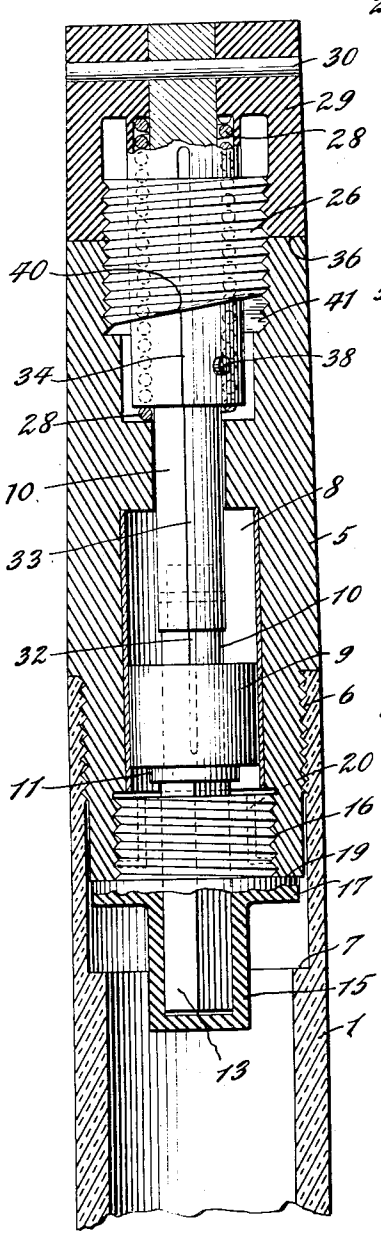


Fig. 1.

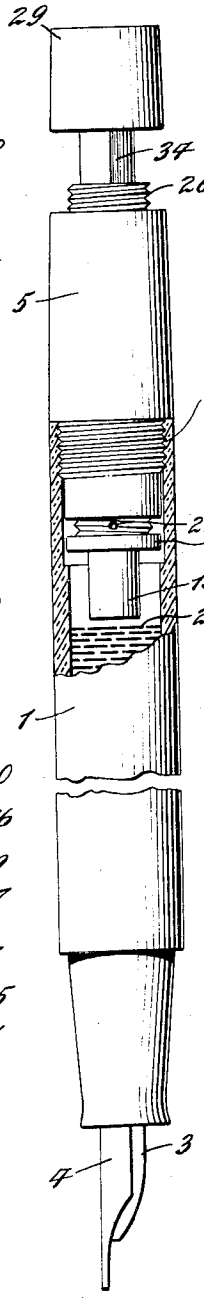
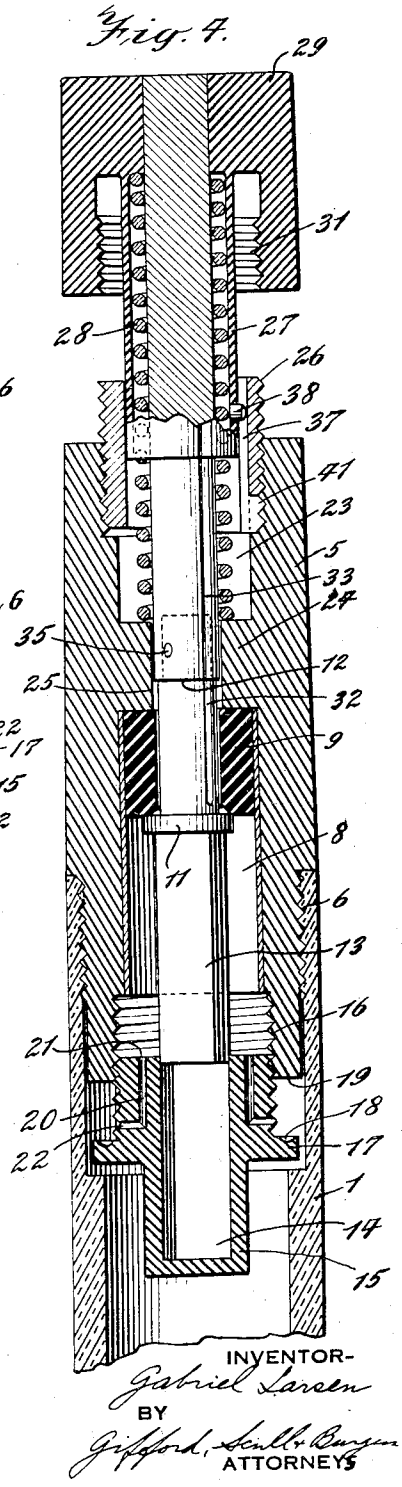


Fig. 4.



INVENTOR-
Gabriel Larsen
BY
Gifford, Scull & Burgess
ATTORNEYS

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Fig. 3.

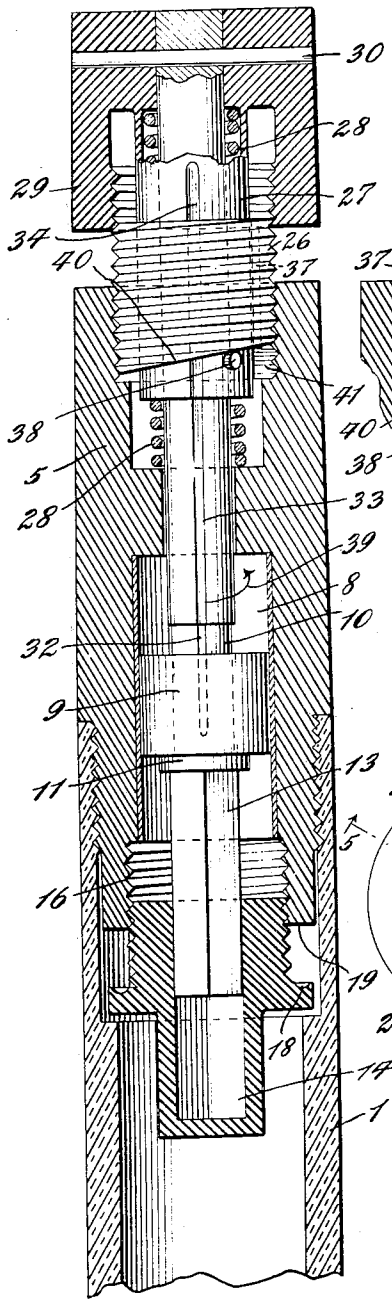


Fig. 7.

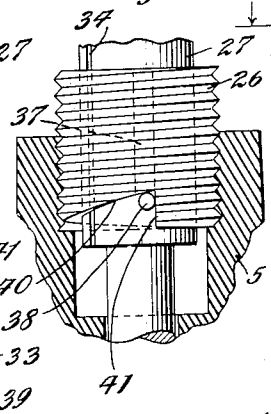


Fig. 6.

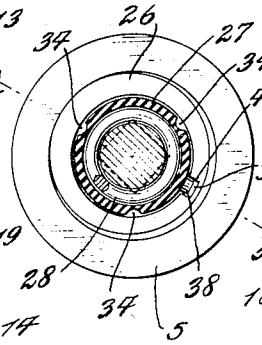
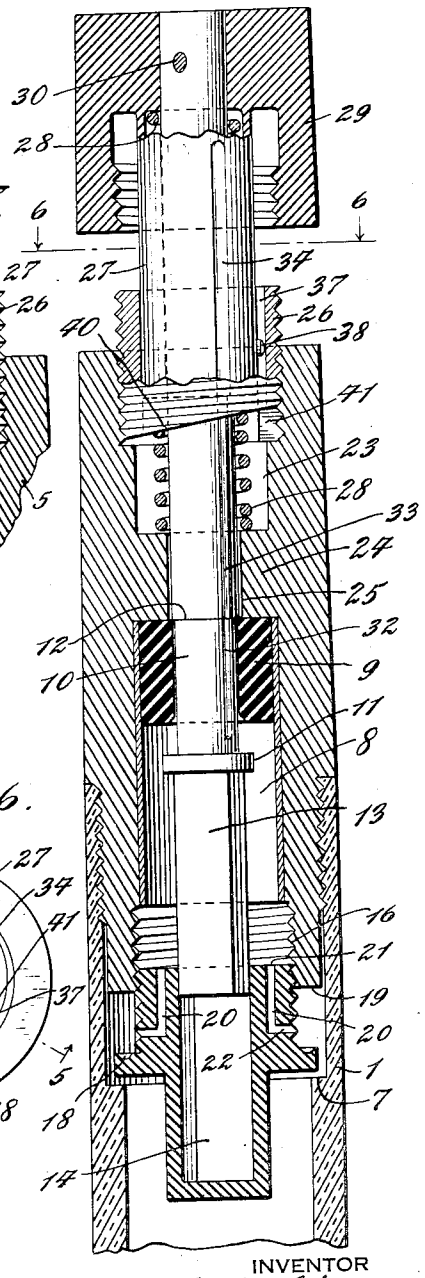


Fig. 5.



INVENTOR
Gabriel Larsen
BY
Gifford, Scull & Bergen
ATTORNEYS

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PUMP

Gabriel Larsen, Springfield, N. J., assignor to L. E. Waterman Company, New York, N. Y., a corporation of New York

Application March 24, 1933, Serial No. 662,423

15 Claims. (Cl. 120—47)

This invention relates to a novel and improved form of pump, the novel features of which will be best understood from the following description and the annexed drawings, in which I have shown a selected embodiment of the invention and in which:

Fig. 1 is a view, partly in elevation and partly in section, of a fountain pen having my invention applied thereto;

Fig. 2 is a vertical sectional view through the upper part of a fountain pen barrel and the pump applied thereto, and showing the parts in their normal position when the pump is inoperative;

Fig. 3 is a view on the same plane as Fig. 2 but showing the parts just before they become operative as a pump;

Figs. 4 and 5 are views similar to Fig. 3 but showing the parts when they are operating as a pump, Fig. 5 being a section on the line 5—5 of Fig. 6;

Fig. 6 is a section on the line 6—6 of Fig. 5;

Fig. 7 is a fragmentary view of a part of the structure shown in Figs. 2, 3, 4, and 5, but taken at right angles to the planes of those figures.

The invention may be used with various devices, but is particularly adapted for use with fountain pens and, for the sake of convenience, I shall describe it when used with a fountain pen. Solely for the purpose of convenience, I also shall assume that the barrel of the pen is extending vertically, and shall refer to the relative positions of the parts as if the pen were in a vertical position.

Referring now to the drawings, the numeral 1 designates the barrel of a fountain pen which is tubular in form and is adapted to contain ink, as indicated at 2. Secured to the upper end of the barrel is a pump which may be used for drawing ink into the barrel through the feed 3 disposed beneath the writing point 4. The feed may be of any usual type of construction, and therefore its details are not illustrated, as they may take various forms, all well known in the art.

The body 5 of the pump is threaded into engagement with the upper end of the barrel, as shown at 6, and in this embodiment the upper end of the barrel wall is thinner than the lower portion thereof, thereby forming a shelf 7 for a purpose which will be explained later.

The body of the pump is provided with a chamber 8 containing a piston 9. In the form shown, the piston is cylindrical in cross-section, as is also the chamber 8, although these forms may, of course, be varied as found expedient. The piston is shown as provided with a centrally disposed hole therethrough in which is received a piston rod 10 having thereon a flange 11 beneath the piston and a shoulder 12 above the piston, the flange and shoulder being spaced apart a distance greater than the thickness or height of the piston, as is plainly shown and for a purpose which will appear presently.

Beneath the flange 11, the piston rod is provided with a squared end 13 slidably mounted in a correspondingly shaped socket 14 in a valve body 15 which is threaded into engagement with the body 5, as indicated at 16. The valve body has thereon a valve proper, here shown as comprising a flange 17 having a cup-shaped recess 18 adapted to contact with the seat 19 on the bottom of the body 5. The valve body is provided with a plurality of vertically extending air vents 20, each vent having the upper end 21 communicating with the chamber 8 at all times, and the lower end 22 being disposed above the valve 17 and sometimes being open as, for example, in Fig. 4, and at other times being closed as in Fig. 2. The opening of the vents is caused by movement of the valve proper away from its seat, and they are closed by movement of the valve proper into engagement with its seat, and this movement in turn is caused by rotation of the valve by means presently to be described.

The upper end of the pump body is provided with a bore or recess 23 separated from the chamber 8 by a horizontally extending partition 24, this partition having therethrough a hole 25 through which the piston rod 10 may slide. As shown in Figs. 4 and 5, this partition serves as a stop to limit the upward movement of the piston 9. Threaded into the upper end of the bore 23 is a tubular plug 26 which receives the upper end of the piston rod. This end is surrounded by a sleeve 27 within which is disposed a compression spring 28 bearing at its lower end against the partition 24 and at its upper end against a cap 29, here shown as secured to the upper end of the piston rod by means of a pin 30, this construction being one which permits ready assembling and disassembling of the various parts. The cap is shown as having the same external diameter and contour as the body 5 of the pump so as to form a substantial continuation thereof when the pump is not being operated. The interior of the cap is provided with threads 31 to engage the threads on the exterior of the plug 26.

Extending lengthwise of the piston rod is a groove or rather a series of grooves communicating with each other, these grooves being des-

ignated, respectively, 32, 33, and 34, and providing a continuous vent or air passage lengthwise of the piston rod. Any desired number of these passages may be used, in this instance three being used, as best shown in Fig. 6. The piston rod is shown as of varying diameters along its length because, in this embodiment, it is made in two parts, one fitting within the other and secured together by a pin 35. This is a convenient manufacturing arrangement which also provides the shoulder 12, although, of course, other convenient forms may be employed.

In operation, when it is desired to pump ink into the barrel 1, the cap 29 is unscrewed from the position in which it appears in Fig. 2. It will be noted that the threads on the plug 26 are right-hand threads, whereas those on the valve body are left-hand. It will also be noted that in Fig. 2, the valve proper 17 is in engagement with its seat 19 when the cap 29 is in engagement with the end 36 of the pump body. Now, as the cap 29 is turned to move it upwardly away from the pump body, the piston rod which is secured to the cap will, through its squared lower end 13, turn the valve so that the valve proper leaves its seat.

When the cap is entirely disengaged from the plug 26, it may be moved up and down, thereby operating the piston and pumping ink into the barrel of the pen through the feed. In the uppermost position of the piston, it engages the partition 24, as seen in Figs. 4 and 5, Fig. 4 showing the end of the up-stroke of the rod. As the down-stroke starts, the shoulder 12, as best shown in Fig. 5, will engage the piston and move it downwardly, and when in this position it will be seen that the air vent or air passage formed by the successive grooves 32, 33, and 34 is continuous from the chamber 8 to the atmosphere, as the groove 34 is exposed between the cap and the end 36. Then, as the down-stroke of the rod and piston takes place, air may escape freely from the chamber. The up-stroke of the piston is caused by engagement of the flange 11 with the piston, as shown in Fig. 3, and there it will be seen that the lower end of the groove 32 is covered by the piston and therefore the chamber 8 is shut off from the atmosphere, and a suction therein is created.

When the pumping action is completed, the parts are returned to the position shown in Fig. 2, and it will be seen that this is done by re-engaging the cap 29 with the threads on the plug 26. The plug 26 is fixed in position in the body 5 of the pump, and in order that, when the cap 29 engages the end 36 of the pump body the valve proper 17 shall also engage its seat 19, it is essential that the turning of the valve body should be simultaneous with the turning of the cap in engagement with the threads of the cap. For example, if the cap were turned several times in vain efforts to catch the threads of the plug, the valve would be seated while the cap was still out of engagement with the end of the pump body, because it will be seen that the valve body is never out of engagement with the threads 16, and therefore any turning of the piston rod means a turning of the valve body. Similarly, if for any reason the threads on the cap should catch the threads on the plug too soon, it would mean that the cap would engage the end 36 of the pump body and thus stop further rotation of the piston rod while the valve proper was still out of engagement with its seat 19. That would mean that ink could work its way through, past the valve and into the pump.

The above difficulty is prevented by means which will insure that the pumping action must always take place with the piston rod in a certain definite rotative position, that it cannot rotate except when the cap is in engagement with the plug, and that this threaded engagement shall always begin at the proper time so that, when the cap engages the end 36 of the pump body, the valve proper 17 will firmly engage its seat 19. This means will now be described.

The interior of the plug 26 is provided with a groove 37 within which is adapted to be received a lug 38 protruding from the sleeve 27. This groove 37 is so arranged that the lug 38 will enter it at the exact instant that the cap 29 becomes disengaged from the threads of the plug 26. This action will probably be best understood from a study of Fig. 3, where it will be seen that the cap 29 is about to become disengaged from the threads of the plug, the cap and consequently the piston rod being turned in the direction indicated by the arrow 39. The lower end of the plug has a portion thereof cut away as indicated at 40 so as to provide an abrupt shoulder 41 against which the lug 38 may engage as the rotation of the cap and consequently the piston rod continues from the position shown in Fig. 3. This shoulder 41 is in line with one wall of the groove 37 so that, as the lug 38 strikes the shoulder, it is in position wherein it may be moved into the groove 37.

The pumping action may now proceed, and after the pumping is completed, the cap is again brought into threaded engagement with the plug 26 and rotated to bring the valve against its seat, and the cap into engagement with the end of the pump body. Because of the lug 38, the piston rod cannot be turned, it being noted that this lug is always within the groove 37 during the pumping action. The shoulder 41 is in fact the lower end of the thread on the plug. It is made an abrupt end rather than a gradual tapering end as is common in threaded constructions, so that, while the lug may pass freely beneath the last thread on the turn previous to that indicated in Fig. 3, nevertheless when that turn takes place, the lug will engage the abrupt lower end of the thread.

It will be seen that the arrangement just described also prevents turning of the piston rod to too great an extent, an extent which would cause the valve body to become disengaged from the threads 16. As a further precaution against this happening, the shoulder 7 is provided which would engage the flange 17 before the threads would become disengaged.

Various parts may be made of any suitable material, the piston here being indicated as made of rubber and working in a metallic sleeve within the chamber 8. It is desirable that the operation of the pump may be discontinued when the ink reaches some such level as indicated in Fig. 1, and for that purpose I have shown the barrel as being made of glass and thus transparent so that the level of ink may be observed. This, of course, performs the double function of permitting the user to see when the barrel has become filled so he may stop pumping, and also of permitting him to see when the barrel is nearly empty. Other suitable means for gauging the amount of ink or other fluid may be used.

The invention is one which is found to be particularly useful in connection with fountain pens, and it has been shown and described as so used.

although it is contemplated that other uses may be found therefor. It will be seen that all operating parts of the pump are in a position where none of them need come in contact with the ink or other fluid, thus preventing clogging of the pump mechanism.

While I have shown the invention as embodied in a specific form, it is to be understood that various changes in details may be made without departing from the scope of the invention, and I therefore do not intend to limit myself except by the appended claims.

I claim:

1. In a pump, a valve having a body and a valve proper, a seat for said valve proper, means for moving said valve proper into and out of engagement with said seat, means forming an air vent past the valve, said vent being closed when the valve proper is in engagement with its seat, a container for fluid on one side of the valve, and a suction producing means on the other side thereof.

2. In combination, a container for fluid, a pump disposed above said container and having a chamber with a suction producing means therein, means normally closing said chamber from communication with said container, normally inoperative means to operate said suction producing means, and means to render said operating means operative and to simultaneously connect said chamber with said container.

3. In combination, a container for fluid, a pump disposed above said container and having a chamber with a suction producing means therein, a valve normally closing said chamber from communication with said container, normally inoperative means to operate said suction producing means, and means to render said operating means operative and to simultaneously open said valve and connect said chamber with said container.

4. In combination, a pump having a body with a chamber therein, a piston slidable within said chamber, a piston rod slidable within said piston, means limiting the sliding movement of the rod within the piston, whereby a lost motion operating connection between the rod and piston is provided, and an air vent in the piston rod and opened and closed by the relative motion of the piston with respect to the piston rod on movement of the rod in opposite directions.

5. In combination, a container for fluid, a pump having a body secured to said container and closing the same, a chamber within said body, a valve having threaded engagement with said body and seated thereon, a piston slidable in said chamber, a piston rod to operate said piston and adapted to turn said valve upon turning of the rod, a member secured to said rod exteriorly of said body and adapted to turn the rod, said member being threaded to the body, said last-named threads being opposite in pitch to the threads between the valve and the body, for the purpose set forth.

6. In combination, a container for fluid, a pump having a body secured to said container and closing the same, a chamber within said body, a valve having threaded engagement with said body and seated thereon, a piston slidable in said chamber, a piston rod to operate said piston and adapted to turn said valve upon turning of the rod, a member secured to said rod exteriorly of said body and adapted to turn the rod, said member being threaded to the body, said last-named threads being opposite in pitch to the threads between the valve and the body and becoming disengaged upon turning of the rod while the valve is still in threaded engagement with the body.

7. In combination, a container for fluid, a pump having a body secured to said container and closing the same, a chamber within said body, a valve having threaded engagement with said body and seated thereon, a piston slidable in said chamber, a piston rod to operate said piston and adapted to turn said valve upon turning of the rod, a member secured to said rod exteriorly of said body and adapted to turn the rod, said member being threaded to the body, said last-named threads being opposite in pitch to the threads between the valve and the body and becoming disengaged upon turning of the rod while the valve is still in threaded engagement with the body, and means preventing further rotation of the rod after disengagement of said last-named threads while permitting movement of the rod lengthwise thereof to operate the piston.

8. In combination, a container for fluid, a pump having a body secured to said container and closing the same, a chamber within said body, a valve having threaded engagement with said body and seated thereon, a piston slidable in said chamber, a piston rod to operate said piston and adapted to turn said valve upon turning of the rod, a member secured to said rod exteriorly of said body and adapted to turn the rod, said member being threaded to the body, said last-named threads being opposite in pitch to the threads between the valve and the body and becoming disengaged upon turning of the rod while the valve is still in threaded engagement with the body, means preventing further rotation of the rod after disengagement of said last-named threads while permitting movement of the rod lengthwise thereof to operate the piston, said means comprising a lug connected to said rod and movable in a groove fixed in position and extending longitudinally of the body, and means causing said lug to enter said groove when said last-named threads are disengaged.

9. In a pump, a body having a chamber with a piston movable therein, a piston rod adapted to operate said piston, a valve normally closing said chamber, a connection between said rod and valve and adapted to open the valve upon turning of the rod, and means to limit the turning of said rod.

10. In a pump, a body having a chamber with a piston movable therein, a piston rod adapted to operate said piston, a valve normally closing said chamber, a connection between said rod and valve adapted to open the valve upon turning of the rod, and means to limit the turning of said rod in both directions.

11. In a pump, a body having a chamber with a piston movable therein, a piston rod adapted to operate said piston, a valve normally closing said chamber and having threaded engagement with said body, a valve proper on said valve and having engagement with a seat on said body, means forming air vents through the valve and terminating at one end between said seat and valve proper and at the other end communicating with said chamber, means to turn said rod and having threaded connection with said body, and means to limit rotation of said rod to prevent disengagement of the threaded valve from the body.

12. In a pump, a body having a chamber with a piston movable therein, a piston rod adapted

to operate said piston, a valve normally closing said chamber and having threaded engagement with said body, a valve proper on said valve and having engagement with a seat on said body, means forming air vents through the valve and terminating at one end between said seat and valve proper and at the other end communicating with said chamber, means to turn said rod and having threaded connection with said body, the extent of said threaded connection being less than the extent of the threaded engagement between the valve and the body, whereby said connection will be broken while said threaded engagement will remain.

13. In a pump, a body having a chamber with a piston movable therein, a piston rod adapted to operate said piston, a valve normally closing said chamber and having threaded engagement with said body, a valve proper on said valve and having engagement with a seat on said body, means forming air vents through the valve and terminating at one end between said seat and valve proper and at the other end communicating with said chamber, means to turn said rod and having threaded connection with said body, the extent of said threaded connection being less than the extent of the threaded engagement between the valve and the body, whereby said connection will be broken while said threaded engagement will remain, and means preventing further rotatable movement of the rod after said threaded connection is ended.

14. In a pump, a body having a chamber with a piston slidable therein, a piston rod adapted to operate said piston and slidably mounted in said body, a valve adapted to close said chamber and having threaded engagement with said body, a connection between said piston rod and said valve adapted to rotate the valve upon rotation of the rod, a bore within said body through which said rod passes, a tubular plug threaded into said bore and surrounding said rod, said plug extending beyond the end of said body, a cap secured to said rod and having threaded engagement with said plug, a lug connected to said rod and normally disposed in the bore beneath said plug, said plug having a groove extending parallel to said rod and adapted to receive said lug, and said lug reaching said groove simultaneously with the disconnection of the cap from the plug when the cap is turned thereon.

15. In a pump, a body having a chamber with a piston slidable therein, a piston rod adapted to operate said piston and slidably mounted in said body, a valve adapted to close said chamber and having threaded engagement with said body, a connection between said piston rod and said valve adapted to rotate the valve upon rotation of the rod, a bore within said body through which said rod passes, a tubular plug threaded into said bore and surrounding said rod, said plug extending beyond the end of said body, a cap secured to said rod and having threaded engagement with said plug, a lug connected to said rod and normally disposed in the bore beneath said plug, said plug having a groove extending parallel to said rod and adapted to receive said lug, said lug reaching said groove simultaneously with the disconnection of the cap from the plug when the cap is turned thereon, and an abrupt shoulder on the plug to engage said lug and guide it into said groove.

GABRIEL LARSEN.