G. R. KENNEDY.

LUBRICATOR.

APPLICATION FILED FEB. 21, 1914.

1,168,646.

Patented Jan. 18, 1916.

2 SHEETS—SHEET 1.

FIG. 1

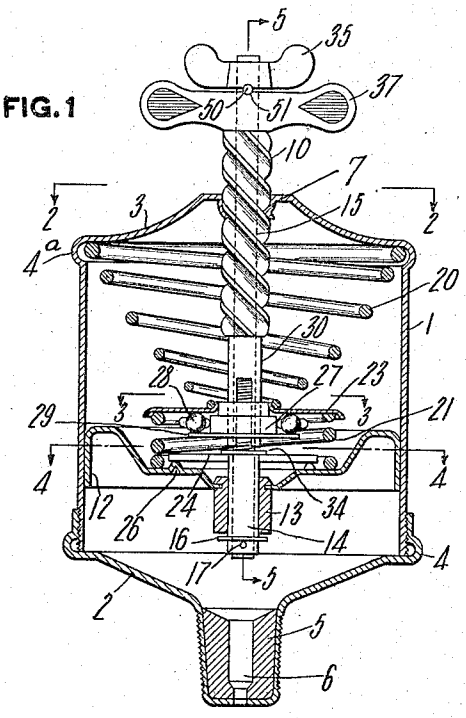


FIG. 2

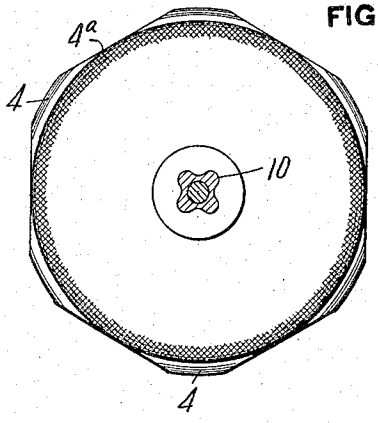


FIG. 4

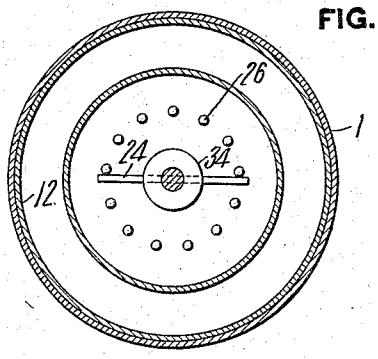


FIG. 5

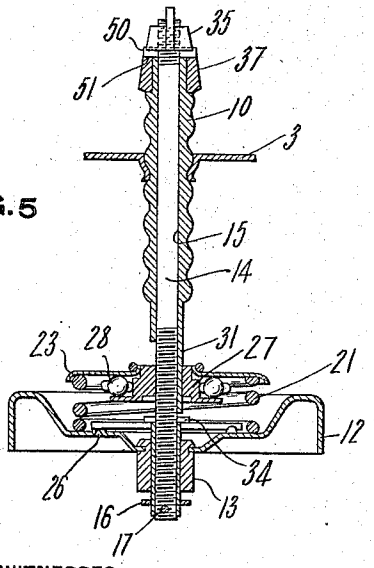


FIG. 6

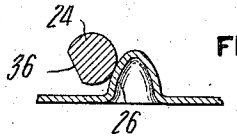
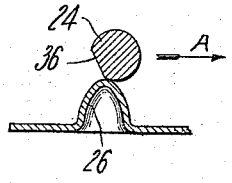


FIG. 7



WITNESSES

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2 SHEETS—SHEET 2.

FIG. 8

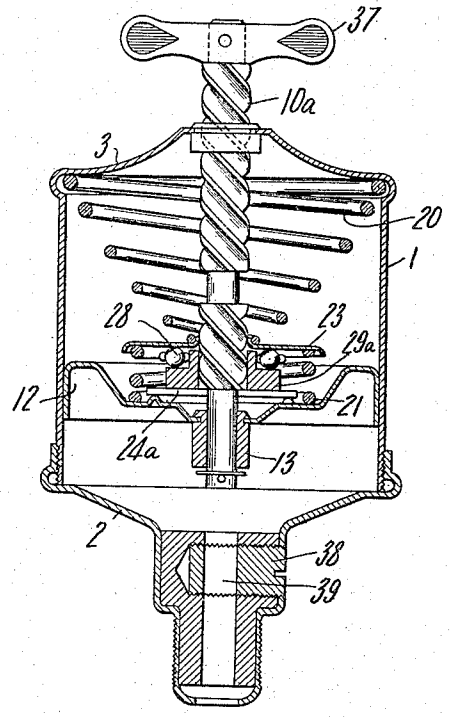
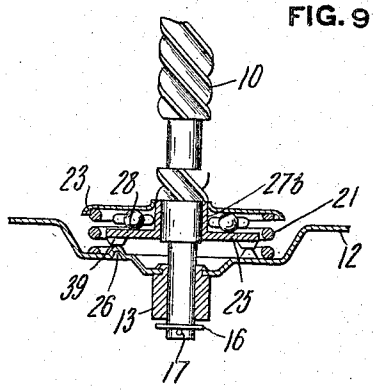


FIG. 9



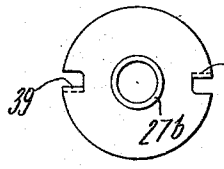


FIG. 10

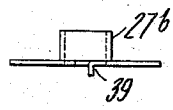
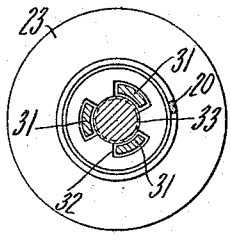


FIG. 11

FIG. 3



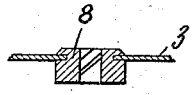


FIG. 12

WITNESSES

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LUBRICATOR.

1,168,646. Specification of Letters Patent. Patented Jan. 18, 1916.

Application filed February 21, 1914. Serial No. 820,290.

To all whom it may concern:

Be it known that I, GEORGE RUSSELL KENNEDY, a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Lubricators, of which the following is a specification.

This invention relates to lubricators and more particularly to cups for feeding lubricants, such as grease, in which pressure is employed to cause the flow or movement of the lubricant to the surface to be lubricated.

The present invention is an improvement upon the lubricator shown, described and claimed in my Patents No. 906,720, dated December 15, 1908, and No. 1,071,754, dated September 2, 1913.

The object of the present invention is to simplify the construction of the lubricator covered by my former patents, to cheapen the manufacture thereof, to provide an improved form of escapement mechanism, to provide a simple arrangement for adjusting the rate of feed of the lubricant, and generally to improve the construction and operation thereof.

The invention comprises the construction and arrangement of parts hereinafter described and claimed.

In the accompanying drawings Figure 1 is a longitudinal sectional view through one form of the lubricator, the piston stem and some of its associated parts being shown in side elevation; Fig. 2 is a sectional plan view on the line 2—2, Fig. 1; Fig. 3 is a detail cross section, on a larger scale, and taken on the line 3—3, Fig. 1, looking in the direction of the arrows; Fig. 4 is a similar cross section on the line 4—4, Fig. 1; Fig. 5 is a detail sectional elevation, on the line 5—5, Fig. 1, and showing the adjusting mechanism for controlling the rate of flow of the lubricant; Figs. 6 and 7 are detail views of the escapement mechanism; Fig. 8 is a view corresponding to Fig. 1, and partly in section, and illustrating another embodiment of the invention; Fig. 9 is a detail view corresponding to Fig. 8, and showing another modification; Figs. 10 and 11 are respectively plan and edge views of the washer shown in Fig. 9; and Fig. 12 is a sectional view of a modification.

The grease cup shown in the drawings embodies a cup 1, which is preferably cylindrical and which is provided with a removable lower cap or head 2 threaded onto the body, as shown in Fig. 1. The upper end of the cup is closed by a head or cap 3, which may be detachably connected to the body, but is shown as integral therewith. The cup and removable cap are preferably beaded outwardly during the pressing operation, for ornamental purposes, the bead 4 on the cap being shaped to provide a wrench hold and the bead 4^a on the cup being preferably knurled for rotating them with reference to each other. The cup may be filled with lubricant either by removing the lower head 2 or in any other suitable way, depending upon the consistency of the lubricant. The lower head 2 of the cup is provided with a threaded discharge nozzle for attachment to the bearing or part to be lubricated. In the form shown in Fig. 1 the central portion of the cap is drawn into the form of a tube in which is placed a solid plug 5, which may be secured to the cap by soldering or may be forced thereinto by pressure as desired. Said plug is then bored to form a central discharge orifice 6 large enough for the maximum discharge of lubricant desired. The upper head or cap 3 is provided with a nut 7, which may be formed in several ways. Fig. 1 shows the nut formed by drawing the central portion of the cap into a short tube and then forming threads therein by a broaching operation. The threads need not be very deep, so there is no liability of removing too much metal by the broaching operation and thereby weakening the cap. Fig. 12 shows another arrangement in which the nut is a part secured to the cap. As shown, the cap is first provided with a central opening to receive a stud 8, the reduced end of which is then swaged over to secure it to the cap. The stud is then bored and broached to form the internal threads of the nut, which consequently can be truly central with respect to the cap.

Extending through the nut is a screw threaded rod 10 which may be either a tube or solid, and which is provided with threads of quick pitch. This screw is preferably formed by twisting a rolled or drawn bar having the cross section shown in Fig. 2, which produces spiral ribs or grooves on the bar which serve as the screw threads. This is a cheap method of forming the screw as it avoids a cutting operation and

does not remove the dense tough skin of the rolled or drawn bar, so that the screw threads are not so liable to wear out. The threads on the screw and in the nut are of such a quick pitch that when force is applied to the shaft in the direction of its length, said shaft moves endwise and rotates in the nut. Preferably two or more threads are used, four being shown, in order to support the rod 10 at a number of points, and thereby keep it more accurately in vertical position.

Within the cup is a piston or plunger 12 which may be provided with the usual cup leather, but which is shown as pressed from sheet metal with a cylindrical rim portion which has a close sliding fit in the cup. This piston is adapted to be shifted lengthwise in the cup by suitably controlled means as hereinafter described. As shown, the piston is provided with a central sleeve 13, which may be formed or secured thereto in the same manner as the nut on the upper cap 3, and which sleeve has a limited amount of sliding motion on a central stud or rod 14 formed on or secured to the lower end of the threaded rod or screw 10. This stud is shown integral with the screw in Fig. 8, and in Fig. 1 is the lower end of a cylindrical bar or rod rotatably mounted in the bore 15 of said screw and extending beyond the outer end thereof, where it is provided with a winged nut 35 for rotating it by hand. At its lower end the stud 14 is provided with a washer 16 and a cross pin 17 to limit the longitudinal movement of the piston or plunger thereon and to prevent escape of the piston from the rod and also to disengage the escapement mechanism when raising the plunger for filling the cup.

The piston or plunger is controlled or operated by substantially the same means as in my patents above described, that is to say, by means of the shifting of a feeding spring 20 and the pressure of a spring 21. Spring 20 is of spiral conical form and its upper turn is seated in the bulge 4^a at the upper end of the cup. The spring 21 may also be conical, but is shown as a cylindrical spiral spring. Spring 20 serves to feed downwardly the rods 10 and 14 and to maintain substantially constant the tension of spring 21, which serves as the effective means for maintaining pressure on the lubricant in the cup and which by reason of the spring 20 and the escapement mechanism to be described exerts an approximately uniform pressure upon the lubricant irrespective of the amount of lubricant in the cup. As shown in Fig. 1, the spring 20 is interposed between the cap 3 and a follower member or washer 23, which is loosely sleeved upon the rod 10 or a part connected thereto, while the spring 21 is interposed between this same follower 23 and the piston or plunger 12.

Interposed between the piston or plunger 12 and the rod or shaft 10 is a suitable escapement mechanism to control the feeding action of spring 20. This escapement mechanism comprises a member which in operation is non-rotatable and lengthwise immovable with respect to the rod or shaft 10 and which coöperates with an annular series of escapement members on the piston or plunger 12. The non-rotatable member on the rod 10 may be a cross pin 24 forced into a cross aperture in the inner rod 14, as shown in Fig. 1, or a pin carried by the threaded rod 10, as in Fig. 8, or may be a disk 25 having a sleeve portion forced by pressure over a cylindrical portion of the rod, as shown in Fig. 9. The escapement members may be teeth of the same type shown in my prior patents referred to, but preferably are formed by punching up small knobs or projections 26 from the metal of the piston or plunger 12, as shown in Fig. 1. This is a cheap construction and produces round blunt teeth which have no sharp edges and are not liable to wear out rapidly.

In the device shown in Fig. 1 the washer 23 is sleeved on a bushing 27 surrounding the threaded rod 10. Said washer rests upon a suitable ball-bearing 28, which, in turn, rests upon the lower flange 29 of said bushing. The bushing 27 is threaded upon the rod 14, and is non-rotatable and longitudinally slidable with reference to the threaded rod 10. The threads are cut away from the lower end of the rod 10 to form a smooth cylindrical tubular portion 30, which is longitudinally slotted at its end to provide a plurality of prongs or teeth 31, three being shown. These teeth at their lower ends are spaced a short distance from a small washer 34 lying just above the cross pin 24, while the rod 10, at its upper end is provided with a suitable rigid operating handle 37 lying just below the wing nut 35, so that the tubular rod 10 is rotatable but longitudinally immovable on the inner rod 14, except as hereinafter described. Bushing 27 has a central opening of the shape shown in Fig. 3 and is provided with three grooves or channels 32 for the prongs 31, the material intermediate said grooves or channels being threaded, as at 33, and projecting through the slots between the prongs of the rod 10 into engagement with the threads of the inner rod 14. The shifting spring 20 holds the follower or washer 23 constantly pressed toward the ball-bearing, which in turn exerts endwise force on the inner rod 14 and cross pin 24, and also upon the threaded rod 10.

The threaded connection between the bushing 27 and rod 14 is provided in order

to adjust the effective pressure upon the plunger 12, to thereby control the rate of discharge of the grease from the cup. This pressure depends upon the tension of spring 21, which is confined between the washer 23 and the piston. Washer 23 is held down by the spring 20 against bearing 28, which rests solidly upon a flange of the bushing 27. Consequently, by adjusting bushing 27 toward or from the piston, the minimum or maximum pressures which can be obtained from spring 21 may be regulated. Rod 14 may be rotated in the hollow rod 10 by turning the winged nut 35. If this rod is rotated in one direction the bushing is forced nearer to the piston, thereby increasing the pressure on the grease and the rate of discharge thereof. Rotation of the rod in the other direction decreases the rate of discharge. When the bushing is adjusted to secure the proper rate of discharge, as described, the rods 10 and 14, and the bushing 27 act as one piece, due to the fact that the friction between bushing 27 and the ball-bearing and between the threads of the screw 10 and nut 7 is much less than that between the rods 10, 14 and the bushing 27, and which must be overcome before these parts rotate or move with reference to each other. Consequently, it can be assumed that in normal operation of the device the bushing 27 and pin 24 are fixed parts of the threaded rod 10.

To prevent any possibility of rods 10 and 14 rotating with reference to each other during operation or at any time except when desired, the winged nut 35, which is threaded on rod 14, is non-rotatably secured thereto by a cross pin 50, which is normally held in a cross groove 51 in the upper surface of the handle 37 by the pressure on the piston, thereby non-rotatably connecting rods 10 and 14. In adjusting the bushing 27 to vary the feeding pressure the winged nut is turned to disengage the pin 50 from the groove 51 which is permitted by the clear space between the ends of the prongs 31 and the washer 34.

When the piston or plunger 12 is exerting pressure upon the lubricant in the cup the escapement members are held interlocked or in the position shown in Figs. 5 and 6. The pressure of the springs in one direction and of the lubricant in the opposite direction exerts sufficient force on the piston or plunger to prevent its rotation under the propelling action of the springs. Consequently, the teeth or projections 26 on the plunger are relatively stationary, that is, non-rotatable, and serve to lock the pin 24 against rotation. Consequently, rods 14 and 10 for the time being are non-rotatable in the nut 7 and cannot move endwise. As the lubricant is forced slowly out of the cup the spring 21 gradually expands, forcing the piston or plunger 12 downwardly as fast as is permitted by the escape of the lubricant until the teeth 26 are withdrawn from engagement with the pin 24, or to the position shown in Figs. 1 and 7. There is an uneven number of the projections 26, thirteen being shown, while the pin 24 is double ended, and its opposite ends coöperate alternately with successive projections. When the piston has been moved downwardly as described, the rods 10 and 14 are free to rotate and do so by reason of the force exerted endwise thereon by the shifting spring 20, turning in the direction of the arrow A, Fig. 7, and moving downwardly through nut 7 until the opposite end of the pin engages another tooth 26. This has the effect of again compressing the spring 21 and the parts remain in this position with the piston being gradually forced downwardly by the spring 21 as fast as allowed by the escape of the lubricant until the escapement mechanism is again released. The result is that the bearing or abutment for the pressure spring 21 represented by the bushing 23, is intermittently shifted downwardly so as to restore tension to the spring 21 as its tension is utilized in moving the piston and maintaining the piston under substantially constant tension irrespective of whether the cup is full or nearly empty, and insuring a constant feed of the lubricant from the cup. Obviously, the spring 20 is the stronger of the two springs and its tension is given up intermittently to restore the tension of spring 21.

Projections 26 are preferably of such size and are so spaced that when the cross pin 24 is interlocked therewith two of said projections are substantially in contact with the same side of the pin, but in successive positions of said pin the projections contact with opposite sides thereof. If the pin has too large a cross section it may be flattened or filed away on one side at each end, as shown at 36, Fig. 6, so that it will fully seat and interlock with the projections and at the same time avoid play or lost motion in the escapement. The arrangement described also equalizes the pressures on the opposite edges of the piston and reduces the liability of its tilting or becoming askew in the cup.

The piston or plunger 12 can be raised to fill the cup or for other purposes by means of the handle 37, which can be grasped and by means of which the shaft can be turned in the proper direction, whereby the threads on the rod 10 cause the rod to move endwise and lift the plunger. The smooth cylindrical portion 30 of the rod 10 is longer than the height of the nut 7, so that when the rod has been fully withdrawn from the nut a partial turn thereof disengages the threads of the screw and nut and holds the piston retracted with the spring 20 under full compression. As soon as the cup is filled, the screw is turned until the threads are again

engaged, whereupon the springs and escapement mechanism become again effective to force the grease from the bearing.

Fig. 8 shows a modified form of the invention in which the adjustable connection between the bushing and the rod supporting the same is omitted. In this form the bushing 29^a has a loose fit over the lower threaded portion of the rod 10^a, which is solid and is provided with a cross pin 24^a. The bushing 29^a carries a ball-bearing 28 which supports the washer 23. Feeding spring 20 rests on the upper face of said washer while the spring 21 lies below the same. This arrangement operates upon the same general principles as the device shown and described in my Patent No. 1,071,754 above referred to, but has the same arrangement of escapement mechanism as in the form heretofore described. The rate of discharge of the grease is controlled by a suitable valve in the lower cap 2, shown as a plug 38 threaded into a cross opening in the neck of the cap 2 and having a cross port or passage 39. By turning said plug the discharge orifice can be opened or restricted as desired.

In the form shown in Fig. 9 the cross pin is dispensed with, and the projections 26 cooperate with two tongues 39 punched out and turned down from the periphery of the bushing 27^b, which is forced onto the rod 10 by pressure. This arrangement has the advantage that the tongues 39, which correspond to the opposite ends of the pin 24 or 24^a can be located exactly on opposite sides of the axis of the shaft, while when the pin is used it is necessary either to have the aperture for receiving the same pass exactly through the center of the rod or bend the ends of the pin to proper position.

The lubricator described is so constructed that it can be very cheaply manufactured, but at the same time is durable and not liable to easily get out of order. The adjusting mechanism described enables the rate of discharge of the lubricant to be adjusted or regulated and does away with the necessity for a special valve for this purpose. The escapement mechanism is of simple construction and balances the pressures at opposite edges of the piston, so that the latter moves easily through the cup and is not liable to tilt and bind therein. Most of the parts are formed of sheet metal by pressing or stamping operations and consequently can be made at low cost.

What I claim is:—

1. In a lubricator, the combination of a cup, a piston or plunger, a threaded rod or shaft, a pressure spring interposed between said threaded rod and piston, a nut engaging the threaded rod and non-rotatably supported on the cup, a shifting spring interposed between the cup and threaded rod and serving to move the latter longitudinally and thereby rotate the same in said nut, and means for adjusting the tension of said pressure spring.

2. In a lubricator, the combination of a cup, a piston or plunger, a threaded rod or shaft, a pressure spring interposed between said threaded rod and piston, a nut engaging the threaded rod and non-rotatably supported on the cup, a shifting spring interposed between the cup and threaded rod and serving to move the latter longitudinally and thereby rotate the same in said nut, and means extending to the outside of the cup and arranged when operated to adjust the tension of said pressure spring.

3. In a lubricator, the combination of a cup, a piston or plunger, a threaded rod or shaft, a pressure spring interposed between the threaded rod and piston, a nut engaging the threaded rod and non-rotatably supported on the cup, a shifting spring interposed between the cup and threaded rod and serving to move the latter longitudinally and rotate the same in said nut, escapement mechanism controlling the action of said last named spring, and means for adjusting the tension of said pressure spring.

4. In a lubricator, the combination of a cup, a piston or plunger, a threaded rod or shaft, a pressure spring interposed between the threaded rod and piston, a nut engaging the threaded rod and non-rotatably supported on the cup, a shifting spring interposed between the cup and threaded rod and serving to move the latter longitudinally and rotate the same in said nut, escapement mechanism controlling the action of said last named spring, and means extending to the outside of the cup and arranged when operated to adjust the tension of said pressure spring.

5. In a lubricator, the combination of a cup, a piston or plunger, a threaded rod carrying said piston or plunger, a nut engaging the threaded rod and non-rotatably supported on the cup, a pressure spring interposed between the threaded rod and piston, a shifting spring interposed between the cup and threaded rod and serving to move the latter longitudinally and rotate the same in said nut, escapement mechanism controlling the action of the last named spring and comprising an odd number of projections on said piston and spaced at intervals around the axis of said rod, and two escapement members coöperating therewith and movable with said rod and lying at opposite sides of the axis thereof, said escapement members coöperating alternately with the projections on opposite sides of the axis of the rod.

6. In a lubricator, the combination of a cup, a sheet metal piston provided with a plurality of integral circumferentially

spaced projections, a threaded rod, a pressure spring interposed between the rod and piston, a nut engaging the rod and non-rotatably supported on the cup, a shifting spring interposed between the cup and rod and serving to move the latter longitudinally and rotate the same in said nut, and escapement members carried by said rod and cooperating with said projections.

7. In a lubricator, the combination of a cup, a sheet metal piston provided with a plurality of integral circumferentially spaced projections, a threaded rod, a pressure spring interposed between the rod and piston, a nut engaging the rod and non-rotatably supported on the cup, a shifting spring interposed between the cup and rod and serving to move the latter longitudinally and rotate the same in said nut, and two escapement members lying on opposite sides of said rod and coöperating alternately with the projections on opposite sides of said rod and arranged to control the action of the last named spring.

8. In a lubricator, the combination of a cup, a piston or plunger, a threaded rod or shaft, an abutment carried thereby, a pressure spring interposed between said abutment and piston, a nut engaging the threaded rod and non-rotatably supported on the cup, and means extending to the outside of said cup for adjusting the tension of said spring.

9. In a lubricator, the combination of a cup, a piston or plunger, a threaded rod or shaft, an abutment carried thereby, a pressure spring interposed between said abutment and piston, a nut engaging the threaded rod and non-rotatably supported on the cup, and means extending to the outside of said cup for adjusting said abutment on said rod to vary the tension of said spring.

10. In a lubricator, the combination of a cup, a piston or plunger, a threaded rod or shaft, an abutment carried thereby, a pressure spring interposed between said abutment and piston, a nut engaging the threaded rod and non-rotatably supported on the cup, a shifting spring interposed between the cup and threaded rod and serving to move the latter longitudinally and thereby rotate the same in said nut, and means for adjusting said abutment to vary the tension of said pressure spring.

11. In a lubricator, the combination of a cup, a piston or plunger, a threaded rod or shaft, an abutment carried thereby, a pressure spring interposed between said abutment and piston, a nut engaging the threaded rod and non-rotatably supported on the cup, a shifting spring interposed between the cup and threaded rod and serving to move the latter longitudinally and thereby rotate the same in said nut, and means for adjusting said abutment longitudinally on said rod to thereby vary the tension of said pressure spring.

12. In a lubricator, the combination of a cup, a piston or plunger, a threaded rod or shaft, an abutment carried thereby, a pressure spring interposed between said abutment and piston, a nut engaging the threaded rod and non-rotatably supported on the cup, a shifting spring interposed between the cup and threaded rod and serving to move the latter longitudinally and thereby rotate the same in said nut, and means extending to the outside of the cup and arranged when operated to adjust said abutment on said rod to vary the tension of said pressure spring.

13. In a lubricator, the combination of a cup, a piston or plunger, a hollow threaded rod or shaft, a nut engaging the threaded rod and non-rotatably supported on the cup, a shaft within said threaded rod and carrying said piston, a bushing having a threaded connection with said inner shaft and non-rotatably connected with said threaded rod, an abutment carried by said bushing, a shifting spring interposed between the cup and abutment and serving to move the latter and the threaded rod longitudinally and rotate the same in said nut, and a pressure spring interposed between the abutment and piston.

14. In a lubricator, the combination of a cup, a piston or plunger, a hollow threaded rod or shaft, a nut engaging the threaded rod and non-rotatably supported on the cup, a shaft within said threaded rod and carrying said piston, a bushing having a threaded connection with said inner shaft and non-rotatably connected with said threaded rod, an abutment carried by said bushing, a shifting spring interposed between the cup and abutment and serving to move the latter and the threaded rod longitudinally and rotate the same in said nut, a pressure spring interposed between the abutment and piston, and escapement mechanism controlling the action of the last named spring.

In testimony whereof, I have hereunto set my hand.

GEORGE RUSSELL KENNEDY.

Witnesses:

WILLIAM B. WHARTON,

ELBERT L. HYDE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."