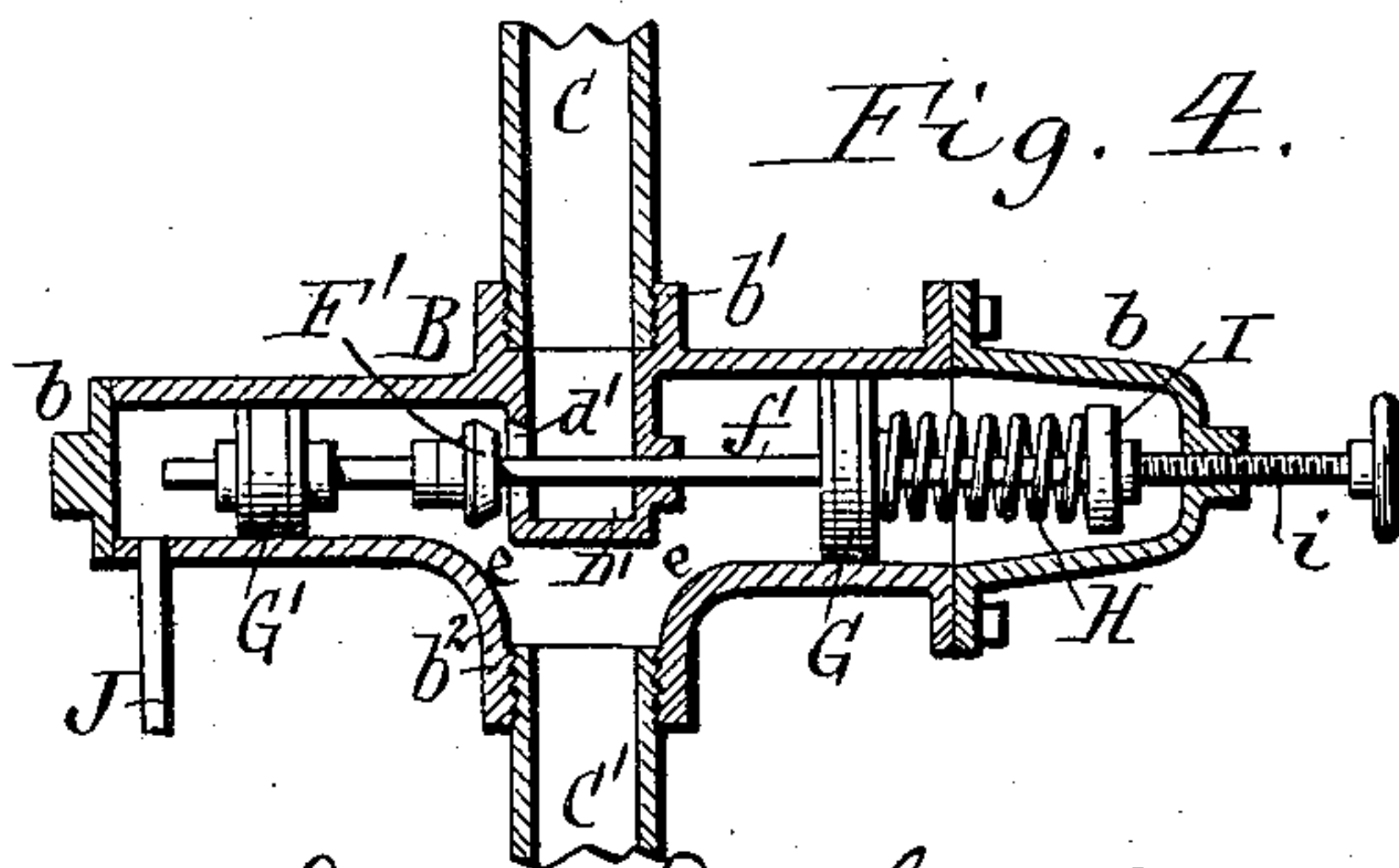
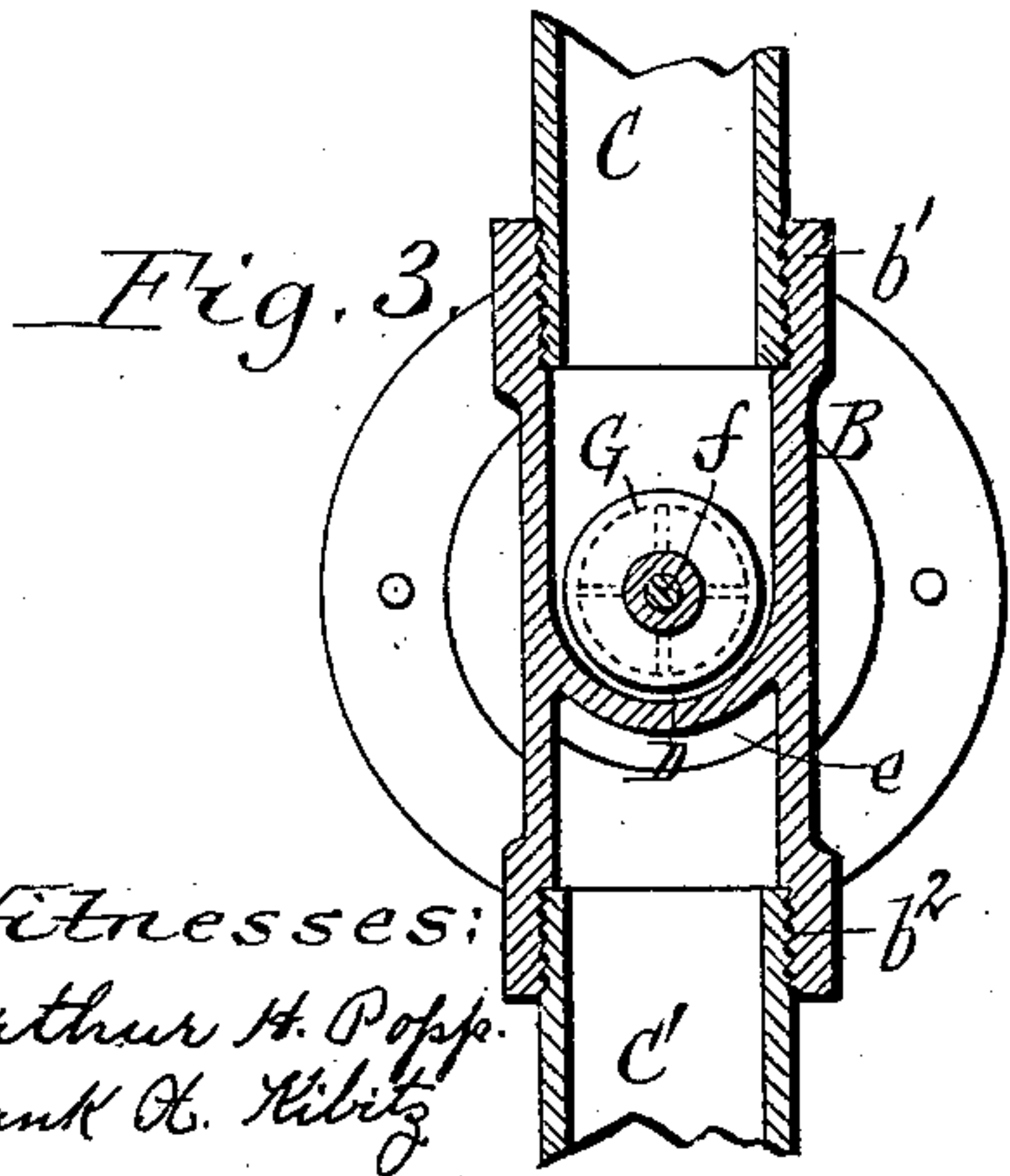
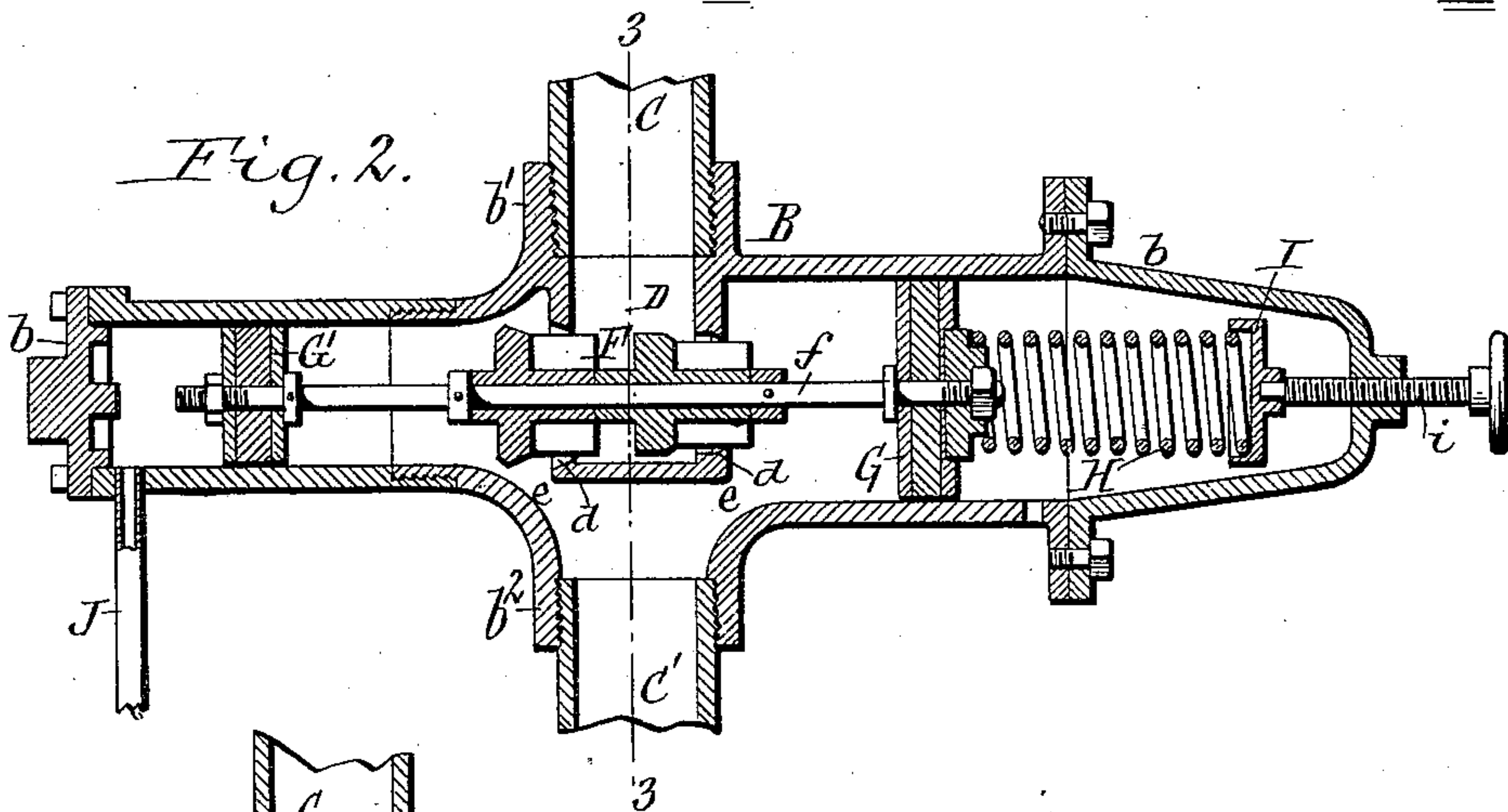
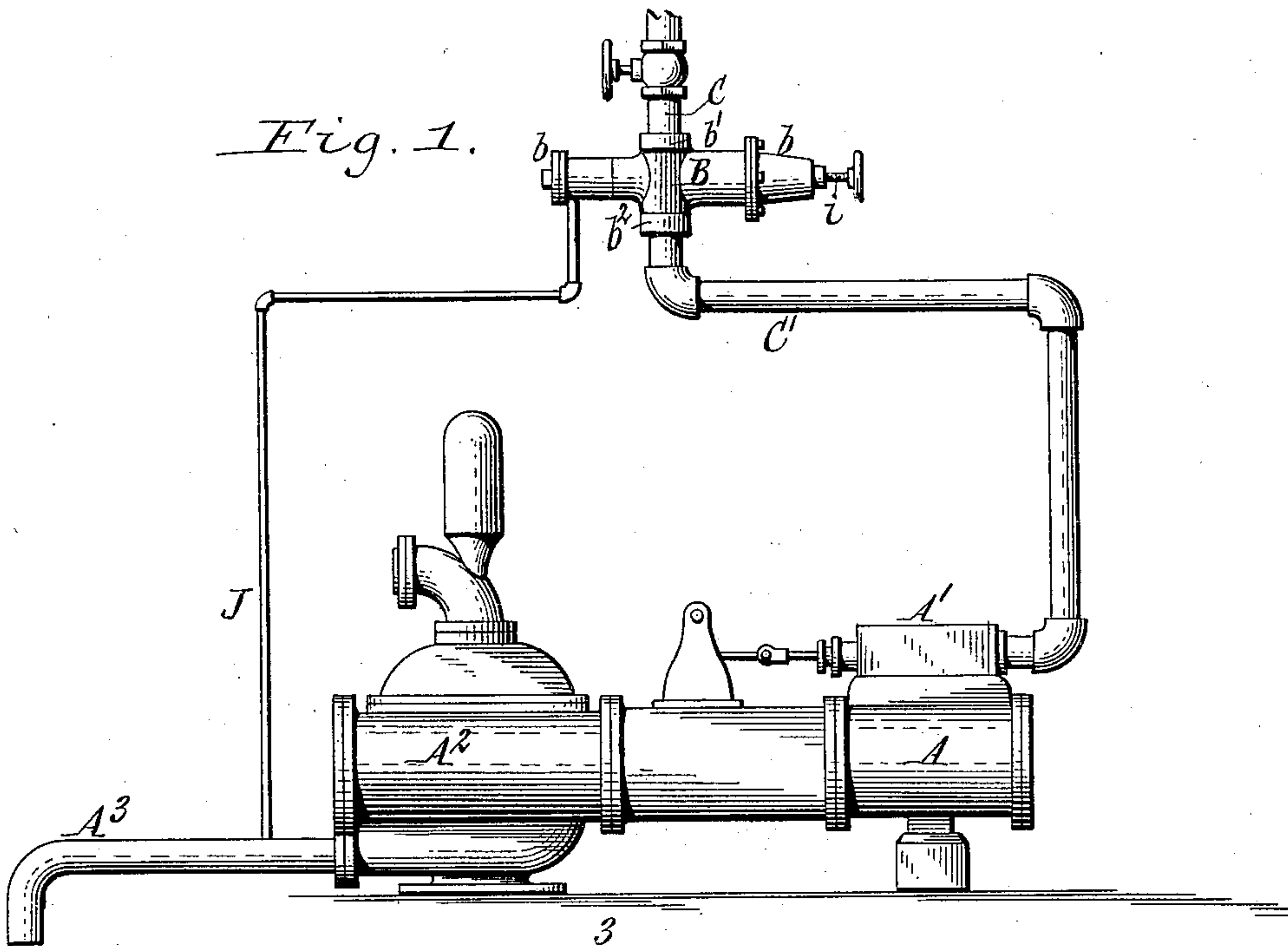


**No. 686,396.**

**Patented Nov. 12, 1901.**

**D. DONOHUE.**  
**PRESSURE GOVERNOR.**  
(Application filed Apr. 17, 1901.)

(No Model.)



Witnesses:  
Arthur H. Popp.  
Frank H. Kibitz.

*Daniel Donohue* Inventor  
*By Eyer & Pope* Attorneys



# UNITED STATES PATENT OFFICE.

DANIEL DONOHUE, OF BUFFALO, NEW YORK.

## PRESSURE-GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 686,396, dated November 12, 1901.

Application filed April 17, 1901. Serial No. 56,286. (No model.)

*To all whom it may concern:*

Be it known that I, DANIEL DONOHUE, a citizen of the United States, residing at the city of Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Pressure-Governors, of which the following is a specification.

This invention relates to a pressure regulator or governor intended more especially for throttling the steam-supply of a pump which draws fluid from a variable or irregular source, such as an oil-storage tank or the bilge-water of a vessel.

The object of my invention is the construction of a simple regulator of this character which is reliable in action.

In the accompanying drawings, Figure 1 is a side elevation of a steam-pump provided with my improved regulator. Fig. 2 is a vertical longitudinal section of the regulator on an enlarged scale. Fig. 3 is a transverse vertical section in line 3 3, Fig. 2. Fig. 4 is a vertical longitudinal section, on a reduced scale, of a slightly-modified construction of the regulator.

Like letters of reference refer to like parts in the several figures.

A is the steam-cylinder, A' the steam-chest, A<sup>2</sup> the pump-cylinder, and A<sup>3</sup> the suction-pipe, of an ordinary steam-pump.

B is the case of the regulator, closed at its ends by heads *b* and provided on opposite sides between its ends with steam inlet and outlet branches *b'* *b*<sup>2</sup>, which are connected by pipes C C' with a steam-boiler and the steam-chest of the pump, respectively.

D is a valve-chamber or double diaphragm arranged transversely in the central portion of the case B in line with the inlet branch *b'* and communicating at its upper end with the steam-supply pipe C. This valve-chamber is closed at its bottom and sides and provided in its front and rear walls with ports *d*, through which the steam passes into the main chamber of the regulator. These ports have suitable valve-seats. The bottom of the valve-chamber D is separated from the bottom of the case by passages *e*, which connect the main chamber of the case with the outlet-pipe C'.

F is a duplex or balanced valve applied to the ports *d* and controlling the passage of the steam from the valve-chamber D into the

body of the regulator. To insure a simultaneous seating of the heads of this balanced valve, one of the same is preferably conical and the other is cylindrical and formed with a slightly conical front edge, the valve-seats being correspondingly shaped, as shown in Fig. 1.

The stem *f* of the throttle-valve passes axially through the ports *d* and is provided on opposite sides of the valve-chamber D with pistons G G', of differential sizes or areas, the portions of the regulator-case in which these pistons slide being constructed of correspondingly-different diameters.

H is a resisting-spring interposed between the rear side of the large piston G and an adjustable follower I, arranged in the case B and tending to open the throttle-valve F. In the construction shown in the drawings the follower I is provided with an adjusting-screw *i*, which passes through a screw-threaded opening formed in the adjacent head of the case and terminates in a hand-wheel for turning it. This follower may be adjusted by any other suitable means, if desired.

J is an exhaust or vacuum pipe leading from the suction-pipe A<sup>3</sup> or the suction-chamber of the pump to the portion of the regulator-case B behind its small piston G'. The current of liquid through the suction-pipe of the pump tends to exhaust the air from the portion of the regulator-case behind the small piston G'.

In the operation of the regulator the steam entering its valve-chamber D passes through the open ports *d* into the portion of the regulator between the pistons G G', and thence into and through the outlet-pipe C' to the pump. The steam-pressure is exerted against the faces of both pistons G G', and owing to the greater area of the large piston the pressure against the same preponderates over that against the small piston, causing the duplex throttle-valve F to be shifted toward its seats and cutting off the steam-supply to the pump more or less. The closing of the throttle-valve by the steam-pressure is opposed by the spring H and also by the vacuum on the rear side of the small piston G', the tension of this spring being regulated to furnish the necessary resistance for reducing the pressure to the desired normal. As the steam-pres-



sure fluctuates the throttle-valve F is automatically opened and closed more or less, supplying steam to the pump at a practically uniform pressure. When the load is removed from the pump by the exhaustion of its source of supply, the pump draws air through its suction-pipe A<sup>3</sup>, and a portion of the air passes through the exhaust-pipe J and enters the regulator-case behind the small piston G', destroying the partial vacuum therein. This correspondingly reduces the resistance upon the throttle-valve encountered by the steam-pressure, and the pressure against the large piston G now overbalances the pressure against the small piston and nearly closes the throttle-valve, thereby preventing racing of the pump when the same runs without a load. The pump continues to run slowly until the bilge-water or other fluid again rises to or above the level of its suction-pipe, when the air is again exhausted from behind the small piston G', thus again increasing the resistance to the steam-pressure, allowing the spring H to open the throttle-valve wider and supplying the necessary pressure for the increased load of the pump.

In the modified construction shown in Fig. 4 the valve-stem f' is provided with a single throttle-valve F', and in this case the valve-chamber D' has but one exit-port d'.

If desired, my improved regulator may in some cases be used without the exhaust-pipe J. When this pipe is omitted, the closing movement of the throttle-valve is resisted by the spring H alone.

The portion or cylinder of the regulator-case which contains the small piston G' is preferably made removable, and the small piston is also removably applied to the valve-stem f' to enable this piston to be replaced by one of greater or smaller diameter relatively to the large piston G for obtaining the desired differential ratio between the pistons.

I claim as my invention—

1. In a pressure-regulator, the combination with a case having an inlet and an outlet, and a diaphragm separating the inlet from the outlet and having a port, of a throttle-valve controlling said port, pistons of differential areas connected with said valve and having their opposing faces exposed to the pressure in the case, a yielding resistance arranged to oppose the closing movement of said valve, an exhaust device, and a pipe connecting the

portion of the case behind said small piston with said exhaust device, substantially as set forth.

2. The combination with a pump and its suction-pipe, of a pressure-regulator comprising a case having an inlet, and an outlet connected with the steam-cylinder of the pump, a diaphragm separating said inlet from said outlet and having a port, a throttle-valve controlling said port, pistons of differential areas connected with said valve and having their opposing faces exposed to the pressure in the regulator-case, and an exhaust-pipe connecting the suction-pipe of the pump with the portion of the regulator-case behind its small piston, substantially as set forth.

3. The combination with a pump and its suction-pipe, of a pressure-regulator comprising a casing having an inlet, and an outlet connected with the steam-cylinder of the pump, a diaphragm separating said inlet from said outlet and having a port, a throttle-valve controlling said port, pistons of differential areas connected with said valve and having their opposing faces exposed to the pressure in the regulator-case, an exhaust-pipe connecting the suction-pipe of the pump with the portion of said case behind its small piston, and a resisting-spring bearing against the rear side of the large piston of the case, substantially as set forth.

4. The combination with a pump and its suction-pipe, of a pressure-regulator comprising a casing having an inlet and an outlet connected with the steam-cylinder of the pump, a diaphragm separating said inlet from said outlet and having a port, a throttle-valve controlling said port, pistons of different areas connected with said valve on opposite sides of said diaphragm, an exhaust-pipe connecting the suction-pipe of the pump with the portion of said case behind its small piston, an adjustable follower arranged behind said large piston, and a spring interposed between said large piston and said follower, substantially as set forth.

Witness my hand this 13th day of April, 1901.

DANIEL DONOHUE.

Witnesses:

THEO. L. POPP,  
ARTHUR H. POPP.