E. McCOY.

LUBRICATOR.

APPLICATION FILED SEPT. 9, 1902.

911,669.

Patented Feb. 9, 1909.

3 SHEETS—SHEET 1.

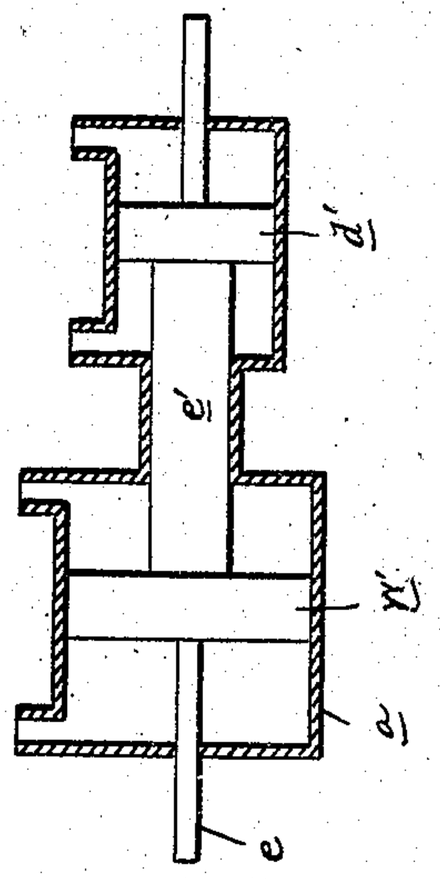

Fig. 7.

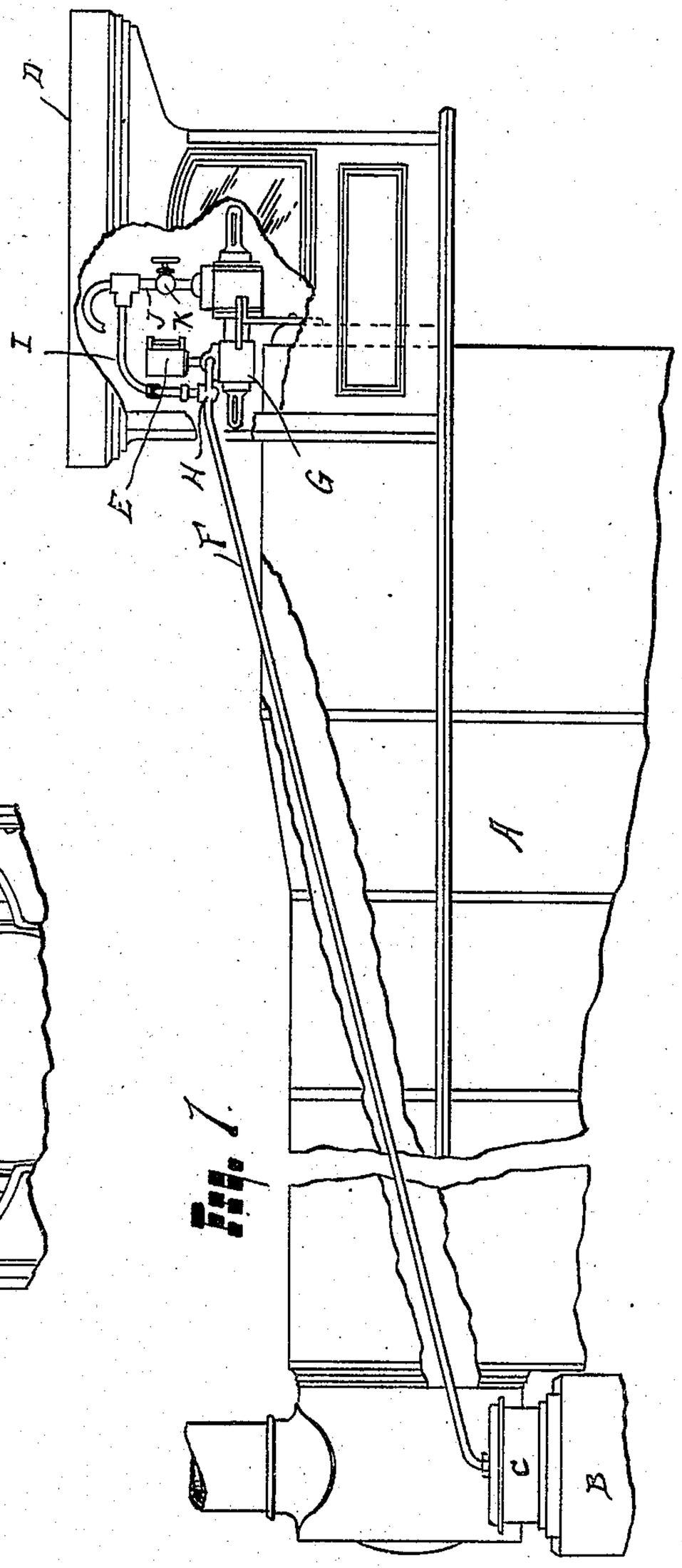

Fig. 7.

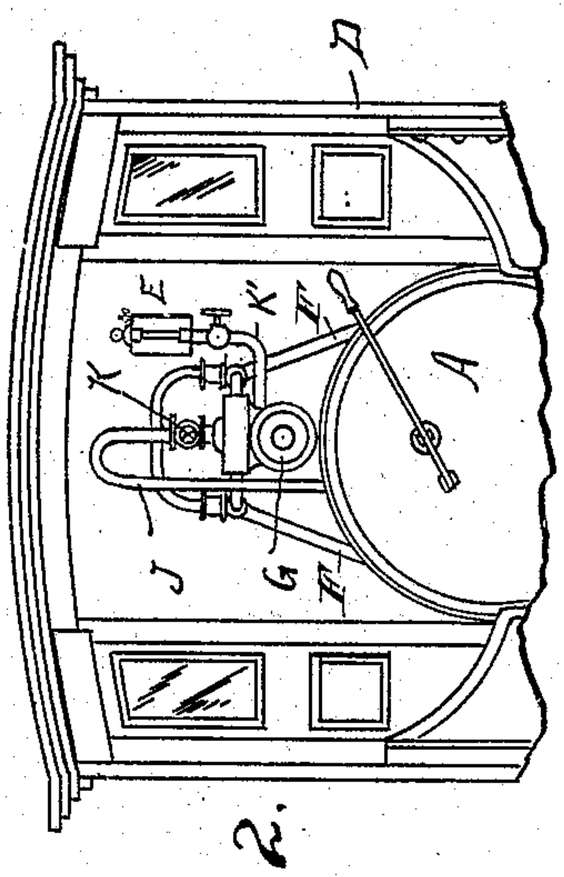

Fig. 2.

WITNESSES

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3 SHEETS—SHEET 2.

Fig. 3

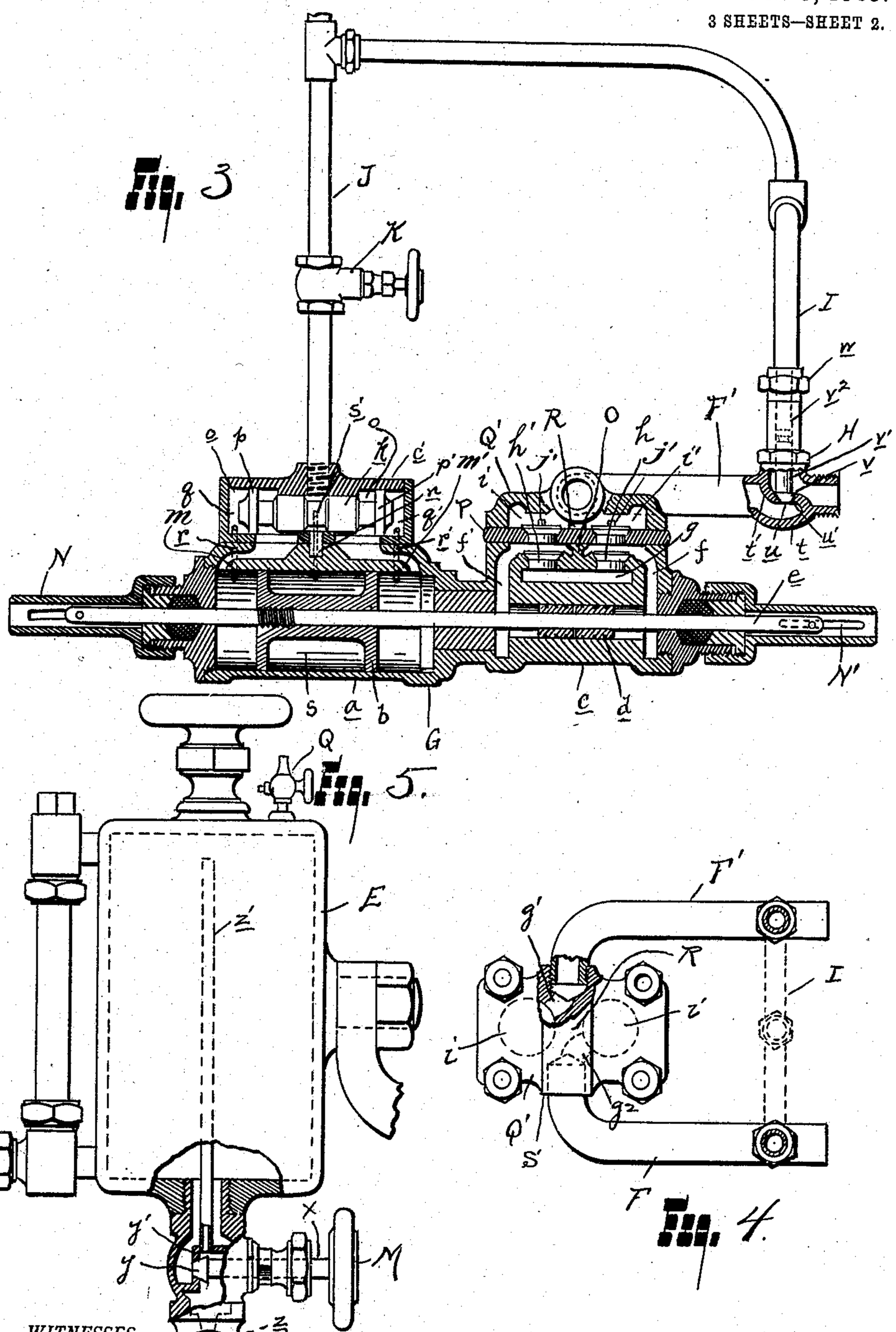

Fig. 4.

WITNESSES

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3 SHEETS—SHEET 3.

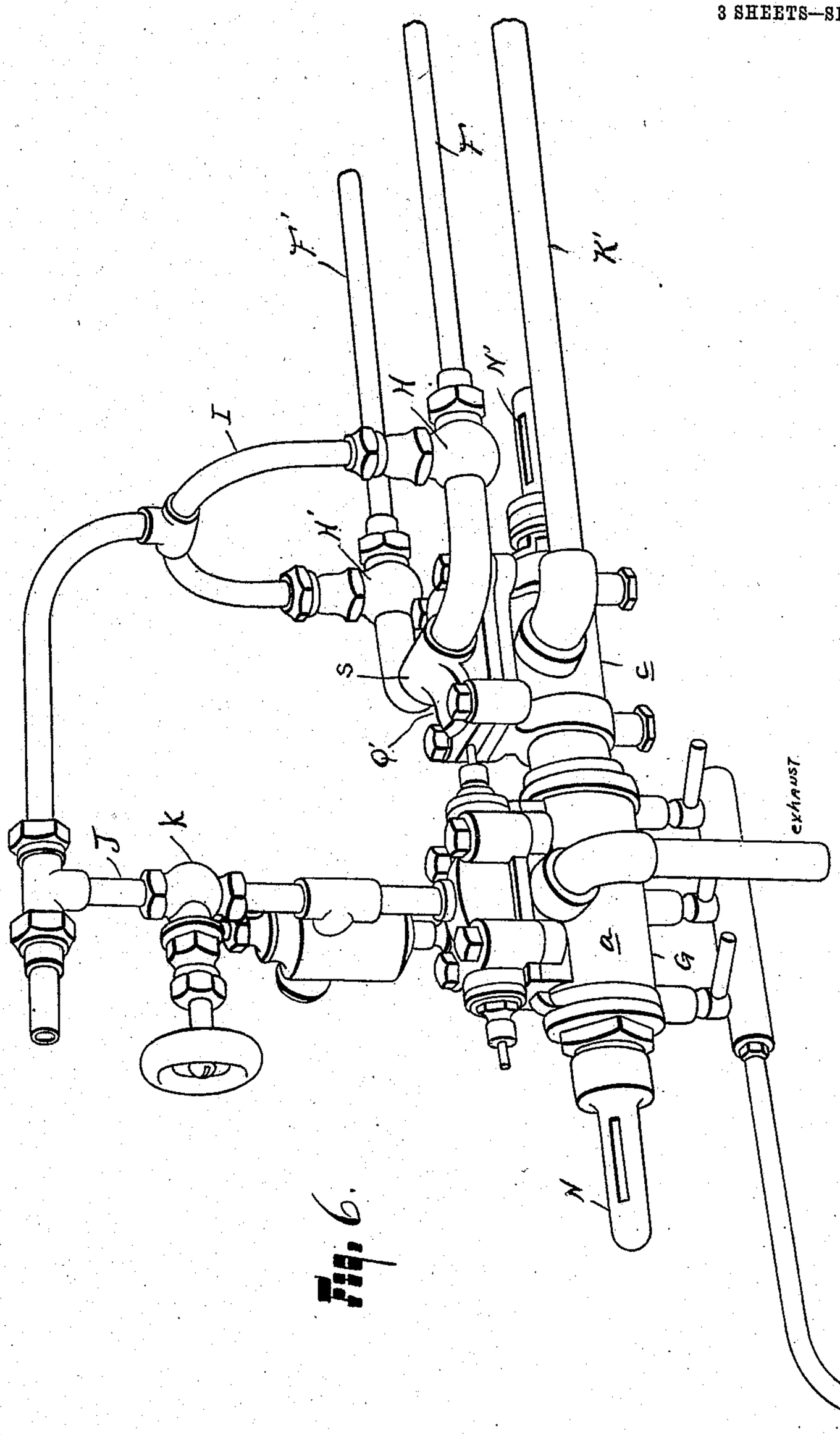

Fig. 6.

WITNESSES

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UNITED STATES PATENT OFFICE.

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LUBRICATOR.

No. 911,669. Specification of Letters Patent. Patented Feb. 9, 1909.

Application filed September 9, 1902. Serial No. 122,678.

To all whom it may concern:

Be it known that I, ELIJAH McCOY, residing at Detroit, in the county of Wayne and State of Michigan, a citizen of the United States, have invented certain new and useful Improvements in Lubricators, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention relates to improvements in lubricators and has more particular reference to that class intended for use on steam engines, both stationary and locomotive.

It is the object of the invention to obtain a construction which will operate satisfactorily and uniformly under the varying conditions to which it is subjected. These conditions are due chiefly to the varying back pressure of steam from the engine or locomotive, which at times, is so strong as to render it difficult to force the oil into the chest, while at other times a suction is produced tending to draw the oil from the cup. The result is, that, with the constructions heretofore used, it is difficult, or impossible to obtain a uniform feeding of the oil at all times.

In the present invention I have overcome the difficulty by providing a positive force feed for the oil adapted to inject the same into the steam chest against any back pressure which may arise therein. At the same time my improvement is provided with means for regulating the feed of the oil, so that a diminution of back pressure, or even a positive suction, as where the locomotive is running without steam, will not cause any increase in the feeding of the oil.

The invention therefore consists in the peculiar combination of a positive force pump for the oil with an automatic governor controlling the discharge from said pump.

The invention further consists in the peculiar construction of the automatic governor; further in the means by which the oil may be fed to a plurality of bearing surfaces, the amount fed to each being proportioned to their different areas. Further in the connection between the oil cup and pump whereby the latter is primed without loss of oil; and further in the peculiar construction, arrangement and combination of parts as is hereinafter described and claimed.

In the drawings, Figure 1 is a side elevation of the locomotive to which my improvement is attached. Fig. 2 is a rear elevation thereof. Fig. 3 is a longitudinal section through the pump and governing valve. Fig. 4 is a plan view of the supply pipes leading from the top showing the hood of the pump partly in section to illustrate the ports therein. Fig. 5 is a longitudinal section partly in elevation through the oil cup and sight feed connection. Fig. 6 is a perspective view of the pump and its connections. Fig. 7 is a diagram section through a slightly modified form of pump.

In the drawings and in the description I shall refer to the construction of my invention intended for use as a locomotive lubricator. I desire it to be understood, however, that the improvements are equally applicable to lubricators for stationary engines, and that such modifications are included in the spirit of my invention.

As shown, A is a locomotive boiler, B is the cylinder, C the steam chest and D the cab. Supported upon a suitable bracket within the cab is the oil cup E, and F are the tallow pipes for conveying the oil to the chests C.

K′ is the pipe for conveying oil from the cup E to the pump. The oil from the cup is fed to the tallow pipes by a mechanical pump G which is preferably of the following construction.

a is the steam cylinder containing the piston *b*, and *c* is the oil cylinder which is arranged in axial alinement with the cylinder *a* and contains the piston *d*. The two cylinders are preferably formed integral and the two pistons are mounted upon a common rod or stem *e*. The diameter of the piston *b* is greater than that of the piston *d* so that the area of the latter is but a fraction of that of the former. The cylinder *c* is connected at opposite ends by ports *f* and *f′* with an inlet chamber *g*. Within these ports are formed valve seats for the valves *h* and *h′* which control the connection between said ports and the chamber *g*.

i and *i′* are ports connecting ports *f* and *f′* respectively, with two separate discharge passages *g′* and *g²*. The ports *i* and *i′* are controlled by valves *j* and *j′*.

The construction just given forms no part of my invention, except as hereinafter described, and any suitable construction of steam actuated force pump may be employed in place thereof. The valve mechanism controlling the movement of the steam piston

may also be of any suitable construction, such as shown, in which k is a piston valve arranged within the chest c'.

m and m' are ports leading from the opposite ends of the cylinder a to said valve and adapted to be alternately connected by said valve with the exhaust port n and the steam chamber o. The opposite ends of valve k are provided with heads or pistons p and p' adapted to travel in cylindrical chambers q and q', said chambers being connected by small ports r and r' with the opposite ends of the cylinder a. The piston b is hollow and forms therein a steam chamber s which is connected by a small part s' with the steam chamber of the chest.

With the construction as described whenever steam is admitted to one end of the cylinder a it will cause the actuation of the piston b therein so as to move the same to the opposite end of the cylinder. In so doing the chamber s within the piston will be brought into communication with one of the ports r and r' thereby permitting steam to pass into the corresponding chambers within the chest q or q'. This will cause the movement of the valve k into a position where live steam is admitted to the opposite end of the cylinder a and the steam just employed for moving the piston is exhausted. The reciprocation of the piston b will impart a like movement to the piston d which will cause it to draw the oil from the chamber g and to expel it alternately through the ports j and j'. These ports are respectively connected to the tallow pipes F and F' which convey the oil to the opposite chests of the locomotive cylinders.

The construction thus far described while adapted for forcing the oil from the cup into the cylinder of the locomotive would be utterly inadequate for use under varying conditions incident to the running of the locomotive. For example, where running on a down grade and where the throttle of the locomotive is completely closed the engine pistons and cylinders will constitute a pump which will create a suction in the steam chest. The valves h and h', and j and j', being free to lift, it is evident that this suction would cause a rapid drawing of the oil from the cup E into the cylinder. The same effect, but to a lesser degree, would be produced where the locomotive is run under small pressure of steam caused by the partial closing of the throttle.

To guard against results just described, I provide a governor of the following construction. H and H' are valves respectively connected in the tallow pipes F and F'. These valves are preferably arranged as shown in Fig. 1 in proximity to the pump G, but may be arranged at the lower ends of the tallow pipes in proximity to the steam chest, or at any intermediate point. As preferably constructed and arranged they are in the position shown in full lines, and each is of the following construction. t is a casing connected into the tallow pipes, which is provided with a diaphragm or partition t', having a port u therein and a surrounding valve seat u'. v is a valve adapted to rest upon the seat u' and arranged to form a check valve in the tallow pipe. v' is a piston connected to the valve v which piston fits within a cylinder v^2 formed in the casing t. The opposite end of this cylinder is connected to a coupling w with a conduit I leading to a source of steam under boiler pressure. As shown, the conduit I connects with a conduit J, which leads from the shell of the boiler to a chest c' of the pump. The conduit J contains a throttle valve K for controlling the operation of the pump, and the conduit I is connected to the conduit J at a point above said valve.

It will be understood from the construction and arrangement of parts just described that the valve v is normally held to its seat u' by steam at full boiler pressure acting upon the piston v'. This pressure is sufficient to prevent the opening of the valve by suction, and also resists the opening thereof by the pressure of the oil. Inasmuch, however, as the area of the steam piston is in excess of the area of the pump piston, a greater pressure will be developed in the oil cylinder than that in the steam cylinder, or even in the boiler. As a consequence the resistance of the valve will be overcome and it will be opened with each stroke of the pump to admit the oil forced thereby into the tallow pipes.

It is further to be observed that the valve is practically balanced so far as the influence of the back pressure from the locomotive steam chest is concerned. This is for the reason that the exposed area of the piston v' is the same as or greater than the exposed area of the valve v. Thus, it is obvious the feeding of the oil by the pump will be unaffected by any variation in back pressure from the chest. It is still further to be noted that the resistance of the valve v is always proportional to the steam pressure acting in the cylinder a and, consequently, the pressure developed in the oil cylinder c. The pump will therefore feed uniformly under varying boiler pressure.

The amount of oil fed by the pump may be varied by regulating the feed from the oil cup E into the inlet chamber g of the pump. As shown the cup E is connected at its lower end to the conduit K' leading to the chamber g and in this connection is arranged a sight feed L. The latter may be of any suitable construction, such as a casing having transparent panels therein through which the feeding of the oil may be observed. For regulating the quantity of oil passing

into the sight feed, the valve M is arranged above the latter. This valve is preferably constructed as shown having an operating stem x extending laterally therefrom, and adapted to move the disk y towards, or from its seat in the dividing partition y'. The oil passing said valve will be conducted into a nozzle z arranged in line with the transparent panels of the sight feed, and adapted to drop the oil directly into the conduit K'.

For priming the pump it is necessary that the air contained in the pump cylinders should be removed. The usual method of accomplishing this is to provide an air-cock on the pump cylinder, which may be opened in the initial operation. The objection to the use of such a device is, that the oil will be wasted, and I have therefore avoided its use by the following construction: z' is a conduit connecting with an aperture in partition y' and extending upward through the cup E to the upper end thereof. This conduit forms a connection through which the air is expelled from the pump and conduit K' during the compression stroke of the pump, while during the suction stroke the in-drawn air will propel the oil admitted through the valve y and nozzle z. This arrangement permits of the introduction of oil through the sight feed into the conduit K' through which it will descend by gravity and the air current into the pump cylinder. Upon the top of the oil cup E I arrange the air cock Q which may be opened during the operation of the device to allow the air to flow in as the oil is drawn out.

In a common type of locomotive the cylinders upon opposite sides thereof being alike, an equal volume of oil is required for the lubrication of each. With the compound locomotive the cylinders are of different sizes and as a consequence a larger quantity of oil is required for lubricating the low pressure cylinder than that needed for the high pressure cylinder. In order that the proper quantity of oil may be fed I construct the pump G so as to proportion the feed to the particular locomotive on which the lubricator is to be placed. Thus, for the common type of locomotive the quantities of oil pumped by the opposite reciprocations of the pump are uniformly equal. It is necessary in order to secure this result that the steam areas upon opposite ends of the piston be equal. I therefore extend the stem or rod e beyond the piston b and out through the end of the cylinder a. In like manner the opposite end of the stem e is extended to pass outward through the ends of the pump cylinder c. The effect will be to present equal exposed areas on opposite sides of both pistons b and d with the result that the operation of the pump will be the same in its forward and return strokes. These extensions of the stem e also serve to indicate the action of the pump, which would not be visible if the stem were entirely inclosed by the casing. To protect the stem from injury housings N are arranged at opposite ends of the pump, and these housings are slotted at N' to permit of observing the movement of the stem.

For a compound locomotive a relatively greater feed of oil is produced by one stroke of the pump from that of the opposite stroke. This may be accomplished by the modified construction shown in Fig. 7, in which the opposite ends of the steam piston w' are of different areas, and the opposite ends of the oil piston d' are of proportional areas. This difference in areas may be produced by increasing the diameter of the stem e' between the two pistons so as to reduce the areas of the adjacent faces of said pistons. The result will be that a greater pressure will be exerted upon the steam piston in the forward stroke than in the return stroke, and correspondingly a greater amount of oil will be pumped by the forward than the return strokes.

As has already been described the outlet passages from opposite ends of the pump cylinder are separated from each other and connected respectively to the tallow pipes F and F'. This separation of the outlets is preferably effected by the construction shown, in which O is a partition in the casing c separating the ports f and f'. The valve controlled ports i and i' are formed in the section P of the casing (Fig. 3) arranged above the cylinder c and above this section is a hood Q' containing the passages g' and g^2. These passages are separated from each other by a partition R above which is arranged a boss S having threaded sockets at opposite ends thereof. These sockets are respectively connected with passages g' and g^2 and serve to connect said passages respectively with the tallow pipes F and F'.

What I claim as my invention is:

1. In a lubricator, the combination of a steam actuated mechanical oil pump, an oil distributing conduit into which said pump delivers, a valve controlling the delivery of oil into said conduit, and means for maintaining a uniform resistance to the opening of said valve under variable pressures of the actuating steam and back pressure in the delivery conduit.

2. A lubricator comprising an oil pump, a steam actuated motor for actuating said pump, an oil distributing conduit into which said pump delivers, a valve controlling the delivery of oil into said conduits, a steam delivery conduit connected with said motor, a branch conduit connecting said main conduit and said valve, a piston in said branch conduit connected to said valve whereby the resistance to the opening of said valve under

variable pressures of the actuating steam and back-pressure in the delivery conduit is uniform.

3. A lubricator comprising an oil pump, a steam actuated motor for actuating said pump, an oil distributing conduit into which said pump delivers, a valve controlling the delivery of oil into said conduit, a piston connected to said valve, the relative areas of said valve, piston and the pump piston being such that the resistance to the opening of said valve under variable pressures of the actuating steam and back pressure in the delivery conduit is uniform.

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

ELIJAH McCOY.

Witnesses:

M. B. O'Dogherty,

H. C. Smith.