No. 657,643. Patented Sept. 11, 1900.

G. A. BURWELL.

LUBRICATOR FOR ENGINE CYLINDERS.

(Application filed June 15, 1899.)

(No Model.)

Fig. 1.

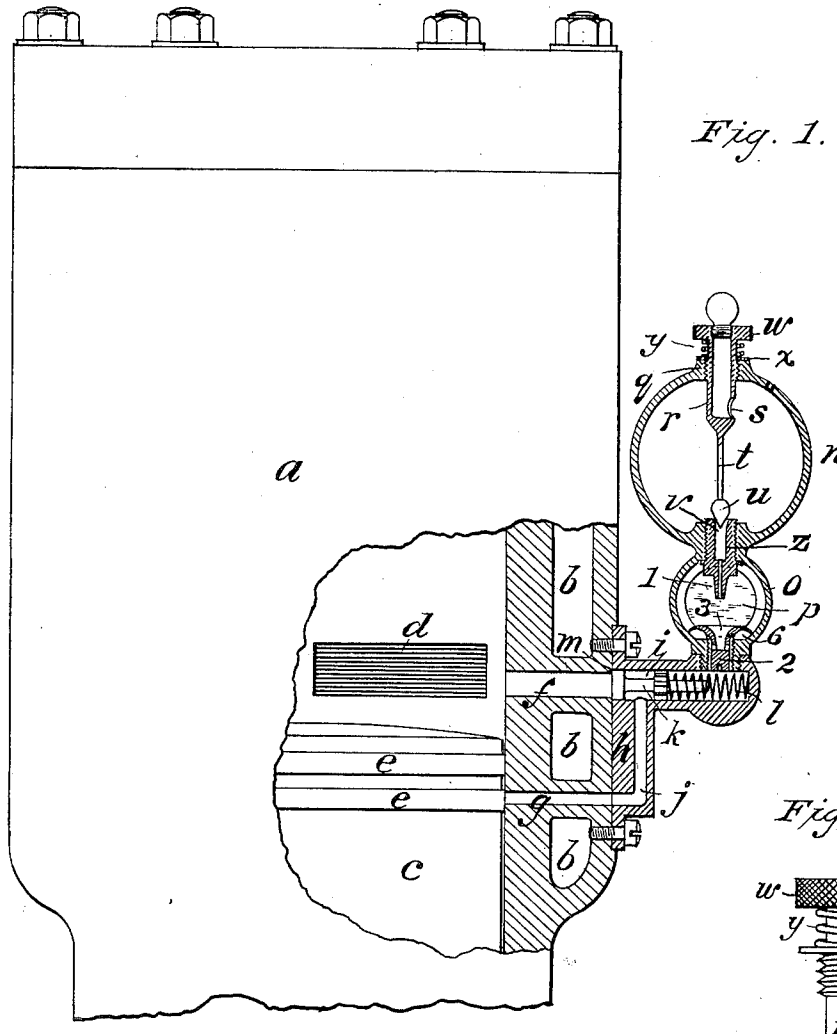


Fig. 2.

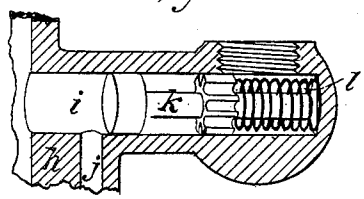


Fig. 5.

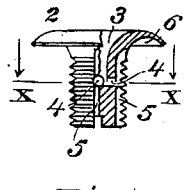


Fig. 4.

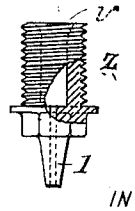
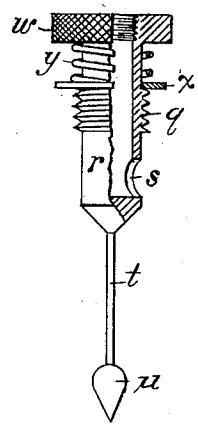


Fig. 3.



WITNESSES:

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Fig. 6.

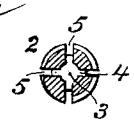
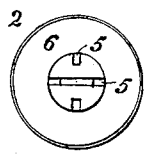


Fig. 7.



INVENTOR

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UNITED STATES PATENT OFFICE.

GEORGE A. BURWELL, OF TOLEDO, OHIO.

LUBRICATOR FOR ENGINE-CYLINDERS.

SPECIFICATION forming part of Letters Patent No. 657,643, dated September 11, 1900.

Application filed June 15, 1899. Serial No. 720,734. (No model.)

To all whom it may concern:

Be it known that I, GEORGE A. BURWELL, a citizen of the United States, residing at Toledo, in the county of Lucas and State of Ohio, have invented certain new and useful Improvements in Lubricators for Engine-Cylinders, of which the following is a specification, that will enable those skilled in the art to which my invention pertains to make and use the same.

My invention relates to a forced-feed lubricator by which the oil is injected or sprayed into the cylinder and onto the piston by the pressure of the gas, steam, air, or other expansive medium employed to drive the engine. It is specially designed for use on caloric or explosive air or gas engines; but it is also applicable to steam-engines, on which it works with much greater efficiency and economy of the lubricant than the devices now in ordinary use for this purpose.

The accompanying drawings show my invention in the best form now known to me; but certain changes in the details of construction and the relative arrangement of the parts might be made therein within the skill of a good mechanic and not requiring the exercise of invention without departing from the spirit of my invention as set forth in the claims at the end of this specification.

Figure 1 is a side elevation of a gas-engine cylinder, partly in section, with my improved lubricator applied thereto and shown in full vertical section. Fig. 2 is a perspective section of a portion of the base of my lubricator. Fig. 3 is a view, partly in elevation and partly in section, of the feed-regulator and the filling-tube leading to the reservoir. Fig. 4 is a similar view of the screw-nipple at the bottom of the reservoir. Fig. 5 is a similar view of the drip cup or nipple at the bottom of the sight-chamber. Fig. 6 is a cross-section of the screwed stem of this cup on the line X X of Fig. 5, and Fig. 7 is a bottom plan view of the drip-cup.

In the drawings I have shown my lubricator as applied to the cylinder *a* of a gas-engine, surrounded by a water-jacket *b* and having a piston *c*, which is shown at or near the end of its stroke and below the exhaust-port *d*. The piston is provided with the usual expansive-spring packing-rings *e*. The cylinder has two openings *f* and *g* extending across the water-space and through the outer jacket. The upper or pressure opening *f* is preferably so located that the exhaust-port will be partially opened and the pressure in the cylinder reduced to the desired extent before the pressure-opening is uncovered, and thereby exposed to the pressure within the cylinder. The lower or outlet opening *g* is located so as to be about opposite the piston-rings *e e* when the pressure-opening is uncovered.

My lubricator is formed with a base *h*, which is secured to the face of the cylinder by screws and which is provided with a horizontal bored recess or chamber *i* in line with the pressure-opening *f* and with an outlet-channel *j*, leading from said chamber to the outlet-opening *g* in the side of the cylinder. A rod *k* is located in the chamber *i* and is provided with a piston and a guide which snugly fit within the bore of the chamber. The piston is plain, while the guide is formed with a series of notches or grooves extending across its face to permit the continuous passage of the oil to the space between the piston and guide, from whence it passes into the channel *j* when the piston is in the position shown in Fig. 1, to which position it is urged by the spring *l*, located between the guide and the inner end of the chamber. Preferably the bore of the chamber is slightly larger than the diameter of the passage *f*, so that the piston is stopped against the abutment *m* when thrust forward by the spring.

The oil-reservoir *n* and the sight-chamber *o* below it are preferably cast in one piece and screwed into the projecting end of that portion of the base containing the chamber or recess *i*. The sides of the sight-chamber *o* may be left open or glazed, as shown at *p*, if desired. The upper end of the reservoir is open and tapped for the reception of the screw-threads *q* on the tubular portion *r* of the feed-regulator stem. This tubular portion is closed at its bottom and has a side opening *s*, through which oil poured into the upper end of the tube may flow out into the reservoir. A stiff wire stem *t* extends from the tubular portion of the regulator and carries at its lower end a pointed bulb *u*, which projects into the opening *v*, leading from the reservoir. The upper end of the tubular por-

tion of the regulator is provided with a milled flange *w*, by means of which it may be turned and screwed up or down to increase or decrease the size of the opening around the bulb *u*. A washer *x* surrounds the tube and rests against the flat top surface of the reservoir and is held in close contact therewith by a spring *y*, also surrounding the tube and bearing against the under side of the milled flange. The opening from the bottom of the reservoir is formed in a nipple *z*, screwed into place from the open sight-chamber and provided with a tapering nozzle 1, through which is a small hole to permit of the drop-by-drop feed of the oil. A drip cup or nipple 2 is screwed into the aperture between the sight-chamber and the plunger-chamber *i* in the base. The central recess or opening 3 in the top of this drip-cup is located directly beneath the nozzle 1 and is rounded or flaring, so as to catch all the drops from the nozzle. The opening 3 extends only about half-way down the length of the cup, where it communicates with cross-apertures 4, which extend through the walls of the cup and open into vertical grooves 5, cut into the outer screw-threaded surface of the neck of the cup. These grooves are deeper than the screw-threads, so as to afford clear passages for the drops of oil passing through them, and they extend the entire length of the neck of the cup and terminate in a circular space 6 under the top of the cup. By this construction any oil forced back or up the grooves 5 by pressure of the steam or gas from the cylinder which might find its way past the piston on the rod *k* will be carried past the cross-openings 4 and collected in the space 6 under the head of the cup, from whence it will flow down the grooves when the gas or steam pressure ceases. When the parts of the lubricator are in the positions shown in Fig. 1, the oil passes drop by drop into the back end of the chamber *i* and finds its way through the grooves in the guide to the channel in which it accumulates in sufficient quantity. When the engine-piston again comes down after an explosion and uncovers the pressure-opening *f*, the expanding gases or steam rush into this opening, driving the piston on the rod *k* back to the position shown in Fig. 2, exposing the entrance to the outlet-channel *j*, down which the gases rush and force out the accumulated lubricant against the surfaces of the engine-piston and its rings, the rush of the gases tending to spray the oil. It will thus be seen that all of the oil passing into the cylinder is projected directly against the wearing-surfaces, where it is needed, and that this occurs in gas-engines after each explosion stroke of the engine-piston, so that sure and thorough lubrication is effected with no waste of material.

In steam-engines the use of my device will effect a great saving in lubricant over the method now generally in use, in which the oil is injected into the steam-pipe leading to the cylinder and commingles with the steam which is the agent for the distribution of the oil to the wearing-surfaces. As only a minute portion of the oil-charged steam comes into contact with these surfaces and then rushes off through the exhaust, carrying away the balance of the oil still in suspension, it follows that of all the oil that enters a steam-cylinder under this method of lubrication only a very small per cent. can be effectually lodged upon the wearing-surfaces, the balance going to waste out of the exhaust-port. By the use of my device all the oil is projected directly against the wearing-surfaces and an enormous saving effected over the old method.

In the construction of my device I use a piston and a guide on the rod *k* in the chamber *i*; but the guide might be dispensed with and other suitable well-known means for holding the inner end of the rod *k* in alinement be employed in its stead. The piston, however, which reciprocates across the opening of the channel, is an essential and indispensable feature of the invention.

Having thus described my invention, what I claim as new and useful is—

1. In a lubricator, a pressure-opening and an outlet-channel, means for supplying oil to the outlet-channel, and movable means alternately closing the oil-supply and the pressure-opening, said outlet-channel communicating with the oil-supply when the pressure-opening is closed and with said pressure-opening when the oil-supply is closed, substantially as described.

2. In a lubricator, the combination of a chamber provided with a pressure-opening and an outlet-channel, means for supplying oil to said chamber, and yielding means in the chamber for closing said pressure-opening, the outlet-channel communicating directly with the oil-supply in the chamber when said pressure-opening is closed, substantially as described.

3. In a lubricator, the combination of a chamber with a pressure-opening, an outlet-channel leading from the chamber, means for delivering a regulated supply of oil to the chamber, and movable means in the chamber reciprocating across the mouth of the outlet-channel alternately connecting said channel directly to the pressure-opening and to the oil-supply in the chamber, substantially as described.

4. In a lubricator, the combination of a chamber provided with a pressure-opening and an outlet-channel, means for supplying oil to the outlet-channel, and movable means in the chamber for alternately closing the oil-supply and the pressure-opening, said outlet-channel communicating directly with the oil-supply when the pressure-opening is closed and with said pressure-opening when the oil-supply is closed, substantially as described.

5. The combination with a cylinder and its

piston, of a lubricator provided with a pressure-channel communicating with said cylinder and alternately covered and uncovered by said piston, an outlet-channel communicating with said cylinder, means for delivering a regulated supply of oil to said outlet-channel, and means for closing said oil-supply and establishing direct communication between said channels when the pressure-channel is uncovered, so as to exert pressure through said outlet-channel, substantially as described.

6. The combination with a cylinder and its moving piston, of a lubricator provided with a pressure-opening and an outlet-channel, each communicating directly with the cylinder, means for supplying oil to said outlet-channel, and means for closing said oil-supply and permitting pressure to be exerted in the outlet-channel through the pressure-opening when said outlet-channel is covered by the piston, substantially as described.

7. The combination with a cylinder and its piston, of a lubricator provided with a pressure-opening and an outlet-channel, each communicating with said cylinder, and being alternately covered and uncovered by the piston, means for supplying oil to said outlet-channel, and means for closing said oil-supply and establishing direct communication between said channels when the outlet-channel is covered and the pressure-channel is uncovered by said piston, substantially as described.

8. The combination of a cylinder provided with two apertures through its side and its moving piston, a lubricating device attached to the cylinder, a chamber in said device opening into one of said apertures and a channel leading from the chamber to the other aperture, a piston adapted to reciprocate in the chamber and a spring to press the piston to a position between the channel-mouth and the aperture leading into the cylinder, when both of said apertures are uncovered by the engine-cylinder with a means for delivering a regulated supply of oil into the chamber behind the piston.

9. The combination of a cylinder and its moving piston, said cylinder being provided with an exhaust-port near its end and two apertures through its side the inner one of said apertures being located at or near the plane of the outer edge of the exhaust-port and the other nearer to the end of the cylinder, a lubricating device attached to the cylinder, a chamber in said device opening into the inner aperture of the cylinder and a channel leading from the chamber to the other aperture of the cylinder a piston adapted to reciprocate in said chamber and a spring to press the piston to a position between the mouth of the channel and the aperture leading into the cylinder, with means for delivering a regulated supply of oil into the chamber behind the piston.

10. In a lubricating device the combination of the chamber *i*, a piston-rod provided with a piston and a guide fitting the bore of the chamber, said guide having a series of grooves or notches across its periphery, a spring between said guide and the end of the chamber and the channel communicating with the chamber at a point between the piston and the guide when in their normal position, with means for delivering a regulated supply of oil into the chamber behind the guide.

11. In combination with a cylinder provided with two apertures through its side, a lubricating device having a chamber communicating with one of said apertures, a channel leading from the chamber to the other aperture, a spring-pressed piston adapted to reciprocate in said chamber across the mouth of the channel with a drip-cup fitting in an aperture leading into the chamber and having a closed recess under its head or top, vertical side grooves in the shank of the cup leading to said recess, a central cavity in the upper end of the cup and horizontal passages leading from the bottom of this cavity to the side grooves substantially as set forth.

12. In a lubricator the combination of the chamber *i*, and a channel leading therefrom, a piston adapted to reciprocate in said chamber, a drip-cup screwed into the top of the chamber behind the piston, the head or flange of the cup being undercut and fitting at its edge against the surface of the part into which the cup is screwed forming a closed recess, vertical side grooves in the screwed shank of the cup leading into said closed recess, a central cavity having a flaring mouth at the top of the cup and horizontal passages leading from the bottom of this cavity to the vertical side grooves substantially as set forth.

13. In a lubricator the combination of the reservoir and the sight-chamber below the reservoir with the feed-passage connecting them, the drip-cup with central flaring cavity located below the feed-passage and provided with transverse passages and vertical side grooves as described with means for regulating the size of the opening leading from the reservoir substantially as described.

In testimony whereof I affix my signature, in the presence of two witnesses, at Toledo, Ohio, May 26, 1899.

GEORGE A. BURWELL.

Witnesses:
P. H. GOODALL,
H. S. LEEPMAN.