(No Model.) 2 Sheets—Sheet 1.

J. P. KEALY.

LUBRICATOR.

No. 475,690. Patented May 24, 1892.

Fig. 1.

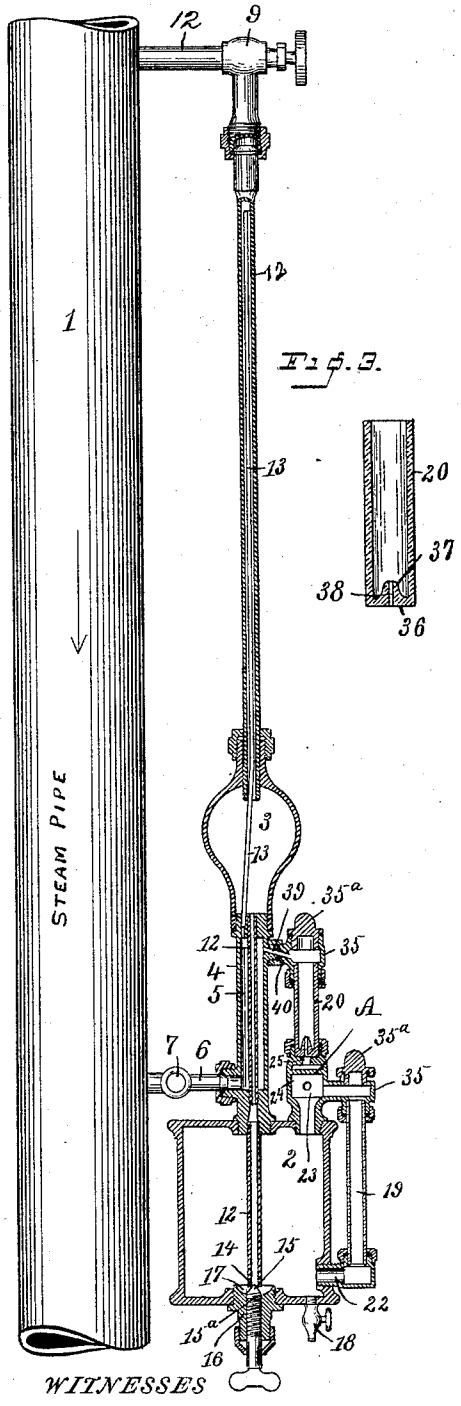
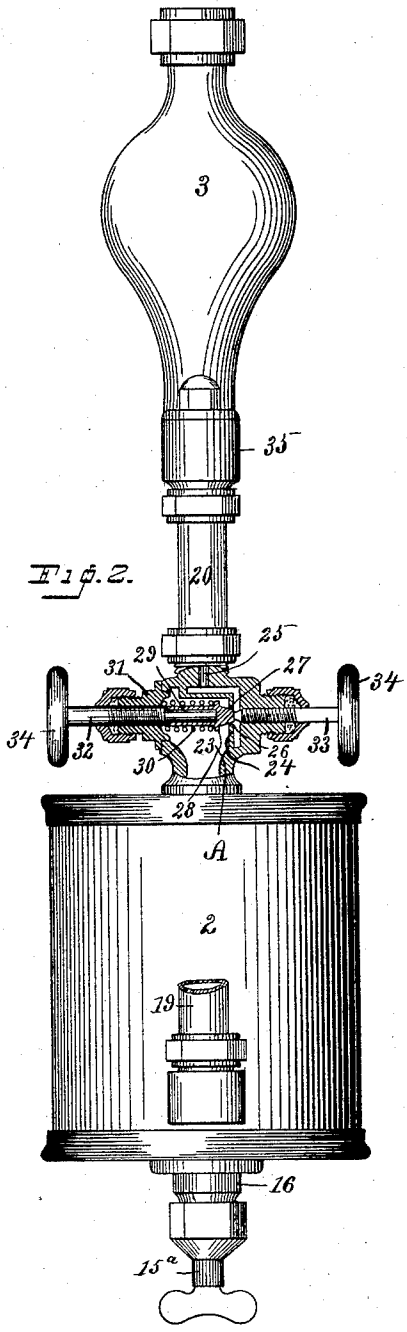


Fig. 3.

Fig. 2.



WITNESSES

C. M. Newman,

Arley P. Munson.

INVENTOR

James P. Kealy

By A. M. Wooster Atty.

(No Model.) 2 Sheets—Sheet 2.

J. P. KEALY.

LUBRICATOR.

No. 475,690. Patented May 24, 1892.

Fig. 4.

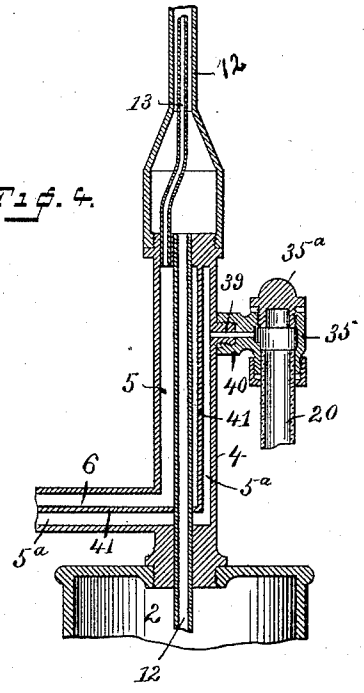


Fig. 5.

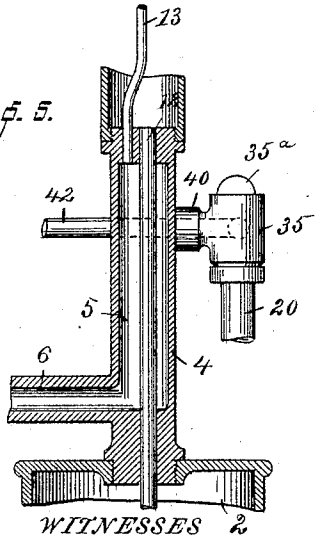
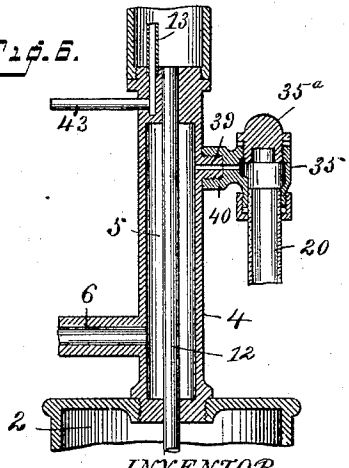


Fig. 6.



WITNESSES

C. M. Newman,

Arley S. Munson

INVENTOR

James P. Kealy

By A. M. Wooster

Atty.

UNITED STATES PATENT OFFICE.

JAMES P. KEALY, OF NEW HAVEN, CONNECTICUT.

LUBRICATOR.

SPECIFICATION forming part of Letters Patent No. 475,690, dated May 24, 1892.

Application filed April 10, 1890. Serial No. 347,350. (No model.)

To all whom it may concern:

Be it known that I, JAMES P. KEALY, a citizen of the United States, residing at New Haven, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Condensing-Lubricators; and I do hereby 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.

The object of my invention is to produce a lubricator in which, owing to there being a perfect internal circulation, live steam and the highly-heated water of condensation, in addition to forcing oil from the lubricant-reservoir, shall be utilized to heat the oil in the reservoir to a mild and uniform temperature and retain it there, and also to raise the temperature of the water in the water-passages, the quantity-glass, the observing-glass, and the various passages through which the globules of oil must pass before entering the main steam-pipe, in which the flow of oil shall be perfectly steady, but shall be subject to exact regulation, and in which pulsation or sucking of the oil from the lubricator at each stroke of the piston of the engine shall be wholly prevented, the action of the instrument being perfectly regular at all times.

It is of course well understood that the condensing-lubricators now upon the market may be divided into two distinct types or classes, one being the down-drop type and the other the up-drop type. The most serious objection to the down-drop type of condensing-lubricators is that the parts frequently get heated to such a degree as to cause saponification of the oil, the result being that the various passages are apt to get clogged and not infrequently the entire instrument gets completely clogged up. In the other class of lubricators referred to the most serious objection is that the various passages are heated but slightly, if any, in use, the result being that the drops or globules of oil become thick and will not pass freely through the passages and so cause clogging from this cause.

In the drawings I have illustrated my novel improvements as applied to a lubricator of the up-drop type, although it should be understood that the principle of my invention is equally applicable to other styles of lubricators, a single illustration being deemed sufficient for the purposes of this specification.

In order to wholly overcome the objections stated and to produce a lubricator in which the oil in the lubricant-reservoir and the water in the quantity-glass and observing-glass and the passages shall be kept at a sufficiently-high temperature to insure free working of the oil at all times and render clogging practically impossible, I have devised the simple and novel construction and combinations of elements, of which the following description, in connection with the accompanying drawings, is a specification, numbers and letters being used to denote the several parts.

Figure 1 is a longitudinal section of my novel lubricator complete, also showing the manner in which it is connected to the main steam-pipe, the pipes being in elevation; Fig. 2, an elevation of my novel lubricator upon an enlarged scale, the point of view being at right angles to Fig. 1 and the regulating-valve in section; Fig. 3, a section of the observing-glass, the novel feature being that the glass itself and the drop-forming cone or teat at the bottom thereof are formed in a single piece, thereby avoiding the use of metal in the observing-glass, making it stronger and easier to clean; and Figs. 4, 5, and 6 are partial sectional views illustrating certain changes in the details of construction which do not, however, affect the principle of the invention in the slightest.

1 denotes the main steam-pipe; 2, the lubricant-reservoir, and 4 a standard by which the various parts are supported and within which is a chamber 5, connected directly with the steam-pipe by means of a pipe 6, which is provided with a valve 7.

12 denotes a water-pipe which extends from the steam-pipe downward through chamber 5 and nearly to the bottom of the lubricant-reservoir. This pipe is, in fact, a continuous passage, and I shall so describe it, although in practice it is commonly made in several pieces, as shown in the drawings, one piece engaging both the upper and lower ends of the standard, another piece engaging the lower end of the standard in which it is rigidly secured and extending downward nearly to the bottom of the lubricant-reservoir, and

still another piece being connected with the steam-pipe at a distance above the lubricator. This pipe is provided with a valve 9 and may or may not be provided with a bulge or enlargement 3, as shown in Fig. 1. This enlargement when used serves as a water-reservoir and may or may not be integral with said pipe and may be omitted altogether, if preferred, as shown in Figs. 4, 5, and 6, in which pipe 12 is simply enlarged sufficiently to permit convenient connection with the top of the standard.

13 denotes a circulating-pipe leading from chamber 5 up through enlargement 3, when used, and extending upward a distance into pipe 12, the exact length of this pipe depending upon the special circumstances attending the use of the lubricator as will be again referred to. The lower end of pipe 12 constitutes a valve-seat 14, which is engaged by a conical valve 15 at the end of a stem 15^a, threaded to engage a plug 16 in the bottom of the lubricant-reservoir. At the upper end of plug 16 is a rounded dish-shaped recess 17, the object of which is to prevent the possibility of clogging and to permit the water to pass from tube 12 and flow out freely under the oil.

18 denotes a cock in the bottom of the lubricant-reservoir for drawing off the water when the reservoir is to be filled with oil.

19 denotes the quantity-glass which exhibits at all times the amount of oil in the lubricant-reservoir, and 20 is the observing-glass, having at its bottom a cone or teat 37, in which the drops or globules of oil are formed, which pass through the observing-glass on their way to the steam-pipe.

22 denotes a pipe leading from near the bottom of the lubricant-reservoir into the bottom of the quantity-glass, and 23 a pipe leading from the top of the lubricant-reservoir to the top of the quantity-glass and also to a regulating-valve denoted as a whole by A, the adjustment of which determines the quantity of oil that can pass from the lubricant-reservoir through the observing-glass and into the steam-pipe. The construction of the regulating-valve is clearly shown in Fig. 2.

24 is a diaphragm which separates passage 23 from passage 25, leading to the observing-glass. This diaphragm is provided with a valve-seat 26, which is engaged by a disk 27, which is provided with a flange 28 and a tubular shank 29.

30 denotes a spring, one end of which bears against flange 28 and the other against a plug 31 in the valve-case.

32 denotes a valve-stem threaded to engage plug 31, the reduced inner end of which enters tubular shank 29 and acts when it is desired to close the valve to force the disk up against its seat, as clearly shown in Fig. 2, the action of the spring being to hold the disk at its closed position without regard to the position of valve-stem 32. It will be seen that the engagement of the reduced inner end of the valve-stem with the tubular shank holds the valve-disk at all times in perfect alignment with its seat, so that it is impossible under any circumstances for it to get out of alignment. In the opposite side of the valve-case and directly in line with valve-stem 32 is another threaded valve-stem 33, adapted to engage the valve-disk and force it back from its seat and against stem 32, the position of which determines the area of the valve-opening.

Valve-stem 32 becomes a positive-set gage to accurately determine the amount of oil allowed to pass to the steam-pipe and thence to the engine, but may be adjusted where necessary to increase or decrease the feed-supply. In use after stem 32 has once been set it remains in position until the adjustment is changed. In opening the valve stem 33 forces the valve-disk off its seat and backward against the power of the spring until it is stopped by stem 32. To close the valve, stem 33 is turned outward again and its spring forces the valve-disk against the seat, neither of the stems being then in contact with the valve-disk. Both of the valve-stems are provided with hand-wheels 34 for convenience in operation.

The quantity-glass and the observing-glass are both supported in suitable holders 35, which may be of the ordinary or any preferred construction, the quantity-glass being provided with a cap 35^a, which is removed when it is desired to fill the lubricant-reservoir, and the observing-glass with a similar cap, which is removed when that is to be filled with water or other transparent liquid.

I preferably use, in connection with my improved lubricator, an observing-glass having formed integral therewith a solid bottom 36, from which rises a cone or teat 37, having through it a small passage 38, through which the oil must pass and which causes the oil to form in drops or globules upon the top of the cone and then to rise through the water or other transparent fluid in the observing-glass, from whence it finds its exit through a passage 39 into chamber 5 within the standard, this passage extending through a connection 40, which is threaded to engage the upper holder of the observing-glass and a suitable hub upon the standard. By dispensing with the ordinary metallic drop-forming device at the bottom of the observing-glass and making the entire glass, bottom, and forming-tube from a single piece of glass I produce a cheaper and stronger observing-glass and one very much easier to keep clean and free from obstruction in use.

When the instrument is not in use, valves 7, 9, 15, and A are all closed. In starting for the first time, these valves being closed, the lubricant-reservoir is filled with oil by removing cap 35^a at the top of the quantity-glass. Pipe 12 is filled with water as high as the top of pipe 13. The observing-glass is also filled

with water by removing the cap, or, if preferred, any other transparent liquid may be used instead of water. When the engine (not shown) is to be started, steam is admitted to pipe 1 and passes in the direction of the arrow. At first, of course, the connection between the steam-pipe and the lubricator is wholly cut off. As soon as valve 9 is opened steam enters pipe 12, condenses therein, the water of condensation running down circulating-pipe 13 until chamber 5 and pipe 6 are completely filled with water. Valve 7 being now opened, the water in pipe 6, chamber 5, and circulating-pipe 13 will be immediately forced out by live steam and into the main steam-pipe, the result being that a complete internal circulation is established through these parts, the steam in the circulating-pipe and its connections moving in the same direction as the steam in the main steam-pipe—that is, in the direction of the engine. The water in pipe 12 being now thoroughly heated, valve 15 is opened, which permits the hot water to pass down through pipe 12 and out under the oil in the bottom of the lubricant-reservoir, the water in passing down being heated to a still higher degree by the external heat from live steam received in passing through chamber 5. It will thus be seen that the water which passes through the oil-reservoir in pipe 12, acting to heat the oil therein and afterward passing out into the reservoir at the bottom to force the oil out, is heated while in the upper portion of pipe 12 by the internal current of live steam and water of condensation passing down pipe 13, and while passing through the portion of pipe 12 in chamber 5 is heated to a still higher degree by the steam in said chamber. The pressure that is exerted by the water in the bottom of the lubricant-reservoir upon the oil to force it out is determined by the height to which pipe 13 extends in pipe 12, the hydrostatic weight of the entire column of water in pipe 12 acting directly upon the oil in the lubricant-reservoir to force it out, it being understood, of course, that pipe 12 constitutes, in fact, one continuous pipe, the column of water extending from the bottom of pipe 12 to the top of pipe 13. As soon as the circulation is established and valve 15 opened the regulating-valve may be opened, which will cause the oil to be forced out from the oil-reservoir through pipes 23 and 25, the observing-glass, and passage 39 into chamber 5, from whence it is instantly carried out through pipe 6 into the main steam-pipe, it being understood, of course, that there is a continuous passage of live steam down through pipe 13 into chamber 5 and from thence into the steam-pipe, the surplus water of condensation being also carried off in this manner.

The supply of water of condensation which causes the continuous operation of the instrument is produced by a condensation of steam in pipe 12, it being understood, of course, that the water in this pipe is always maintained at the height of pipe 13 and that the column of water in pipe 12 acts continuously to force the oil out from the oil-reservoir. As each particle of oil is forced out from the reservoir, its place is supplied by a particle of water from pipe 12, which is forced out from said pipe under the oil by the weight of the column of water, recess 17 in the top of plug 16 being made cup-shaped and flaring, so as to prevent clogging and permit the water to flow out freely under the oil and insure a speedy action of the feed. The regulating-valve, denoted as a whole by A, is operated by first turning valve-stem 32 outward slightly and then turning valve-stem 33 inward slightly, so as to force valve-disk 27 back from its seat and leave a slight opening between the valve and seat for the oil to pass out into the observing-glass. As already explained, the observing-glass is provided with a teat in its bottom having a passage through it so small as to compel the oil to pass through it slowly and form in drops or globules upon the upper end thereof, the drops rising up through the observing-glass and passing off through passage 39 into chamber 5 and then out into the steam-pipe. It will be seen that by means of the two valve-stems and the spring acting to force the valve-disk into engagement with its seat I am enabled to adjust the valve-disk with the utmost accuracy.

It will of course be understood that the details of construction may be varied greatly from those shown in the drawings without departing from the principle of my invention.

I have not shown the throttle-valve in the steam-pipe, as that forms no portion of my invention, and, furthermore, because the principle of my invention is the same whether connection is made with the steam-pipe above or below the throttle-valve. The advisability of connecting with the steam-pipe above or below the throttle-valve is best determined in view of the special construction and arrangement of the parts and the circumstances attending the use of the lubricator.

In Fig. 4 I have illustrated a construction in which an enlarged water-reservoir in the sense of Fig. 1 is dispensed with, pipe 12 being simply enlarged sufficiently to permit connection with the top of the standard, the connection necessarily giving ample room to permit the connection of pipe 13 with the chamber within the standard at one side of pipe 12, which passes through the standard, but without connection therewith. In this form I place a diaphragm 41 in chamber 5 between the opening into passage 39 and pipe 12. This diaphragm extends nearly to the bottom of chamber 5, and then turns at a right angle and extends through pipe 6 to the steam-pipe, pipe 12 in chamber 5 passing through the diaphragm, but a perfectly-tight connection being made. In this construction the drops or globules of oil after passing from passage 39 do not pass into chamber 5, but

into the independent chamber formed within chamber 5 by the diaphragm, this chamber, which I designate 5^a, extending also through pipe 6 to the steam-pipe. The diaphragm and chamber 5^a may be formed in the standard in the operation of casting, or that portion of the standard may be cast solid and chamber 5^a formed by drilling afterward, the simple requirement being to provide an independent chamber within chamber 5 and pipe 6, through which the drops or globules of oil from the observing-glass may be conducted to the steam-pipe without contact with the live steam in chamber 5.

In Fig. 5 the diaphragm and chamber 5^a are dispensed with, and likewise the passage 39, by which the globules of oil pass from the observing-glass. In this form an independent pipe 42 is provided leading from the top of the observing-glass around outside of standard 5 and connecting independently with the steam-pipe. The connection of this pipe with the steam-pipe is in practice preferably made above the throttle-valve, irrespective of whether pipe 6 is connected above or below the throttle-valve.

In Fig. 6 I have illustrated a form in which the drops or globules of oil from the observing-glass pass through passage 39 into chamber 5, and thence to the steam-pipe through pipe 6, in the same manner as in Figs. 1 and 2. In this form, however, pipe 13 does not connect with chamber 5, but with an independent pipe 43, leading from the upper end of the standard to the steam-pipe, but without connection with the chamber in the standard. It will be seen that in the forms illustrated in Figs. 4 and 5 the heat of the live steam and water of condensation is utilized in chamber 5 to raise or maintain the temperature of the column of water in pipe 12 in the same manner as in the form illustrated in Figs. 1 and 2. In the form illustrated in Fig. 4 the heat of the live steam and water of condensation in chamber 5 is also utilized to raise the temperature of the oil passing from the observing-glass to the steam-pipe, but without direct contact of the oil with the steam and water of condensation, as in the other form.

In the form illustrated in Fig. 5 the oil passes from the observing-glass to the steam-pipe without going through the chamber at all, and in the form illustrated in Fig. 6 the steam and water of condensation do not pass through the chamber, although the oil does.

Having thus described my invention, I claim—

1. The combination, with the main steam-pipe 1, of a lubricant-reservoir, a water-pipe 12, having the valve 9 and a connection at its upper end with the steam-pipe and extending to the bottom of the reservoir, the circulating-pipe 13 within and opening into the pipe 12, a connection 6 between the bottom of the circulating-pipe and the steam-pipe 1 and entering the latter below the first-mentioned connection, a valve 7 in the latter connection, and an oil-delivery conduit leading from the reservoir, substantially as set forth.

2. The combination, with the steam-pipe 1, of the hollow standard 4, an oil-reservoir attached thereto, a water-pipe having a connection with the steam-pipe, passing through said standard, and leading to the bottom of the reservoir, a circulating-pipe within and opening into the water-pipe and also opening into said standard, a connection between said standard and the steam-pipe and entering the latter at a point below the first-mentioned connection, and an oil-delivery conduit leading from the lubricator, substantially as set forth.

3. The combination, with the lubricant-reservoir, of the water-pipe leading thereinto, the steam-circulating pipe within said water-pipe, connections whereby said pipes may be connected with a steam-pipe, an oil-delivery conduit leading from the reservoir, a valve-seat and valve in and adapted to close said conduit, a spring engaging the valve, a regulating-stem engaging the valve from one side to limit its movement, and an operating-stem engaging the valve from the opposite side and adapted to move the valve against the pressure of the spring, substantially as set forth.

4. A lubricator consisting, essentially, of a standard having a chamber within it, a lubricant-reservoir connected thereto, a pipe 6, leading from the chamber to the main steam-pipe, a pipe 12, leading to the main steam-pipe above the lubricator and above said pipe 6, and having an enlargement 3, serving as a water-reservoir, a pipe 12, extending from enlargement 3 down through the chamber and to the bottom of the lubricant-reservoir, a circulating-pipe extending from the chamber up through enlargement 3 and a distance into the pipe leading therefrom to the steam-pipe, connections leading from the lubricant-reservoir into the chamber, and a regulating-valve between the lubricant-reservoir and the chamber, whereby the flow of lubricant may be regulated.

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

JAMES P. KEALY.

Witnesses:
A. M. WOOSTER,
W. C. BRYANT.