No. 668,814. Patented Feb. 26, 1901.

F. W. EDWARDS.

LUBRICATOR.

(Application filed Jan. 10, 1900.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

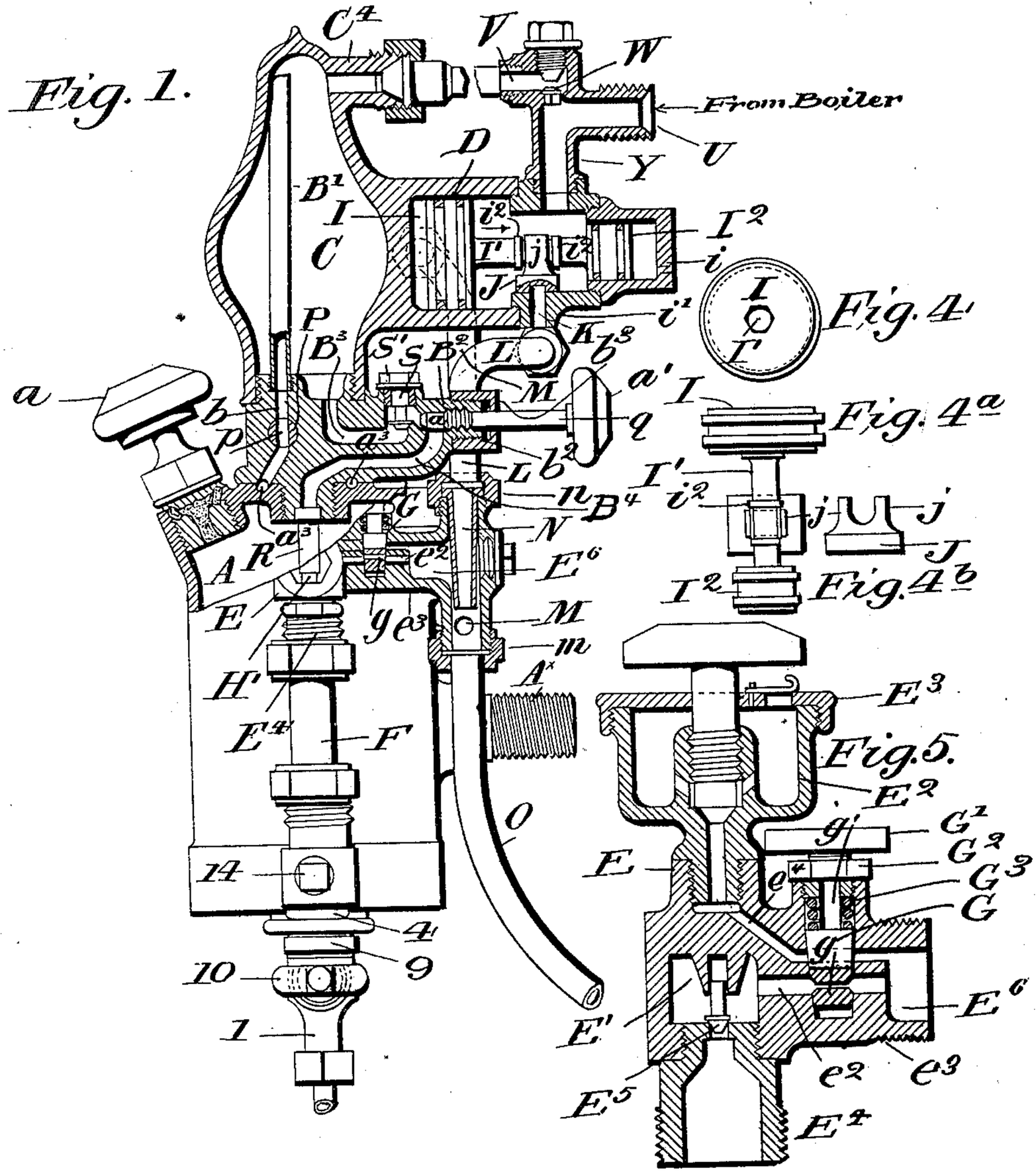

Fig. 4.

Fig. 4a

Fig. 4b

Fig. 5.

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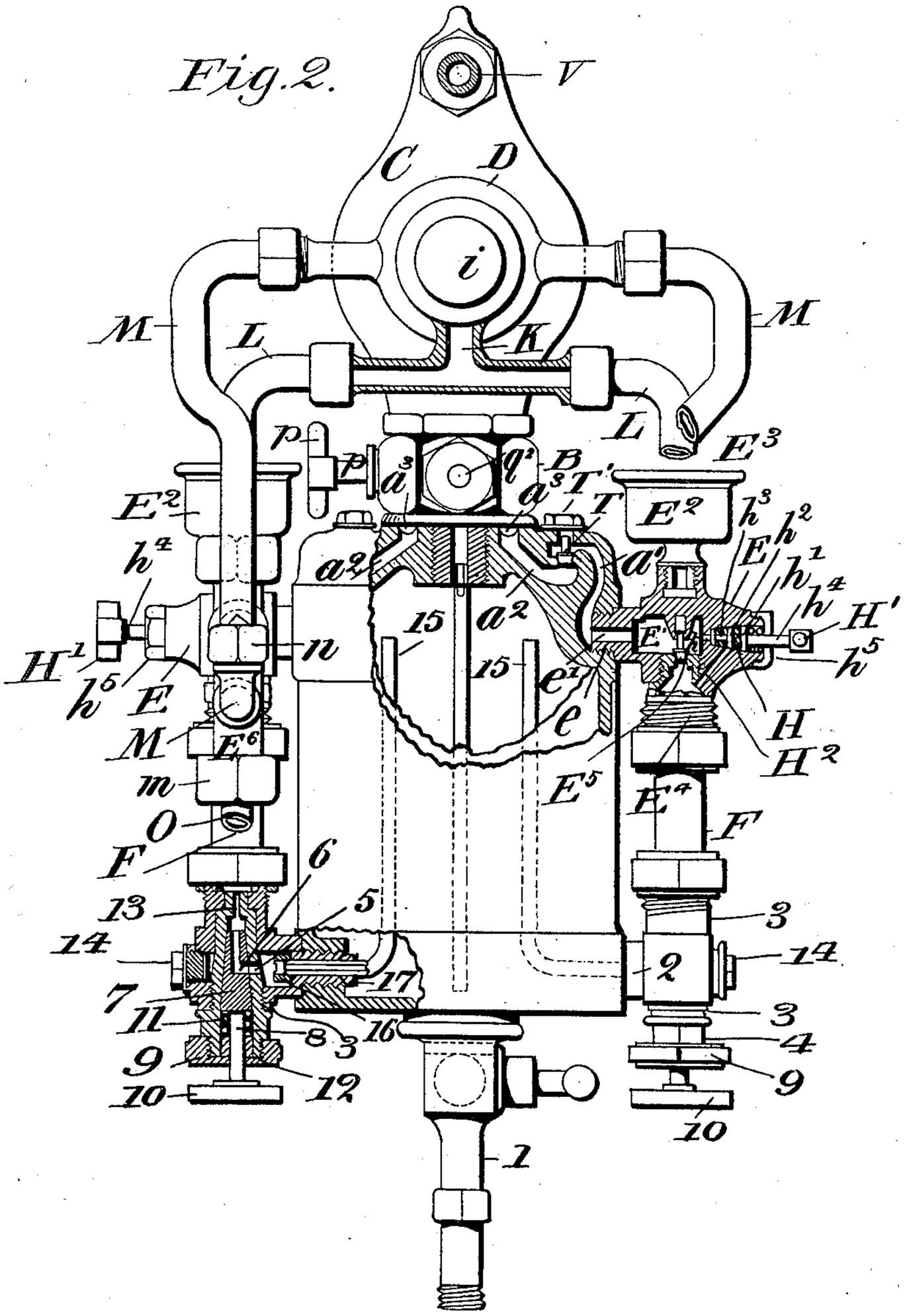
(No Model.) 3 Sheets—Sheet 2.

Fig. 2.



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(No Model.) 3 Sheets—Sheet 3.

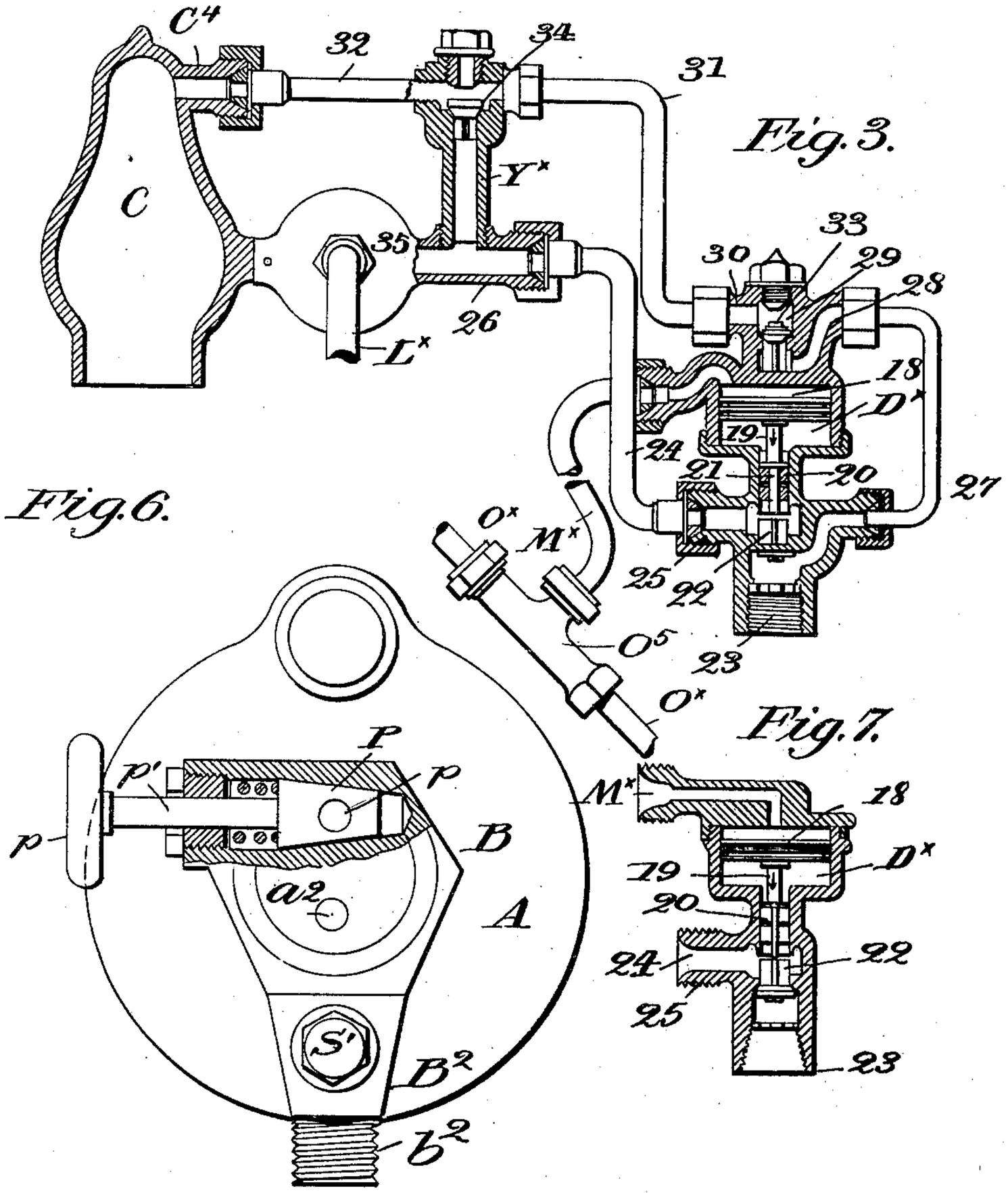

Fig. 6.

Fig. 7.

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UNITED STATES PATENT OFFICE.

FRANK W. EDWARDS, OF LOGANSPORT, INDIANA.

LUBRICATOR.

SPECIFICATION forming part of Letters Patent No. 668,814, dated February 26, 1901.

Original application filed March 16, 1899, Serial No. 709,356. Divided and this application filed January 10, 1900. Serial No. 955. (No model.)

To all whom it may concern:

Be it known that I, FRANK W. EDWARDS, a citizen of the United States, residing at Logansport, in the county of Cass and State of Indiana, have invented certain new and useful Improvements in Lubricators; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to lubricators of that class in which provision is made for the displacement of the oil as condensation takes place and known in the art as "displacement-lubricators."

The present application is filed as a division of my application, Serial No. 709,356, filed March 16, 1899.

The present invention has for its objects, among others, to provide for the filling of the sight-tube with condensed steam when the same becomes exhausted; also, to provide against cross-feeding should the feed-tube become choked.

Still a further object is to provide means for preventing backflow of oil from the reservoir when condensation takes place in the boiler and the condensation-valve is left open. I provide a reversible choke-plug, whereby the same may be readily and automatically cleaned should it become clogged. Between the condenser and the oil-reservoir I interpose a connection, affording communication between the condenser and the upper feed-arm, and in this passage I place a valve for controlling the passage of the live steam from the condenser.

I aim at improvements in the details of construction, whereby assemblage of the parts is facilitated and the operation of the device rendered more satisfactory.

Other objects and advantages of the invention will hereinafter appear, and the novel features thereof will be specifically defined by the appended claims.

The invention is clearly illustrated in the accompanying drawings, which, with the letters and numerals of reference marked thereon, form a part of this specification, and in which—

Figure 1 is a longitudinal central section with parts in elevation. Fig. 2 is a rear elevation at right angles to Fig. 1 with parts in section and portions broken away. Fig. 3 is a diagrammatic view, partly in section, showing the intercepting-valve designed for operation independent of the condenser-casting. Fig. 4 is an end view of the piston shown in Fig. 1. Fig. 4^a is a top plan of the said piston and its valve. Fig. 4^b is an end elevation of the valve. Fig. 5 is a sectional detail, on an enlarged scale, of the choke-plug and hand oiling-cup. Fig. 6 is a view, partly in plan and partly in section, showing the valve for controlling the passage of live steam from the condensing-chamber. Fig. 7 is a sectional detail showing a different form of connection with the intercepting-valve.

Like letters and numerals of reference indicate like parts throughout the several views.

As will be readily understood from the drawings and from the following description, this invention relates more particularly to lubricators of that class designed more especially for use upon locomotives.

Referring now to the details of the drawings, A designates the oil reservoir or receptacle, provided with a filling-aperture, closed by a suitable plug *a*. Upon the upper end of this cylinder is the casting B, in this instance shown as formed with a depending screw-threaded neck engaged in a threaded opening in the top of the cylinder, and to the upper face of this casting is detachably connected the condensing-chamber C, which supports the cylinder D, which constitutes both a cylinder in which works a piston, soon to be described, and a supply-chamber.

E is the upper feed-arm, of which there are two shown; but it is evident that in triple-feed lubricators there would be three of these feed-arms. As they are all alike, a description of one will suffice for all. Referring, then, to Figs. 2 and 5, it will be seen that the arm consists of a casting having a neck portion *e*, by means of which it is affixed in position on the oil-reservoir, the passage *e'* thereof communicating with the passage *a'* in the thick-

ened upper portion of the reservoir and this passage by the channel a^2 with the passage a^3, and this in turn communicates with the vertical passage b in the connection B, as shown clearly in Fig. 1.

B′ is a pipe secured in the connection B in line with the passage b, as seen clearly in Fig. 1, and extends upward within the condensing-chamber C to receive live steam in a manner which will be more fully hereinafter set forth.

E′ is a water-chamber in the upper feed-arm, and this chamber is put in communication with the passage a' by the passage e', as seen best in Fig. 2. The upper feed-arm may be provided with any well-known or desired form of hand oiling-cup E^2 and cap E^3, as seen, for instance, in Fig. 5.

E^4 is a nipple secured to the under side of the upper feed-arm, as shown best in Fig. 5, and designed for the attachment of the sight-tube F of usual construction.

E^5 is a valve within the water-chamber, as seen in Fig. 5, being seated upon a seat on the upper end of the nipple E^4, and its stem is guided in a suitable guideway, as shown more clearly in Fig. 5.

e^2 is a passage leading from the water-chamber E′ through the lateral branch e^3, while e^4 is an inclined passage for the oil from the oil-cup E^2, both of these passages communicating with the oil-receiving chamber E^6, as seen clearly in Fig. 5.

G is a choke-plug. It is disposed at right angles to the passage e^2, as seen in Fig. 5, and near its inner end is provided with the transverse contracted or restricted passage g, adapted when the plug is in position to come coincident with the passage e^2, provision being made for the seating of the inner end of the plug, as shown, so as to hold it in proper alinement. The stem g' of this plug passes through the branch e^3 and is provided with a suitable handle G′, a cap-nut G^2 being also provided, as seen best in Fig. 5, and a spring G^3, interposed between the inner end of this cap-nut and the outer end of the plug, serves to hold the plug to its position without the employment of packing. As shown, the plug is tapered and fits a correspondingly-shaped socket or seat, so as to make a tight joint at all times, the spring aiding in automatically insuring a tight joint as the plug wears. In practice when the lubricator is feeding should the passage g become clogged with dirt or other obstruction, so as to choke or close one side of the passage, a simple reversal of the plug—that is, a half-revolution thereof—will serve to bring the opposite or free side of the opening nearest the oil, so that the dirt or other obstruction will be forced out by the pressure of the oil. The spring will keep the valve to its seat, notwithstanding this half-revolution of the same.

The water-chamber E′ is connected by the passage h with a chamber H in the outer portion of the upper feed-arm E, as shown in Fig. 2, and in this chamber is located a valve or plug h', shown in this instance as a tapered valve having a transverse passage h^2, which communicates with the longitudinal passage h^3 of said plug or valve, as seen in said Fig. 2. This valve has a stem h^4 extended through the cap h^5 and provided with a suitable handle H′, by means of which the valve may be turned when desired. As shown in Fig. 2, this valve is so turned as to afford communication between the water-chamber E′ and the by-pass H^2 in the upper feed-arm through the longitudinal passage h^3 and the transverse passage h^2 of the valve, so as to fill the sight tube or glass F. When the valve is turned at right angles to the position in which it is here shown, the communication between the water-chamber and the sight-tube will be shut off by reason of the transverse passage being brought otherwise than in communication with the by-pass in the feed-arm. By this means the sight-tube can be readily filled with condensed steam when the same becomes exhausted. It is to be understood that the valve or plug h' is designed to be held in its adjusted position by friction, aided by a spring H^4, interposed between the cap and the outer end of the plug.

The oil-reservoir is provided with the usual drain plug or pipe I, as shown in Figs. 1 and 2.

The receiving-arm and its accessories are shown in detail in Fig. 2, to which attention is now directed. 2 is a connection or coupling detachably engaged in a threaded opening in the reservoir A at its lower end and having the vertical extension 3, in which is arranged the tapered plug 4, having an opening 5 in the wall thereof adjacent the reservoir, so as to register with the passage 6 in the valve, which is mounted within the said plug. This valve 7 is tapered, as shown, and is provided with a stem 8, passing through the cap-nut 9 and provided with the handle 10. Within the plug, between the cap-nut and the outer end of the valve, is a spring 11, a collar or sleeve 12 being in this instance shown as bearing against the cap-nut and receiving the outer end of the spring, although this collar or sleeve may sometimes be dispensed with. It will be evident that the plug is so fitted as to form a perfectly steam-tight joint, the shoulders at the inner and outer ends thereof being provided in order to assist in the accomplishment of this end. The upper end of the vertical extension or portion 3 is connected with the lower end of the sight-tube, as shown in Fig. 2. The plug 4 is provided with a passage 13, which serves as an outlet for the oil, from which it passes drop by drop through the sight-tube in the usual manner.

14 is a plug provided for the purpose of affording ready access to the interior of the receiving-arm, as well as access to the means for affixing the end of the feed-pipe in position. The plug and its valve may be readily removed when desired, and a new valve or

plug is as easily inserted in case the one previously used should become worn.

15 is the feed-pipe from the reservoir to the receiving-arm. It is secured in position in the following manner: Its lower end is extended horizontally and is inserted through the bore of the lateral portion of the receiving-arm, as seen at the left of Fig. 2, its outer end being screw-threaded to receive the jam-nut 16, which is screwed thereon, as seen in said Fig. 2 at the left, a collar 17 being provided at the inner end, which is brazed on and bears against the inner end of the threaded portion of the horizontal part of the arm. This serves to hold the feed-pipe steady.

Within the cylinder D is mounted to slide the piston I, carried by a piston-rod I′, as seen in Fig. 1, and this piston-rod is disposed horizontally and carries at its outer end a piston-valve I^2, which is mounted to work within the extension i of the cylinder. This extension in this instance is provided at the outer end of the coupling i', joined to the outer end of the cylinder; but it is evident that other provision may be made for this purpose. The piston-rod or stem of these valves carries a slide-valve J, which is held between collars i^2 on the stem or piston-rod, and thus prevented against displacement, the upright portions j of the valve serving to allow of the necessary movement of the valve to permit it to automatically adjust itself to its seat. This slide-valve is designed to open or close the port K, which communicates with the pipe L, soon to be described, it being understood that there are two of these pipes L, as seen in Fig. 2.

M represents pipes the upper ends of which communicate with the cylinder D behind the piston or valve I, as seen best in Fig. 1, and their lower ends lead into the lower portions of the receiving-chambers E^6 beneath the injectors therein, the point of connection of the pipe M with this chamber being seen clearly in Fig. 1. The lower ends of the pipes L communicate with the upper ends of the oil-receiving chambers E^6, as shown best in Fig. 1. As seen in Fig. 1, the ends of the pipes L and the injectors N abut, and the cap-nut n serves to secure them in position and to form the joint between the same and the chamber. Any well-known form of injecting arrangement may be employed. That shown serves its function satisfactorily.

O represents the tallow-pipes or the pipes for delivering the lubricant to the parts to be lubricated. They are shown as connected to the lower ends of the oil-receiving chambers E^6 by cap-nuts m, so as to form tight joints. It will of course be understood that in lieu of the cap-nuts herein shown as means for connecting the pipes and other parts other means may be employed, and I do not wish to restrict myself to the precise construction and arrangement of parts in this regard as herein shown. Equally as good results may be attained by other means without affecting the operation of the essential features of the invention.

Under some circumstances one pipe M may be found sufficient, and I therefore do not wish to be limited in this regard.

For controlling the passage of live steam through the pipe B′ to the water-chamber E′, I provide a valve P. (Seen in cross-section in Fig. 1 and in plan in Fig. 6.) This valve is tapered, as shown, and fits a correspondingly-shaped seat in the casting B and has the transverse port p, which when the valve is turned, as seen in Fig. 1, alines with the port or passage b through the said part B and affords communication between the pipe B′ and the water-chamber E′ through the cross-passages a^3 and passages a^2, a', and e', as will be readily understood from Fig. 2 when taken in connection with Fig. 1. The cross-passages permit of the employment of but a single pipe for supplying steam from the condenser; but it is obvious that more than one pipe for such purpose may be employed, if desired. This valve has a stem p' and a handle p^2 and a cap-nut and spring similar to the construction shown in Fig. 5 in connection with the choke-plug and for a similar purpose.

Referring now to Fig. 1 and also to Fig. 6, it will be noticed that the casting B has a lateral extension B^2, which is exteriorly threaded, as seen at b^2, to receive a cap-nut b^3 and interiorly threaded to receive a screw-plug Q, having a stem q and a hand-wheel or analogous provision Q′. This valve is adapted to a seat in the casting B, as best seen in Fig. 1, and is adapted to control the passage of the water of condensation from the condensing-chamber C to and through the pipe R. The said water of condensation passes from the condensing-chamber through the port B^3 and thence through the port B^4 in the casting B, which passages are best seen in Fig. 1. At the junction of these two passages I place a check-valve S, (seen also in Fig. 1,) and this is adapted to seat on the casting B practically at the junction of the two passages and is disposed at substantially right angles to the valve Q. A removable plug S′ permits of the ready access to said check-valve for the purpose of repairs or other cause. This plug is cored to provide for the necessary movement of the stem of the check-valve. T represents similar check-valves located at the junction of the passages a' and a^2, as shown in Fig. 2. Only one is seen in Fig. 2; but it is to be understood that there is another at the junction of the passages a' and a^2 at the other side of the oil-reservoir. Removable caps or plugs T′ are here provided for the same purpose as the removable cap or plug S′ just described in connection with the check-valve S.

U is a connection for receiving live steam from the steam-space of the boiler. This communicates by way of the passage V with the upper end of the condensing-chamber C

and also by way of the port Y with the cylinder D, as seen in Fig. 1, a check-valve W being provided at the junction of the passages U, Y, and V, as seen in Fig. 1, which check-valve is normally open—that is, when steam is being admitted through the passage U—but which closes when the steam is shut off. The vertical passage Y is provided in the vertical leg of the coupling, which is joined at its lower end to the coupling *i*, and the neck or nipple C^4 receives the end of the pipe through which the horizontal communication is formed, suitable cap-nuts or the like being employed to insure tight joints.

The device may be mounted in position in any desired manner. In Fig. 1 the oil-reservoir is shown as provided with a screw-threaded stud $A^\times$ for this purpose.

With the parts constructed and arranged substantially as above described the operation is as follows: Assuming that steam from the boiler is shut off, the parts will be in the position in which they are shown in Fig. 1. Now as steam is admitted from the boiler through the passage U the check-valve W is opened and live steam admitted into the condenser C and at the same time into the cylinder D between the two pistons I and I^2, holding the valve J in its central position—that shown in said Fig. 1—closing the port K. The said valve J is thus held in its central position by means of the differential pistons I and I^2 in a manner which will be readily understood. Now this being the condition of things when the throttle-valve of the engine is closed, should the throttle-valve be opened a pressure is created in the steam-chest, which in turn creates a pressure in the pipe O and through the pipe M upon the rear of the piston I, forcing the latter in the direction of the arrow in Fig. 1 and moving the valve J, so as to open the port K. When the port K is opened, steam at boiler-pressure (which is greater than the back pressure through the pipe O) passes into the cylinder D through the port K and the pipes L into the injectors N into the oil-receiving chambers E^6 of the upper feed-arms, it being understood that the lower ends of the injectors are below the bottom of said chambers, so as to create a suction to cause the oil through the passage e^2 to pass down the pipe O to the steam-chest. This condition of affairs remains so long as the throttle-valve is open and steam is admitted from the boiler, insuring a steady supply of oil to the steam-chest when the engine is working under a full pressure of steam. When the throttle-valve is closed, pressure through the pipes M is shut off, when the steam from the boiler, acting upon the piston I, restores the valve J to its normal position, closing the port K; but the check-valve W remains open and the live steam passes to the condensing-chamber C, furnishing condensation for the displacement of the oil in the reservoir A in a manner which will be readily understood. The valve Q being opened, the water of condensation from the condensing-chamber C passes through the port B^3, lifting the check-valve S, and through the passage B^4 into the pipe R and displacing the oil in the reservoir A, which oil in turn passes through the pipe 15 and through the passages 5, 6, and 13 and through the sight-tube F into the chamber E′, and thence through the passage e^2 and through the passage *g* of the choke-plug into the receiving-chamber E^6, and from thence through the pipe O into the steam-chest, it being understood that during this operation the valve 7 is opened, as shown at the left of Fig. 2, insuring a supply of oil to the steam-chest in case the engine runs a great distance with the throttle-valve closed.

In order to provide for the interception of cross-feeding of the oil, I employ the check-valve T, hereinbefore described and seen in position in Fig. 2. Should the choke-plug become clogged, the oil would accumulate in the chamber E′ and backflow through the passages a', a^2, and a^3 and across to the other side; but by the interposition of my check-valve T the oil would act to close the said valve, and thus prevent this cross-feed, as will be readily understood from Fig. 2. The valve T is of course held open in the normal condition of affairs by the pressure of the steam coming through the passages a^3 a^2 and acting upon its under face. The check-valve S serves a similar function in connection with the backflow of oil from the oil-reservoir through the pipe R in case the valve Q is left open when the lubricator is not in service or when condensation takes place in the boiler. The valve W may sometimes be omitted, depending upon the valve S for preventing interception, as above described.

It is sometimes desirable to admit water of condensation to the sight-tube—as, for instance, when the same becomes exhausted—and for this purpose I have provided the construction shown in detail at the right of Fig. 2 at the upper portion of the oil-reservoir and which has been previously described. Its operation is as follows: Normally the valve h' is closed. In Fig. 2 it is shown as open, so that the water of condensation may pass from the chamber E′ through the port *h*, through the port h^3 and port h^2 in the valve, and thence by way of the passage H^2 into the sight-tube, thus speedily filling the same with the water of condensation from the chamber E′, into which it has passed in a manner above described.

Modifications in the details of construction and arrangement of parts may be resorted to without departing from the spirit of the invention or sacrificing any of its advantages. For instance, in Fig. 3 I have shown a somewhat different form and arrangement of intercepting-valve. In this view the cylinder $D^\times$ corresponds to the cylinder D in Fig. 1 and is disposed vertically instead of horizontally and at a distance from the condensing-chamber. In this cylinder works the piston

18, having a stem 19, carrying a smaller piston 20, working in a suitable chamber 21, and the stem extended beyond the smaller piston, as shown, and designed to contact with and actuate a check or other valve 22, adapted to a seat on the nipple 23, which is designed for connection with the steam-space of the boiler and located in any desired position. $O^{\times}$ represents the tallow-pipes, or pipes for delivering the oil, and in this arrangement these pipes are connected to the coupling or branch O^{5}, from which extends the pipe $M^{\times}$, leading to the chamber $D^{\times}$ back of the piston 18. 24 is a pipe leading from the coupling 25 and connected with the coupling 26, to which is connected the pipe $L^{\times}$, corresponding to the pipe L in Figs. 1 and 2, and of which there may be one or more, and which pipe is designed to lead to the oil-receiving chamber E^{6}, containing the injector. From the opposite side of the valve 22 there extends a pipe 27, communicating with the passage 28, which communicates by the passage 29 with the port 30, which communicates by the pipes 31 and 32 with the upper end of the condensing-chamber C. At the junction of the passages 28 and 29 I arrange a check-valve 33, while at the intersection of the passages through the pipe $Y^{\times}$ and the pipes 31 and 32 I arrange another check-valve 34. The operation of this form of construction is in all respects similar to the corresponding parts in Figs. 1 and 2. Normally the valve 22 is closed. When the throttle-valve is opened, back pressure in the pipe $O^{\times}$ exerts its influence against the back side of the piston 18 and forces it in the direction of the arrow in Fig. 3, and as this piston is moved its stem, contacting with the valve 22, opens the same and admits live steam from the steam-space of the boiler through the nipple 23. The steam at boiler-pressure then passes through the pipe 24 into the pipe 26 and thence through the chamber 35 into the pipe or pipes $L^{\times}$ and from thence takes the same course as the steam in the pipes L in the form shown in Figs. 1 and 2. At the same time steam is admitted to the condensing-chamber C through the passages 27, 28, 29, 30, 31, and 32. The check-valve 34 serves to prevent steam under pressure entering the pipe $Y^{\times}$, while the valve 33 prevents backflow from the condensing-chamber, it being understood that the check-valve 34 is provided for the purpose of preventing live steam from entering the steam-chest while the engine is standing still.

In Fig. 7 is shown a construction embodying a portion of what has just been described in connection with Fig. 3, the connections from the under side of the valve 22, however, being omitted, except, of course, the connection to the boiler. By this means I am enabled to supply live steam to the pipe $L^{\times}$ and to the condenser when the engine is in service; but when the throttle-valve is closed, shutting off pressure on the rear of the piston through the pipe $M^{\times}$, and the valve 22 is closed live steam cannot enter either the condenser or the pipe $L^{\times}$. This is desirable in many cases, especially in local or yard service, where the engine is liable to remain idle for perhaps hours at a time.

Other like changes I should consider as falling within the scope of my invention, and I therefore do not intend to limit myself to the precise construction and arrangement of parts herein disclosed.

What I claim as new is—

1. In a lubricator, in combination with an oil-reservoir a condenser and a lateral extension connected therewith, of means for controlling the passage of water of condensation from the condensing-chamber to the oil-reservoir through said extension, and a check-valve located at the junction of the passage controlled by said means and the passage communicating with the condenser.

2. In a lubricator having a water-pipe R in combination with a condenser, a lateral extension having a passage communicating with the condenser and a second passage connected to said first passage and communicating with the pipe R, of a screw-plug for controlling the latter passage, and a check-valve disposed at right angles to said plug for controlling the first-mentioned passage, as set forth.

3. In a lubricator, the combination with the sight-tubes, of cross-passages affording communication between the said tubes and a source of steam-supply, and means for preventing cross-feeding of the oil.

4. In a lubricator having a plurality of communicating sight-tubes, means for supplying steam to the communication between said sight-tubes, and means in connection therewith for preventing cross-feeding of the oil from one tube to the other.

5. In a multiple-feed lubricator, an oil-reservoir having passages affording communication substantially transversely between the sight-tubes, and check-valves in said passages for preventing cross-feeding of the oil.

6. In a lubricator, the combination with the oil-reservoir, the condenser and the casting at the upper end of the reservoir having passages as described, one communicating with the condenser, of a valve controlling said passages, and a check-valve in one of said passages at the junction of the two for preventing backflow.

7. In a lubricator, an upper feed-arm having a water-chamber, a check-valve, a valve located in a chamber communicating with the said water-chamber and provided with passages for admitting and controlling the admission of condensed steam to the sight-tube.

8. In a lubricator, the combination with the oil-reservoir, of a casting connected therewith, a choke-plug mounted in said casting, and a valve rotatably mounted in said casting at right angles to the said plug for controlling the flow of condensed steam into the sight-tube.

9. In a lubricator, the combination with the oil-reservoir, of a casting connected therewith and with the sight-tube, a by-pass in said connection, and a valve having longitudinal and transverse passages for controlling the by-pass through the connection or casting to the sight-tube.

10. In a lubricator, the upper feed-arm having the following elements—a water-chamber, an oil-receiving chamber, check-valve in the water-chamber, choke-plug between said valve and the receiving-chamber, and a valve at right angles to said plug for admitting water of condensation to the sight-tube when the same becomes exhausted.

11. In a lubricator, the upper feed-arm provided with a by-pass and a rotatable valve mounted in said arm at right angles to the sight-tube and spring-pressed to its seat for controlling the passage of water of condensation through said by-pass.

12. In a lubricator, the lower feed-arm having removable tapered sleeve with port at its inner end and a transverse port between its ends, a removable rotatable tapered valve with coincident longitudinal and transverse ports, a cap-nut, and a removable plug at right angles to the length of the sleeve.

13. In a lubricator, the combination of an oil-reservoir, a lower feed-arm detachably connected therewith, a pipe within the reservoir and held in said arm, a removable tapered plug in the feed-arm, a removable tapered valve in said plug, means for assuring a tight joint between said parts, a removable plug in said arm opposite the securing means for said pipe, and means for rotating the tapered plug.

14. A lubricator provided with a plurality of sight-tubes, means for preventing cross-feeding of the oil from one to the other of said tubes, and means for admitting and controlling the flow of condensed steam to the sight-tube.

In testimony whereof I affix my signature in presence of two witnesses.

FRANK W. EDWARDS.

Witnesses:

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