(No Model.)

S. REID.

LUBRICATOR.

No. 294,151. Patented Feb. 26, 1884.

Fig. 3.

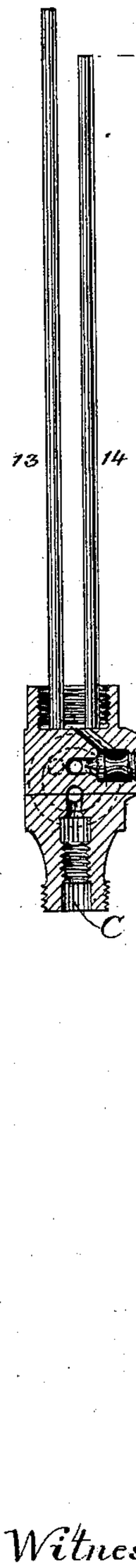

Fig. 1.

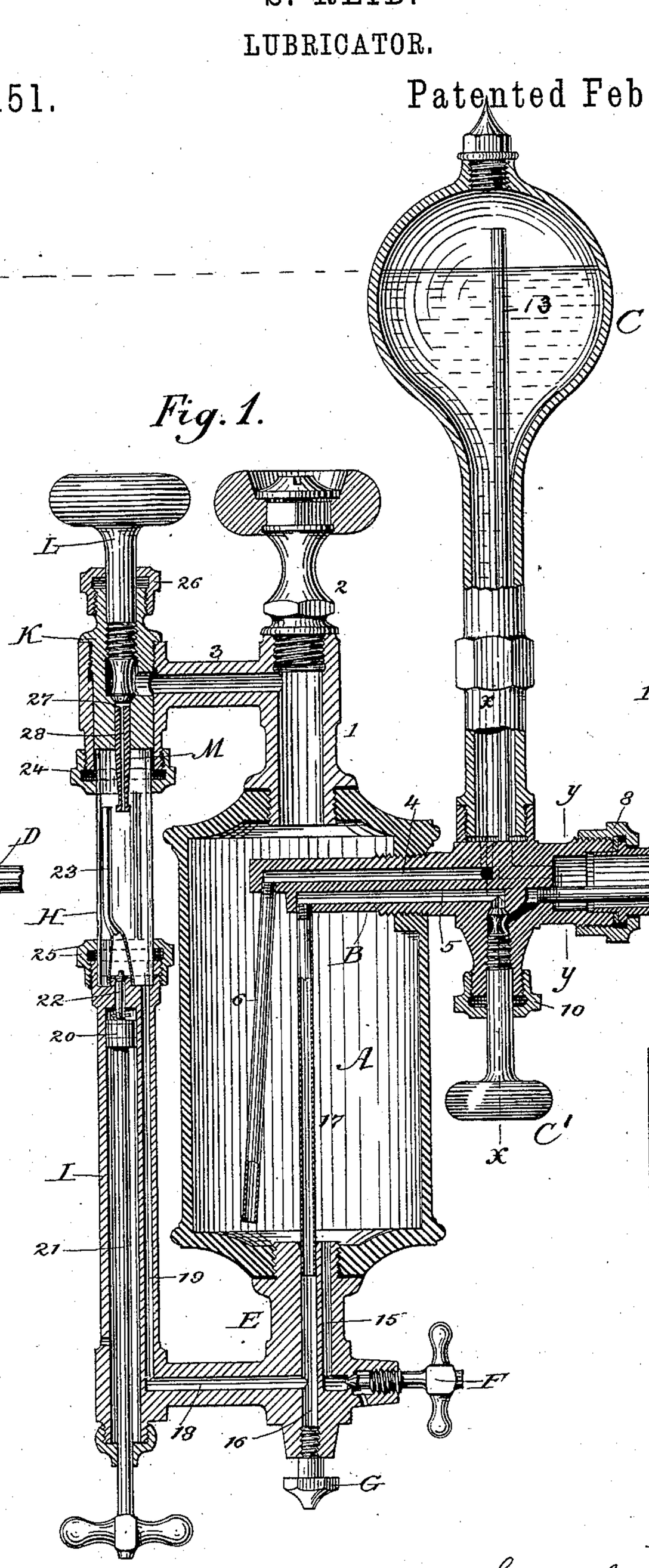

Fig. 4.

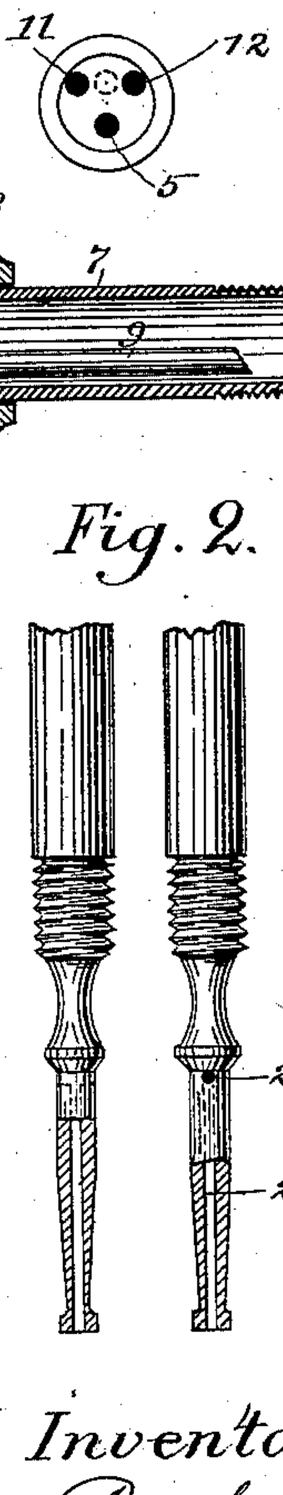

Fig. 2.

Witnesses:
Jacob Lorum.
F. J. Blanchard.

Inventor:
Samuel Reid
By Jno. G. Elliott
Attorney.

UNITED STATES PATENT OFFICE.

SAMUEL REID, OF CHICAGO, ILLINOIS.

LUBRICATOR.

SPECIFICATION forming part of Letters Patent No. 294,151, dated February 26, 1884.

Application filed June 15, 1882. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL REID, a subject of the Queen of Great Britain, residing in Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Lubricators, of which the following is a specification.

My invention relates to improvements in lubricators in which a column or other pressure of water is employed to overcome the pressure of steam against the flow of oil, which lubricators are provided with a glass tube, more commonly termed a "sight-feed," so that by the eye the amount of oil being fed may be determined.

Prior to my invention a glass dome mounted upon the oil-reservoir, and having air normally contained therein at atmospheric pressure, afterward compressed in the upper part thereof without the addition of other air, and compressed entirely by the flow of oil, has been employed in a lubricator, which oil is displaced by supply-water from a boiler arranged in a plane below the oil-reservoir; and it should here be stated that by the "addition of other" or an "excess of air," as herein used, is meant air in excess of that normally in the sight-feed and artificially forced therein. In the particular lubricator described the flow of water to displace the oil is caused entirely by the steam-pressure in the boiler and not by hydrostatic pressure; hence such a lubricator is only adapted to feed oil to a steam-cylinder or other device in which the steam-pressure is below that of the boiler, and cannot be successfully employed where the opposing pressures of the boiler and the device fed are equal, or where the pressure of the latter is in excess. Furthermore, the glass dome is subject to fracture by the pressure against the end thereof of the compressed air, this liability to fracture being increased by the requisite diameter of the dome to contain an oil-nozzle projected therein and bent downwardly at its free end, so as to open in a line with an oil-supply tube passing through the oil-reservoir and opening in the center of the base of the dome. A more serious objection, however, is the liability of the oil to rise in the dome to the nozzle-opening, thereby destroying the functions of the dome, which liability it is subject to, owing to the limited quantity of air in the dome, which cannot be increased, and is constantly diminished by being carried off by the oil-globules in their passage therethrough, and owing to the nozzle projecting a considerable distance downwardly in the dome, to a point beyond which the air will be compressed if the steam in the boiler is above a minimum operative pressure, or there is not a material difference between the steam-pressure in the boiler and that in the device to which the oil is intended to be fed.

The oil-supply of lubricators as now employed is subject to opposing and equal pressure of steam, and it is therefore of vital importance that means should be provided for overcoming this equilibrium, so that the oil will flow to the desired destination, and such means usually consist of a head of water generally derived from condensation, and subject to a pressure of steam directed toward the destination of the oil; but in the device above referred to no means to this end are provided, and hence such lubricators are not and never have been a practical success. Lubricators in which the oil is subject to equal and opposing pressures of steam have had sight-feeds arranged above, below, and at one side of the reservoir, and filled with steam or water, through which the oil displaced from the reservoir passes to the steam-pipe of the engine to be lubricated, and these lubricators have invariably been constructed to utilize the greater specific gravity of water to displace the oil in the reservoir, and a water column operating against the outward pressure of the steam from the steam-pipe to an extent sufficient to permit the oil to flow freely forward to its destination.

The employment of steam in sight-feeds is objectionable, for the reason that not only its misty appearance in and globular condensation upon the glass seriously obstruct the view to the passing oil, but that it causes a varying temperature, resulting eventually in breaking the glass, which, of course, renders the lubricator useless, at least for the time being. To a limited extent water avoids these objections—that is to say, it does not of itself impair the sight, nor is it a quick enough conductor of heat and cold to subject the glass to sudden changes of temperature; but it does seriously retard the flow of the oil when the

feed is rapid, as is demonstrated by the division of the oil-globules into quite small particles, which, by every pulsation of the engine, are driven against the glass in their passage through the sight-feed, and the result is that the glass becomes so discolored by the adhesion of resinous and oily substances that the sight is destroyed. Furthermore, in water sight-feeds it frequently happens that a mistake is made in not first opening the proper valve—as, for instance, the valve in the passage leading from the steam-pipe to the sight-feed--the effect of which is that any oil which may be in the passage next the steam-pipe is forced by the steam into the sight-feed and caused to adhere to and discolor the glass. The common method of cleaning water sight-feeds, when discolored, is to shut off the feed of oil, open a blow-off valve to the sight-feed, and turn on the steam from the steam-pipe, and, in fact, this is the only ready means for cleaning such sight-feeds; but the result is that the glass is frequently broken by the sudden change in temperature, or by the heat of the steam and a cold outside draft upon the glass.

The objects of my invention are to avoid the objections above set forth by entirely dispensing with the use of steam or water in the sight-feed tube, and to substitute therefor air supplied to said tube in excess of its normal capacity, and compressed therein by means other than by the flow of oil and pressure of steam, so that said air will have all the functions of steam or water without any of their defects; to provide a lubricator with a novel form of valve and nozzle controlling the flow of and directing the oil from the reservoir to the sight-feed, for facilitating the removal of the nozzle when its oil-passage is obstructed by foreign substances; and, finally, to provide a lubricator with a novel form of oil-passage leading from the sight-feed to the steam-pipe, said passage being adapted to cause the oil therein to offer an opposing column, operating as a counter-balance, effectually preventing the backward pressure of the steam from forcing back the column of oil into or itself entering the sight-feed. I attain these objects by devices illustrated in the accompanying drawings, in which—

Figure 1 is a sectional view of a lubricator embodying my invention; Fig. 2, details, partly in section, of my combined valve and nozzle; Fig. 3, a detail sectional view on the line *x x* of Fig. 1, showing the water-outlet from the condenser to the oil-reservoir, the valve for regulating the same, and the arrangement of the water-regulating pipe in the condenser relative to the steam-supply pipe; and Fig. 4, a cross-section on the line *y y* of Fig. 1, showing the relative positions of the steam-inlet to the steam-supply and water-regulating pipes in the condenser, and the outlet for the water-supply pipe leading from the condenser to the oil-reservoir.

Similar letters of reference indicate the same parts in the several figures of the drawings.

A represents a cylindrical oil-reservoir, constructed of suitable material adapted to withstand the required pressure, and provided with a stem, 1, tapped into the top of the reservoir, closed by a stopper, 2, and adapted for filling purposes, and to form a connection between the reservoir and the sight-feed by means of the pipe or branch 3.

Entering one side and near the top of the reservoir is a stem, B, provided with independent passages 4 and 5, the passage 4 leading from the stem of a bulb-condenser, C, and forming a water-duct, in connection with the pipe 6, leading from the lower end of the stem of the condenser to near the bottom of the reservoir, for the purpose of supplying water to the reservoir to displace and cause the oil to flow in its proper channel to the steam-pipe, a valve, D, (see Fig. 3,) being provided to cut off the water. Stem B is screw-threaded upon its outer end, for the purpose of joining a short pipe, 7, by means of a collar, 8, and suitable packing connecting the lubricator with the steam-pipe of an engine, and for affording a chamber for a projecting oil-tube, 9, forming a continuation of the oil-passage 5, said passage extending downwardly and thence upwardly to the oil-tube, to adapt it for the operation of a screw-threaded valve, C′, regulating the supply of oil to the oil-tube, but used more especially to shut off the steam until the valve from the oil-reservoir is first opened preparatory to operating the lubricator, and to admit steam, when desirable, for blowing out the oil-passage, said valve having a tight joint formed by a cap, 10, and packing. In the stem B, and opening into the joint 7, and hence into the steam-pipes, are passages 11 and 12, (see Fig. 4,) the latter of which is shown in dotted lines in Fig. 1, from which passages extend up into the bulb of the condenser two tubes, 13 and 14, (see Fig. 3,) the tube 14 opening in a plane below the tube 13, for the purpose of drawing off the water, to prevent it from choking the tube 13 and stopping the operation of the lubricator, as has been more fully described in a former application. For clearness in the present description it may, however, be well to add that tube 14 operates as a steam-supply tube to the condenser until the water rises to its level, after which the water, owing to its gravity and the pressure of the steam from the tube 13, descends to the steam-pipe, whence it is carried off by the current of steam to the engine, and by this means a permanent steam-chamber is formed in the condenser, the steam in which materially augments the force of the column of water to displace the oil in the reservoir.

Tapped in the bottom of the reservoir is a stem, E, provided with a blow-off passage, 15, closed by a valve, F, for removing sediment or the water from the reservoir preparatory to again filling the reservoir with oil. Stem C is also provided with a vertical passage, 16, connected with the passage 5 of the stem B by a tube, 17, said passage 16 having

a blow-off plug, G, and is connected with a horizontal passage, 18, connected in turn with a vertical passage, 19, opening into the glass tube H of the sight-feed. Passages 18 and 19 are respectively a horizontal and vertical extension of the stem E, in the vertical portion of which extension is also formed the barrel of an air-pump, I, provided with a piston, 20, and pump-rod 21, and at its upper end with a check-valve, 22, opening into a tube, 23, which tube may extend, as shown, to a point above the end of the oil-nozzle, so as to prevent any possibility of incoming air throwing against the glass, oil, either in the bottom of the glass or passing from the nozzle. It may also be stated that the passages 18 and 19 may consist of several detached castings or tubes, respectively, and suitably jointed in their operative positions, though, for economy, the construction shown is preferable. The casting in which the passage 3 is formed, when taken separate from the stem 1, is of a T form, hollow, and screw-threaded on one end to receive a cap, 24, connecting it with and forming a tight joint for the glass of the sight-feed, said glass being also jointed, in a similar manner, at its bottom, by a cap, 25, and the usual packing, to the upper end of the casting, in which are formed the passage 19 and the pump-barrel. The hollow T-casting is also internally screw-threaded at its upper end, to hold a plug, K, perforated to connect the passage 3 with the glass of the sight-feed, and externally screw-threaded for a cap, 26, serving to hold a packing, and form a tight joint between the plug and valve, said plug and the passage 19 forming a supply-pipe between or in which the sight-feed is arranged.

Valve L is for shutting off and regulating the supply of oil from the reservoir, through the sight-feed, to the steam-pipe, and involves novel and important construction, in that it has formed, in continuation of it, the oil-nozzle M, provided with a horizontal passage, 27, (see Figs. 1 and 2,) intersecting with a vertical passage, 28, and extending down into the glass H a sufficient distance to afford a full view of the oil passing from it through the glass to the steam-pipe, and in this respect the nozzle is a necessity in all sight-feeds of this same general construction. As shown in Fig. 1, the valve is closed; hence the horizontal opening 27 has no connection with the oil-passage; but it will be seen that if the valve be elevated the horizontal passage will then connect the nozzle with the passage 3, and the oil forced out of the reservoir will flow through the horizontal and vertical passages, and thence drop through the glass and intermediate passages to the passage 14.

It frequently occurs that the nozzle of a lubricator becomes stopped up, and in former constructions it is necessary that the plug and valve shall be removed before removing the nozzle to extract the obstruction; but by the construction above described the valve and nozzle are simultaneously removable; hence much time and labor are saved, and the removal of the nozzle correspondingly facilitated. While my combined valve and nozzle is particularly adapted for lubricators, it is obvious that it might be used in other devices without a departure from the invention embodied therein, and therefore I do not limit myself to its application to lubricators.

To operate my lubricator the reservoir is filled with oil, and having first closed the valves C′ and L and opened the valve D, steam is admitted from the steam-pipe of the engine through the tubes 13 and 14 to the condenser, from whence the condensed water enters the passage 4 and is admitted by the tube 6 to near the bottom of the oil-reservoir, where by its superior gravity the water forces the oil up into the passage 3. The air-pump is then brought into action and air is pumped into the glass tube in sufficient quantity to nearly, if not entirely, fill the same after being compressed by the column of oil and the opposing pressure of steam, both of which pressures are dependent in force upon the height of the column of water in the condenser and the pressure of steam in the steam-pipe. The valve L is then opened and next the valve C′, the feed of oil being regulated by the former, and the result is that if the passages 5, 17, 18, and 19 are empty the air in them will be forced by the steam into the glass; but as the pressure of oil is greater than the pressure of steam, it will also aid in displacing the air, and at the same time effectually prevent the steam from entering the glass. If the pressure of air in the glass is in excess of the combined steam and oil, the air will expand in volume when the valve L is open, and fill the passages 1 and 3; but upon opening the valve C′ the air will be displaced from the passages 1 and 3 and be forced into the passages 18 and 19, and perhaps 17, until the air is displaced from the nozzle and oil begins to flow. Owing to the tendency of the air to rise, and the less degree of pressure of the steam as compared with the oil, the excess in volume of air filling the passages 17 and 18 will be forced into the steam-pipes; or, in other words, the volume of air, when the lubricator is in full operation, will not extend beyond the glass and the passage 19. The elasticity of the compressed air in the glass permits the air to expand and contract, and thereby establish an equilibrium at all times between two opposing pressures varying in force—as, for instance, such variation as might occur by a sudden increase or decrease in the height of the water column, induced through rapid or slow condensation, or by any variation in the steam-pressure, or both, during the operation of the lubricator, for it will be understood if either one or both of these pressures decrease, the air will expand in the glass, and, on the other hand, if they increase, the air will be compressed into smaller space. In view of this expansion and compressibility of the air in the sight-feed, it is obvious that if no air

were forced into the feed the compression of the air already in there would be sufficient for practical purposes, if the air and steam pressure were not sufficient to compress the air in a space above the oil-nozzle, in which case the oil would rise in the glass tube and cover the mouth of the nozzle; or, in other words, it is necessary to keep the glass free of oil, that sufficient compressed air to establish equilibrium shall partly fill the glass below the nozzle.

It should be stated that as the oil-globules passing through the glass tube are constantly absorbing and carrying off particles of air, and as there is also a liability of leakage in the joint of the tube, the importance and necessity of the supply of an excess of air to the tube are obvious for a completely successful employment of air in such a sight-feed. When such absorption and leakage occur to a sufficient degree, a small portion of the lower end of the glass is filled with oil; but this oil may be displaced by a few strokes of the pump forcing in sufficient air to that end. An air column in the sight-feed does not retard the flow of the oil as does water, neither does it obscure the sight as steam, but, on the contrary, keeps the glass of the feed dry, and has a tendency to keep it clean, and by the provision made and described it is impossible for the oil to entirely fill the glass, for the steam to enter the same, or for either to simultaneously vary the temperature of the glass.

The air-pump shown is a convenient means for introducing an excess of air to the sight-feed; but it is obvious that the air might be supplied from any other source—from the air-chamber of the pump of the engine, or by a tube of considerable length connected with the steam-pipe, when the steam might be utilized for compressing the air in the tube and forcing it into the glass of the feed.

In conclusion it should be stated that the oil being fed may be determined by the dropping or flow of water instead of oil through the air in the sight-tube, to do which only mechanical skill is required to make the necessary changes in the parts for this purpose—as, for instance, by conducting the condensations first through the sight-feed and thence to the oil-reservoir, or by locating a sight-tube containing air at any point in the path of the water flowing from the condenser to the oil-reservoir, from which there should of course be an oil-outlet to the device to be lubricated; but while the substitution of a flow of water for oil in the tube is clearly within the scope of my invention, and an obvious equivalent thereof, I consider it of inferior merit.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A sight-feed the glass of which contains an excess of air under pressure, substantially as described.

2. A sight-feed lubricator containing an excess of air under pressure, in combination with devices, substantially as described, for supplying air to and compressing the same in the sight-feed, substantially as described.

3. The combination, with a lubricator, of a sight-feed tube arranged at a point between the oil-reservoir and an oil-passage to a steam-pipe, said feed containing air under pressure, substantially as described.

4. In a lubricator, the combination, with a sight-feed and with the outlet oil-passage to the steam-pipe, of an intermediate oil-passage adapted to contain an opposing column of oil for preventing the steam from entering the sight-feed, substantially as described.

5. The combination, with a sight-feed and with the direct outlet of the oil to the steam-pipe, of a horizontal passage, 18, and a vertical passage, 17, connecting said outlet and sight-feed, substantially as described.

6. A combined valve and nozzle, the nozzle of which is provided with perforations intersecting and extending at a right angle to each other, substantially as described.

7. In a lubricator, the combination, with the oil-reservoir, the passage 1 3, the plug K, and its bushing, of the combined and removable valve and nozzle and a sight-feed, substantially as described.

8. The combination, with the sight-feed and with the projecting oil-nozzle, of an air-supply tube extending up into the sight-feed and above the opening of the nozzle, substantially as described.

9. In lubricators, the herein-described method of feeding oil, which consists in passing oil through a glass tube filled with an excess of air under pressure.

10. In a lubricator, a means for determining the amount or quantity of oil or other liquid being injected or fed, consisting of a sight-feed arranged in a supply-pipe, and a valve for limiting or regulating the passage of the liquid therethrough, substantially as described.

SAMUEL REID.

Witnesses:
JNO. G. ELLIOTT,
WILLIAM C. WHITING.