No. 782,532. PATENTED FEB. 14, 1905.

G. W. THURSTON.

LUBRICATOR.

APPLICATION FILED NOV. 18, 1904.

2 SHEETS—SHEET 1.

FIG. 1.

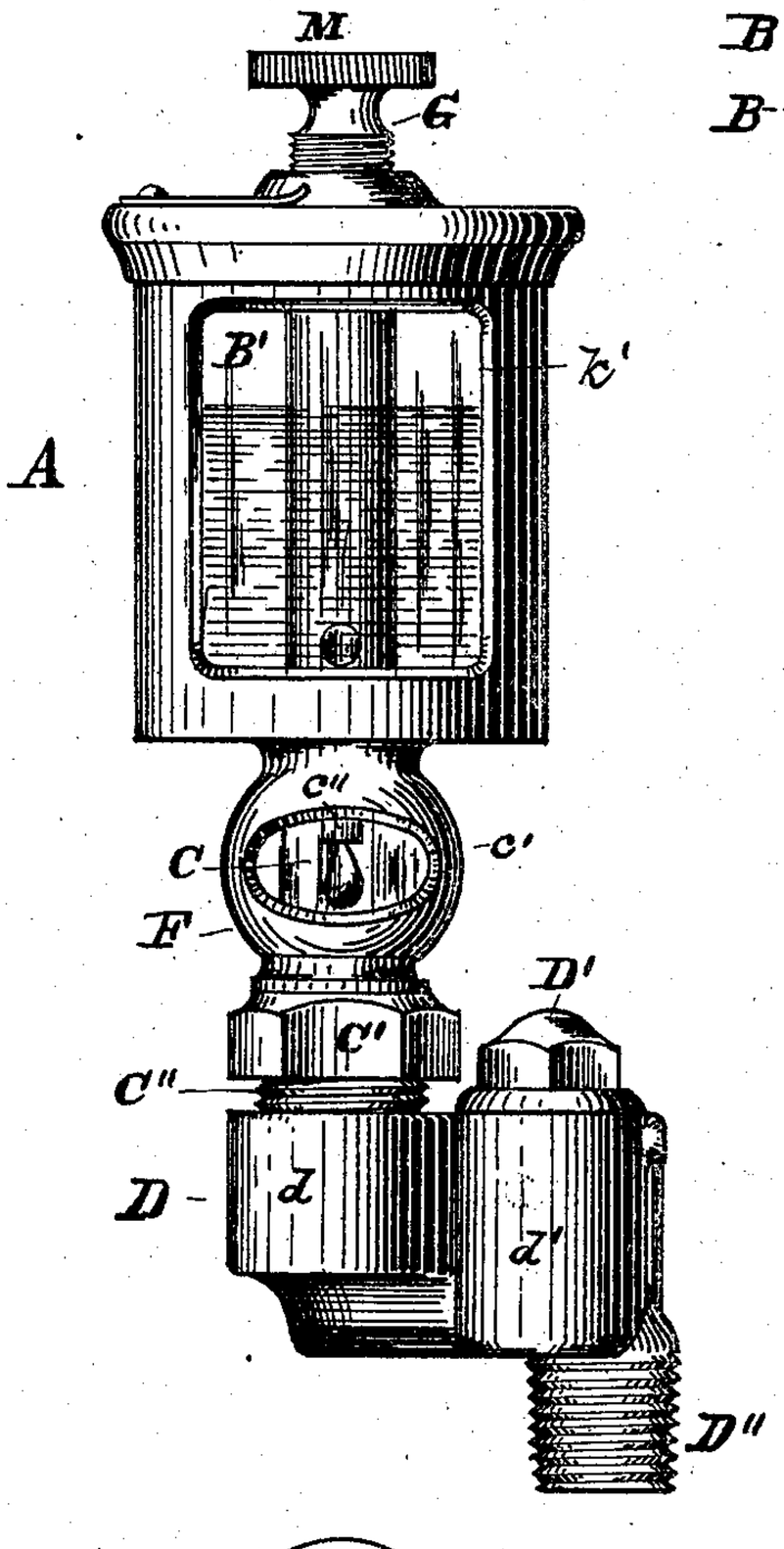
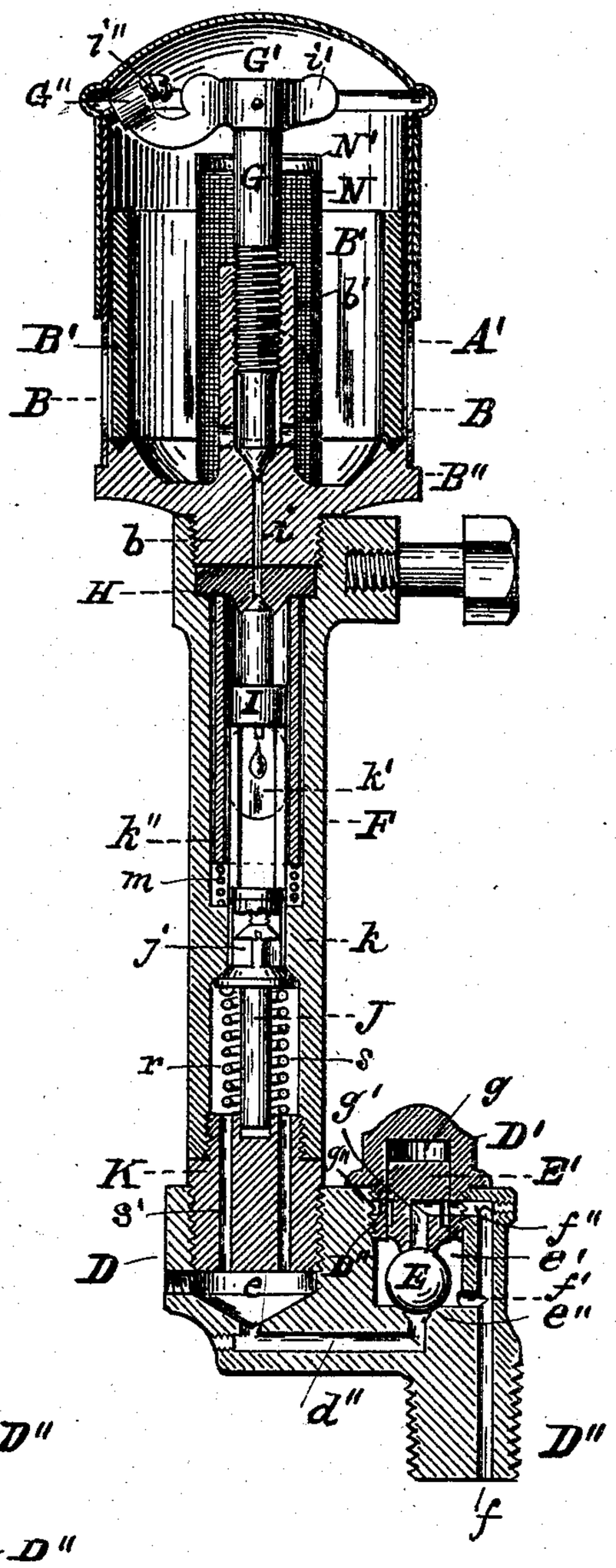


FIG. 2.



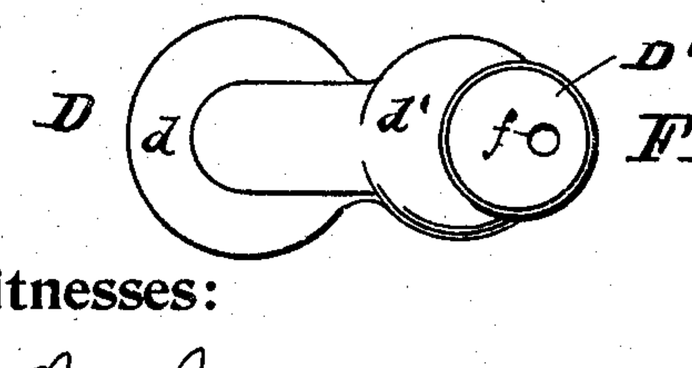


FIG. 3.

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2 SHEETS—SHEET 2.

FIG. 4.

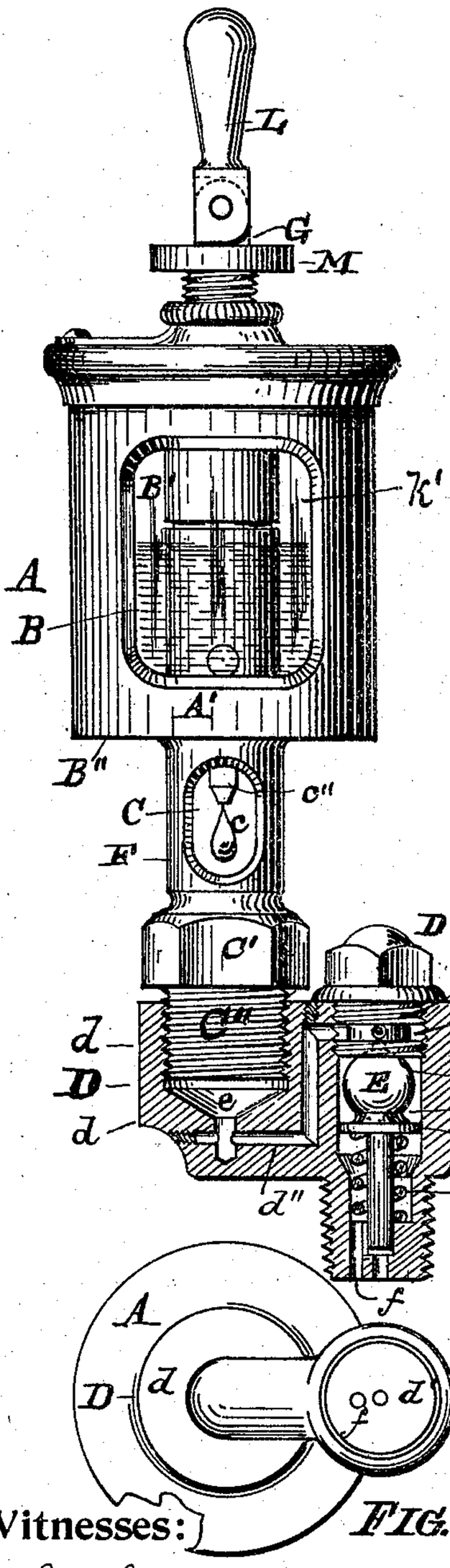


FIG. 9.

FIG. 5.

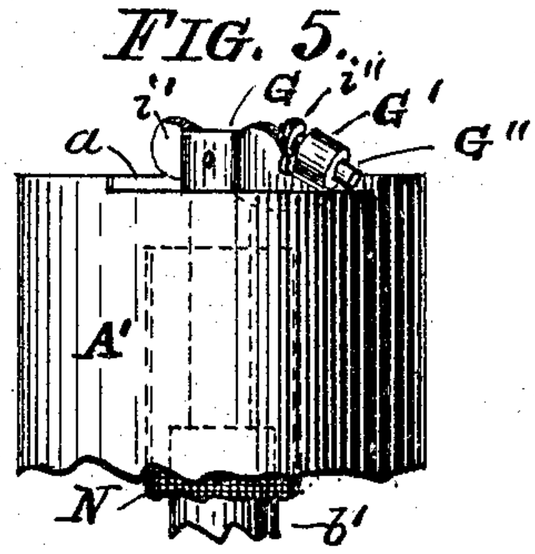


FIG. 6. FIG. 7. FIG. 8.

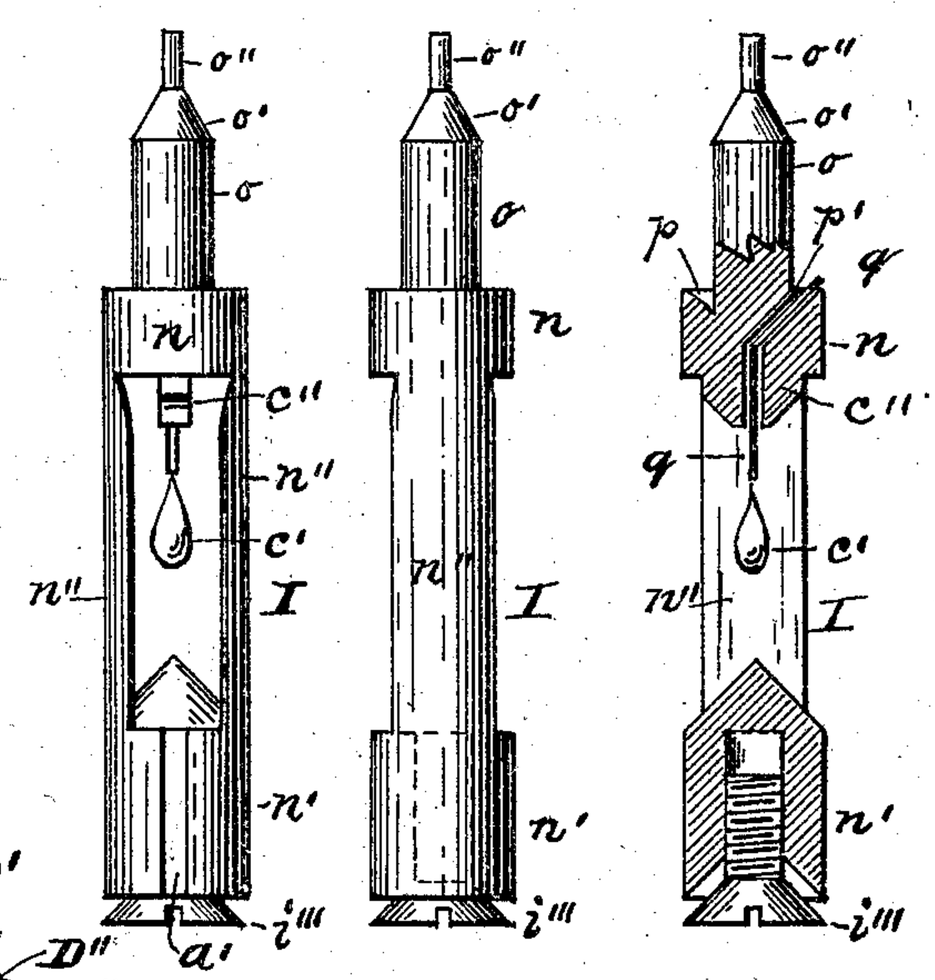
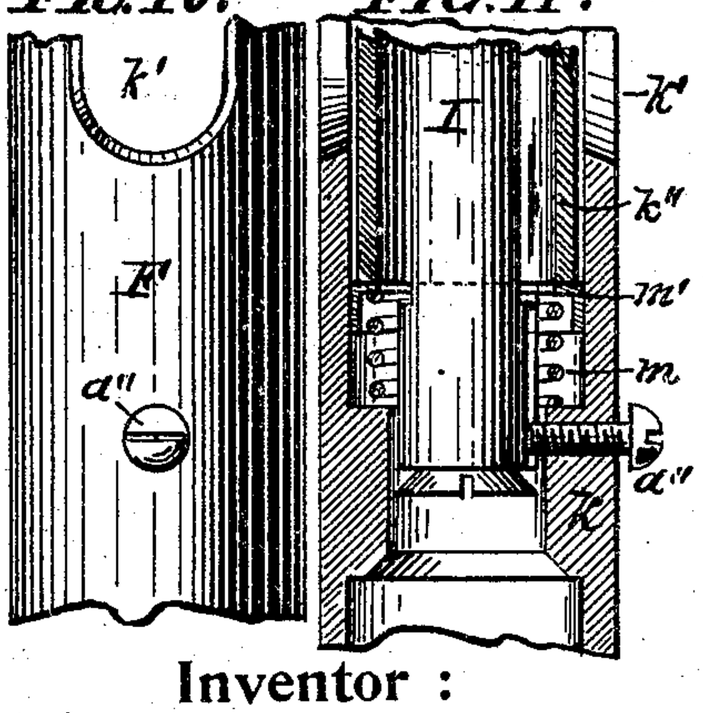


FIG. 10. FIG. 11.



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No. 782,532. Patented February 14, 1905.

UNITED STATES PATENT OFFICE.

GLENN W. THURSTON, OF CHICAGO, ILLINOIS.

LUBRICATOR.

SPECIFICATION forming part of Letters Patent No. 782,532, dated February 14, 1905.

Application filed November 18, 1904. Serial No. 233,332.

To all whom it may concern:

Be it known that I, GLENN W. THURSTON, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Lubricators; and I do hereby declare that the following description of my said invention, taken in connection with the accompanying drawings, forms a full, clear, and exact specification, which will enable others skilled in the art to which it appertains or with which it is most closely connected to make and use the same.

This invention has general reference to improvements in lubricators; and it consists, essentially, in the novel and peculiar combination of parts and details of construction, as hereinafter first fully set forth and described and then pointed out in the claims.

In the drawings already referred to and in which like parts are indicated by corresponding symbols of reference, Figure 1 is a side elevation of one form of my improved lubricator. Fig. 2 is a longitudinal sectional elevation of a modified form of my improved lubricator. Fig. 3 is a bottom plan of the same. Fig. 4 is an elevation, partly in section, of the device shown in Fig. 1 slightly modified. Fig. 5 is an elevation of a fragment of the oil-reservoir and the regulating-valve. Figs. 6 and 7 are side elevations, and Fig. 8 a sectional elevation, of the dropper used in this lubricator. Fig. 9 is a bottom plan of the device shown in Fig. 4. Fig. 10 is a side elevation, and Fig. 11 a sectional elevation, of the feed-tube.

This lubricator is especially designed for use on gasolene and gas engines, air-pumps, condensing-engines, and all other motors wherein during a part of the stroke or during the entire stroke of the piston a vacuum is caused to exist in the cylinder; and its object is to provide for lubrication during that part of the stroke of the piston only—as, for instance, in a four-cycle gas and gasolene engine during the stroke which draws into the cylinder a charge of the explosive fluid, &c., whereby a considerable saving and better lubrication is attained than by a continuous feed-lubricator. To attain this desirable object, I construct this lubricator essentially of an oil-reservoir A of usual construction and having by preference a sight-opening B, through which the level of the lubricant may at all times be observed. This reservoir is provided with a feed-tube F, having a "sight-feed," so called, C being a cylinder provided with openings k' and fitted with a glass cylinder k'', through which the drops of oil c' may be seen as they are formed below the dropper-nozzle c''. This cylinder C has the usual hexagonal wrench-section C′, and it terminates in an externally-screw-threaded shank C″ to engage a valve-casing D, which casing is of peculiar construction, it consisting of two cylindrical bodies d d', placed adjacent to one another, the former being internally screw-threaded to engage the shank C″ of the lubricator and the latter formed to receive a valve E, the two chambers e e', respectively, being connected by a passage d'', as clearly shown in Figs. 2 and 4.

The chamber e' is internally screw-threaded at its upper end to receive a screw-cap D′, by means of which said chamber is closed, and it is provided with a valve-seat e'', upon which the valve E is normally seated to close the passage d''. The valve-casing D terminates in an externally-screw-threaded shank D″ to adapt it for being applied to an engine-cylinder (not shown) either directly or by means of suitable piping. In this shank D″ there is a passage f, communicating with the chamber e' either directly, as shown in Fig. 4, or by means of a branch f', as indicated in Fig. 2.

The screw-cap D′, as shown in Fig. 2, is internally bored at g to receive a piston E′, which has a central passage g', which communicates with the passage f by a branch f'', there being a circumferential groove g'' in said screw-cap for the purpose hereinafter to be referred to. In the preferred form of construction this piston serves as a weight to act upon the valve E to increase its weight without increasing its size, and it further prevents the valve from vibrating, as it would be apt to do when functioning, and thereby prevent its proper instantaneous closing of the passage d''. In this view, Fig. 2, the valve E is lifted from its seat by the vacuum in the passage f acting upon the piston E′ and through the passage g' directly upon the valve E, thus ver-

tically lifting the valve E from its seat. In Fig. 4 this construction is reversed—that is to say, the valve E drops vertically from its seat, and it is retained in its normal closed position by a carrier *h*, which is acted upon by a spiral spring *h'*, it being understood that this reversal of the order of parts is the equivalent of that heretofore described and that in order to accomplish this object the valve-seat *e''* is formed in the screw-cap D'.

In Figs. 1 and 4 I have shown oil-reservoirs, &c., of usual construction, such devices being commercially obtainable and known as "sight-feed" lubricators.

In Fig. 2 and other figures I have shown the lubricator in its most perfected construction. Thus the oil-reservoir A is a cylindrical shell A', provided with a dome-shaped removable cover and having the usual observation-openings B and being further provided with a glass cylinder B', which is cemented into the shell A', this shell being permanently secured to a bottom B'', which latter has an externally-screw-threaded shank *b*, by means of which it engages the feed-tube F. This bottom B'' has centrally a tubular upwardly-projecting boss *b'*, which is internally screw-threaded to receive a correspondingly screw-threaded needle-valve G, which normally closes a passage *i* in the shank *b*. The upper edge of the shell A' is notched at *a*, Fig. 5, and the upper end of the needle-valve G is provided with an arm G', having an obliquely-arranged boss G'', provided with an adjusting-screw *i'''*, engaging the notch *a*. This arm G' is so located upon the end of the needle-valve rod that when the adjusting-screw *i'''* reaches one end of said notch *a* the needle-valve has closed the passage *i*, and thereby prevents escape of the lubricant from the oil-reservoir A, while when the arm G' is revolved in the proper direction until the said adjusting-screw reaches the opposite end of the notch *a* the needle-valve has opened the passage *i* to the full capacity of discharge of lubricant which it is desired to attain. The arm G' is of the butterfly type, and by its wings *i''* it is enabled to be readily revolved. By tightening the adjusting-screw *i'''* to introduce sufficient friction upon the edge of the notch *a* the needle-valve is retained in any position to which it may be set. I will here remark that by the introduction of this notch *a* and by the construction of the arm G' a change in the maximum feed of the lubricant cannot be made without first removing the adjusting-screw *i'''*, or rather by withdrawing it sufficiently to clear the notch *a*. This feature is introduced in this lubricator to prevent interference with the adjustment of the needle-valve beyond its predetermined maximum capacity and the wasting of the lubricant.

The feed-tube F has about midway an internal constriction *k*, Figs. 2 and 11, and above this constriction are located the observation-openings *k'*. Within this tube there is loosely placed a glass cylinder *k''*, which bears with its upper edge against a valve-disk H, and which glass cylinder is carried by a coil-spring *m* through the intervention of a cup-shaped carrier *m'*, Fig. 11. Within this glass cylinder *k''* there is placed a dropper I, shown in detail in Figs. 6, 7, and 8 and consisting of two cylindrical bodies *n n'*, connected by bars *n''*. The upper cylinder *n* terminates in a valve-spindle *o*, tapering to a needle-valve *o'*, having an extension *o''*, serving as a guide to the dropper. The upper surface of this dropper is cup-shaped to form a gutter *p*, and from this gutter *p* leads a passage *p'* downwardly to a dropper-nozzle *c''*, projecting from the lower surface of the cylinder *n*. In this passage *p'* there is a strip of metal *q* loosely fitting said passage, so as to guide the lubricant escaping through the passage *i* past the needle-valve *o'*, down the valve-spindle *o*, into the gutter *p*, and thence through the passage *p'* to the point of said metallic strip, and from which point the drop of oil *c* disengages itself by gravity. This strip of metal *q* is introduced in order to cause the formation of comparatively small drops, it being a well-known fact that the size of a drop of liquid is partly governed by the specific gravity of the liquid, its viscosity, and also the size of opening or shape of surface from which the drop disengages itself, it being the smaller the smaller the opening or sharper the point from which it drops.

The cylinder *n'* of the dropper I has in its lower end a flat-headed adjusting-screw *i'''* and in its periphery a longitudinal groove *a'*. Its upper surface is preferably of pyramidical contour, so that the drops of oil in their descent will readily slide down the incline of the pyramid and over the outer surface of the cylinder *n'*.

The lower portion of the feed-tube F is fitted with a valve J, Fig. 2, bearing against the lower surface of the constriction *k* and retained in a normally closed position by a coil-spring *r*. This valve is preferably of the wing type, and it bears with its wings *j* against the flat-headed adjusting-screw *i'''* on the dropper in such a manner that when in its normal closed position it has pushed the dropper I upward to seat the needle-valve *o'* and close the passage *i*. The lower end of the feed-tube F is internally screw-threaded to engage an intermediary K, serving the purpose of the shank C' of the commercial lubricator A, heretofore described, for engaging the valve-casing D already mentioned.

Reference has heretofore been made to the longitudinal groove *a'* in the lower cylinder of the dropper I. This groove is devised to engage a screw or pin *a''*, Figs. 10 and 11, located in the constriction *k* of the feed-tube F to properly locate the dropper in the glass cylinder *k''* and so that the drops *c'* issuing from the dropper-

nozzle c'' may be seen through the observation-openings k', which might not be the case if the dropper could revolve in the glass cylinder and the bars n'' come opposite the observation-openings k'. The extension o'' on the dropper enables the dropper being readily placed into correct position, besides guiding it, as already stated.

The flat-headed adjusting-screw i''' in the dropper I is designed to provide ready means for adjusting the length of the dropper, it being a mechanical difficulty to so produce the parts that the valve J and the needle-valve o'' will seat simultaneously. By the introduction of this adjusting-screw i''' the valve J and needle-valve o'' may be independently ground to a perfect seat and then the length of the dropper adjusted to properly seat the needle-valve. Thus the mechanical execution of the parts presents no difficulty whatever and requires no exactitude of lengths.

I shall now proceed to describe the operation of this improved style of lubricators. Assuming that this lubricator is connected with an engine-cylinder wherein a vacuum is periodically formed at more or less regular intervals, this vacuum causes an inrush of air through the observation-opening k' in either of the two lubricators described, and lifting the valve E draws the lubricant through the passages d'' and f to the place where lubrication is required, the valve E being immediately closed when pressure in said cylinder exists. Hence it follows that lubrication takes place only with each one of the vacuum-strokes of the piston of the engine when these strokes occur at reasonably-regular intervals; but where these intervals vary considerably and where an absolutely positive and a minimum amount of lubrication is a desideratum I employ the lubricator shown in Fig. 2. In this case air will also rush in at the observation-openings k' and passing between the glass cylinder k'' and the inner wall of the feed-tube cause the valve J to open in a downward direction and then passing through the lower chamber s in said feed-tube and the passage or passages s' in the intermediary K, chamber e, and passage d'' lift the valve E, thereby establishing a free passage from the oil-reservoir to the place where lubrication is desired. As soon as the valve J drops, the dropper I is set free to follow the said valve, and thereby opening the passage i allows the lubricant to escape as stated; but the moment that the inrush of air ceases the valves will immediately close and lubrication will be interrupted. By this construction no oil can escape from the oil-reservoir except when a vacuum is formed in the engine-cylinder, and this will continue to take place entirely automatically, so that this lubricator requires no further attention after having been once regulated, except the refilling of the reservoir when empty.

While the device shown in Figs. 1 and 4 functions in substantially the same manner as that shown in Fig. 2, it has not the entirely automatic feature of the latter, since it will continue feeding the lubricant into the chamber e and passage d'' and finally overflow from the observation-opening k' unless the regulating-valve G is turned off by revolving the knurled nut M, Fig. 4, or by turning down of the lever L, Fig. 4, as is now usually done with all lubricators of the commercial types as used on gas and other engines.

In order to prevent foreign substances from passing from the oil-reservoir A', the central boss b' therein is surrounded by a strainer N, as shown in Fig. 2, said strainer being preferably a wire-gauze cylinder soldered to a cap N' and the latter secured to the valve-stem G, so that the said strainer may revolve with the valve stem G, but cannot be removed from the oil-reservoir without removing the regulating-valve G. This is a desirable feature in lubricators, because it prevents the strainer from being lost or misplaced.

I have heretofore mentioned the circumferential groove g'' in the screw-threaded portion of the cap D' in the valve-casing D. This groove acts as a passage to connect the passage d'' with the passage f'', Fig. 2, and it is provided for the special purpose of avoiding mechanical difficulties in bringing these two passages into coincidence, it being mechanically impractical to so drill the passages d'' and f'' that they will properly register unless drilled when the cap D' is in position. This compels the parts being kept together and defeats interchangeability, so essential in manufacturing articles of the kind mentioned. By this annular groove g'' the positions of the passages d'' and f'' are immaterial, since communication between them is established by said annular groove g''. There is also a similar annular groove in the periphery of the piston E' to connect the passage g therein with said passage f'', for the reason that the said piston when reciprocating is also liable to revolve axially, whereby coincidence or register of these ports would be defeated—a matter which will be readily understood without further detailed explanations. I have also stated that this lubricator connects with an engine-cylinder by suitable piping, (not shown,) for the reason that individual construction of the various motors and engines require different connections. I find it desirable, however, to make this connection in about the middle of the cylinders in all cases where trunk-pistons are employed therein, so that the port connecting the lubricator with the cylinder is closed by the piston except during the latter half of the stroke. By this arrangement the lubrication takes place only during the latter half of the piston-stroke and results in a material saving of the lubricant, it being a well-known fact that in nearly all

engine-cylinder lubricators a very large percentage of the lubricant is wasted, and a number of experiments conducted by me have demonstrated the fact that with my system of lubrication on air-pumps, gas and gasolene engines, &c., I have effected a saving of lubricant amounting in some cases as high as eighty per cent. without detriment to the engine mechanism.

The valve J is shown in Fig. 2 as being of the wing type; but it is evident that it may be a ball and that the ball-valve shown in said valve-casing may be of the wing type without departing from my invention, such changes, as well as others that may suggest themselves to the skilled mechanic, being within the scope of this present invention. So may the piston E′ be dispensed with, if desired, without materially affecting the operation of this lubricator.

Having thus fully described this invention, I claim as new and desire to secure by Letters Patent of the United States—

1. A vacuum-operated lubricator consisting, essentially of an oil-reservoir, an adjusting-valve therein adapted to control the discharge of the lubricant, a dropper as described, a valve-case having two chambers one of which connects with the oil-reservoir and the other with the point of lubrication, a cap closing the latter chamber, a valve in this chamber adapted to open under the influence of a vacuum in said chamber, and means for establishing communication between the two chambers, as set forth.

2. In a vacuum-operated lubricator, a sight-feed reservoir of the type described, and a separate valve-casing, said valve-casing consisting, essentially, of two cylinders placed side by side; there being a chamber in one of these cylinders adapted to receive the shank of the reservoir, a chamber in the second cylinder; a passage between the two chambers and connecting one with the other; a valve in the second chamber; a cap closing the second chamber; there being a shank on the second cylinder, and a passage connecting the second chamber with a passage in said shank, as specified.

3. In a vacuum-operated lubricator, an oil-reservoir; a dropper below said reservoir; an adjusting-valve in said reservoir to regulate the frequency of the drops escaping from said dropper; there being a shank on said reservoir; a separate valve-casing consisting, essentially of two cylinders adjacent to one another one of which is adapted to receive the shank of the said reservoir; there being a chamber in this cylinder; a passage connecting the two cylinders, a chamber in the second cylinder; a valve in this last-named chamber adapted to open the passage between the two chambers under the influence of a vacuum therein; a cap adapted to close the valve-chamber, a passage leading from the valve-chamber through said cap; a shank on said second cylinder having a passage connecting with the passage in the cap, as set forth.

4. In a lubricator, an oil-reservoir; there being a central boss therein having an internal screw-threaded passage; a needle-valve in said passage; an arm at the upper end of said needle-valve and an adjusting-screw at the end of said arm and adapted to engage the upper edge of said reservoir, as specified.

5. In a lubricator, an oil-reservoir having a notch or excision in its upper edge; there being an internally-screw-threaded boss in said reservoir; a needle-valve in said boss; an arm at the upper end of said needle-valve, and an adjusting-screw in the said arm adapted to engage said notch, as stated.

6. In a vacuum-operated lubricator, an oil-reservoir; a feed-tube connected therewith; a dropper in said feed-tube, and a valve below said dropper, said dropper being provided with an adjusting-screw for varying its length and adapted to be operated by said valve, as specified.

7. In a lubricator, a dropper consisting of two cylinders connected by bars; there being a gutter in the upper surface of the upper cylinder, a passage leading from said gutter downwardly to the lower surface of the upper cylinder, a tapering projection on the upper surface of the lower cylinder, and an adjusting-screw in the end thereof, as specified.

8. In a lubricator, a feed-tube adapted for attachment to an oil-reservoir as described; there being observation-openings in the said feed-tube; a glass cylinder in the upper portion of said feed-tube; a cup-shaped carrier for said glass tube; a coil-spring acting upon said carrier to sustain the glass cylinder in position; a dropper within said glass cylinder and consisting of two cylindrical bodies connected by bars; there being a longitudinal groove in the lower cylinder, and means engaging said groove to retain said dropper in its normal position and prevent it from revolving, as set forth.

9. In a vacuum-operated lubricator, a valve-casing having a valve-chamber and two passages f and d'' as described; a valve in said chamber; a loosely-placed piston upon said valve; a cap adapted to close said valve-chamber and having a bore to receive said piston, said piston being provided with a passage and an annular groove in its periphery connecting with the discharge-passage in the valve-casing through an annular groove in the periphery of the screw-threaded portion of said cap, as and for the purpose specified.

In testimony that I claim the foregoing as my invention I have hereunto set my hand in the presence of two subscribing witnesses.

G. W. THURSTON.

Witnesses:

MICHAEL J. STARK,

AL. STARK.