(No Model.)

3 Sheets—Sheet 1.

R. G. McAULEY.

FORCE FEED LUBRICATOR.

No. 262,682. Patented Aug. 15, 1882.

Fig. 1.

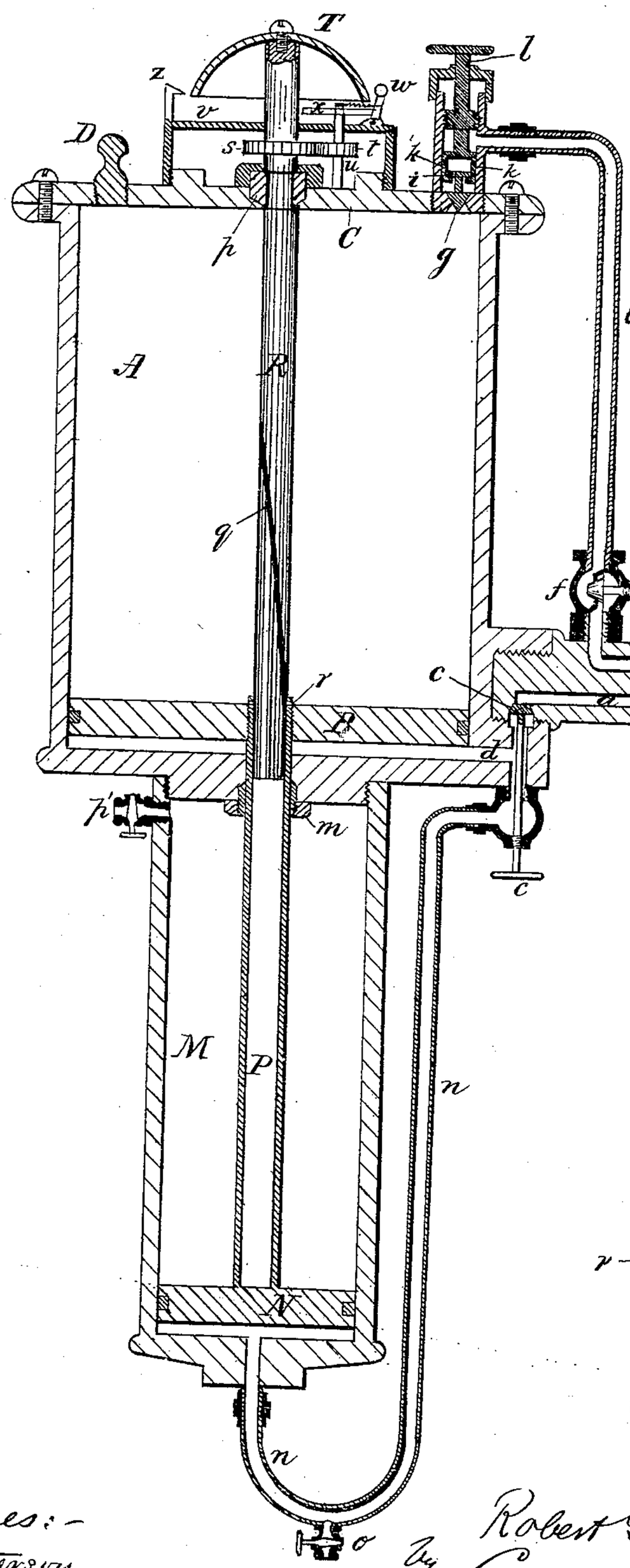


Fig. 2.

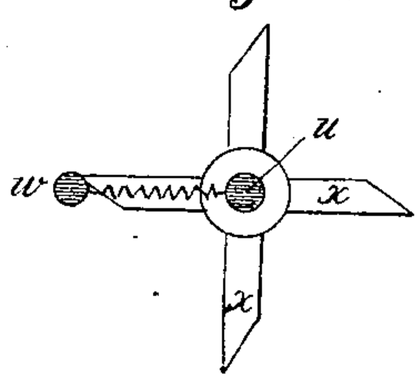
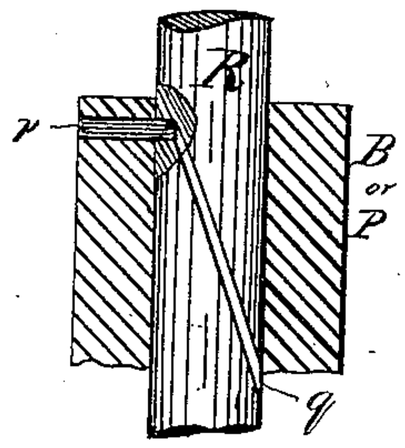


Fig. 3.



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(No Model.) 3 Sheets—Sheet 2.

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FORCE FEED LUBRICATOR.

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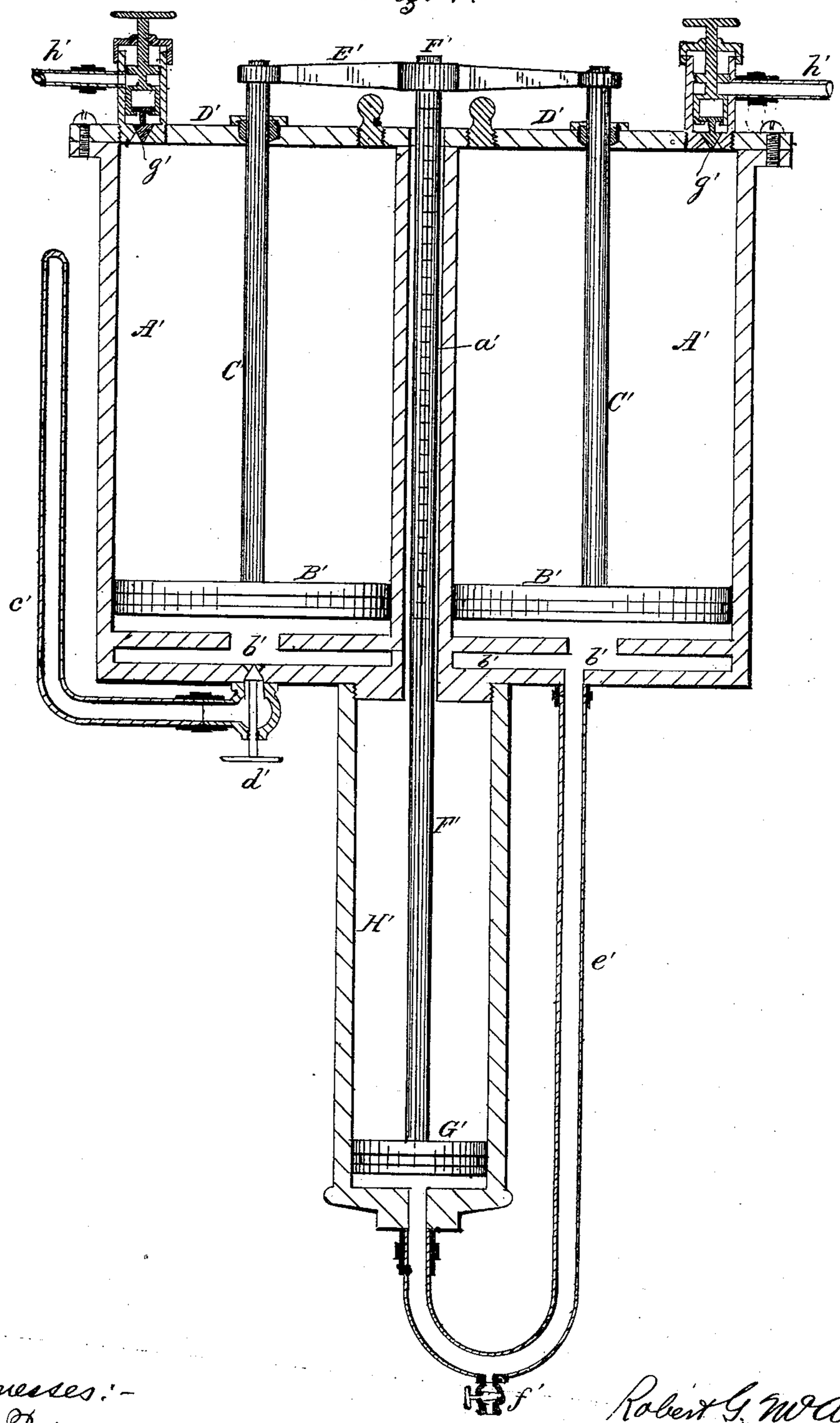
Fig. 4.



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(No Model.) 3 Sheets—Sheet 3.

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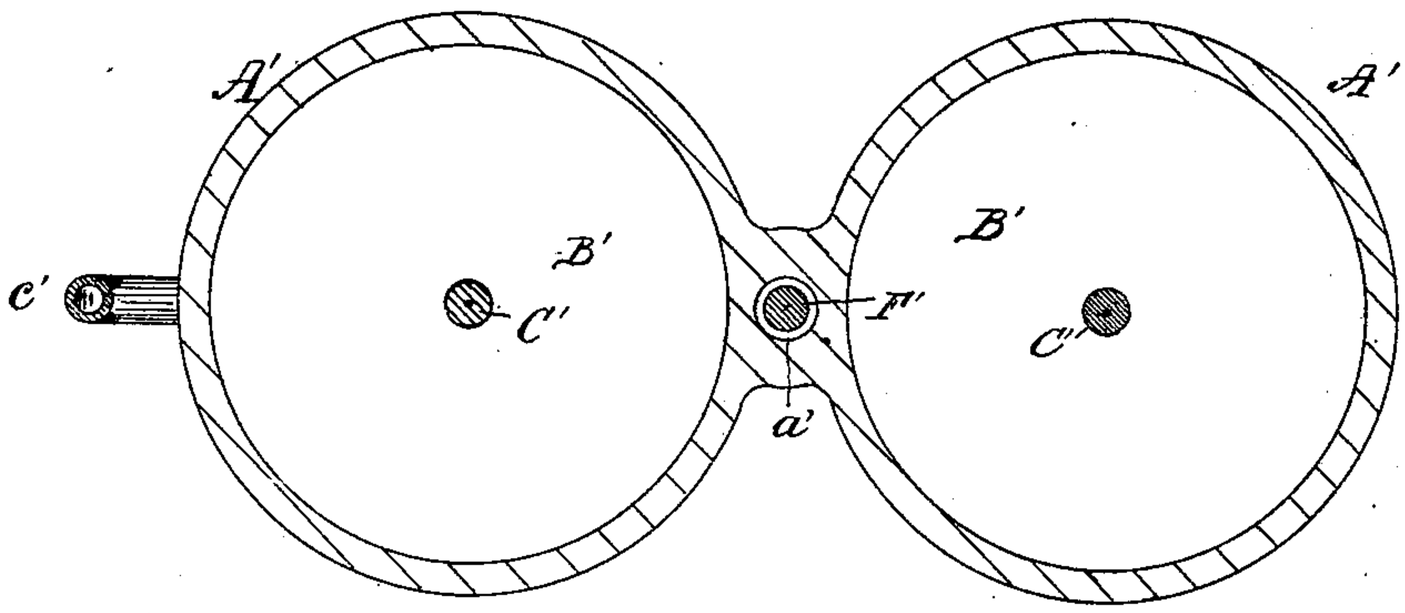
Fig. 5.



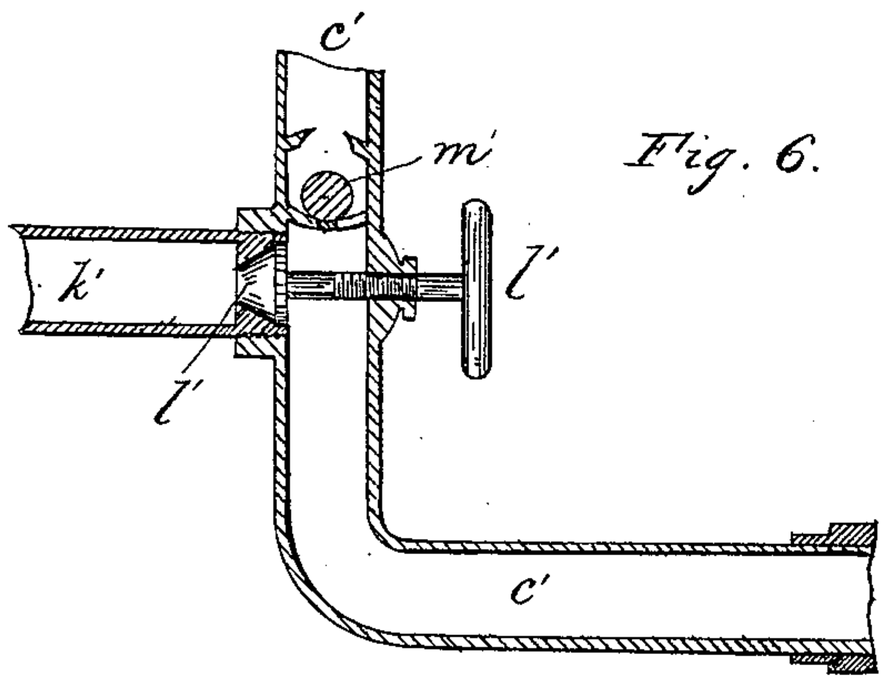


Fig. 6.

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UNITED STATES PATENT OFFICE.

ROBERT G. McAULEY, OF DETROIT, MICH., ASSIGNOR OF THREE-FOURTHS TO LOUIS B. FULTON, THOMAS J. McTIGHE, AND FRANCIS A. POLLOCK, ALL OF PITTSBURG, PA.

FORCE-FEED LUBRICATOR.

SPECIFICATION forming part of Letters Patent No. 262,682, dated August 15, 1882.

Application filed June 22, 1882. (No model.)

To all whom it may concern:

Be it known that I, ROBERT G. McAULEY, of Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Force-Feed Lubricators; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification, in which—

Figure 1 is a vertical section of my lubricator for stationary engines. Fig. 2 is a plan of the gong-cam. Fig. 3 is an enlarged detail of the grooved shaft and feather. Fig. 4 is a vertical section of the lubricator as adapted for locomotives. Fig. 5 is a plan section of Fig. 4. Fig. 6 is a detail.

This invention relates to the construction of that class of devices known as "force-feed lubricators," which are adapted to inject the lubricant into the working parts of engines against the steam or other pressure existing therein.

It consists in the combination, with a cylinder communicating at both ends with the steam-pipe, and containing oil on one side of a piston therein, said piston being thus in equilibrium, of an auxiliary steam-cylinder, also communicating with the steam-pipe at one end and having a piston connected to the other piston, whereby a preponderance is obtained for the steam and the oil is expelled.

The invention further consists in the combination and arrangement of parts, as hereinafter fully described and claimed.

In the drawings, A designates a cylinder containing a piston, B, suitably packed. The cap C is separate to facilitate construction and repairs, and is attached by screws or otherwise. A removable plug, D, in cap C allows the cylinder A above the piston B to be filled with oil. An arm, E, is attached laterally at or near the bottom of cylinder A, serving for attachment to and communication with the dry-pipe or a connection thereto or main steam-pipe. Arm E has two passages, *a b*, passage *a* being provided with the stop-valve *c*, and leading to port *d* at the bottom of cylinder A, and passage *b* connecting with a pipe, *e*, provided with a stop-valve, *f*, which leads to the top of cylinder A, as shown. At a suitable point in pipe *e*, preferably at cap C, I place a check-valve, *g*, tending to close with the pressure of steam from the steam-pipe; but I make valve *g* adjustable by providing it with the head or collar *i*, which is grasped loosely between the forks *k* of a screw-stem, *l*, so that by operating the stem *l* the valve *g* may be forcibly lifted from its seat to any desired extent. Below the cylinder A, but axially in line therewith, I attach to it a small auxiliary cylinder, M, of the same length as cylinder A, and provide it with the piston N. The piston-rod P passes up through the bottom of cylinder A, and is attached to the piston B therein, a stuffing-box, *m*, being provided to prevent leakage. The lower end of cylinder M communicates by a pipe, *n*, with the passage *a* of arm, E, the valve *c* being arranged to shut off steam from both cylinders at the same time. An opening, *p'*, at upper end of cylinder M allows the air to escape during the upward stroke of piston P, and to enter during its downward stroke.

At starting the two pistons B and N will be at the downward limit of their stroke, and cylinder A will be full of oil and all valves closed. I then open valve *f*, admitting steam-pressure to check-valve *g*. Then I open the valve *c*, admitting steam below both pistons B N. The admission of steam under piston B would not move it, since the same steam-pressure would be exerted against the top of piston B through the medium of the contained oil and the valve *g;* but the steam also enters under piston N, and, as piston B is in a state of equilibrium, the pressure under N causes it to rise, and with it the piston B, to which it is connected. This ejects the oil at check-valve *g*, and the oil passes over into pipe *e* to passage *b*, whence it passes into the main steam-pipe on its way to the steam-chest or other locality. The amount of oil passing over into pipe *e* is governed by the amount of opening given the check-valve *g*,

which is controlled by the screw-stem *l*, and thus a very uniform and reliable feed of oil is effected.

To refill the cylinder A with oil I first shut off steam at the valve *c*, then open the drain-cock *o* at the lowest point in pipe *n*, which allows any steam or water in the two cylinders under their pistons to escape, and prevents cushioning in their desired downward movement. I then open the valve *g* by means of the stem *l*, thus admitting the live steam above the piston B, and, there being no counteracting pressure of steam below, the pistons are forced down, after which plug D is removed and the cylinder A filled with oil, and the plug restored. Then on closing the drain-cock *o* and opening the valve *c* the operations of feeding are again inaugurated. As the pipes and passages are all in metal, it is desirable to by some means indicate the rate of feed to the engineer. This I do by means as follows: The piston-rod P is made tubular, and receives a rod or shaft, R, which projects upwardly through the cap C, and is packed therein by the packing device *p*. Shaft R has a spiral groove, *q*, cut in its surface, into which a pin, *r*, or feather projects. Pin *r* is attached to a sleeve on top of piston B, or is set in the upper end of the hollow piston-rod. The shaft R, by means of a suitable shoulder or collar at the cap C, is prevented from upward movement. The result of this construction is that when the piston B rises it revolves the shaft R slowly. Above cap C the shaft R is provided with a gear-wheel, *s*, which meshes with a pinion, *t*, the shaft *u* of which is suitably stepped in cap C, so that the slow rotation of shaft R produces a comparatively rapid rotation of shaft *u*. The wheels *s t* are protected by a casing, *v*. On the upper end of the rotating shaft R, I fix a gong, T, and on the casing *v*, I pivot or otherwise arrange a spring-hammer, *w*. A cam, *x*, on shaft *u* rotates with the latter, and intermittently pushes out the hammer *w* and releases it. Every time the hammer is released it strikes the gong, thereby announcing the fact to the attendant that the feed is in operation, and indicating the rate of feed by the number of taps given in a certain period of time. The amount of oil in the cup is indicated at any time by the pointer *z*, standing at the periphery of the gong T, around which a scale is marked. As the shaft R makes but one revolution during the stroke of piston B, the level of oil can be easily read off the scale on gong T.

For locomotives I construct as follows: I make the twin cylinders A′ A′ with a central opening, *a′*, in the neck, which unites them, and a cored-out passage, *b′*, at the bottom, so that when steam is admitted to said passage it has access at once to both pistons B′ in the cylinders. A pipe, *c′*, leads from the dry-pipe of the engine to the passage *b′*, and is provided with the stop-valve *d′*. Each of the pistons B′ has a piston-rod, C′, passing through the cap D′ and suitably packed. Both piston-rods are attached to a cross-head, E′, to which also is attached centrally the piston-rod F′, which carries the piston G′ in the auxiliary cylinder H′ below, the rod F′ passing loosely up through opening *a′*, as shown. The three pistons B′ B′ G′ are thus connected and move together. Passage *b′* communicates by the pipe *e′* with the bottom of cylinder H′, and has the drain-cock *f′*, as before. Check-valves *g′ g′* are provided at the top of the cylinders A′, where the connection is made to the oil-pipes *h′ h′*, which lead to the respective steam-chests on the sides of the engine. These valves *g′* may be ordinary check-valves, as they will not be required to be forced open to drive down the pistons B′ for refilling with oil, as the pistons B′ can here be pushed down by hand.

The operations are as before. By this construction, however, the one auxiliary piston, G′, preponderates over the equilibrium established in two independent cylinders, A′ A′, and causes the two pipes *h′ h′* to be independently supplied with oil. The rate of feed and level of oil in this case is indicated by the position and rate of movement of the rod F or rods C′.

In going down grade it is frequently the practice to shut off steam from the engine-cylinders, this being done at the throttle-valve. The dry-pipe contains no live steam, and consequently in that event no feed of oil takes place; but a feed is desirable, as the pistons and valves are moving and require lubrication. To effect such I connect as shown, at Fig. 6, where c^2 is the connection from the dry-pipe to the lubricator. I connect the pipe *c′* also to the steam-dome or other live-steam space of the boiler by means of a pipe, *k′*, and provide this pipe with a stop-valve, *l′*, which, while the engine is using steam, I keep closed. In pipe *c′*, I place a globe check-valve, *m′*, so that when the throttle-valve is closed, in order to allow the engine to "roll" by gravity, the tendency to vacuum in the dry-pipe will close the valve *m′* outwardly; or the latter will be closed by the opening of the valve *l′*. I then open the valve *l′*, and thus admit steam directly from the boiler, after which the feed is forced, as before, notwithstanding the air-pressure which may then exist in the steam-chests and the pipes *h′*.

I have shown in Fig. 1 the oil-cylinder and the auxiliary cylinder axially arranged with a piston-rod common to both pistons; but Fig. 4 shows that the axial arrangement is not an essential feature. In fact, the compounding of the cylinders may be much varied. Their positions may be reversed and the two piston-rods required in such case connected by a sort of walking-beam or lever.

I claim as my invention—

1. In a lubricator having an oil-cylinder and a movable piston subject to like steam-pressure on both sides thereof, the combination therewith of an auxiliary steam-cylinder having a piston connected to the piston of the oil-cylinder and subject to direct steam-pressure

in one direction only, substantially as described, whereby the equilibrium in the oil-cylinder is overcome and the oil ejected by the preponderance of pressure exerted by the piston of the auxiliary steam-cylinder.

2. In a lubricator, the combination of a cylinder, A, forming an oil-chamber, piston B, auxiliary steam-cylinder M, having piston N, connected to piston B, steam-connections admitting steam-pressure simultaneously on both sides of piston B and on one side only of piston N, and an escape for the oil, substantially as described.

3. In a lubricator, in combination with the oil-ejecting piston B, a shaft, R, rotated by the movement of piston B and projecting outside the cylinder, a gong, T, fixed on the end of shaft R and rotating therewith, a hammer for said gong, and a rotary tripping wheel or cam operated by said shaft, substantially as described.

4. The combination, with rotating shaft R, having gong T with a peripheral scale marked thereon, of the stationary pointer *z*, substantially as described.

5. The combination of piston B, having feather *r*, spirally-grooved shaft R, wheels *s* and *t*, shaft *u*, cam *x*, spring-hammer *w*, and gong T, substantially as described.

6. In a lubricator, the combination of oil-cylinder A, having a port, *d*, and piston B, check-valve *g*, operating-stem *l* and pipe *e*, auxiliary steam-cylinder M, having piston N, connected to piston B, pipe *n*, communicating with port *d*, and arm E, communicating on one hand with pipe *e* and on the other with port *d* and pipe *n*, substantially as described.

7. In a locomotive-lubricator, having cylinders A′ A′ H′, pistons B′ B′ G′, connected substantially as shown, pipes *c′* and *h′*, connected to the dry-pipe, and check-valves *g′*, the combination therewith of the pipe *k′*, leading to the live-steam space of the boiler, valve *l′* therein, and check-valve *m′* in pipe *c′*, substantially as described.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in presence of two witnesses.

ROBERT G. McAULEY.

Witnesses:
LOUIS B. FULTON,
T. J. McTIGHE.