

(No Model.)

2 Sheets—Sheet 1.

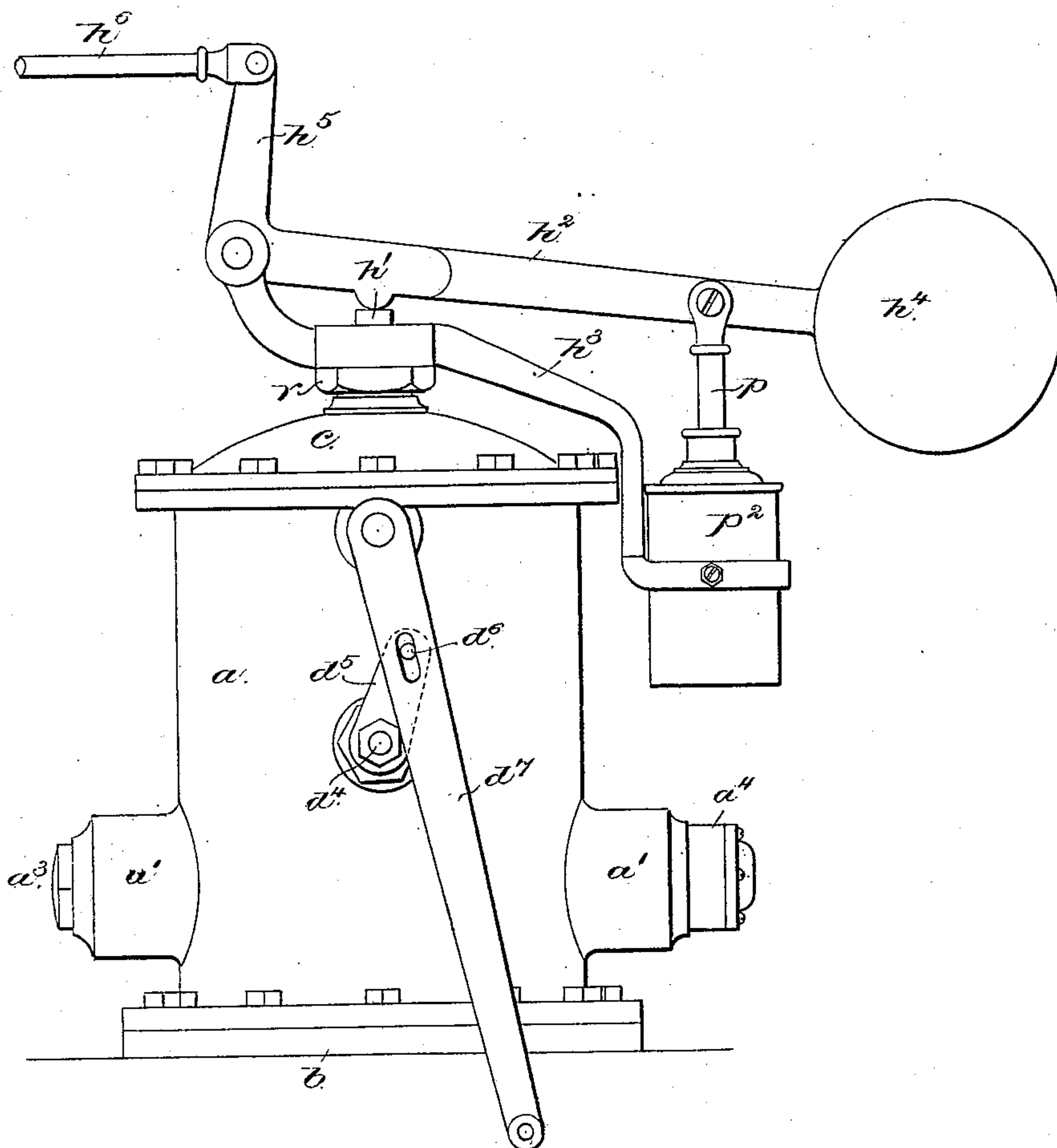
W. B. MASON.

GOVERNOR.

No. 312,137.

Patented Feb. 10, 1885.

Fig. 7.



Witnesses.

John F. C. Prentiss
B. J. Hayes.

Fuentes:

William B. Mason.
by Crosby & Gregory lith.

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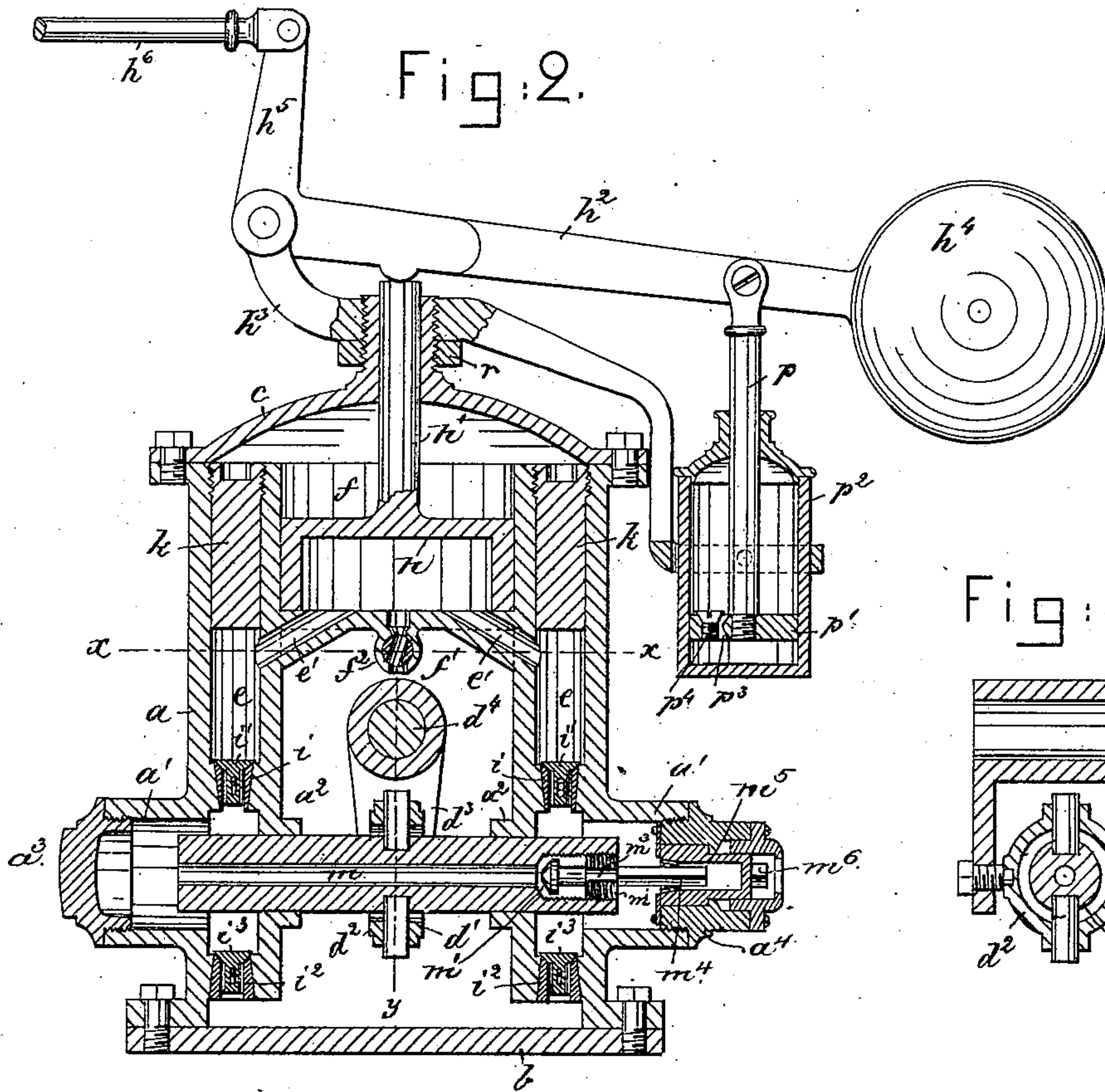


Fig:4.

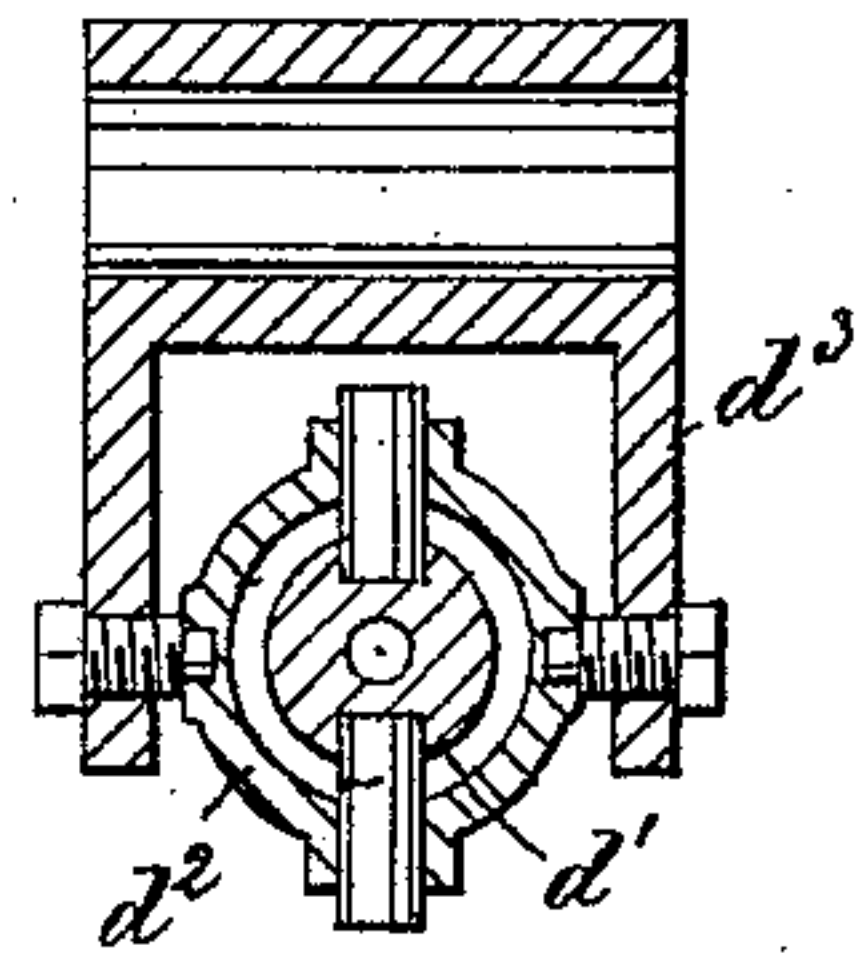
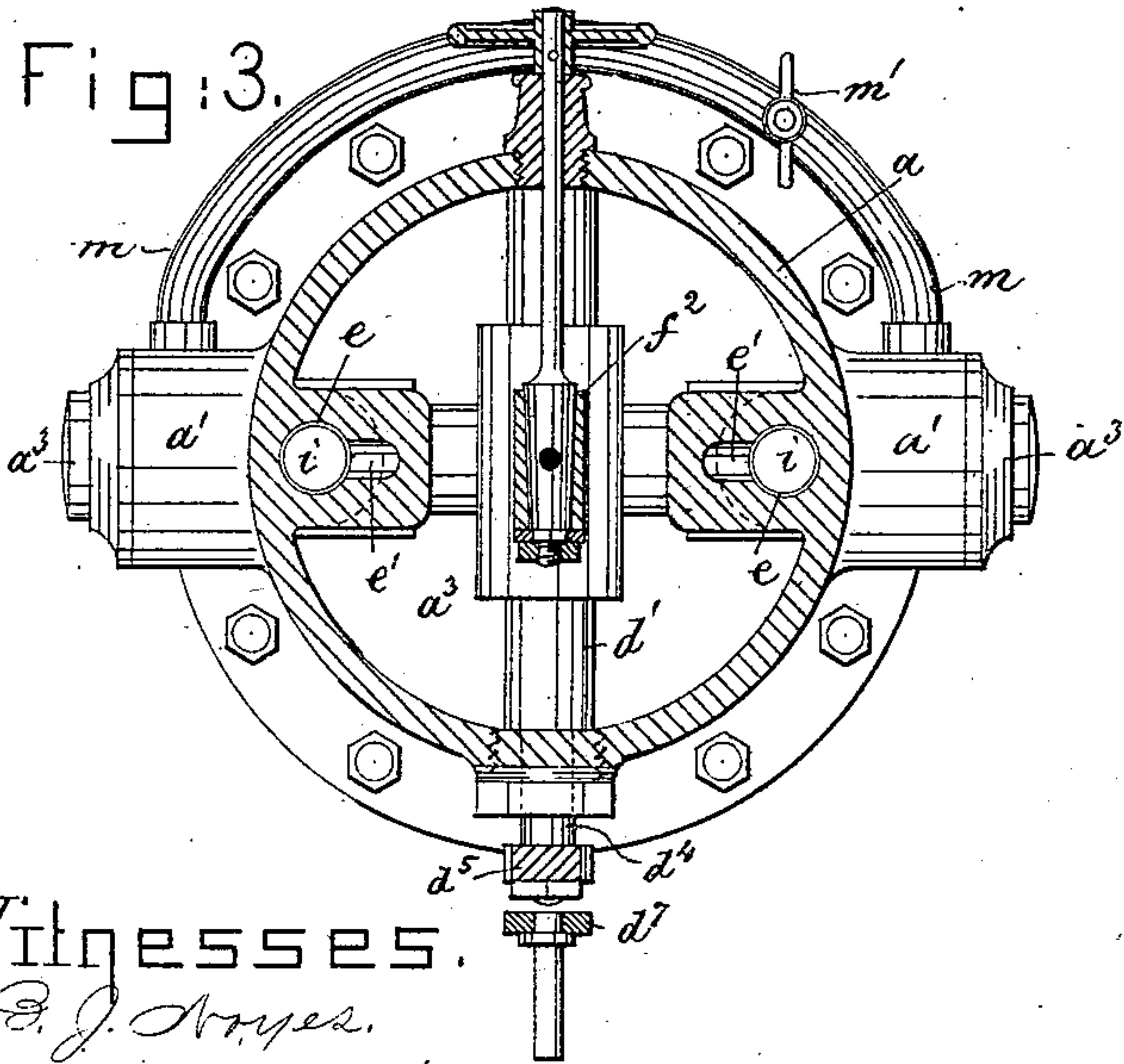


Fig:3.



Witnesses.

R. J. Hayes.
John F. C. Reinkerk

Inventor.

William B. Mason.
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UNITED STATES PATENT OFFICE.

WILLIAM B. MASON, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THE
MASON REGULATOR COMPANY, OF SAME PLACE.

GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 312,137, dated February 10, 1885.

Application filed September 24, 1883. (No model.)

To all whom it may concern.

Be it known that I, WILLIAM B. MASON, of Boston, county of Suffolk, and State of Massachusetts, have invented an Improvement in Governors, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention relating to a governor for steam-engines is intended as an improvement on the governor for which Letters Patent No. 274,625 were granted to me March 27, 1883. The governor is of that class in which a liquid is forced by a small pump connected with and actuated by the engine to be governed, the said pumped liquid controlling the throttle or other valve of the engine to govern the amount of steam or other fluid pressure supplied to the engine. In my former patent the governor-pump was shown as comprising two cylinders, the pistons of which were geared together so as to make their strokes in opposite directions at the same time, and the entire quantity of liquid forced at each stroke of the pump acted upon a diaphragm connected with the throttle or other valve of the engine, such a form of governor being especially adapted to control the long uniform stroke of a direct-acting engine or steam-pump.

The present invention consists, partly, in a novel arrangement of the ducts or passages for the fluid of the governor, whereby only a portion of the pumped fluid, capable of being varied and regulated, acts upon the diaphragm or piston, the movement of which controls the engine-valve, the pressure of the said fluid on the said diaphragm or piston being affected by the slightest change in the speed of the governor-pump or engine, to thereby regulate the movement of the latter with extreme delicacy. This result is accomplished by connecting the chambers of the two single-acting pumps of the governor so that a portion of the fluid forced from one pump will be received into the other, each of the said pumps, however, having an independent passage leading to the valve-actuating diaphragm or piston, which is thus always affected by a force proportioned to that in the discharge-passage of the pump that is then making its forward or forcing stroke.

The invention also consists in details of construction of the apparatus whereby it is greatly simplified and cheapened.

Figure 1 is a side elevation of a governor embodying this invention; Fig. 2, a vertical section thereof; Fig. 3, a horizontal section on line *x x*, Fig. 2, showing, however, a modification of the connecting-passage between the pump-chambers; and Fig. 4, a sectional detail on line *y*, Fig. 2.

The main body *a* of the governor is composed of a single casting, having a bottom plate, *b*, and a cover or bonnet, *c*, bolted or fastened thereto in any suitable manner. The main portion *a* has near its lower end two opposite tubular extensions or chambers, *a'*, the inner ends, *a''*, of which are bored accurately in line with one another to fit the pump-plunger *d*, which is thus adapted to reciprocate back and forth in the chambers *a'*, the ends of which when finished are closed by suitable caps, *a'''*. The main portion *a* also has formed in it, preferably by coring, ducts or passages *e*, leading from its lower to its upper portions, passing through each chamber *a'*, and near the upper end of the said case *a*, branch passages *e'* lead from the said passages *e* to a short cylindrical chamber, *f*, in the upper portion of the said case, in which is fitted the piston *h*, provided with a rod, *h'*, passing out through the bonnet *c* of the governor, and operating, as will be described, to control the valve of the engine. The passages *e* are continued to the top of the casing *a* to enable a suitable tool to be inserted to bore sockets for the seats *i* of the valves *i'*, opening outwardly from the chambers *a'*, to permit the fluid to be forced therefrom into the said passages *e*, which are subsequently tightly closed by plugs *k*, so that the liquid flows through the passages *e'* into the chamber *f* beneath the piston *h*. The lower ends of the passages *e* are also bored to form sockets for the seats *i''* of the valves *i''*, opening inward to the chambers *a'*, to permit the fluid to be drawn from the lower portion of the main chamber *a* into the said chambers *a'*, the said fluid standing a considerable distance above the lower ends of the said passages *e*.

As thus far described it will be seen that the chambers *a'*, with the plunger *d* and valves

$i' i^3$, constitute two connected single-acting pumps, by which fluid is alternately forced into the chamber f beneath the piston h , the said chamber having an outlet, f' , controlled by a valve, f^2 , by which the fluid is returned to the lower portion of the chamber a , the operation being substantially the same as in the former patent referred to for the part thus far described.

In the apparatus described in the former patent it is essential that the liquid shall escape from the chamber with the same average speed with which it is forced into the said chamber by the pumps, and such construction necessitates considerable variation in the movement of the piston or diaphragm controlling the engine-valve, it vibrating more or less at each stroke of the governor-pump. In order to reduce such variation in the movement of the valve-actuating piston, so as to enable the apparatus to operate advantageously with all kinds of engines, the pump-chambers a' are connected with one another by a duct or passage, m , provided with a controlling-valve, m' , through which any desired portion of the liquid may be forced directly from one chamber to the other, the said valve m' , however, obstructing the flow, and thus causing a pressure in the chamber a' , toward and into which the plunger is moving, so that a portion of the liquid will be forced through the passage $e e'$ into the chamber f , tending to raise the piston h .

As shown in Fig. 2, the connecting-passage m , between the pump-chambers a' , is within the plunger d , and the valve m' , controlling the flow of fluid through the said passage, is operated by a stem provided with a threaded hub, m^2 , having grooves or passages m^3 , sufficient for the maximum flow of fluid that is to pass between the chambers, and operating by its rotation to move the valve m' toward or from its seat, so as to increase or decrease the flow of fluid.

In order to enable the said valve to be operated at any time without opening the chamber a' or stopping the operation of the governor, the valve-stem is squared, as shown at m^4 , and enters a squared socket in a key-piece, m^5 , that is free to rotate in the cap a^4 of the chamber a' , it being surrounded with suitable packing and having a squared end, m^6 , adapted to be engaged by a socket wrench or key inserted through an opening in the end of the cap a^4 . The said squared end m^6 is inclosed within the cap, so as to prevent tampering with the valve m' , and, if desired, the key used to engage and rotate the key-piece m^5 in order to adjust the valve may be controlled by tumblers or any of the usual devices employed in locks to prevent operation except by the proper key.

When there is no fear of the governor being tampered with, the connecting-passage m may be made as a tube, either within or outside of the body of the governor, as shown in Fig. 3, and the valve m' may be an ordinary plug-cock.

In the construction shown in Fig. 2 the stem m^4 has a loose fit in the key-piece m^5 , or the latter is provided with small passages around the stem, as shown, to prevent the entrapment of the fluid within the said key-piece as the stem reciprocates thereon, and it is obvious that instead of squaring the stem it may be connected with the key-piece by a spline, the essential point being that it is free to reciprocate in the said key-piece, but compelled to accompany the said key-piece in its rotary movement.

In operation, when the governor is running uniformly, the larger part of the liquid is merely pumped back and forth through the pipe m , a small portion passing through the valves i' into the chamber f and returning therefrom through the passage f' .

Any sudden acceleration of the plunger d will immediately increase the pressure in the chamber a' , toward which it is moving, and will cause more fluid to enter the chamber f , thus raising the piston h , and at once checking the engine, the effect of the acceleration being immediately transmitted to the piston h and to the engine, and thus preventing any injury in case of a sudden reduction of the load, as by the breakage of the main belt, or, in case of a marine engine, by the propeller rising out of the water. When the speed of the plunger d diminishes, the amount of liquid that is caused to enter the chamber f is reduced, and the fluid flowing out of the passage f' more rapidly than it is forced in permits the piston h to descend, the power of the engine being usually increased by the governor somewhat more slowly and gradually than it is diminished, the latter effect being practically instantaneous.

The plunger d may be actuated by the engine through any suitable connecting mechanism. As herein shown, the said plunger is provided with a guide-pin, d' , upon which a ring, d^2 , surrounding the plunger d , slides vertically, the said ring being pivotally connected with a forked crank, d^3 , mounted on a rock-shaft, d^4 , extending out through the side of the casing a , and provided with a crank, d^5 , the crank-pin d^6 of which enters a slot in a lever, d^7 , pivoted at one end to the casing a' , and adapted to be connected at its other end with some reciprocating part of the engine—such, for instance, as the cross-head of the piston-rod. The stem h' of the valve-actuating piston acts upon a lever, h^2 , pivoted in a bracket, h^3 , supported on the bonnet c of the apparatus, the said lever h^2 being provided at one end with a weight, h^4 , to act in opposition to the pressure of the fluid in the chamber f . The lever h^2 has an arm, h^5 , which may be connected by a rod or link, h^6 , with the throttle-valve, or with any suitable portion of the valve-gear of the engine.

When it is desired to give the lever h^2 greater steadiness of movement, it may be connected with the rod p of a piston, p' , working in a cylinder, p^2 , pivoted in a portion of the

bracket h^3 upon which the lever h^2 is pivoted. The cylinder p^2 will be filled with a fluid, and the piston p' will have a loose fit therein, or be provided, as shown, with a small orifice,

5 p^3 , which may be regulated by a screw, p^4 .

The bracket h^3 , together with the lever h^2 and regulating-cylinder or dash-pot p^2 thereon, may be turned about the bonnet c in any desired direction for greater convenience in
10 the connection of the lever d^7 and rod h^6 with the proper parts of the engine. the said bracket being shown as threaded and held, when properly adjusted, by a check-nut, r .

It will be seen that the operation of the
15 governor may be regulated by the valve m' , as well as by the valve f^2 , and that by means of both valves the quickness of the governor to respond to both increase and decrease in the speed of the engine may be varied, it
20 being more sensitive to both kinds of change in proportion as the valve f^2 is opened and the one n is more nearly closed, but being more steady in operation and none the less sensitive to increase in speed in proportion as
25 the valve n is opened and the one f^2 is more nearly closed.

The piston h , by which the engine-valve is to be actuated, is made with a chamber in its under side, as shown in Fig. 2, in which air is
30 entrapped, forming a cushion for its movement.

I claim—

1. In a governor, the case a , constituting a reservoir, provided with opposite chambers a'
35 and an upper chamber, f , and ducts connecting the said chambers a' with the one f , combined with the plunger d , adapted to operate in both the said chambers a' , the valves in the said ducts, and actuating mechanism for the
40 said plunger, substantially as described.

2. In a governor, the pump comprising two chambers from which the fluid is alternately forced, combined with a duct or passage connecting the said chambers, and a chamber to
45 receive a portion of the fluid forced by the said pump, and mechanism actuated by the said fluid entering the said chamber for controlling the admission of steam to the engine, substantially as and for the purposes described.

50 3. The reciprocating pump adapted to be actuated by the engine to be governed, and comprising two chambers from which the

pumped fluid is alternately forced, combined with a duct connecting the said chambers and controlling-valve therein, and the chamber
55 connected with the said pump-chambers having an escape-passage and controlling-valve, and mechanism actuated by the pumped liquid for governing the valve of the engine, substantially as described. 60

4. The reciprocating pump comprising the chambers from which the pumped fluid is alternately forced, combined with the plunger working in both the said chambers and provided with a passage connecting the said
65 chambers, and a valve controlling the flow of fluid through the said passage, substantially as described.

5. The reciprocating pump comprising two chambers from which the pumped fluid is al- 70 ternately forced, combined with the plunger operating in both the said chambers and provided with a passage connecting them, and a valve controlling the flow of fluid through the said passage, and its key-piece adapted to be
75 operated from the outside of the chamber, substantially as described.

6. The main case constituting a reservoir provided with pump-chambers a' in line with one another, combined with the plunger oper- 80 ating in both the said chambers, the crank connected with the said plunger and inclosed within the main case, and the rock-shaft extending from the interior to the exterior of the said case, adapted to be connected with
85 the moving parts of the engine or motor to be governed, substantially as described.

7. The main case constituting a reservoir provided with pump-chambers a' in line with one another, combined with the plunger op- 90 erating in both the said chambers, provided with a guide-pin, the ring having a sliding movement thereon, and the crank pivotally connected with the said ring, and a rock-shaft connected with said crank and actuated from
95 the exterior of the case, substantially as described.

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

WM. B. MASON.

Witnesses:

JOS. P. LIVERMORE,

B. J. NOYES.