Feb. 14, 1950 E. MARTIN ET AL 2,497,822

LUBRICATOR

Filed Sept. 5, 1945 2 Sheets-Sheet 1

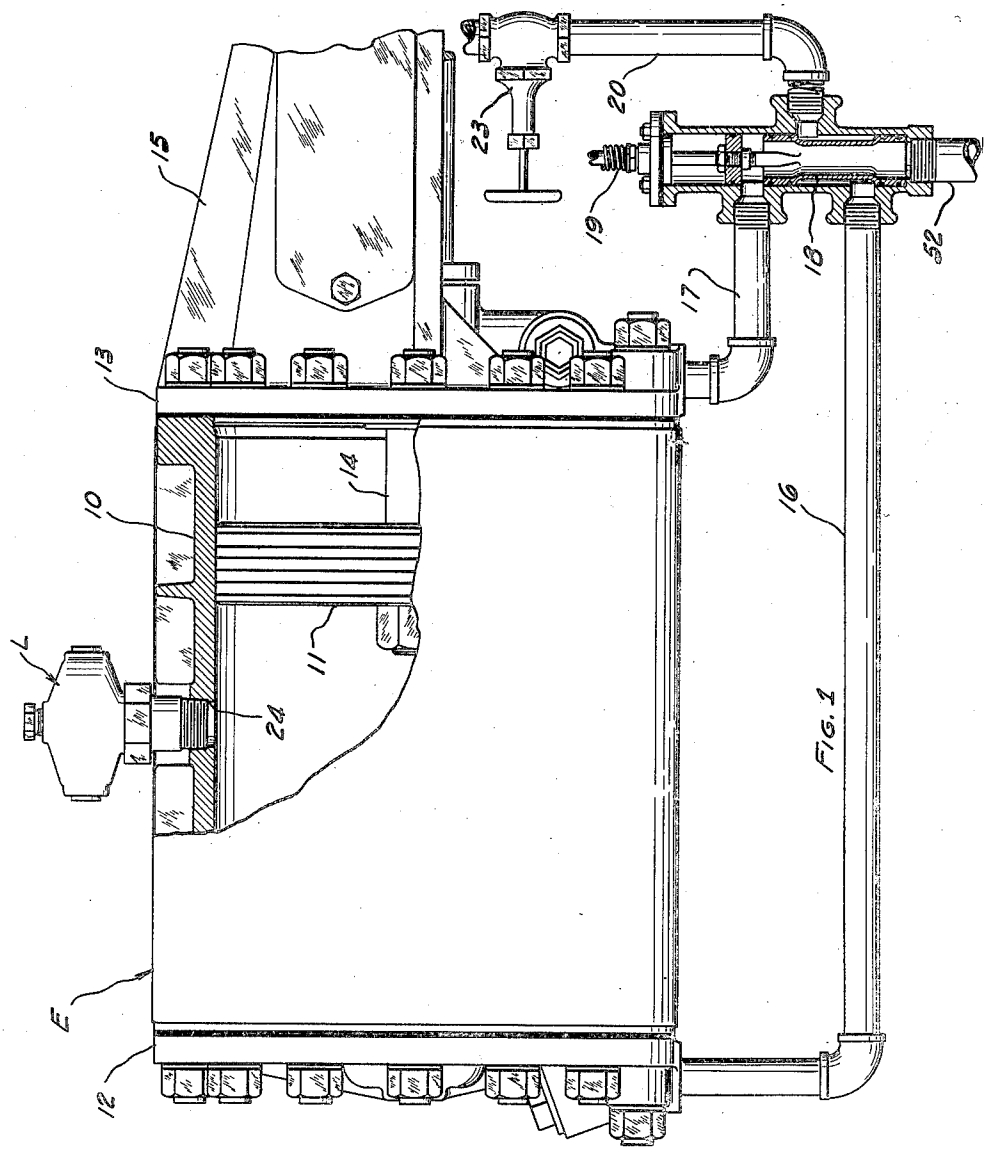


FIG. 1

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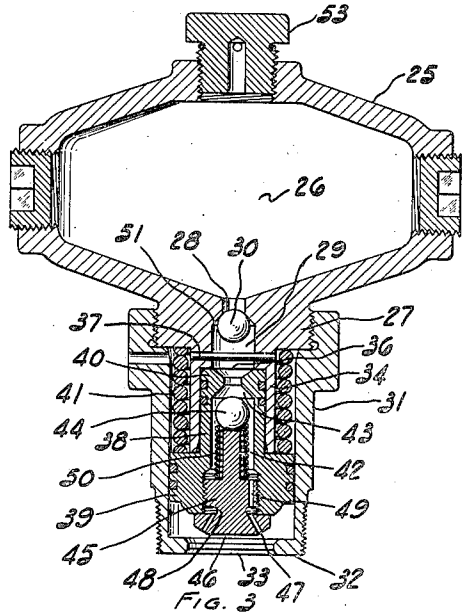


FIG. 3

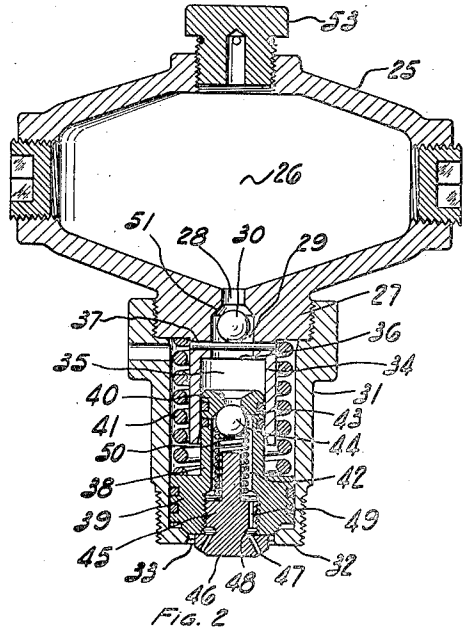


FIG. 2

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LUBRICATOR

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Application September 5, 1945, Serial No. 614,482

7 Claims. (Cl. 184—42)

1

This invention relates to an automatic lubricator and particularly to a lubricator for use in connection with engines, especially adapted to deliver lubricant to the steam cylinder of a reciprocating steam engine.

An object of the invention is to provide an improved lubricator of the type automatically responsive to pressure differentials that is simple and compact in construction, that is positive and efficient in operation and while capable of use with reciprocating pressure fluid operated engines generally is specially adapted for use with engines operated periodically. An engine typical of this type and with which my improved lubricator is particularly adapted, is shown in United States Letters Patent No. 1,747,899 issued to Francis Hogg, February 10, 1930.

In engines of the type described, it has been customary to provide a lubricator in the pressure field line leading to the engine cylinder. Since in such installations, some oil is dissipated in the piping and some oil escapes through drain valves customarily used, an excessive amount of oil is required and frequent refilling of the lubricator reservoir is necessary. It is, therefore, another object of the invention to eliminate these and other deficiencies by providing a lubricator and engine arrangement wherein the lubricator is in direct communication with the engine cylinder and delivers a positive and predetermined charge of oil directly to the cylinder on each stroke of the cylinder piston.

Additional objects, advantages and features of invention reside in the construction, arrangement and combination of parts, as will be understood from the preferred and practical embodiment of the invention hereinafter described and illustrated in the accompanying drawings, in which

Figure 1 is a diagrammatic view with parts in section showing an application of invention to an engine of the type described;

Figure 2 is a central vertical sectional view through the lubricator shown in Figure 1 in its normal or closed position; and

Figure 3 is a central vertical sectional view through the lubricator in its open or lubricant supplying position.

Referring to Figure 1 of the drawings, a periodically operated engine, designated by the letter E, comprises a cylinder 10, a piston 11 mounted for reciprocation therein, a ported rear cylinder head 12 and a ported front cylinder head 13. Secured to the piston 11 is the piston rod 14 which passes through a suitable stuffing box (not shown) in the front cylinder head 13 and

2

transmits the power developed by the engine E for performing any suitable operation, as for example operating a locomotive tender coal pusher such as shown in Hogg Patent 1,747,899, referred to above. A portion of such a coal pusher is shown at 15.

The piston 11 is actuated preferably by steam which is admitted to the cylinder 10 through ports (not shown) in the cylinder heads 12 and 13 from the steam pipes 16 and 17. Preferably the piston 11 is normally at the rearmost end of the cylinder 10 and operation thereof is governed by a control valve 18. In the normal position of the piston 11, the control valve 18 is in its uppermost position, being held there by the action of spring 19, in which position of the valve 18 steam is admitted from the main supply lead 20 to the supply lead 17, and thence through the ported front cylinder head 13 into the cylinder 10. In Figure 1 the valve 18 has been depressed against the action of the spring 19, thereby admitting steam from the main supply lead 20 to the supply lead 16, through the ported rear cylinder head 12 into the cylinder 10, in consequence of which the piston 11 is moved from the rear to the front of the cylinder 10. A valve 23, in the main supply lead 20, is provided for interrupting the flow of steam to the control valve 18.

Intermediate its ends, the cylinder 10 is provided with a threaded opening 24 arranged to receive a lubricator, generally indicated at L, for lubricating the cylinder walls of the engine E.

Referring to Figures 2 and 3, the lubricator L comprises a lubricator body 25 enclosing a main lubricant containing reservoir 26. The lower end of the body 25 is provided with a threaded boss 27 having a central passageway 28 there through opening into the lubricant reservoir 26. The lower or outer end of the passageway 28 is enlarged to form a valve cage 29, which contains a ball check valve 30, the function and operation thereof being hereinafter described.

A cylinder 31 is threaded on the boss 27 and is provided in its bottom wall 32 with an opening 33 which provides communication with the interior of engine cylinder 10 when the lubricator L is screwed into the threaded opening 24 of cylinder 10. Depending from the boss 27, and preferably formed integral therewith, is a cylindrical sleeve 34 extending into the cylinder 31 providing an auxiliary reservoir 35, as shown in Figure 2. The sleeve 34 is provided in its inner or upper end with an opening 36 registering with the enlargement or valve cage 29 of the passage-

way 28, permitting lubricant to pass from the main reservoir 26 to the auxiliary reservoir 35 when the ball valve 30 is in the position shown in Figure 2. A pin 37 extending through the upper end of the sleeve 34 and its opening 36 retains the ball valve 30 in the valve cage 29.

A piston 38, provided at one end with a large head 39 adapted to reciprocate in the cylinder 31, and at the other end with a small head 40 adapted to reciprocate in the cylindrical sleeve 34, is normally retained in the position shown in Figure 2 by action of the spring 41. A bore 42 extends through the piston 38, and is restricted at the inner or small end 40 of the piston 38 providing a seat 43 arranged to receive the ball check valve 44. At the outer or large end 39 of the piston 38, the bore 42 is threaded to receive a plug 45. The outer end of the plug 45 is provided with a nozzle 46 having a plurality of diverging orifices 47 communicating at their inner ends with a circumferential groove 48, which in turn communicates with the interior of the bore 42 through a passage 49 in the plug 45. The ball valve 44 is normally held against the seat 43 by action of a spring 50 disposed in the bore 42 between the plug 45 and the ball valve 44.

In operation, assuming the piston 11 to be in its normal position at the rear of the cylinder 10 with the valve 23 in the main steam supply lead 20 closed, then the control valve 18 will be in its uppermost position, as opposed to the position shown in Figure 1, and the lubricator piston and valves will be in the position shown in Figure 2. The operator first opens the main steam valve 23, causing steam to pass through the control valve 18 into the steam pipe 17 and thence through ported front cylinder head 13 into the cylinder 10. When a predetermined pressure has been built up in the cylinder 10, the lubricator piston 38 will move from the position shown in Figure 2 to the position shown in Figure 3, it being understood that a spring 41 of such strength is selected as to resist movement of the piston 38 until the desired predetermined pressure is reached. Upon such movement of the piston 38, the pressure exerted on the lubricant in the auxiliary reservoir 35 first forces the ball check valve 30 against the seat 51 closing the passageway 28, and then forces the ball check valve 44 away from its seat 43 against the action of spring 50, whereupon the lubricant in the auxiliary reservoir passes into the bore 42, then through passageway 49 into the circumferential groove 48, from which it is discharged through the orifices 47 of the nozzle 46 against the interior wall of the cylinder 10. From the operation thus far described, it is evident that a charge of lubricant is delivered to the walls of the cylinder 10 in advance of the movement of the piston 11 in the engine cylinder, thereby insuring a protective film of oil for the cylinder prior to operation of the engine.

The operator having opened the main steam valve 23 permitting a charge of lubricant to be delivered to the cylinder 10 by lubricator L as described, he then depresses the control valve 18 against the action of spring 19, to the position shown in Figure 1. Steam will then pass from the main steam supply lead 20 through the control valve 18 to the steam pipe 16, thence through the ported rear cylinder head 12 into the cylinder 10 at the rear of the piston 11. In the depressed position of the control valve 18, steam in the cylinder 10 forward of the piston 11 exhausts through pipe 17, through the control valve 18 and

thence to exhaust pipe 52. Upon reduction of the pressure in the cylinder 10 at the forward side of piston 11, action of the spring 41 causes the piston 38 to resume the position shown in Figure 2, whereupon ball check valve 44 will be seated by action of spring 50 and ball check valve 30 will be unseated by gravity, permitting a charge of lubricant to enter the auxiliary reservoir 35 through passageway 28 from the main lubricant reservoir 26.

Now, when the piston 11 has moved toward the forward end of the cylinder a distance sufficient to clear the opening 24, the pressure of the steam rearward of the piston 11 will again raise the lubricator piston 38 and as described above a charge of oil will be discharged from the auxiliary reservoir 35 through the nozzle 46 to the walls of the cylinder 10. When the piston 11 has reached the forward end of the cylinder 10, the operator may reverse the direction of the piston 11 by releasing the control valve 18, the action of spring 19 against a handle (not shown) raising the control valve to its upper position. The pipe 17 then becomes the live steam pipe and pipe 16 becomes the exhaust pipe. Live steam entering the cylinder 10 at the rear of the piston 11 moves the piston toward the front of the cylinder, and as before a charge of lubricant will be admitted to the cylinder when the piston 11 clears the opening 24.

From the above description it will be evident that a predetermined charge of lubricant is automatically and directly delivered to the motor cylinder on each stroke of the piston and also prior to initial movement of the piston, thereby insuring a protective film of oil for the engine cylinder walls at all times. The supply of lubricant may be replenished by removing a screw plug 53 in the top of the lubricator body 25.

We claim:

1. A lubricator comprising a main lubricant reservoir and an auxiliary reservoir with a communicating passageway therebetween, a check valve in said passageway, a lubricant discharge passageway leading from said auxiliary reservoir, a check valve in said discharge passageway, said check valves adapted for normally opening said communicating passageway and closing said discharge passageway, and a reciprocable member responsive to an external pressure applied thereon at the discharge end of said lubricator for transmitting pressure on the lubricant in said auxiliary reservoir, said check valves being responsive to the pressure on the lubricant in said auxiliary reservoir for closing said communicating passageway and opening said discharge passageway to effect a discharge of lubricant from said auxiliary reservoir through said discharge passageway.

2. A lubricator comprising a main lubricant reservoir and an auxiliary reservoir with a communicating passageway therebetween, a check valve in said passageway, a lubricant discharge passageway leading from said auxiliary reservoir, a check valve in said discharge passageway, said check valves arranged for normally admitting lubricant from said main reservoir to said auxiliary reservoir and restraining discharge of lubricant from said auxiliary reservoir, a spring loaded piston movable from its normal position by application of a predetermined external pressure applied thereon at the discharge end of said lubricator for transmitting pressure on the lubricant in said auxiliary reservoir, said check valves being responsive to such movement of said piston for restraining flow of lubricant from said main reser-

voir to said auxiliary reservoir and effecting a discharge of lubricant from said auxiliary reservoir.

3. A lubricator comprising a main lubricant reservoir, an auxiliary reservoir and a cylinder housing a reciprocable piston, a communicating passageway between said main reservoir and said auxiliary reservoir, a check valve in said passageway, a lubricant discharge passageway extending through said piston communicating with said auxiliary reservoir and a check valve in said discharge passageway, said check valves arranged for normally admitting lubricant from said main reservoir to said auxiliary reservoir and restraining discharge of lubricant from said auxiliary reservoir, said piston being movable from its normal position by application of external pressure applied at the discharge end of said lubricator, said check valves being responsive to such movement of said piston for restraining flow of lubricant from said main reservoir to said auxiliary reservoir and effecting a discharge of lubricant from said auxiliary reservoir.

4. A lubricator comprising a main lubricant reservoir, an auxiliary reservoir and a cylinder housing a reciprocable piston, a communicating passageway between said main reservoir and said auxiliary reservoir, a check valve in said passageway, a lubricant discharge passageway extending through said piston communicating with said auxiliary reservoir and a check valve in said discharge passageway, said check valves arranged for normally admitting lubricant from said main reservoir to said auxiliary reservoir and restraining discharge of lubricant from said auxiliary reservoir, said piston being movable from its normal position by application of a predetermined external pressure applied at the discharge end of said lubricator, said check valves being responsive to such movement of said piston for restraining flow of lubricant from said main reservoir to said auxiliary reservoir and effecting a discharge of lubricant from said auxiliary reservoir, and resilient means retaining said piston in its normal position below said predetermined pressure.

5. A lubricator comprising a main lubricant reservoir and an auxiliary reservoir with a communicating passageway therebetween, a check valve controlling said passageway, a hollow reciprocable piston having a restricted opening at its inner end in communication with said auxiliary reservoir and a threaded opening at its outer end, a check valve at the inner end of said piston controlling said restricted opening and a nozzle threaded in said threaded opening at the outer end of said piston, said check valves arranged for normally admitting lubricant from said main reservoir to said auxiliary reservoir and restraining discharge of lubricant from said auxiliary through said nozzle, said piston being movable from its normal position by application of external pressure against its outer end, and said check valves being responsive to such movement of said piston for restraining flow of lubricant from said main reservoir to said auxiliary reservoir and effecting a discharge of lubricant from said auxiliary reservoir through said nozzle.

6. A lubricator comprising a main body member having a main lubricant reservoir and an auxiliary reservoir with a communicating passageway therebetween, a cylinder secured to said main body member embracing said auxiliary reservoir, connected differential pistons having a large head operating in said cylinder and a small head operating in said auxiliary reservoir, a lubricant discharge passageway extending through said connected pistons communicating with said auxiliary reservoir, a check valve in each of said passageways adapted for normally opening said communicating passageway and closing said discharge passageway, the outer side of said large piston head being responsive to an external pressure for transmitting pressure on the lubricant in said auxiliary reservoir, said check valves being responsive to the pressure on the lubricant in said auxiliary reservoir for closing said communicating passageway and opening said discharge passageway to effect discharge of lubricant from said auxiliary reservoir through said discharge passageway.

7. In combination, an engine comprising a cylinder and a piston reciprocable therein, valve controlled means for alternately admitting pressure fluid to and exhausting pressure fluid from each side of said piston, and a lubricator in direct communication with said cylinder between the opposite ends thereof, said lubricator comprising a main lubricant reservoir and an auxiliary reservoir with a communicating passageway therebetween, a check valve in said passageway, a lubricant discharge passageway providing communication between said auxiliary reservoir and said cylinder, a check valve in said discharge passageway, said check valves adapted for normally opening said communicating passageway and closing said discharge passageway, and a pressure fluid actuated piston movable from its normal position when in communication with the pressure side of said engine piston, said check valves being responsive to such movement of said lubricator piston for closing said communicating passageway and opening said discharge passageway.

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