

G. E. WHITNEY:  
LIQUID FUEL FEEDING SYSTEM.

APPLICATION FILED APR. 10, 1902.

4 SHEETS—SHEET 1.

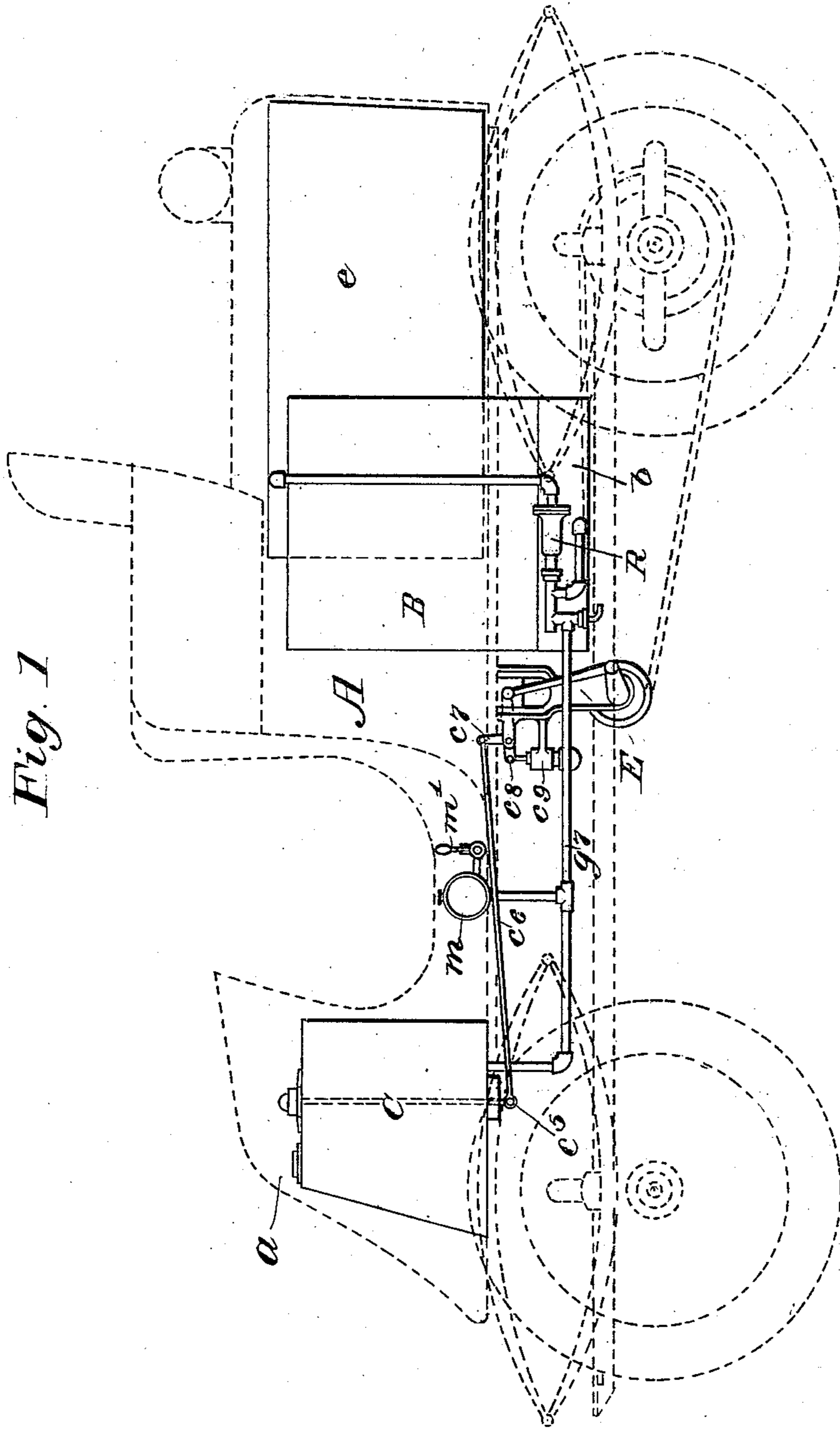


Fig. 1

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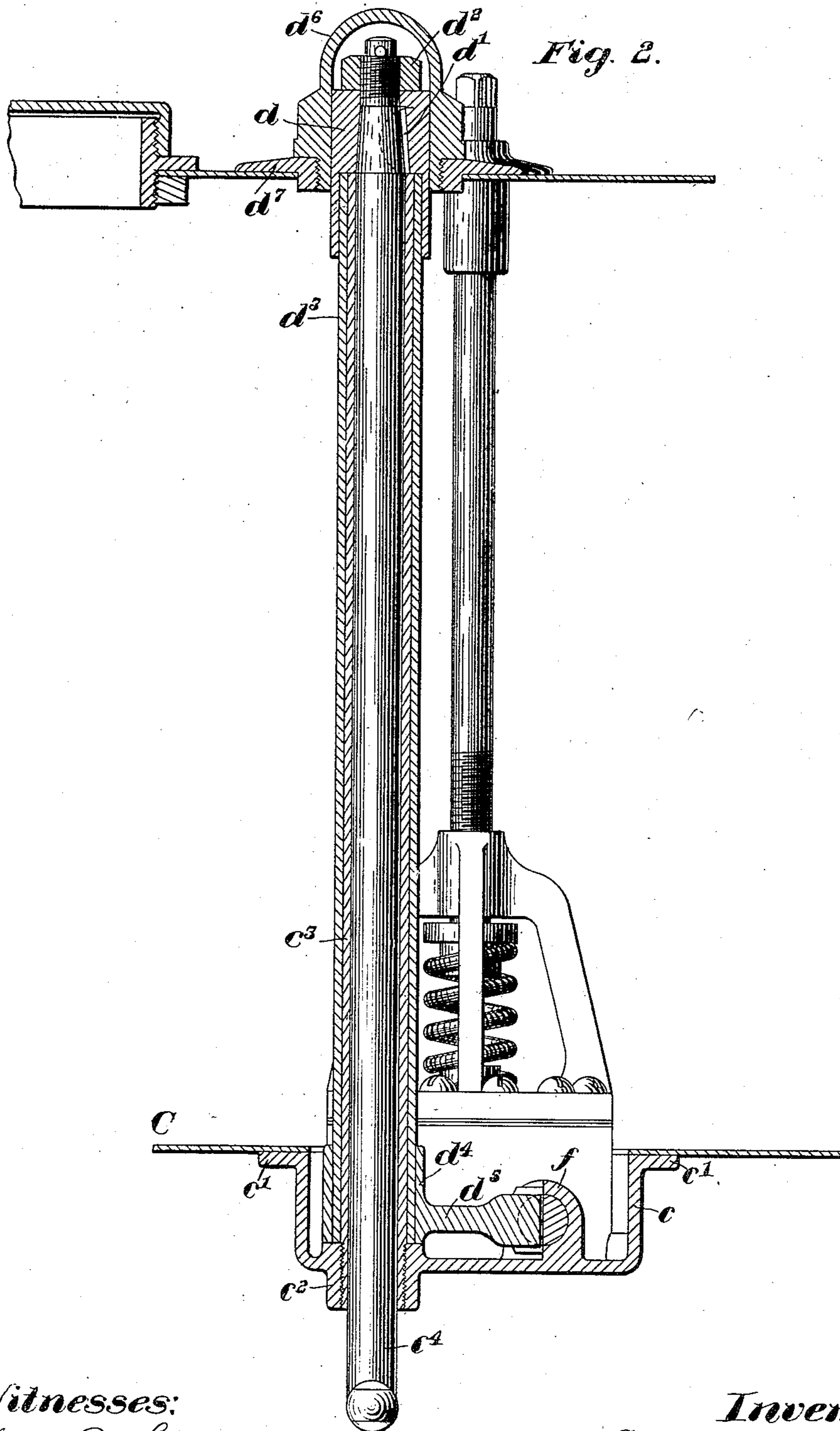
No. 860,716.

PATENTED JULY 23, 1907.

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4 SHEETS—SHEET 2.



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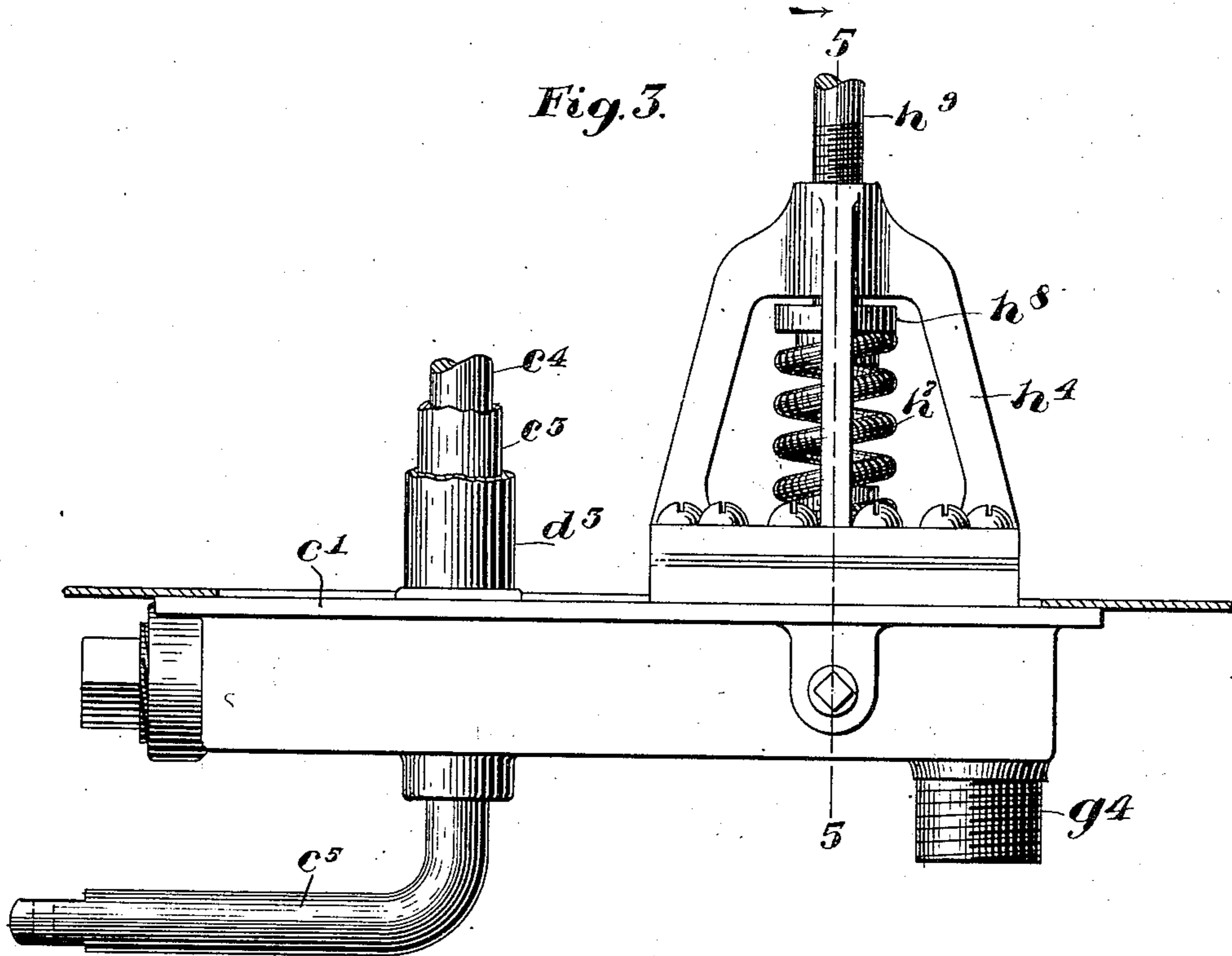


Fig. 3.

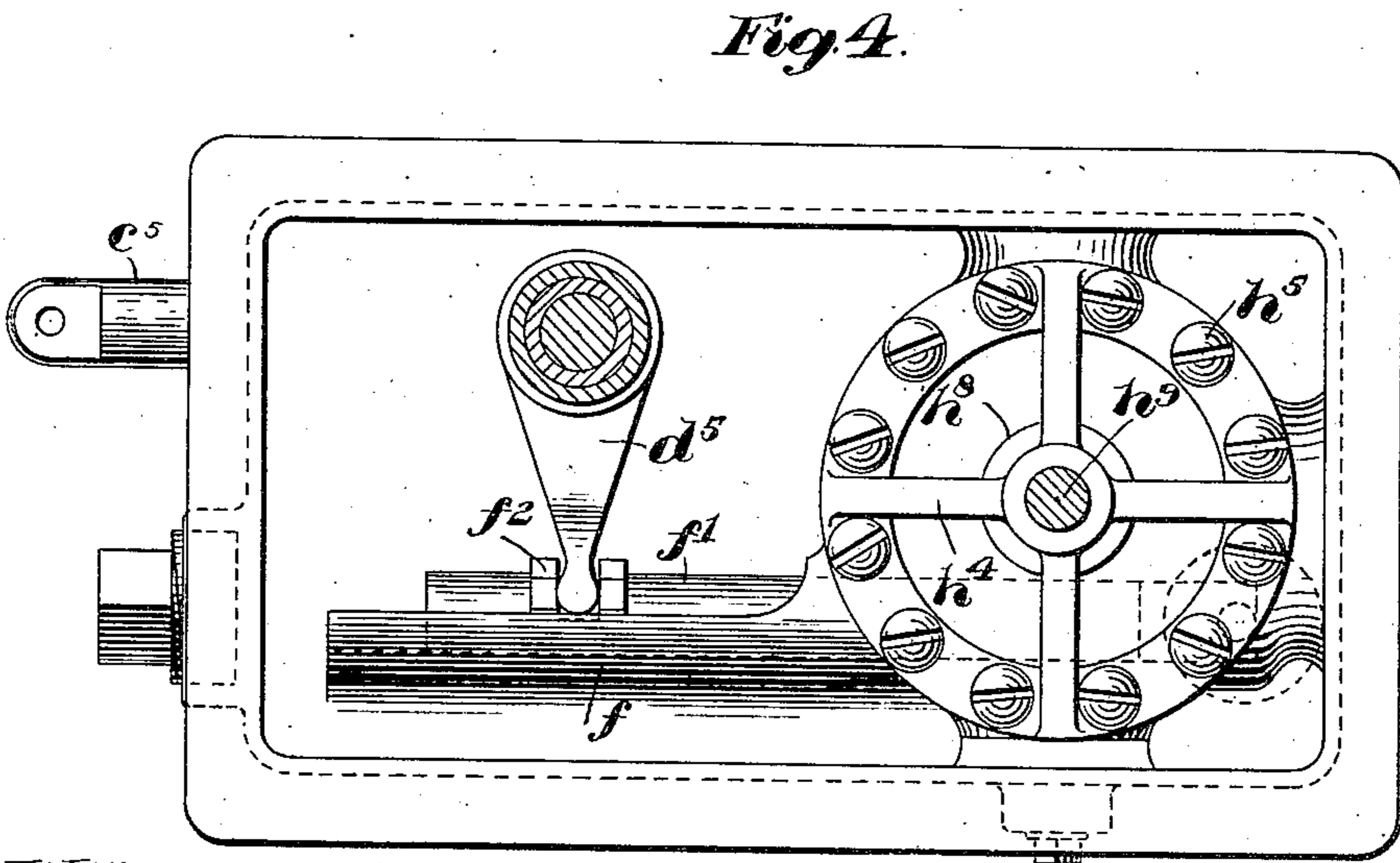
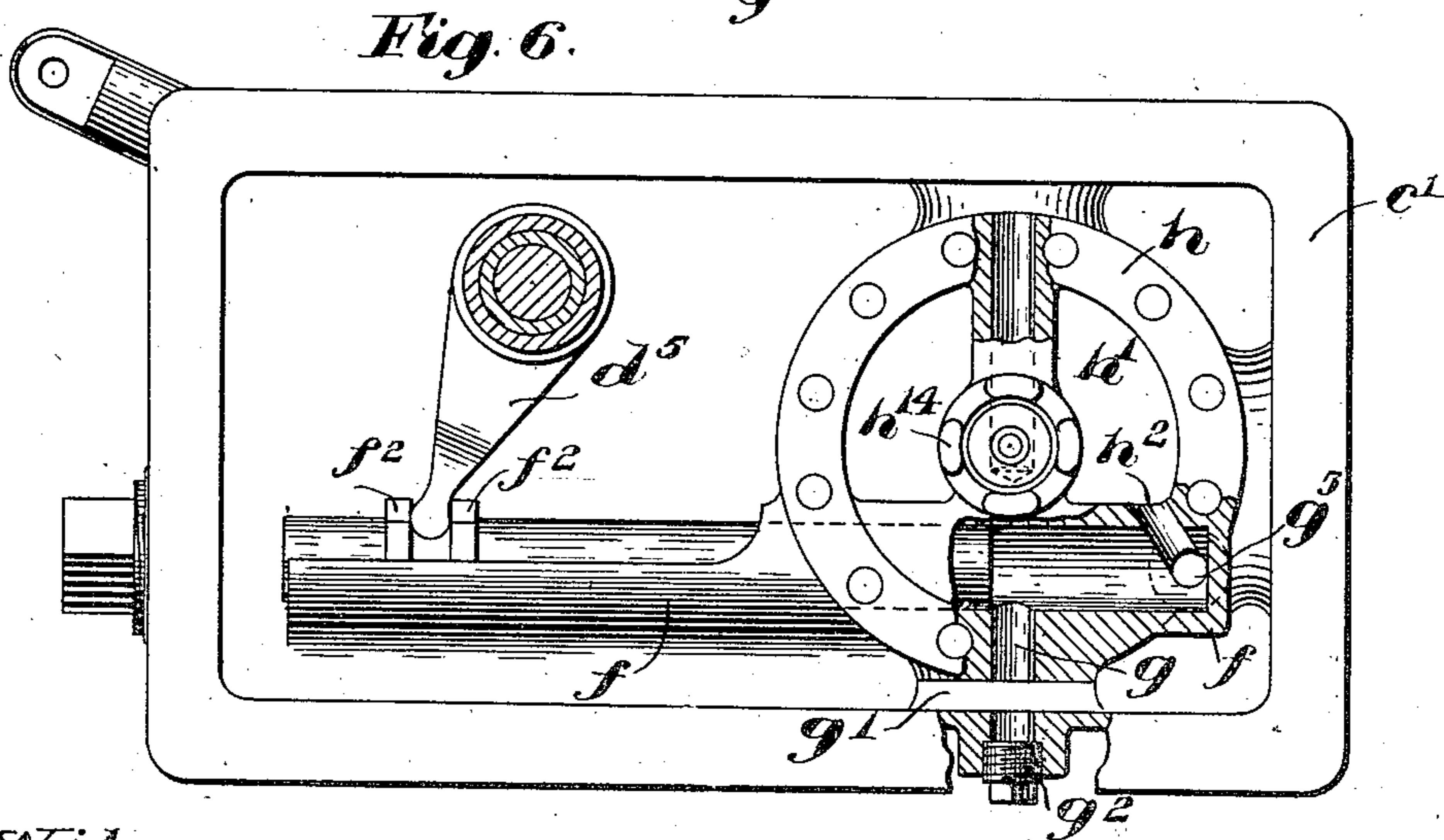
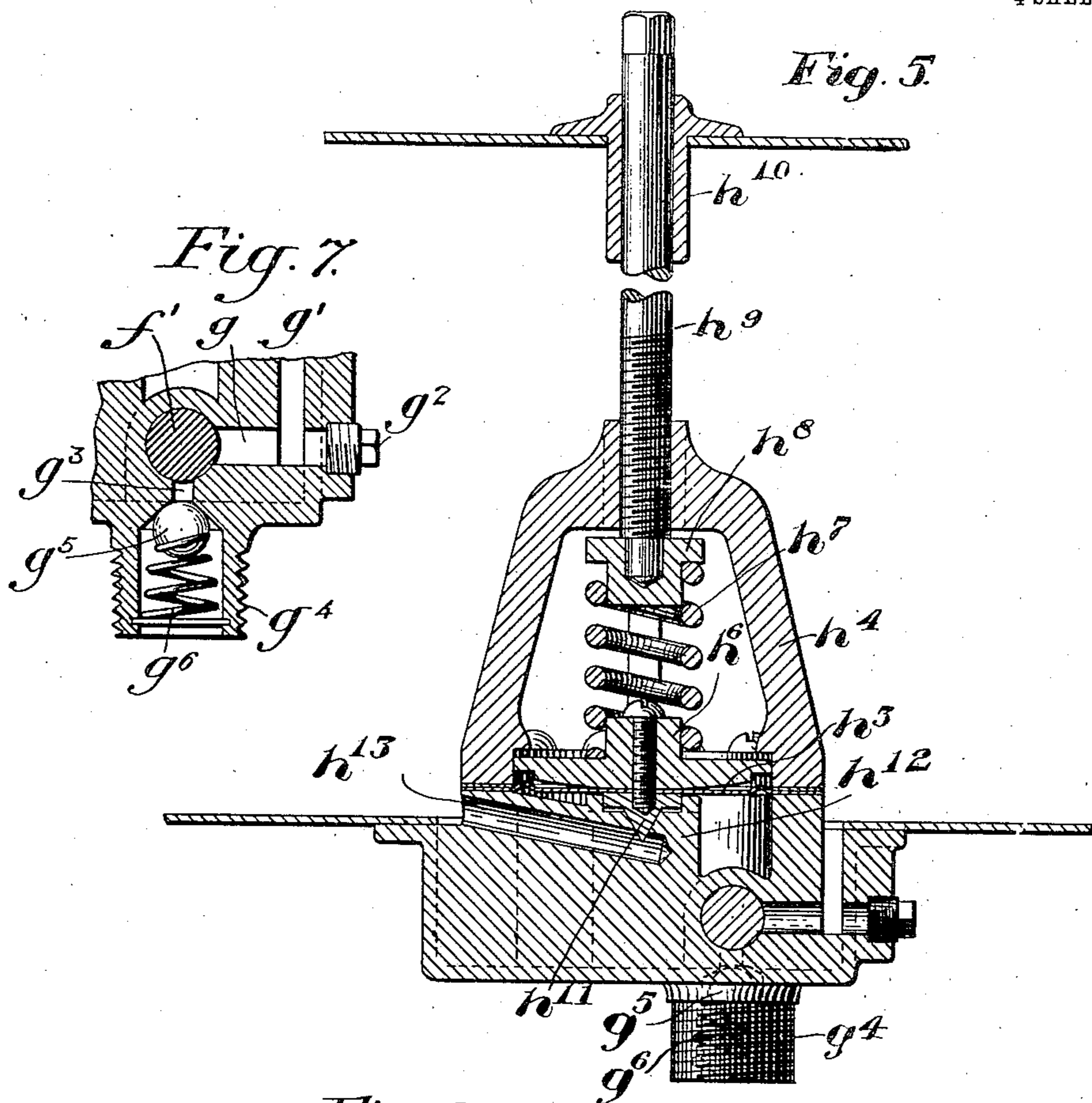


Fig. 4.

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# UNITED STATES PATENT OFFICE.

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TO STANLEY MOTOR CARRIAGE COMPANY, A CORPORATION OF MASSACHUSETTS.

## LIQUID-FUEL-FEEDING SYSTEM.

No. 860,716.

Specification of Letters Patent.

Patented July 23, 1907.

Application filed April 10, 1902. Serial No. 102,259.

*To all whom it may concern:*

Be it known that I, GEORGE E. WHITNEY, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Liquid-Fuel-Feeding Systems, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates particularly to means for feeding liquid fuel, the invention being particularly useful in automobiles in connection with which I have elected to disclose the same.

Probably the most common method of feeding liquid fuel to the burners of automobiles, is to create and maintain an elastic air pressure within the fuel supply tank and upon the liquid fuel therein, which air pressure acts to force the fuel along the supply pipe to the burner. This method of feeding the fuel has been objected to because of the large volume of inflammable fuel maintained under pressure and which it is claimed is likely to be freed by collision or otherwise, to the damage of the machine. In an effort to overcome this objection, attempts have been made to feed the liquid fuel by means of a pump drawing the fuel from the supply reservoir where it is kept without pressure and forcing the same to the burner, a by-pass being provided under the control of a regulator, which diverts more or less of the delivery of the pump, as may be necessary to maintain the required supply of fuel. One difficulty with apparatus of this last-mentioned type is the practical impossibility of providing a pump which will operate without objectionable leakage when employed in pumping gasoline or other hydro-carbon fuels,—gasoline being much more difficult to pack against than most any other liquid.

To retain the admitted advantages of this method of feeding the fuel by the use of a pump without the necessity for maintaining the main fuel supply under pressure, and at the same time to eliminate the objections incident to any attempt to pump liquid hydro-carbon,—such as gasoline,—by a pump of ordinary construction and location, my present invention comprises a novel construction and arrangement of the pump involving the placing of the latter in the main supply receptacle, where any leakage that may take place mingles at once with the main body of liquid fuel therein; so that no damage or detrimental action results.

The various features of my invention will be best understood after a description of the best embodiment thereof now known to me.

In the drawings,—Figure 1, in side elevation, illustrates one form of my invention as applied to a typical motor vehicle, the latter shown in dotted lines; Fig. 2

is an enlarged vertical sectional detail through a portion of the fuel supply tank or reservoir and showing the means for actuating the pump located within the reservoir from the actuating devices arranged outside thereof; Fig. 3 is a side elevation of the pocket casting placed at the bottom of the reservoir, Figs. 1 and 2, with a portion of the superimposed devices in connection therewith; Fig. 4, a top or plan view of Fig. 3; Fig. 5, a vertical sectional detail on the dotted line, 5—5, Fig. 3; and, Fig. 6, a view similar to Fig. 4, with the diaphragm removed partially broken away in an irregular section and showing the parts in different position. Fig. 7 is a detail in section showing the check valve at the feed outlet of the reservoir.

In the embodiment of my invention selected for illustration and shown in the drawings, referring first to Fig. 1, which shows the vehicle parts in dotted lines the vehicle body, A, spring supported upon a suitable running gear, is provided with a generator, as B, supplied with heat from a burner, b, of suitable construction, an engine E, supplied with steam from said generator communicating its power in suitable manner through suitable driving connections,—which need not be described,—to the wheels of the running gear.

Within the body A and at the rear of the generator is a suitable water tank, e, Fig. 1, and at the front of the vehicle and inclosed within the front or dasher box, a, may be arranged the fuel receptacle or reservoir, C.

Referring now to Figs. 2 to 6, inclusive, I have provided in the bottom of the fuel receptacle or reservoir, C, an opening, preferably corresponding in shape and dimensions with the inside opening of a well casting, c, shown as provided with flanges, c', by which it may be secured to the bottom of the reservoir, as by rivets, solder, or the like. This well casting, c, is shown provided with an internally threaded boss or nipple, c<sup>2</sup>, into which is screwed from above the stand-pipe, c<sup>3</sup>, reaching preferably quite to the top of the reservoir. Working within this stand-pipe, c<sup>3</sup>, is the pump actuating rod, c<sup>4</sup>, having its lower end, see Fig. 3, turned at right angles to form a crank, c<sup>5</sup>, by which it may be rocked,—as, for instance, by a connecting rod, c<sup>6</sup>, Fig. 1, leading to the engine. As herein shown, the actuating rod, c<sup>6</sup>, is jointed to a vertically extended arm, c<sup>7</sup>, on the pump beam, c<sup>8</sup>, of the engine, which is connected at one end to the reciprocating cross-head of the engine, and, at its opposite end, is connected with and actuates the usual water pump, c<sup>9</sup>.

Referring again to Fig. 2, the vertical actuating rod, c<sup>4</sup>, which I will hereinafter designate as the rock shaft, is made conical at its upper end or is otherwise suitably shaped, to receive the cup-like casting or head, d, which, in the present instance, is secured upon the rock shaft by a key, d', and a jam nut, d<sup>2</sup>. The cup-

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shaped head,  $d$ , receives and securely holds the rocking tube or tubular shaft,  $d^3$ , which extends downward within the reservoir but outside the standpipe,  $c^3$ , and at its lower end is fitted with a casting,  $d^4$ , suitably provided with a pump actuating arm,  $d^5$ , preferably arranged within the well,  $c$ . Thus is provided a construction which permits a rocking motion obtained from some part exterior to the tank or reservoir, to be communicated to the pump or part which it is desired shall be located within the tank or reservoir, all without the necessity for any packings of any sort. Since the standpipe,  $c^3$ , rises above any possible liquid level within the reservoir, it is clear that there can be no leakage from within the tank to the outside thereof around the connections referred to.

At its top, the tank or receptacle,  $C$ , is provided with a dome-like cap or nut,  $d^6$ , screwed into a suitable washer or plate,  $d^7$ , in the top of the said tank or reservoir and which permits of ready access to the parts at the top of the standpipe when desired, the same also serving as a bearing to constitute the upper end of the rotating rock shafts and to preserve the alinement of the latter.

Referring now to Figs. 4, 5 and 6, there is formed within the well,  $c$ , and preferably as a part of the casting thereof, a pump casing or barrel,  $f$ , which need be nothing more than a long boss or lug bored to correspond with the desired inside diameter of the pump. Within this pump cylinder or barrel,  $f$ , is an ordinary cylindrical pump plunger,  $f'$ , a portion of the side wall of the casing or barrel being cut away or removed, as best shown in Figs. 4, 5 and 6, to permit of the engagement of the actuating arm,  $d^5$ , with the plunger,  $f'$ , which it is to reciprocate. This may conveniently be done by providing the pump plunger with two lugs,  $f^2$ , between which is received the rounded end of the said actuating arm. Thus, any rocking movement of the rock shaft,  $c^4$ , and tubular shaft,  $c^3$ , is imparted to the actuating arm,  $d^5$ , and in turn reciprocates the plunger within the pump barrel.

Referring now to Fig. 6, the pump inlet is shown at  $g$ , part way down the barrel and just inside the end of the outward stroke of the plunger, this inlet communicating through a slit-like opening,  $g^1$ , with the interior of the well and reservoir. A screw plug,  $g^2$ , furnishes access to the inlet, for cleaning or otherwise. As the pump plunger approaches the end of its outward stroke, it uncovers this inlet,  $g$ , and permits the barrel to fill from the well and reservoir, and the pump plunger at the beginning of its return stroke, passes and thus closes said inlet, so that the plunger fulfils the further function of inlet valve. The pump outlet,  $g^3$ , is at the end of the barrel, see Fig. 6, and extends downward, as indicated in Fig. 7, into the threaded boss,  $g^4$ , the outlet valve being indicated at  $g^5$ ; a spring,  $g^6$ , serving to hold said ball valve normally to its seat. This outlet,  $g^3$ , is connected in suitable manner, as by the supply pipe,  $g^7$ , Fig. 1, with the burner, or other device to be supplied with fuel. Thus, it will appear that the operation of the engine through the connections described, will reciprocate the pump in the fuel supply reservoir wherever the latter may conveniently be located, to cause the said pump to force the liquid fuel to the burner, wherever the latter may be located. And it matters not how much the pump may leak, for

its leakage merely reenters the main supply from which it was drawn, so that it becomes necessary merely to make the pump of sufficient capacity to give the required supply notwithstanding there may be considerable leakage, and a successful working device is assured for all time. It is a fact, however, that the operation of the pump immersed in the body of liquid, causes the latter to become so much more thoroughly lubricated than would otherwise be possible, that excessive wear is eliminated. The arrangement therefore not only prolongs the life of the pump against wear and leakage, but takes care of the leakage when the latter occurs.

To produce the required pressure upon the liquid forced to the burner, the pump is made of a capacity such that when operated at its normal speed, it will tend to force the liquid through the pipe,  $g^7$ , more rapidly than it will flow therethrough under the influence of gravity alone, thus causing a pressure to accumulate in the said pipe and pump cylinder. To control this pressure and to maintain it at a substantially predetermined point, I have provided a by-pass, under the control of a suitable, preferably diaphragm regulator, which, by regulating the amount of liquid fuel permitted to escape through the by-pass, maintains the pressure within the supply pipe to the burner at the required constant point. This may conveniently be done by the construction shown in the drawings, reference being had particularly to Figs. 3 to 6.

Referring to Fig. 6, within the well,  $c$ , there is formed, preferably by casting, a ring-like wall,  $h$ , forming a contained chamber,  $h'$ , which is in communication with the interior of the pump barrel,  $f$ , through a passage  $h^2$ . Thus there is maintained within this chamber  $h'$ , which I will call the regulating chamber, at all times a pressure the same as in the pump cylinder and supply pipe leading to the burner.

Referring to Fig. 5, the top of this chamber is closed by a flexible diaphragm,  $h^3$ , which rests upon the top face of the circular wall,  $h$ , and is clamped thereupon by the ring-like bottom of the yoke,  $h^4$ , the latter being secured in position by bolts,  $h^5$ , or otherwise, as desired. Bearing upon the top of the diaphragm,  $h^3$ , is a pressure plate,  $h^6$ , acted upon by a spring,  $h^7$ , which in turn is seated against a cap,  $h^8$ , upon the lower end of an adjusting device,  $h^9$ , threaded in the crown of the yoke and extended vertically to and out through the top of the reservoir through a suitable bearing sleeve,  $h^{10}$ . The outer end of this adjusting device,  $h^9$ , is squared or otherwise fitted or equipped, to enable it to be rotated to vary the pressure of the screw,  $h^7$ , upon the diaphragm and correspondingly vary the responsive action of the said diaphragm to pressure beneath it within the chamber,  $h'$ . The diaphragm, under the action of the spring,  $h^7$ , is pressed constantly downward upon a conical valve,  $h^{11}$ , secured to the diaphragm and cooperating with a suitable valve seat,  $h^{12}$ , formed in a column, within the chamber,  $h'$ , and which controls entrance to a by-pass,  $h^{13}$ , leading into the reservoir.

When the pump is in operation, the pressure created within the pump and regulating chamber,  $h'$ , acts upon the diaphragm,  $h^3$ , and lifts the latter, more or less, against the action of the spring,  $h^7$ , and this opens more or less the valve,  $h^{11}$ , and the by-pass,  $h^{13}$ , so that all excess of pressure created by the pump over and

above what it is desired shall be communicated to the burner, which pressure is determined by adjustment of the spring,  $h^7$ , escapes through the by-pass,  $h^{13}$ , back again into and mingle with the main body of fuel in the reservoir.

To provide the necessary pressure for initially starting the burner and maintaining the latter until steam is raised and the vehicle is in motion, I have provided an air chamber, indicated at  $m$ , Fig. 1, in communication with the supply pipe,  $g^7$ , and this air chamber is equipped with a suitable pump,  $m'$ , Fig. 1, whereby sufficient air pressure may be created manually or otherwise, acting upon the fuel in the supply pipe to start the burner and maintain the latter for a considerable period of time. The air reservoir should be of sufficient capacity to feed the fuel to the burner until the vehicle is ready for operation. When steam is once raised, the usual diaphragm regulator indicated at  $R$ , responsive to variations in pressure of steam, cuts off the supply or flow of fuel through the supply pipe,  $g^7$ , until the steam pressure has become reduced. At such times, the entire delivery of the pump is of course of necessity returned into the tank or reservoir and through the by-pass,  $h^{13}$ , since it cannot go to the burner. This air chamber also fulfils the further function of taking up the impulses or shocks from the reciprocations of the pump, and renders the fuel supply therefrom substantially continuous and uniform.

During the operation of the engine and the main fuel feeding device, the liquid fuel will rise and enter the air chamber against the air cushion, filling a portion of the space within the chamber. The fuel within the air chamber is afterwards available, together with the fuel trapped within the supply conduit in initially starting the burner; but since communication between the main reservoir  $C$  and the air chamber  $m$  is interrupted by the check valve  $g^5$ , only the fuel within the chamber  $m$  and the conduit  $g^7$ , which need be but a small portion of the total fuel carried, is subject to stored pressure.

So far as the supply tank is concerned, the apparatus required for my invention is substantially self-contained,—that is, it is contained substantially wholly within and carried by the well casting,  $c$ , so that it is inexpensive to make and apply and is easy of access when necessary.

My invention is not limited to the particular embodiment thereof here shown for illustrative purposes, but may be varied as required within the spirit and scope of the invention.

#### Claim.

1. In a liquid fuel feeding system, a burner, a fuel supply reservoir, a stand-pipe therein, a fuel feeding device in said reservoir, and actuating connections therefor leading outward from said tank through the bottom of said stand-pipe.

2. In a liquid fuel feeding reservoir, a standpipe therein, a feeding device at or near the bottom of said reservoir and actuating connections therefor leading upward to the top of said stand-pipe and downward within the same, and means exterior to said reservoir for operating said connections and said feeding device.

3. In a liquid fuel feeding system, a burner, a fuel supply reservoir, a fuel feeding device located therein, and means to actuate the same, and an automatic delivery controlling device for said delivery device also arranged in said reservoir.

4. In a liquid fuel feeding system, a fuel supply reservoir, a fuel feeding device located therein, and means to actuate the same, and an automatic delivery controlling device for said delivery device also arranged in said reservoir and responsive to variations in pressure of the fuel at the delivery side of said delivery device.

5. In a liquid fuel feeding system, a fuel supply reservoir, a liquid fuel feeding device arranged therein, and an interior automatic regulator for the said delivery device, said regulator being accessible from the exterior of said reservoir.

6. In a liquid fuel feeding system, a fuel supply reservoir, a horizontally arranged pump therein, a vertically extended rock shaft entering said reservoir and connected with and to reciprocate the plunger of said pump.

7. In a liquid fuel feeding system, a liquid fuel supply reservoir, a fuel feed device therein operated from the exterior of said reservoir, a by-pass for said delivery device, and an automatic controlling device therefor also arranged in said reservoir, and an air reservoir in communication with the delivery side of said device.

8. In a motor vehicle, an engine, a steam generator and a liquid fuel burner therefor, a liquid fuel supply reservoir, a feeding device within said reservoir and connected with and actuated by said engine, and automatic means in said reservoir controlling the delivery of said device, to prevent excessive pressure at the delivery side of said device.

9. In a motor vehicle, an engine, a generator and a liquid fuel burner therefor, a liquid fuel supply reservoir, a fuel feed device arranged therein and actuated from said engine, automatic means for limiting the pressure at the delivery side of said delivery device, an air chamber in communication with the delivery side of said device, and means independent of said delivery device for creating air pressure in said air reservoir.

10. In a motor vehicle, an engine, a steam generator, a liquid fuel burner therefor, a hydro-carbon supply reservoir, fuel conduits connecting said reservoir and said burner, and a fuel feeding device located within said reservoir for supplying fuel from said reservoir to such burner through said conduit and maintaining said supply during the operation of the burner.

11. The combination in a motor vehicle of a motor, a pressure generator, a burner and a liquid fuel feeding system for said burner, the motor having a main supply reservoir remote from said burner, piping connections between said reservoir and burner, a pressure creating device within said reservoir, and means for operating said pressure creating device from power derived from said motor.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

GEORGE E. WHITNEY.

Witnesses:

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