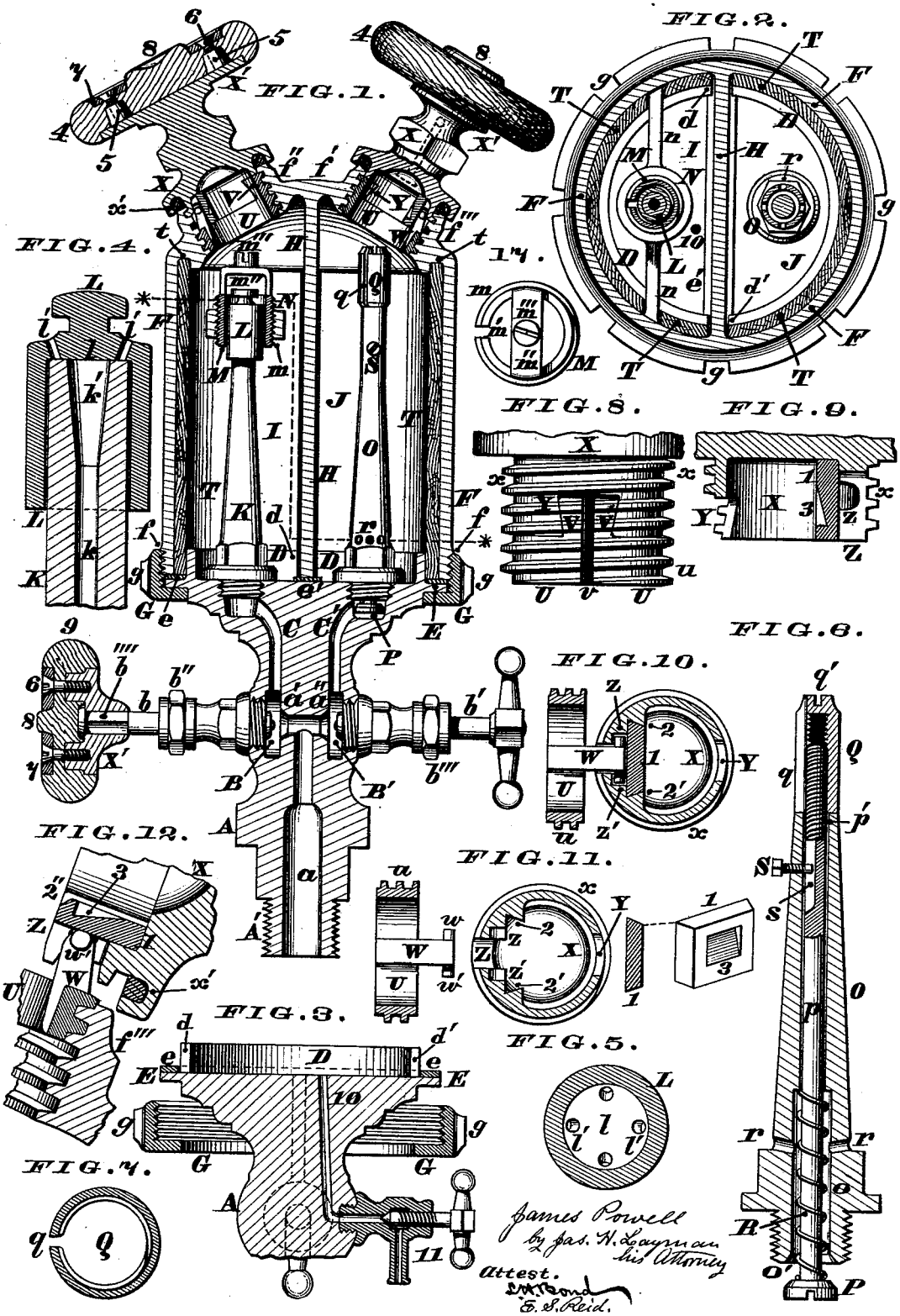
2 Sheets—Sheet 1.

J. POWELL.

LUBRICATORS FOR STEAM ENGINES.

No. 189,651. Patented April 17, 1877.



2 Sheets—Sheet 2.

J. POWELL.

LUBRICATORS FOR STEAM ENGINES.

No. 189,651. Patented April 17, 1877.

FIG. 16.

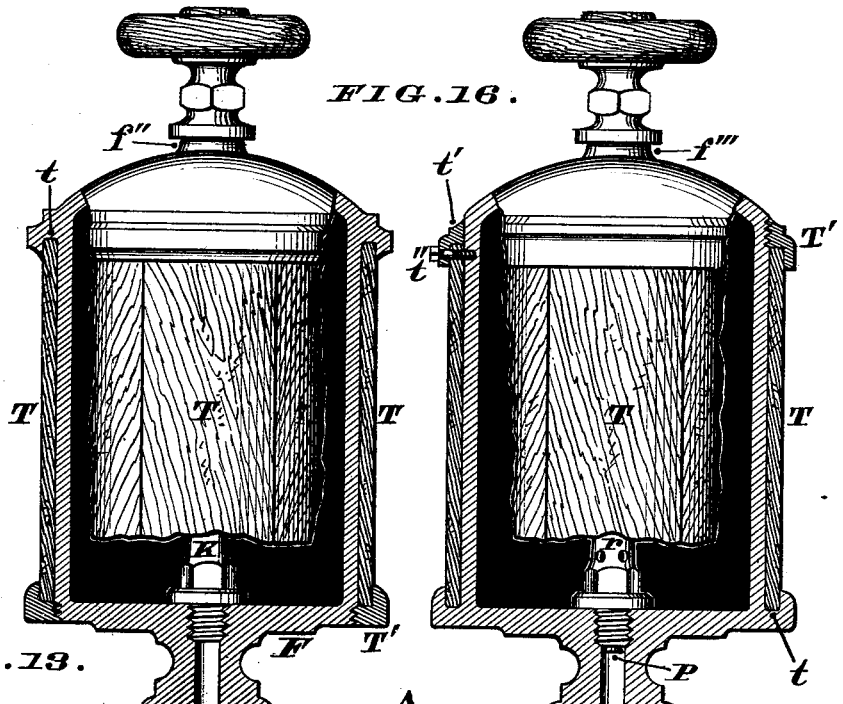


FIG. 13.

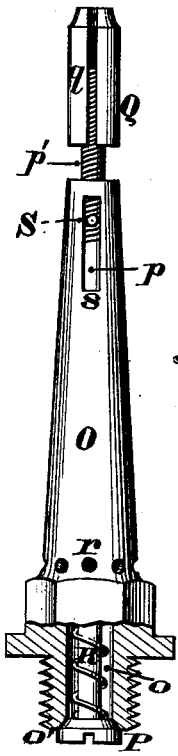
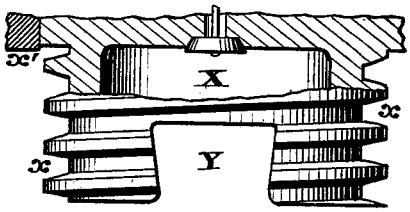


FIG. 15.



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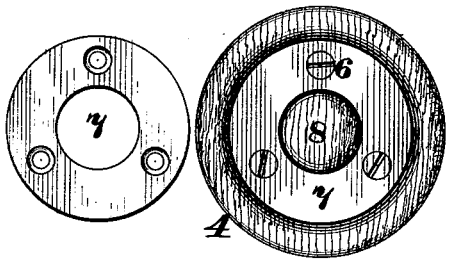
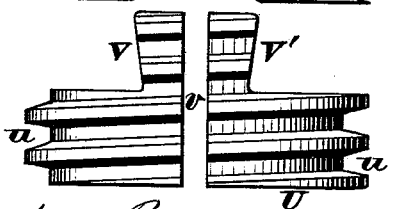
L. M. Bond
C. S. Reid.

FIG. 14.





James Powell
by Jas. F. Layman
his Attorney.

UNITED STATES PATENT OFFICE.

JAMES POWELL, OF CINCINNATI, OHIO.

IMPROVEMENT IN LUBRICATORS FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. **189,651**, dated April 17, 1877; application filed August 28, 1876.

To all whom it may concern:

Be it known that I, JAMES POWELL, of Cincinnati, Hamilton county, Ohio, have invented certain new and useful Improvements in Lubricators for Steam-Engines, of which the following is a specification:

This invention relates to that class of devices which are employed for automatically admitting oil, tallow, or other lubricants to the valve-chests of steam-engines, locomotives, &c.; and the first part of my improvements comprises a novel feature, which I have designated the vacuum-chamber, inasmuch as said chamber discharges oil only when steam is shut off, and when the action of the piston produces a vacuum or partial vacuum in the cylinder of the engine.

This vacuum-chamber may be a separate and distinct member with reference to the condensing-chamber, which latter lubricates the engine when steam is turned on; or said vacuum-chamber may be cast in one piece with the condensing-chamber, and be separated therefrom by any suitable partition or division; but in either case the vacuum-chamber is to be arranged so as to discharge its contents gradually and automatically through suitable passages or ports at or near its lower end, which ports communicate through the base and stem of the lubricator with the valve-chest.

This discharge from the vacuum-chamber is controlled by a downwardly-opening valve applied to the lower end of a tube or pipe that projects vertically from the bottom of said chamber, said valve being rendered capable of adjustment in any suitable manner, so as to regulate the flow of lubricant with the utmost nicety.

This vacuum-chamber is filled by disengaging from the top of the same a suitable cap, and after the chamber has been charged, said cap is screwed down, thereby hermetically closing the vessel.

The second part of my invention consists in combining the above-described improvements with a condensing-chamber, whose leading features of construction and operation are essentially the same as described in Letters Patent No, 159,962, issued to me February 16, 1875.

This combination is effected by means of a metallic reservoir or shell, which is, preferably, cylindrical, and closed with a dome-shaped top, cast in one piece with said cylinder, the lower end of the latter being attached to the supporting stand or base of the lubricator, with an air-tight joint. A vertical partition extends from top to bottom of this duplex reservoir, thereby dividing it into two semi-cylindrical compartments that constitute the condensing-chamber and vacuum-chamber previously alluded to. This partition, which is, preferably, cast with the reservoir, not only acts as the division-plate between the two chambers, but it also serves to conduct heat from the condensing-chamber into the vacuum-chamber, and thereby maintains the tallow in the latter in a fluid condition, no matter how cold the weather may be.

The third part of my invention consists in providing the reservoir with a jacket or lining of wood, or other cheap and durable non-conducting medium, which jacket prevents radiation of heat from the shell or reservoir. This non-conducting medium may be applied either to the exterior or interior of the shell; but it is, preferably, located within the latter, by which arrangement the metallic cylinder acts as a guard or fender to prevent any injury of the lining.

The fourth part of my invention comprises an improvement in the vertically-reciprocating sleeve-valve of the condensing-chamber, whereby the discharge of oil is rendered more regular and certain than with the old form of valve.

The fifth part of the invention comprises an improved construction of hinged cap for the lubricator.

The sixth part of the invention includes a secure method of attaching the wooden handles or knobs of the cocks, valves, &c., to their respective metallic stems.

In addition to the above, I have devised other but minor improvements, whose details will be hereinafter fully described.

In the annexed drawings, forming part of this specification, Figure 1 is a vertical section of my lubricator, the section being taken in the plane of the throttle-valves, or at right angles to the division-plate. Fig. 2 is a trans-

verse section at the line * *. Fig. 3 is a vertical section through a portion of the base in the plane of the pet-cock, the reservoir or shell being removed from said base and the coupling-ring shown detached. Fig. 4 is a longitudinal section through the sleeve valve and its seat. Fig. 5 is a transverse section of said valve. Fig. 6 is an axial section through the feed-regulating appliances of the vacuum-chamber. Fig. 7 is a transverse section of the split-nut that is applied to the upper end of said feed devices. Fig. 8 is a front elevation of one of the hinged screw-caps of the shell. Fig. 9 is a vertical section, from front to back, of the upper member of a hinged screw-cap. Fig. 10 is a horizontal section of a hinged screw-cap with its upper member thrown back. Fig. 11 represents, by sections and perspective view, the various parts of a hinged screw-cap detached from each other. Fig. 12 is a vertical section, showing one of the caps unscrewed far enough from the neck of the lubricator to allow the upper member of said cap being thrown back for the purpose of filling the reservoir. Fig. 13 is a partially-sectionized elevation of the feed-tube of the vacuum-chamber, the valve being shown closed against its seat. Fig. 14 is a plan of a hand-wheel with one of the metallic rings shown detached. Fig. 15 is an illustration, partially in elevation and partially in section, of the two members of a hinged screw-cap separated from each other; and Fig. 16 represents that form of my invention in which the condensing and vacuum chambers are separate vessels, but communicate with a common stand or other support.

Diagram 17 is a plan of the split guide of the sleeve-valve.

A represents the metallic base, stand, or other supporting-member of the lubricator, which base may be of any appropriate size and shape.

This base is applied to the steam-chest of an engine by means of a screw-threaded stem, A′, or otherwise.

Said stem and the lower part of the base are traversed with an axial bore, *a*, that communicates at top with a short transverse passage, having at its ends countersunk seats *a′* and *a″*, for the two oppositely-disposed throttle-valves B B′, whose respective stems *b b′* traverse appropriate stuffing-boxes *b″ b‴*.

The base is chambered out around said seats *a a′*, and these chambers are intersected at top with channels C and C′, respectively, of which channels the one, C, communicates with the condensing side of the lubricator, while the other channel, C′, leads into the vacuum-chamber, as hereinafter more fully explained. Projecting upwardly from the flat top of base A is an annular flange or curb, D, having two notches or interruptions, *d d′*, diametrically opposite each other. Located outside of this flange is an annular ledge or seat, E, for the reception of a soft-metal washer or gasket, *e*, upon which latter rests the cylindrical reservoir or shell F, that is firmly secured to the base by a coupling-ring, G, whose female thread receives the male screw *f* of said shell.

This coupling-ring is notched at *g* to admit a spanner or wrench.

The reservoir F, which may be composed of brass or any other suitable metal, is closed with a dome-shaped top, *f′*, from which depends a partition, H, that is preferably cast with said reservoir, although it may be soldered therein, if desired. This partition H extends completely across, so as to unite the opposite walls of the reservoir, and when the latter is secured to the base A, the lower portion of said dividing-plate enters the notches *d d′* of curb D, and rests upon the diametrical portion *e′* of washer *e*, as more clearly shown in Fig. 2.

By this arrangement the reservoir is separated into two equal, or nearly equal, compartments or vessels, I and J, of which the one, I, is the condensing-chamber, and the one, J, the vacuum-chamber. Erected within the condensing-chamber I is a tube, K, whose axial bore *k* communicates with channel C of the base. The upper portion of this bore is reamed out at *k′*, while the extreme upper end of tube K constitutes the seat for a vertically-reciprocating and automatically-acting sleeve-valve, L, as more clearly shown in Fig. 4.

This sleeve-valve has the shape of a cylinder, open at bottom, but closed at top with a head, *l*, which head is pierced with a series of apertures, *l′*. These apertures *l′* constitute the oil ducts or passages of the valve, and they are represented as inclined or pitched toward the center of the valve; but they may be drilled vertically through the head of the same.

In order to limit the upward stroke of this valve, and thereby regulate the quantity of lubricant flowing through apertures *l′* every time said valve is raised from its seat, a tubular guide, M, is provided, within which guide the valve L has free vertical play. The inner periphery of this guide is smooth, while its outer periphery is threaded at *m* to engage with a boss, N, which latter, with its bridge *n*, are preferably cast with the shell F. The aforesaid tubular and screw-threaded guide is split completely through on one side from top to bottom, as seen at *m′* in diagram 17, which division imparts sufficient elasticity to said guide to enable it to yield to any irregularities in the thread of boss N, or to any sediment that may accumulate therein.

The top of guide M is spanned with a yoke or bail, *m″*, having a slotted head, *m‴*, projecting upwardly therefrom.

When the cap of condensing-chamber I is opened, a screw-driver can be engaged with said slotted head, so as to adjust the guide M either up or down, according to the supply of oil required, the yoke *m″* serving as a stop to limit the ascent of sleeve-valve L.

Vacuum-chamber J has fitted within it a

tube, O, whose axial bore *o* communicates with channel C′ of the base.

The lower end of this bore is reamed out at *o′*, to afford a seat for the conical valve P, the latter being secured to a shaft or stem, *p*, located within tube O. This valve is slotted to receive a screw-driver or other implement when said valve needs regrinding.

The upper portion of stem *p* is screw-threaded at *p′*, to receive a nut, Q, which latter is free to rotate upon the end of tube O, the nut Q being split at *q*, to prevent binding upon shaft-thread *p′*. A slot, *q′*, in the head of said nut enables it being turned either to the right or left, so as to regulate the stroke of feed-valve P, which latter is forced away from its seat by a spiral spring, R, fitted within the enlarged diameter of bore *o*. (See Fig. 6.)

Communicating with this enlarged diameter of said bore are a series of slots or other lateral passages, *r*, which admit oil to the interior of tube O.

Rod *p* is grooved at *s*, to receive a screw or pin, S, which prevents rotation of said rod when nut Q is turned, while at the same time rod *p* is free to play vertically within the bore *o*.

This arrangement, however, may be reversed, as shown in Fig. 13, in which illustration the pin S is represented as tapped into the valve-stem, and adapted to play within a vertical slot in the tube O; or this valve-stem may have a square or other non-circular portion, to prevent its rotation.

Interposed between the curb D and the inner side of shell F is the wooden filling T, previously alluded to, the upper end of said filling being inserted in an annular groove, *t*, in the dome of the lubricator. This filling may be made in two distinct sections, one for each of the chambers I and J; or, if preferred, the filling for each chamber may be composed of several segments.

As this filling is applied for the purpose of preventing radiation of heat from the lubricator, it is evident that any other non-conductor may be substituted for wood; but this material is preferred on account of its cheapness and facility of application.

Instead of being internal, this wooden member may constitute an external jacket around shell F, as seen in Fig. 16.

In order that the two chambers I and J may be readily filled with any appropriate lubricant, the top *f′* of the shell is furnished with two interiorly-threaded necks, *f″* and *f‴*, with which are engaged screw-threaded caps; but as the latter are precisely alike, a description of one will suffice for both.

The lower member of each cap consists of a ring, U, screw-threaded externally at *u*, and provided in front with two upwardly-projecting snaps, V and V′, separated by a vertical part or split, *v*, cut completely through the front of said threaded ring. These snaps are somewhat wider at top than at bottom, as seen in Figs. 8 and 15. Located diametrically opposite the split *v*, and cast with ring U, is a tongue, W, having two lateral studs or lugs, *w w′*, which latter constitute the pintles or pivots of the hinged cap.

X represents the upper member of the cap, having a screw-threaded portion, *x*, which is continuous with the thread of split ring U. The front of this screw-threaded portion of the cap is cut away to form a notch, Y, made wider at top than at bottom, so as to securely retain snaps V and V′ when the latter are expanded, as represented in Fig. 8.

Located opposite notch Y is a slot, Z, of sufficient width to receive tongue W, said slot being flanked with two sockets, *z z′*, to receive the pintles *w w′* of the split ring U. These pintles are maintained within their respective sockets by a locking-plate, 1, whose chamfered edges engage with the undercut grooves 2 and 2′ of cap X, as more clearly shown in Figs. 10 and 12.

After being thus fitted together, the metal at the outer end of one of these grooves may be clinched against said plate, to prevent the latter slipping out, as indicated at 2″ in Fig. 12.

Furthermore, this locking-plate is furnished with a notch, 3, which enables said plate being readily withdrawn from grooves 2 and 2′, after the clinched or upset portion 2″ has been straightened out.

As all of the above-described hinge appliances are ready for use as soon as they are cast, I am thereby enabled to dispense with any tedious and expensive fitting together of the various parts.

The cap X, which may be of any appropriate shape, terminates at top in a plate, X′, seated in a circular recess in the under side of the wooden hand-wheel 4.

Projecting upwardly from plate X′ are two or more stumps or ribs, 5, tapped to receive screws 6, which pass through a metallic ring, 7, the latter being seated in an annular recess made in the upper side of hand-wheel 4. This ring 7 surrounds a central boss, 8, of the wheel 4, which boss or hub projects somewhat above the upper surface of said wheel.

By this arrangement the hand-wheel 4 is effectually secured from being twisted off from the cap X X′, and even in case said wheel should crack, either by heat or any other cause, the ring 7 would prevent the member 4 becoming detached from the cap. Substantially the same construction is adopted with hand-wheel 9 of throttle-valve B, with the exception that in this case the plate X′ is pierced with a non-circular aperture to receive the square shank *b‴″* of valve-stem *b*. This shank is then riveted to said plate.

10 is a waste-way leading from the condensing-chamber I, said waste-way being furnished at its outlet with a pet-cock, 1 1. *x′* is a packing-ring let into the under side of cap X, for the purpose of securing an air-tight joint between said cap and the neck of the lubricator when the cap is screwed home.

As far as the condensing-chamber is concerned, the operation of the device is essentially the same as the lubricator described in my patent previously alluded to, the principal difference being in the construction of sleeve-valve L, which valve is in the present case much more reliable in its action.

In my old lubricator, the ports of the valve are disposed laterally of the same, which arrangement does not afford a sufficient supply of oil under all circumstances; but, by making these ports in the head of the valve, a more certain flow is insured. This positive flow is induced by the quick vertical movement of the valve, whose upstroke causes the oil to be ejected through the apertures or ports *l'*, while the downstroke drives the lubricant into the feed-tube K, and thence down the channels C *a' a*, into the steam-chest of the locomotive or engine.

As this upwardly-acting sleeve-valve is raised from its seat by the pressure of steam at every stroke of the engine, it is evident that such a device will be of no service whatever when the locomotive is running on a down-grade with the steam shut off, and the piston acting as a pump, because a vacuum is thereby produced in the steam-chest, which vacuum draws the valve L down upon the tube K, and, consequently, no lubricant can escape through said tube. This very serious defect led me to devise the chamber J, with its adjuncts O P Q, which operate the instant a vacuum or partial vacuum is produced, and not a moment sooner.

The reason for such action will be apparent when it is understood that so long as a pressure of steam exists in the connected channels *a* C C', the valve P is forced upwardly by such pressure, and held snugly against its seat *o'*, thereby preventing any escape of oil from vacuum-chamber J, as seen in Fig. 13.

But the instant a vacuum is produced in the steam-chest, the vacuum coacts with spring R to dislodge valve P from its seat, and allow oil to flow down from chamber J through the appropriate channels *r*, *o*, C', *a''*, and *a*, in precisely the same manner it would be discharged from the other or condensing chamber I.

At a first glance at the apparatus it is not apparent how this flow is induced, inasmuch as no aperture exists in the top of chamber J, to allow atmosphere acting on the oil contained in said chamber.

But practical experience has fully demonstrated that an accumulation of vapor takes place in the top of vacuum-chamber J, which vapor is sufficiently elastic to expand and gradually eject the oil as long as valve P remains open, although an inwardly-opening valve may be applied to the screw-cap of this chamber, as represented in Fig. 15, which air-valve should be maintained in its normal or closed condition with a suitable spring.

The valve P is constantly open as long as the vacuum is maintained, or until steam is again turned on, and the stress of spring R is overcome, when said valve is automatically closed, and the chamber I is again automatically caused to operate, as previously described.

To fill either of the chambers I. or J with oil or tallow, it is only necessary to rotate the proper cap in such a manner as to bring the upper edge of ring U slightly above the lubricator-neck, as seen in Fig. 12. The cap X is then thrown back by means of its hinged bearings *w w'*, the split portion *v* of ring U allowing the latter to collapse far enough for the snaps V V' to disengage from their retaining-notch Y.

This act having been accomplished, an ample and unobstructed mouth is afforded for the speedy filling of the vessel.

After the chamber has been charged, cap X is thrown back to its original position, a slight degree of force being all that is necessary to engage the notch Y around the snaps V V', so as to lock the two members U and X temporarily together.

These two members having been thus coupled together, so as to render their threads *u* and *x* practically continuous, a few revolutions of hand-wheel 4 runs the screws *u* and *x* down into the neck, and thereby hermetically closes the chamber.

As the gist of my invention consists of a lubricator whose condensing and vacuum chambers discharge their contents through a common stand or base into the steam-chest of an engine, I reserve the right, as previously stated, of making these two chambers separate and distinct from each other. Such a modification of the invention is represented in Fig. 16, in which two shells are shown mounted upon the stand A, the channels C and C' for these shells being continued below seats *a'* and *a''*, so as to afford independent outlets *c* and *c'* for these separate shells.

This illustration shows wooden jackets applied externally to the shells or separate chambers, the jacket of the condensing-chamber being fitted into an annular groove, *t*, at the top of said shell. The bottom of this jacket is secured with a ring, T', screwed to the lower portion of said shell.

This construction is reversed with the vacuum-chamber, whose groove *t* is at bottom, and the screw-threaded ring T' at the top of said shell.

Or, if preferred, the various staves of the jacket may be secured in position with a ring, *t'*, and screws *t''*.

I claim as my invention—

1. An improved steam-engine lubricator, consisting of a condensing-chamber and a vacuum-chamber, applied to a common supporting stand or base, substantially as described and set forth.

2. An improved steam-engine lubricator, consisting of a condensing-chamber and a vacuum-chamber contained within a single shell, which latter is applied to a stand or base, through which base the contents of said

chambers are discharged into the steam-chest, substantially as described and set forth.

3. An improved steam-engine lubricator, consisting of shell or reservoir F, provided with partition H, that divides said shell into two separate and distinct chambers, I and J, having independent outlets communicating with the steam-chest through the supporting-stand, the former chamber I being adapted to discharge its contents solely by condensation, while the latter chamber J operates only by a vacuum, substantially as herein described, and for the purpose set forth.

4. An improved steam-engine lubricator, consisting of shell F, plate H, semi-cylindrical chambers I and J, stand A, channels C C′, common discharge-passage *a*, and throttle-valves *a′* B *a″* B′, as and for the purpose specified.

5. In combination, with condensing-chamber I, discharge-tube K, and sleeve-valve L *l′*, the bridge N *n*, and vertically-adjustable guide-stop M *m m″*, as and for the purpose specified.

6. In combination with vacuum-chamber J and tube O *o′ r*, the valve P *p*, which latter opens downwardly and discharges oil from said chamber when a vacuum is produced in the steam-chest, and closes upwardly to arrest the flow of lubricant the moment a pressure of steam occurs in said chest, the stroke of said valve being controlled by the adjusting devices *p′* Q, situated externally with reference to tube O, and at the upper end of the same, substantially as herein described and set forth.

7. The vertically-reciprocating sleeve-valve L, when constructed with a series of vertical or nearly vertical apertures, *l′*, in its head *l*, as and for the purpose herein described and set forth.

8. In combination with the screw-stem *p′*, the nut Q, whose threaded portion is split completely through on one side from end to end, while the upper extremity of said nut is closed, with a solid and grooved head, *q′*, substantially as herein described and set forth.

9. A non-conducting medium, extending from the base-plate to the cap of a lubricator, for the purpose of preventing radiation of heat from the sides of the reservoir, said non-conductor being applied either to the exterior or interior of the shell, substantially as herein described and set forth.

10. The internal non-conducting lining T, secured in a groove, *t*, at top of the lubricator and confined at bottom by a curb, D, and the shell F, as and for the purpose specified.

11. In combination with the hinged members U *u* and X *x*, the notch Y, for reception of the snaps V V′, which latter are separated by an interval, *v*, as and for the purpose specified.

12. The hinge appliances, consisting of cap X Z *z z′* 2 2′ and ring U W *w w′*, whose pivots *w w′* are retained in their respective sockets *z z′* by the locking-plate 1 engaging with the under-cut grooves 2 and 2′, as and for the purpose specified.

13. The combination of plate X′, outwardly-projecting lugs or stumps 5, and metallic ring 7, which latter surrounds the central boss 8 of wooden handle or wheel 4, and is secured thereto by screws 6 tapped into said lugs 5 of plate X′, substantially as herein described, and for the purpose set forth.

14. The cylindrical guide M, screw-threaded externally at *m*, split longitudinally at *m′*, and spanned at top with a yoke, *m″ m‴*, which yoke serves as a stop to limit the ascent of vertically-reciprocating sleeve-valve L, substantially as herein described and set forth.

15. In combination with vacuum-chamber J, tube O *o o′ r*, and valve P *p*, the adjusting devices *p′* Q, and spring R, substantially as herein described and set forth.

In testimony of which invention I hereunto set my hand.

JAMES POWELL.

Witnesses:
JAMES H. LAYMAN,
JOHN G. MURDOCK.