No Model.)

2 Sheets—Sheet 1.

F. BRUNBAUER.

LUBRICATOR.

No. 493,475. Patented Mar. 14, 1893.

Fig. 1.

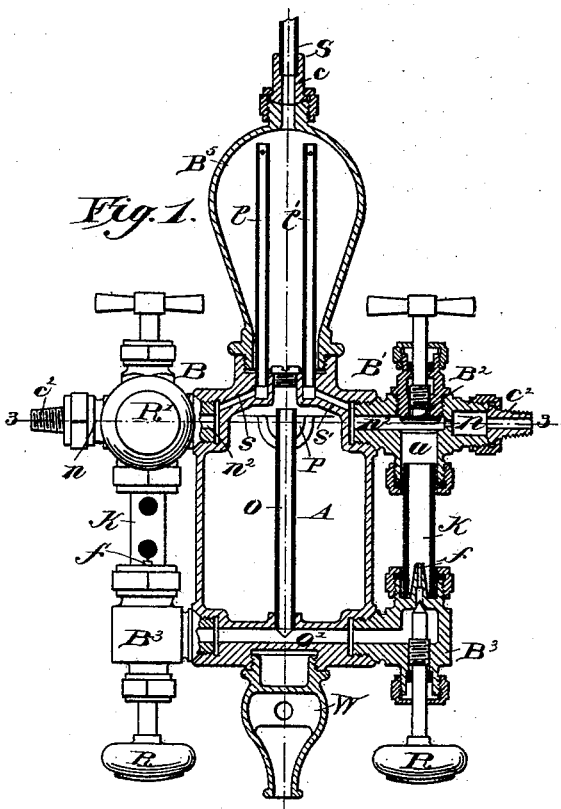


Fig. 2.

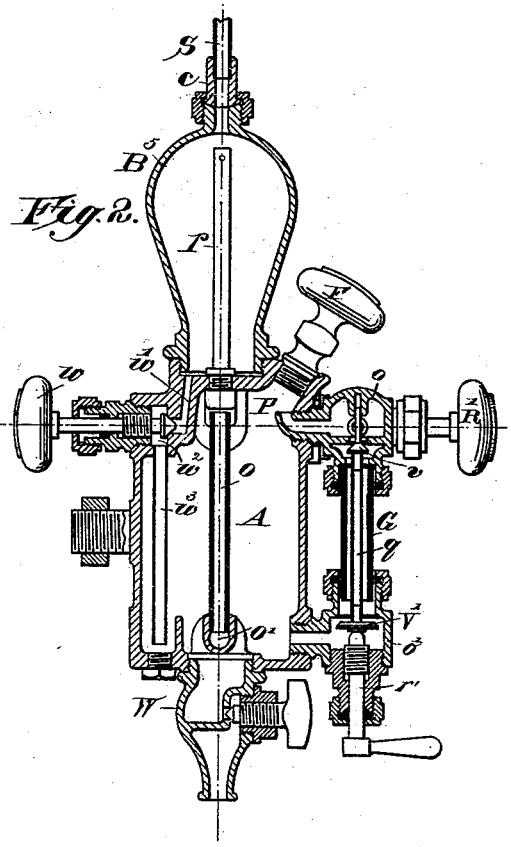


Fig. 3.

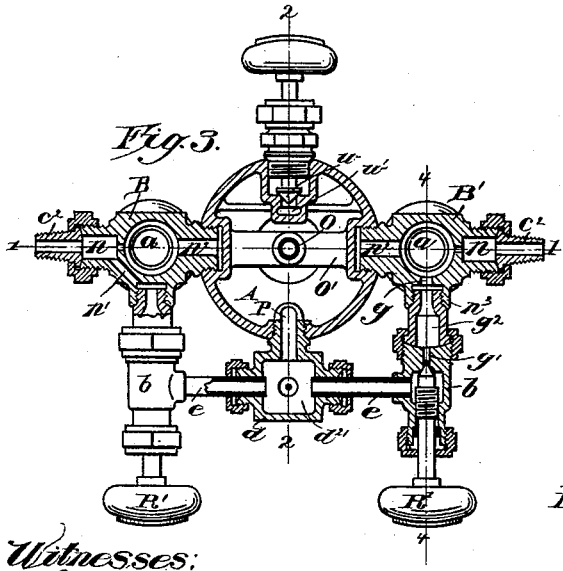


Fig. 4.

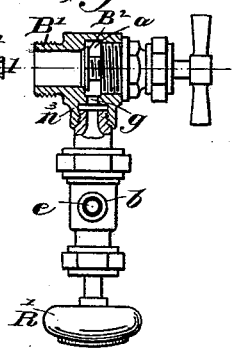
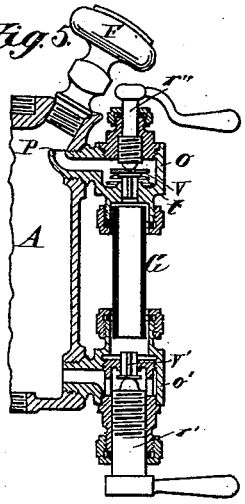


Fig. 5.



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(No Model.) 2 Sheets—Sheet 2.

F. BRUNBAUER.

LUBRICATOR.

No. 493,475. Patented Mar. 14, 1893.

Fig. 7.

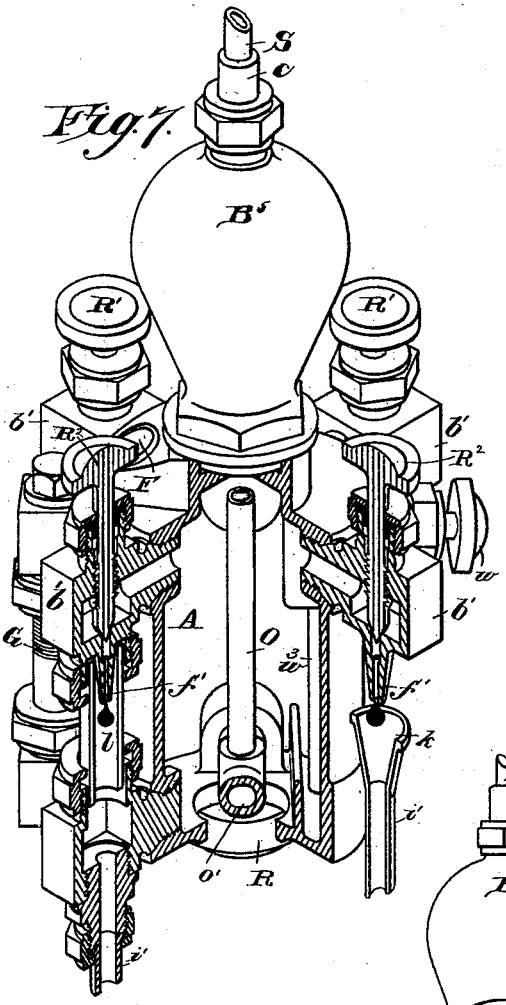


Fig. 8.

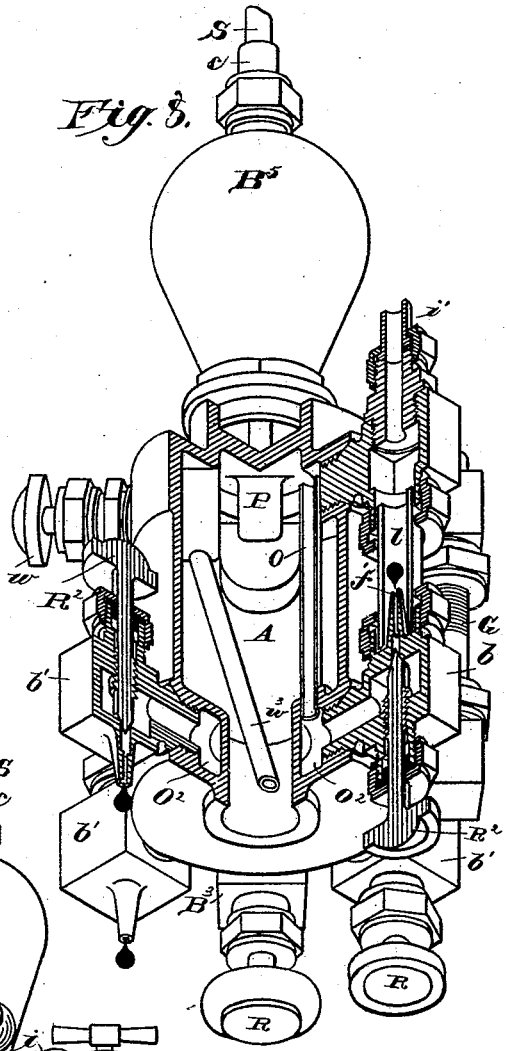
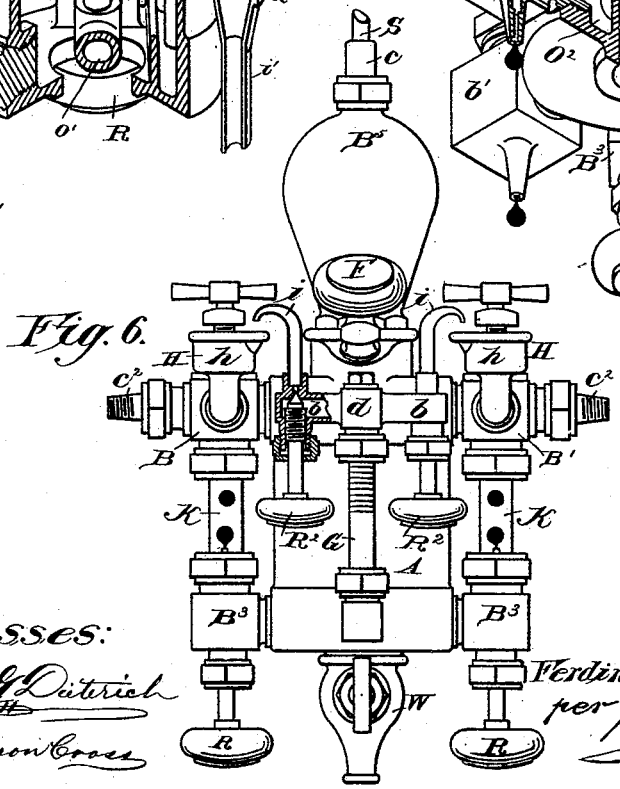


Fig. 6.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

FERDINAND BRUNBAUER, OF VIENNA, AUSTRIA-HUNGARY.

LUBRICATOR.

SPECIFICATION forming part of Letters Patent No. 493,475, dated March 14, 1893.

Application filed March 20, 1890. Serial No. 344,608. (No model.)

To all whom it may concern:

Be it known that I, FERDINAND BRUNBAUER, mechanical engineer, a subject of the Emperor of Austria-Hungary, residing at Vienna, in the Province of Lower Austria, in the Empire of Austria-Hungary, have invented certain new and useful improvements in 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, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

Referring to the accompanying drawings:—Figures 1 and 2, are vertical axial sections of a sight feed cylinder lubricator, taken respectively on lines, 1—1, and, 2—2, of Fig. 3. Fig. 3, is a transverse section taken on line, 3—3, of Fig. 1. Fig. 4, is a sectional inside view of the upper sight feed connection on line, 4—4, of Fig. 3. Fig. 5, is a vertical section of the gage glass and its connections. Fig. 6, is a front elevation of the lubricator, and—Figs. 7 and 8, are perspective sectional views illustrating means for oiling other moving or machine parts besides the cylinders of an engine.

The invention relates to that class of lubricators in which the lubricant is displaced by the pressure or action of a hydrostatic column and known as sight feed lubricators and operating as a drop-up feed of which the lubricator shown in the patent granted to Nicholas Seibert on the 22d. of April, 1879, No. 214,589, may be considered as a type.

The sight feed lubricators of the type referred to as heretofore constructed do not accomplish the object for which they are designed under all conditions of use. For instance, as in the lubricator described and illustrated in Letters Patent granted to Leopold Kaczander on the 15th. of February, 1887, No. 357,931, it is necessary that independent auxiliary steam ducts should be provided to produce a balancing pressure above the body of lubricant in the sight feed glass, and thereby avoid if not the instantaneous discharge of the lubricant, at least an excessive flow thereof in case a vacuum or partial vacuum is produced within the cylinder as when the steam is cut off therefrom, and thus maintain the feed of the lubricant substantially constant when once adjusted to a given feed. On the other hand, in case of the breakage of a sight feed glass, auxiliary or hand lubricators have been provided to supply the lubricant to the cylinder, the lubricant being fed to the distributing cup by hand, and as in the lubricator of Kaczander, means are provided to cut off the supply of oil to the sight feed glass, such means consisting of hand operated valves.

In the lubricator referred to, or in any other cylinder lubricator with which I am acquainted, no means are provided to avert danger of injury to the engineer from a comparatively large volume of hot oil and water escaping from a broken gage glass as well as the consequent loss of a comparatively large amount of lubricant and the interruption of the operation of the lubricator, inasmuch as the breakage of a gage-glass is usually sudden and unexpected. On the other hand, the cut off devices shown in the patent referred to, are effective only in that they cut off the communication between the sight feed glass connections and the lubricant inlet and outlet pipes, but do not affect the operation of the auxiliary lubricator, such operation being due exclusively to the action of a vacuum or partial vacuum within the cylinder which is produced only when steam is cut off from such cylinders, as clearly stated by Kaczander in his description of his lubricator. As the steam is not cut off from the cylinders except on down-grades the operation of the hand lubricators depends therefore exclusively on the down travel of the locomotive, such operation ceasing when the locomotive travels up grade or on a level, so that overheated cylinders will invariably result on the breakage of a sight feed glass, the dangers of which are well known and understood. Furthermore, the auxiliary lubricating devices require additional attention on the part of the engineer, while the cut-off valves need almost constant attention to avoid leakage.

In all the sight feed lubricators with which I am acquainted, including the Kaczander lubricator, the supply of lubricant to the cylinders is limited within the range of the feed adjusting devices, or the cross-sectional area

of the ducts leading to the sight feed glasses and from the latter to the discharge. These ducts are generally of very small cross-sectional area to avoid an unintentional excessive feed so that no provisions are made to supply the lubricant to the cylinders in accordance with the work performed.

This, my invention, has for its object to avoid all the difficulties and dangers above referred to, in that I provide automatic auxiliary lubricators the operation of which is absolutely independent of the sight feed lubricator and may be used in conjunction therewith when the engine performs a greater amount of work than usual, so that I am enabled to supply the lubricant to the cylinders according to the work performed.

The invention has for its further object to provide an automatic cut-off for the connections between the lubricant reservoir and the gage glass so that in case of the breakage of the gage-glass such communications will be automatically and instantaneously cut off.

The invention has for its further object to so arrange the auxiliary lubricators as to take the lubricant from the sight feed reservoir thereby avoiding the supply of lubricant by hand, as is now the case.

The invention has for its further object to so construct the auxiliary lubricators as that their function will be independent of the plane of travel of the engine.

The invention has for its further object a construction of lubricator or sight feed lubricator adapted to supply lubricant not only to the cylinders of a locomotive or to the cylinder of a stationary engine, but to other moving parts of an engine or of such and other moving mechanism driven thereby whether by sight feed drop-up or drop-down, or by invisible feed, or either of these in combination.

To these ends the invention consists in the construction of sight feed lubricators as to adapt the same for the lubrication of other moving elements of an engine or a machine or machines besides the engine-cylinders; in providing auxiliary lubricators adapted to take the lubricant from the main reservoir, and to operate in conjunction with or independently of the sight feed lubricators; in the combination with the gage glass of automatic cut-off devices, and finally, the invention consists in structural features and combinations of parts as will now be fully described, reference being had to the accompanying drawings.

So far as I know the Kaczander lubricator is now generally considered the most improved lubricator of this class, and owing to its more general use is perhaps better known than any other. In view of this I have deemed it best to illustrate my invention in its application to this form of lubricator and will therefore but briefly refer to its general features and operation, the parts of the lubricator being indicated by the same letters used in the patent of Kaczander to indicate similar parts.

A, indicates the oil reservoir; B^5, the condenser; S, the steam-pipe admitting steam to said condenser; and, w', w^2, w^3, the ducts or passages that conduct the water of condensation from the condenser to the lower part of the oil reservoir.

w, is the valve for regulating the supply of water to the oil reservoir, and, p, and, p', are the steam-pipes terminating near the upper end of the condenser and having holes for the passage of the steam at their upper ends. The lower ends of the steam-pipes, p, and, p', communicate with passages, s, and s', leading to the straight passages, n^2, that traverse the upper end of the oil chamber of the sight feed glasses, K, and communicate by a narrow passage, n, with the oil exit pipe, c^2. The oil in reservoir, A, is supplied to the sight feed glasses, K, by pipe, O, that extends nearly to the upper end of the oil reservoir, the lower end of said pipe communicating with a cross-channel, O', that conducts the oil to the lower sight feed glass connections, B^3, to be supplied to the glasses through nozzle, f, the feed being regulated by cone valves, R. Steam from the boiler being admitted to the condenser, B^5, through pipe, S, the water resulting from the condensation flows into the oil reservoir, A, displacing the oil therein which flows through pipe, O, to cross-channel, O', to nozzles, f, ascending through the water in the feed glasses, K, drop by drop, and finally passing from the upper end of the glass connection through passage, n, to exit-pipe, c^2. At the same time steam passes also through pipes, p, and, p', and passage, n^2, n, to the oil exit-pipe, c^2, exerting a balancing pressure on the oil in the sight feed glasses, K, so that the oil is fed to the exit-pipe, c^2, by the pressure or weight exerted by the column of water in the condenser, B^5, and the ducts, w', w^2, w^3, only. The balancing pressure in the chamber, a, above the sight feed glasses, K, may therefore be considered entirely independent of the pressure prevailing in the exit-pipe, c^2, consequently the feed when once regulated will be kept constant whatever may be the plane on which the locomotive may travel whether on a level or up or down grade. The auxiliary or hand lubricators, H, are shown in Fig. 6, and are brought into use only in certain emergencies, namely, in case one or both of the sight-feed glasses should break, each of the upper connections for the sight-feed glasses being provided with such a lubricator, and these are supplied with lubricant by hand. The lubricant is conveyed directly to the exit-pipe, c^2, the valve, B^2, being first closed and does therefore not pass to the pressure balancing chamber, a, so that a reliable operation of the auxiliary oiler can be obtained only when the steam is cut off from the cylinders, as—distinctly stated by Kaczander in his patent above referred to, the lubricant being then drawn to the cylinders by the suction resulting from a partial vacuum produced in said cylinders by the cutting off of the steam. But since the travel of a loco-

motive on a down-grade is merely an occasional occurrence it will readily be seen that an auxiliary lubricator that will perform its functions on such occurrence only, does not answer the purposes of the sight-feed lubricator.

I am aware that sight-feed lubricators have been proposed in which the oil for the auxiliary lubricator is taken from the oil reservoir itself, as shown and described in Letters Patent of the United States granted to C. W. Sherburne July 20, 1888, No. 345,929, means being provided for forcing the lubricant by means of steam through the auxiliary lubricators. In all these devices multiple way valves or cocks are employed which in view of unequal expansion due to the action of steam and the hot lubricant require constant attention to prevent leakage thus rendering their operation more or less insecure. Besides these drawbacks it is extremely difficult to control the supply of lubricant to the parts lubricated through the medium of these multiple way valves, in fact it is impossible to control the feed owing to its invisibility. But aside from these drawbacks there is still a greater inconvenience in that the auxiliary lubricators cannot be used in conjunction with the sight-feed lubricators, which under certain conditions of work is not only desirable but necessary in order to increase the supply of lubricant delivered to the parts to be lubricated.

I will now describe the means by which the inconveniences difficulties and disadvantages above referred to are entirely obviated, reference being had to Figs. 1, 2 and 3.

The lubricant supplied to the auxiliary lubricators is taken directly from the main reservoir, A, from the upper end thereof, through a port and passage, P, leading to a coupling or union, d, screwed into the upper end of the lubricant reservoir, A, said coupling having a lubricant chamber, d^{21}, which may also serve as an upper connection for the level indicator or gage-glass, G. From the chamber, d^{21}, the lubricant flows through pipes, e, e, connected thereto on opposite sides, to the auxiliary lubricators, b, b, through the passages, g^2, g', g, thereof to the balancing lubricant chamber, a, above the sight-feed glasses, the flow of lubricant being regulated by the valves, R′, the lubricant passing from, a, to the exit-pipes, c^2, as above described. As the lubricant is conducted directly to or over the balancing chamber, a, above the sight-feed glasses the feed of the auxiliary lubricators when once adjusted will remain constant and will not be influenced by the travel of the locomotive whether such locomotive travels on a level or on an up or down-grade. Consequently, the auxiliary lubricators will perform their function with the same automatic regularity as the sight-feed lubricators, either independently of the latter or in conjunction therewith.

The operation of the auxiliary lubricators is as follows: If for instance, the right hand sight-feed glass, K, should break it is only necessary to shut the right hand valves, R, and, B^2, of the lower and upper glass connections and to adjust the inlet valve, R′, to the same extent as the valve, R, was adjusted previous to its being shut off, when the right hand auxiliary lubricator will perform its function precisely as the cut out sight-feed lubricator did without in the least interfering with the left hand sight-feed lubricator. Instead of conducting the lubricant directly over the lubricant chamber of the sight-feed glass and thence to the exit-pipe, c^2, the lubricant may be conducted around the said chamber through a passage, n', formed in the upper sight-feed connection, B, as shown on the left of Fig. 3. This may also be accomplished by a pipe connecting the exit passage, c^2, with the passage, g^2, of the auxiliary lubricator. In this arrangement of auxiliary lubricator when the steam is cut off from the cylinders the supply of lubricant is increased by the vacuum or partial vacuum produced in the cylinders and this can be remedied by the proper manipulation of the regulating valve, R′.

Although the auxiliary lubricators may be provided with sight-feed glasses I prefer for locomotive service to resort to an invisible feed as these lubricators should under no circumstances be exposed to the danger of having their function impaired in any manner for obvious reasons. But since my improved lubricator is also applicable to stationary engines, a sight-feed, for the auxiliary lubricators, operating either on the drop-up or the drop-down principle may be used. In order to insure the feeding of the lubricant in proper quantities through the invisible feed lubricators I construct the valve passages and the valves for regulating the flow of the lubricant through said passages the same as the corresponding passages and valves of the sight-feed regulators so that an adjustment of the valves, R′, corresponding with the adjustment of the valves, R, will insure a like feed of the lubricant.

This modification in the construction of the auxiliary lubricators, from invisible to visible or sight feed auxiliary lubricators is illustrated in Fig. 6 in their application to a Kaczander lubricator which is shown in front elevation combined with means for automatically supplying the lubricant to the oil cups, h, of the auxiliary lubricators, H, so that both forms of auxiliary lubricators may be combined in the same sight-feed lubricator if desired or either of them.

As shown, a union, d, similar to that described in reference to the auxiliary lubricators shown in Fig. 3 is connected with the oil reservoir at its upper end and has the lubricant duct, b, and the lubricant exit-pipes, i, bent over the oil cups, h, for the auxiliary lubricators, the flow of the lubricant being regulated by means of valves, R^2, the lubri-

cant being discharged from the nozzles of pipes, *i*, drop by drop, thus producing a visible and automatic feed without a glass.

From what has been said above, and from what is shown in Figs. 1 to 3, and in Fig. 6, it will be readily seen that it is not absolutely necessary that the lubricant for the auxiliary lubricators should be taken from a given point of the oil reservoir, A, each auxiliary lubricator may be provided with a separate feed duct connected with the lubricant reservoir at any point whatever provided there is a connection between said point and the upper end of the reservoir, or the lubricant may be taken from any point of the conduits shown as for instance, from the pipe, O, and cross-channel, O′, these modifications being comprehended in my improvements. It will also be observed that by the means employed to feed the oil cups, *h*, of the auxiliary lubricators, H, I am enabled to enlarge the scope of the lubricator so as to adapt it for use as a cylinder lubricator and as a lubricator for other moving parts of the engine or of a machine or machines driven thereby, as I am thus enabled to convey the lubricant to any desired point or distance, and at the same time provide a sight-feed whenever this is desirable.

This modification in the arrangement of the lubricating devices is shown in Figs. 7 and 8, and is also based upon the Kaczander lubricator. In these figures the essential elements of the lubricator remain the same, A, is the oil reservoir, O, the oil reservoir supply pipe, *w*, the water valve, w^3, the conduit for the water of condensation to the oil reservoir. One of the sight-feed lubricators for the engine cylinders is in rear of the lubricator and is indicated by its valve, R, only, and part of its lower connection, B^3, while the other is removed, the lubricator being shown with a section thereof removed to show its interior. Besides the two cylinder lubricators and their auxiliary lubricators I provide other lubricators, *b*′, of which I have shown four, which as shown in Fig. 7, take the lubricant from the upper end of the reservoir, A, or they may be connected with an annular channel, O^2, formed around the reservoir and connected therewith near its upper end by the pipe, O, as shown in Fig. 8. The flow of lubricant through the lubricators, *b*′, is regulated by the usual valves, R^2. On the left of Fig. 7, I have shown a drop-down visible feed of which, *f*′, is the nozzle, and, *l*, the glass, *i*, being the exit-pipe which may extend any distance to the element to be lubricated. On the right of Fig. 7, I have illustrated a drop-down visible feed the exit nozzle *f*″, being arranged above the conveying pipe, *i*′, which for this purpose has a funnel-shaped inlet, *k*.

On the right of Fig. 8, I have shown a drop up lubricator of which, *l*, is the sight-glass, *f*″, the nozzle and, *i*′, the exit or transmitting pipe for conveying the lubricant any desired distance to a part to be lubricated.

It will thus be seen that any desired number of lubricators may be grouped around a lubricant reservoir and that they may be connected in pairs by auxiliary lubricators; that all of these lubricators or any desired number of them may be sight-feed lubricators, and that all of them may take the lubricant either from the upper or the lower end of the reservoir, or that some of them may take the lubricant from the upper and some of them from the lower end of said reservoir. On the other hand, in order to facilitate the manipulation of the valves, the connections between the lubricators and reservoir may be made of any desired length. Finally, I comprehend in my improvements the combination of one or more auxiliary lubricant reservoirs in which the displacement of the lubricant is effected by the water of condensation in the main reservoir, A, or by providing such with condensers, so that the system of lubrication may be greatly extended and effected and controlled from a central or main reservoir. It will thus be seen that the supplemental lubricators may be used as independent lubricators or as auxiliaries in case of breakage of one of the glasses of the regular sight-feed lubricators.

It is obvious that a lubricator constructed and operating as described, will perform its function under all conditions except one, and that is the sudden discharge of the contents or a considerable portion of the contents of the lubricant reservoir, A. This can however, take place in but one way, and that is by the breakage of the gage glass, G, and this is as liable to be broken as one of the sight-feed glasses and so far as I know no provision has been made for avoiding this danger which renders the lubricator absolutely inoperative.

In Figs. 2 and 5, I have shown means whereby this danger is avoided. In the construction shown in Fig. 2, there are two valves, *v*, and, *v*′, connected by a valve-stem, *q*, that extends through the gage glass, the valve, *v*′, controlling the inlet and the valve, *v*, the exit for the lubricant. As shown the valve, *v*′, is a disk valve of considerable area so that on the breakage of the gage glass the said valves, *v*′, and, *v*, will be lifted to their seats by reason of an increase in the pressure below or behind valve, *v*′, in the chamber, *o*′. The valves are held in a normal position relatively to the ports or ducts controlled thereby by an adjusting screw, *r*′, and should the gage glass break and there should be a slight leakage at the valve seats the valves can be tightly seated by means of the said adjusting screw, to prevent further leakage. The same results may be obtained by disconnected gravity valves, as shown in Fig. 5, both valves, *v*′, *v*, being forced onto their seats by an increase in the pressure behind them on the breakage of the gage glass, the valve, *v*, being held normally off its seat by a spring, *t*, the tension of which is sufficient to hold the said valve normally

off its seat, but insufficient to resist the increase in the pressure above the same should the gage glass break. In this construction, a second set-screw, r'', is employed to hold the valve in proper position under the stress of the spring, t, or to force the same tightly to its seat, should this become necessary.

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

1. A lubricator comprising an oil reservoir, an oil delivery pipe, a sight feed tube connected at one end with said reservoir and at the other end with the delivery pipe, an auxiliary oil duct also connected with said reservoir and with the delivery end of the sight feed tube, a valve for controlling the flow of oil through the auxiliary oil duct, and a valve having its seat in the delivery end of the sight feed tube below the discharge of the auxiliary oil duct, for the purpose set forth.

2. In a lubricator of the class described, an oil reservoir, a steam condenser in communication therewith, a sight feed tube, an oil delivery pipe, a connection between the receiving end of the sight feed tube and the oil space in the reservoir and between the discharge end of said tube and the oil delivery pipe, an auxiliary oil duct connecting the oil space in the reservoir with the delivery end of the sight feed tube, a valve for controlling the flow of oil through said auxiliary duct, a steam duct leading from the steam space of the condenser across the delivery end of the sight feed and auxiliary oil ducts, and a valve having its seat in the delivery end of said sight feed tube below the discharge of the steam and auxiliary oil ducts, for the purpose set forth.

3. In a lubricator of the class described, the combination with the oil reservoir, A, the condenser, B^5, the sight feed tubes, K, K, having their lower end connected with the oil reservoir by a duct or ducts extending into the same near its upper end, and two oil delivery pipes connected with the upper end of the sight feed tubes and with the steam space of the condenser, of two auxiliary oil ducts, e, e, and valved branches, b, b, leading from the upper end of the oil reservoir to the upper end of the sight feed tubes, and valves, B, adapted to seat within the discharge orifice of the sight feed tubes, as and for the purpose set forth.

4. A lubricator in which the oil is displaced by a body of water comprising an oil reservoir, one or more sight feed nozzles connected therewith and discharging oil into the atmosphere, one or more distributing pipes provided with drip cups for catching the oil dripping from the nozzles, and regulating devices for controlling the supply of oil to the distributing pipe or pipes, for the purpose set forth.

5. A lubricator in which the oil is displaced by a body of water comprising an oil reservoir, an oil delivery pipe, a sight feed tube connected with said reservoir and pipe, an auxiliary sight feed nozzle discharging oil into the atmosphere, a delivery pipe provided with a drip cup for catching the oil dripping from said nozzle and regulating devices for controlling the supply of oil to the sight feed tube and nozzle, for the purpose set forth.

6. A lubricator in which the oil is displaced by a body of water comprising an oil reservoir, an oil delivery pipe, a sight feed tube connected with the reservoir and pipe, an auxiliary sight feed nozzle connected with the oil reservoir and discharging oil into the atmosphere, a drip cup connected with the oil delivery pipe for receiving the oil from the sight feed nozzle said nozzle operating jointly with or independently of said sight feed tube and regulating devices for controlling the flow of oil to the delivery pipe, for the purpose set forth.

7. A lubricator in which the oil is displaced by a body of water, comprising an oil reservoir, a condenser in communication therewith, an oil delivery pipe, a sight feed tube connected with the reservoir and delivery pipe, a steam duct connected with the condenser and delivery pipe, an auxiliary sight feed nozzle connected with the reservoir and discharging oil into the atmosphere and operating jointly with or independently of the sight feed tube, a drip cup in communication with the oil delivery pipe, and means for controlling the flow of oil from the reservoir to the sight feed devices, for the purpose set forth.

8. The combination with the oil reservoir and the gage glass connected therewith and having valve seats at opposite ends, of two rigidly connected gravity valves controlled by the pressure within the reservoir to automatically cut off the communication between the same and the gage glass, for the purpose set forth.

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

FERDINAND BRUNBAUER.

Witnesses:
RUDOLPHUS PLANK,
NETTIE S. HARRIS.