

(No Model.)

2 Sheets—Sheet 1.

F. GRINNELL.

AUTOMATIC FIRE EXTINGUISHING APPARATUS.

No. 372,220.

Patented Oct. 25, 1887.

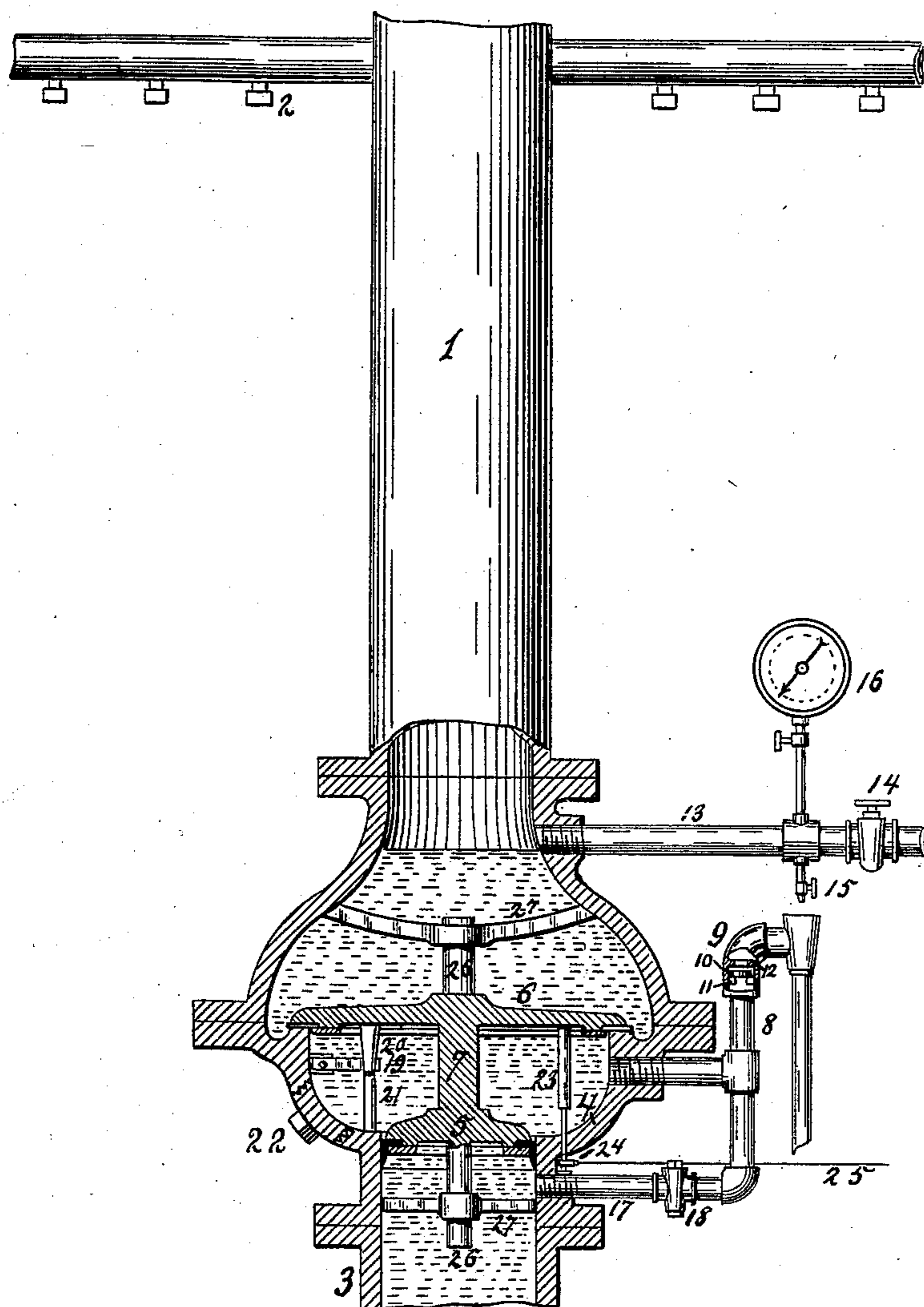


Fig. 1.

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H. C. Thurston.

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Inventor:

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(No Model.)

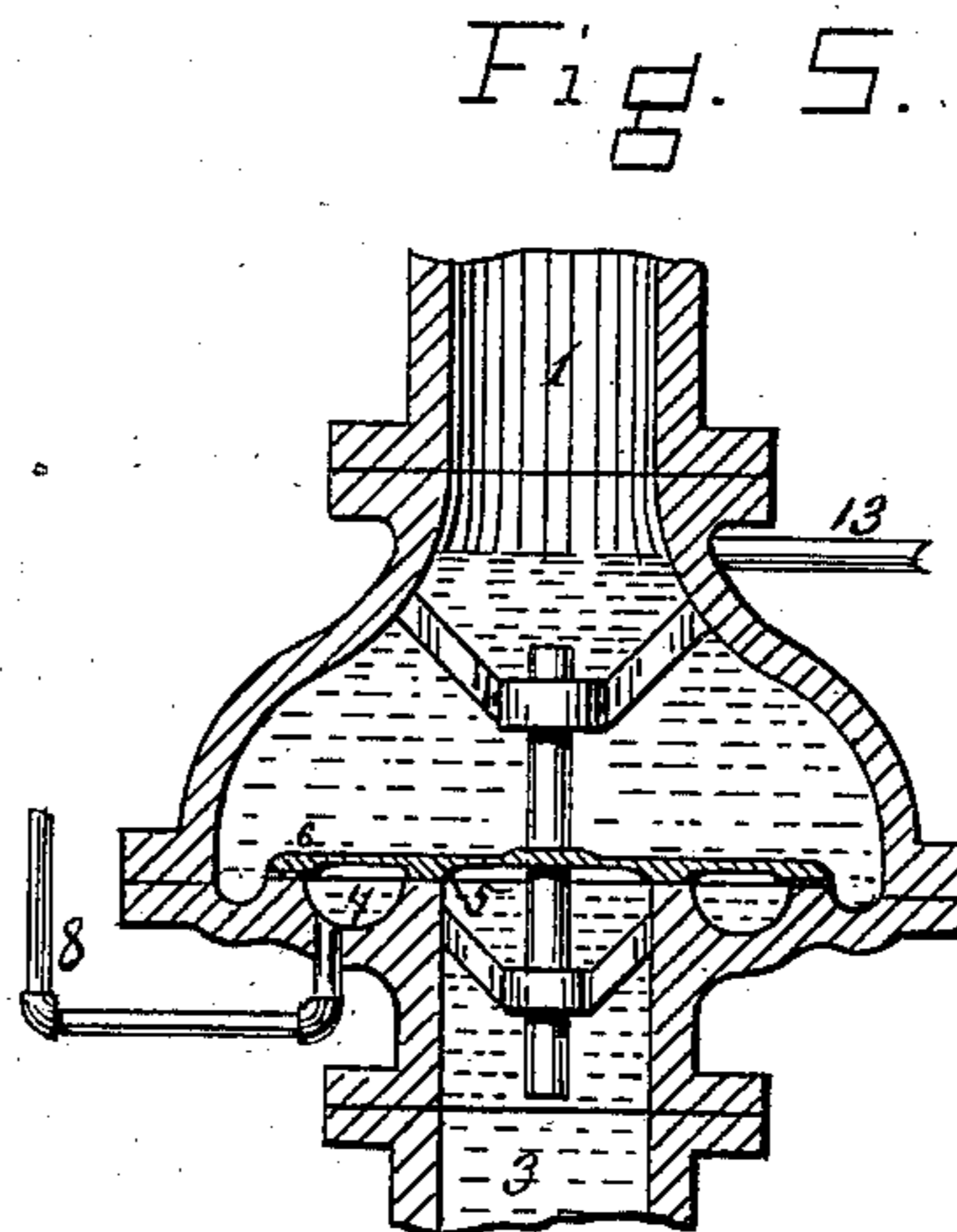
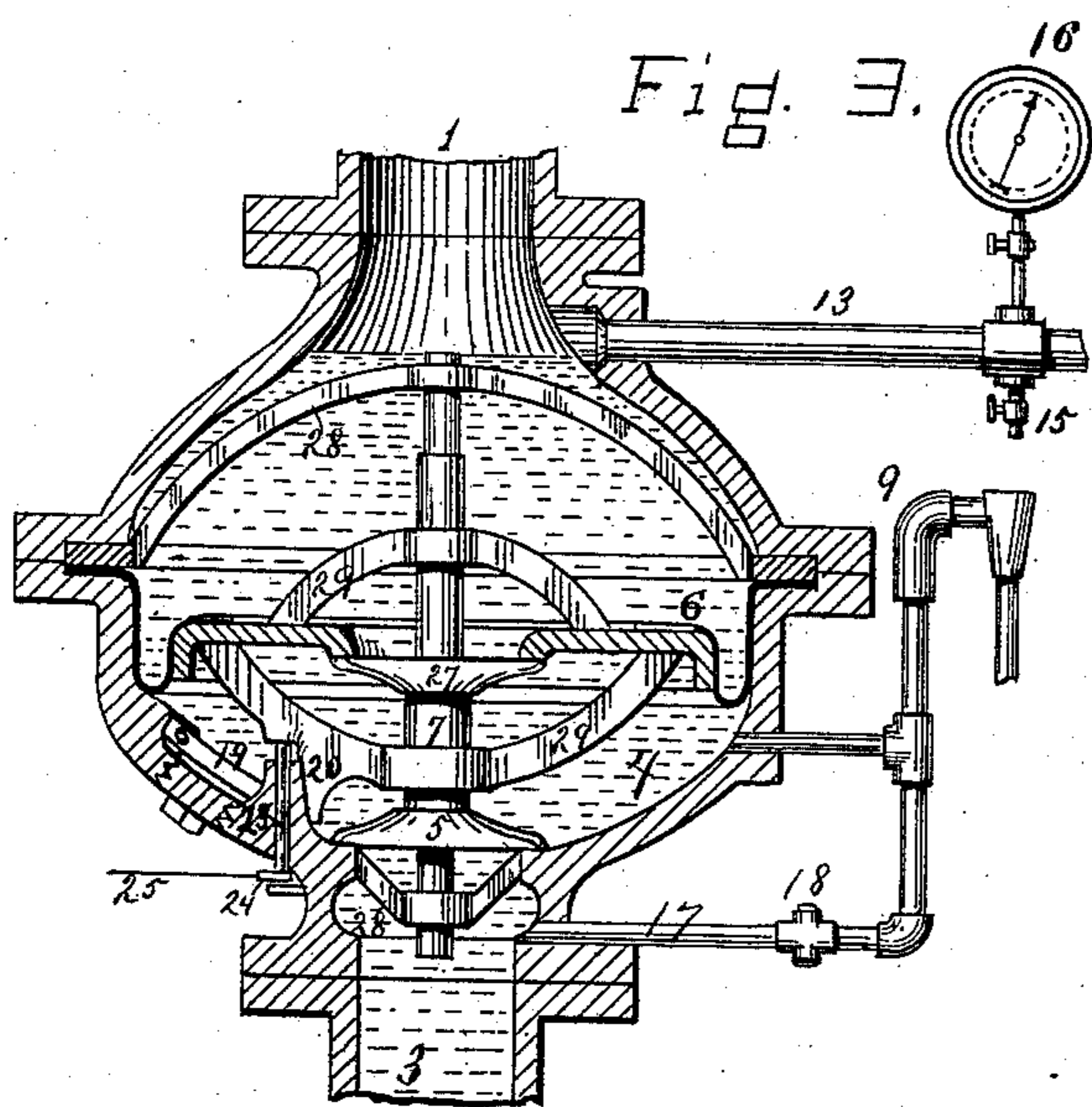
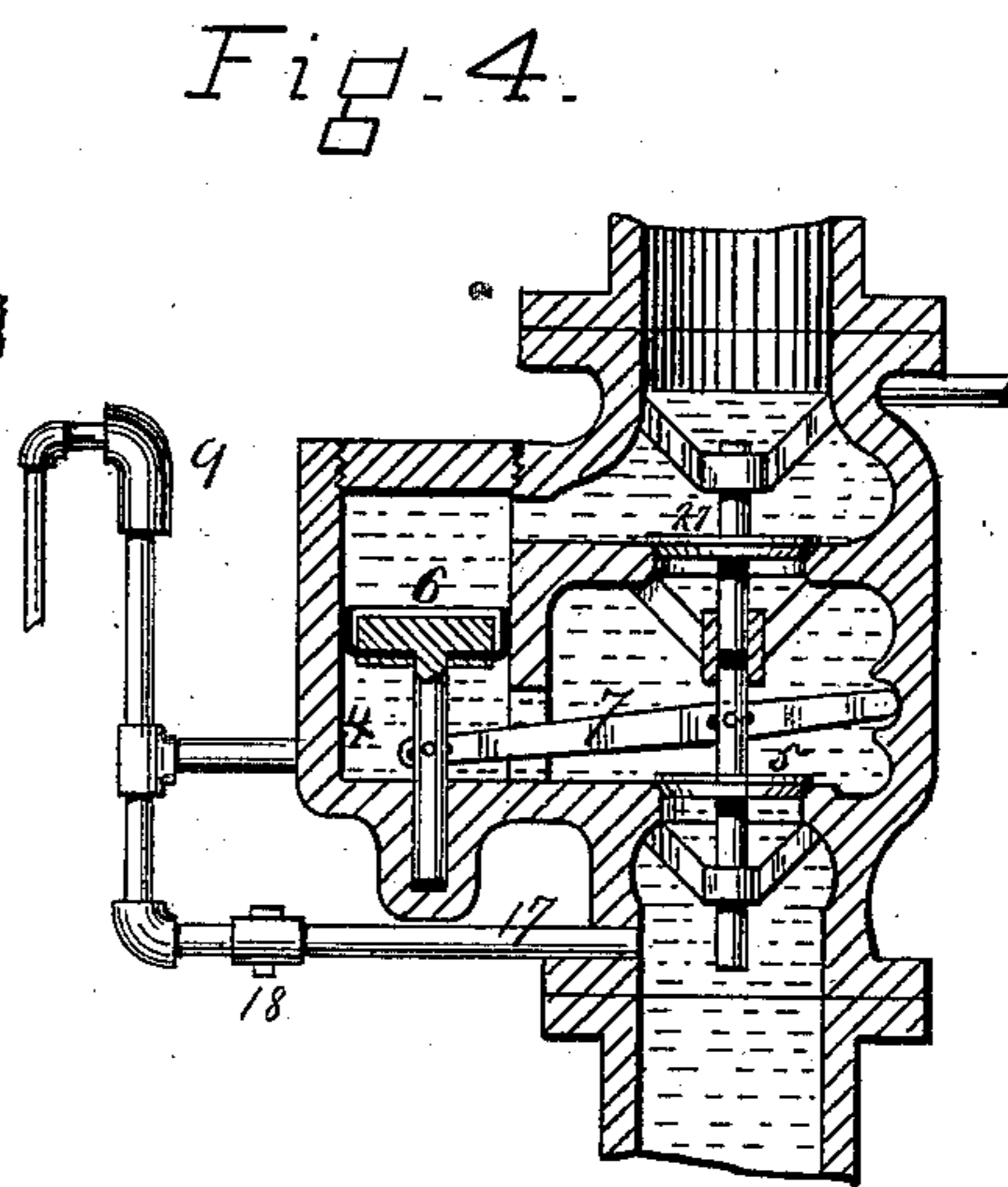
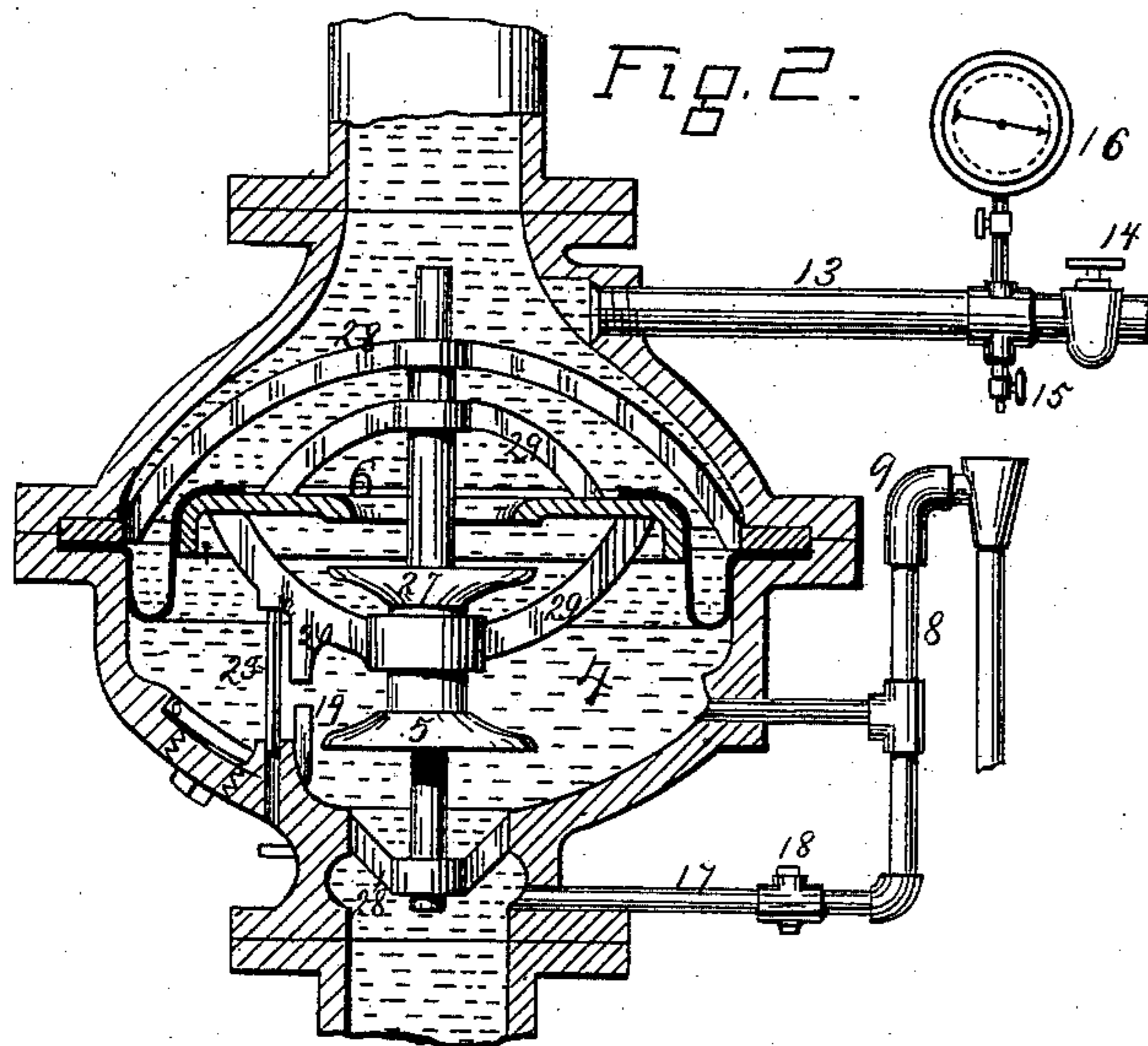
2 Sheets—Sheet 2.

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AUTOMATIC FIRE EXTINGUISHING APPARATUS.

No. 372,220.

Patented Oct. 25, 1887.



Attest,
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Inventor:
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UNITED STATES PATENT OFFICE.

FREDERICK GRINNELL, OF PROVIDENCE, RHODE ISLAND.

AUTOMATIC FIRE-EXTINGUISHING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 372,220, dated October 25, 1887.

Application filed December 30, 1886. Serial No. 222,985. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK GRINNELL, of the city and county of Providence, and State of Rhode Island, have invented a new and useful Improvement in Automatic Fire-Extinguishing Apparatus, of which the following is a specification.

This invention relates to those systems of fire extinguishers in which the distributing-pipes located throughout the building to be protected, and provided with sprinklers opening automatically upon the occurrence of a fire in their vicinity, are filled with air under a light pressure, the water being held in check by a valve of suitable construction under control of the light air-pressure. Such a system was shown in Patent No. 249,171, granted to me November 8, 1881, where the water-valve is shown as held closed through the medium of suitable intervening mechanism by the action of the air-pressure in the distributing-pipes, the release of the said pressure by the opening of one or more of the sprinklers allowing a weight to drop and open the water-valve.

My present invention consists of certain combinations of devices whereby the light air-pressure in the distributing-pipes is made to act in direct opposition to the water-pressure in holding the water-valve closed, thereby doing away with all intervening mechanism and rendering the device simpler and more reliable in operation.

My invention further consists of certain details of construction, hereinafter described.

In the accompanying drawings, Figure 1 represents a sectional view of a fire-extinguishing apparatus embodying my improvement, and showing the valves in their normal or closed position. Figs. 2 and 3 represent, respectively, sectional views, in its open and closed positions, of a modified form of the apparatus. Figs. 4 and 5 show other modifications.

The distributing-pipes 1 and the sprinklers 2 are of the usual construction, the sprinklers being of a character that will open automatically upon the occurrence of a fire in their vicinity—such, for instance, as are shown in various patents granted to me, in which the fusion of a soldered joint allows the internal pressure to force an opening.

Between the distributing-pipe 1 and the water-supply pipe 3, I interpose an intermediate chamber or casing, 4, separated from the water-supply pipe by the water-valve 5, controlled by a valve, 6, or its equivalent means, which, being exposed to the pressure in the distributing-pipes and suitably connected with the water-valve, keeps the latter from opening under the action of the water-pressure until the pressure in the distributing-pipes is released by the opening of one or more of the sprinklers.

I have in Fig. 1 shown a valve, 6, connected to the water-valve 5 by a stem, 7; but it is evident that there are other suitable means, substantially equivalents of those shown, that may be employed to accomplish the same result.

In the modification shown in Figs. 2 and 3 I use a diaphragm, 6, for holding the water-valve closed, and both in this form and the one shown in Fig. 1 I make the member 6 enough larger in area than the water-valve to more than compensate for the excess of the water-pressure per square inch over that of the air-pressure. The diaphragm is provided with a water-passage through its center, and this passage is normally closed by the diaphragm seating down on a second valve, 27, supported upon the water-valve. These valves 5 and 27 have a common stem, 7, the extensions of which slide in guide-yokes 28, and the diaphragm is similarly guided by yokes 29, embracing the valve-stem.

Fig. 4 represents another modification, and in this instance, instead of making the member 6 larger in area than the water-valve, I give it a mechanical advantage over the water-valve by causing it to act upon the outer end of a lever, the inner end of which bears down upon the stem of the water-valve. In this figure I have shown the member 6 as a piston, and I wish it to be understood that I consider valves, pistons, and diaphragms as equivalents for this purpose. The stem of the piston presses down upon the outer end of lever 7, fulcrumed, as shown, in the casing, and at a point nearer the fulcrum the lever is connected to the stem of the water-valve, so that the light air-pressure above the piston 6 is multiplied by this leverage so as to withstand the much greater water-pressure, even though the piston may not be larger than the water-

valve. A check-valve, 27, closes a port between the intermediate chamber, 4, and the distributing-pipes, so as to restrain the light air-pressure, and yet permit the water to flow freely to the distributing-pipes when valve 5 opens.

In Fig. 5 a modification of the form shown in Fig. 1 is illustrated. In this form the valves 5 and 6 are formed in one single disk having two valve-seats, and the intermediate chamber, 4, is reduced to a simple annular space between the two seats. Thus it will be seen that the gist of this invention consists of means for holding the water in check by opposing directly to the water-pressure the lighter air-pressure in the distributing-pipes. The intermediate chamber, 4, is designed to contain air or water under a pressure less than that in the distributing-pipes, preferably about atmospheric pressure, so that the movable member 6 will not be prevented from exerting its proper pressure on the water-valve. To insure this I provide a drip-pipe, 8, which allows a free leakage from said chamber, so that even if the valve or valves should not fit perfectly tight the small amount leaking past them would easily escape. This drip-pipe is preferably provided with a check-valve, 9, which is so constructed that any considerable increase in pressure—such as arises when the water-valve is open—will close the said pipe and thus prevent the further escape of water therethrough. This check-valve consists of a disk, 10, resting normally on pins or studs 11, so as to allow of a free passage of water around it, but closing up against a seat, 12, when the "head" of water exceeds a certain amount. A pipe, 13, leads from the lower part of the distributing-pipe and has a cock, 14, whereby the system of pipes may be freed from water down to that point. The distributing-pipes may be charged with air under pressure by attaching an air-pump to pipe 15, and the gage 16 serves to indicate at any time the pressure in the system. A by-pass, 17, having a stop cock, 18, enables one to turn the water into the distributing-pipes and intermediate chamber when desired.

In order to prevent the valve from returning to the seat after once it has opened I provide a stop in the form of a spring, 19, which normally rests against a stud, 20, depending from the valve 6, and which passes in between said stud and another stud, 21, when the valve opens, and prevents it from closing. To close the valve it is then necessary to take out one of the hand-hole plugs 22 and push aside the spring, and in doing this the attention is called to any sediment or other obstruction on the valve-seats. A rod, 23, depending from the valve 6 through a hole in the casing or chamber 4, passes through a ring, 24, to which is attached a cord or wire, 25, that holds in check a suitable alarm mechanism, and releases the same when the valve lifts.

The water-valve is shown as a cup-valve in Fig. 1, because this form of valve allows of a certain amount of movement—sufficient, say,

to release the alarm mechanism—before the water escapes. This form of valve also allows of a more accurate fitting of the controller-valve 6. It is desirable to have the water stand normally in the pipes about as shown, and it will be seen that the arrangement of pipes and cocks is such as to leave it so.

When a fire occurs in any part of the building, the nearest fusible joint is melted, and the air escaping through the sprinkler thus opened relieves the distributing-pipes from pressure, and the water in supply-pipe 3, not being any longer opposed by a pressure above member 6 opens valve 5, carrying with it member 6, and, passing up through the distributing-pipes, discharges through the open sprinkler and extinguishes the fire.

The means which I employ for directly opposing the light air-pressure in the distributing-pipes to the water-pressure of the supply-pipe consists in every instance of a reciprocating cut-off, 6, acted upon by the light air-pressure, the said reciprocating cut-off in turn acting directly upon the water-valve, giving, either by virtue of its superior area or its greater leverage, sufficient advantage to the light air-pressure to more than overbalance the opposing water-pressure until such air-pressure is reduced by the opening of one or more of the automatic sprinklers.

The operation of the device is independent of any external or indirect mechanism, it depending solely upon the condition of the sprinklers and the opposing pneumatic and hydraulic forces.

In describing the reciprocating cut-off 6 as acting directly upon the water-valve to hold it to its seat, the word "directly" is used to distinguish this invention from other systems in which the release of the air-pressure simply allows other forces to be brought into action for forcibly opening the water-valve. It should also be understood that it is essential to this invention that the distributing-pipes themselves be charged with air-pressure, so that a balance between the air and water pressures may be effected entirely within the conduit and the prompt and certain opening of the water-valve insured by the simple release of one of these balancing-pressures.

By the expression "light air-pressure" I mean air or gas under a pressure light as compared with the water-pressure in the supply-mains.

It will be seen that all the essential features of the device are completely inclosed within the walls of the conduits, so that they are rendered much less liable to molestation.

I do not make in this case any specific claims upon the construction shown in Figs. 2 and 3, such claims having been made by me in another case filed of even date herewith and serially numbered 222,983.

Having thus described my invention, what I claim as new is—

1. The combination of the water-supply pipe, the distributing-pipe having hermeti-

10 cally-sealed automatic sprinklers attached and
charged with light air-pressure, the water-
valve closing the supply-pipe, a reciprocating
cut-off connected to the water-valve, having
5 one side exposed to the light air-pressure in
the distributing-pipe and of sufficient area to
balance by said light air-pressure the water-
pressure upon the water-valve until released
by the opening of the automatic sprinklers,
10 and means permitting the passage of water
past or around said valve and cut-off when so
released.

15 2. The combination of the water-supply
pipe, the distributing-pipe having hermeti-
cally-closed automatic sprinklers attached and
charged with light air-pressure, an interme-
diate chamber or casing under a less pressure
than that in the distributing-pipe, and a valve
20 closing a port between said intermediate cham-
ber and the water-supply pipe, and connected
to a reciprocating cut-off between the said
chamber and the distributing-pipe of suffi-
ciently large area to prevent by the light air-
pressure to which it is exposed the opening of
25 the water-valve to which it is connected,
whereby the decrease in the air-pressure con-
sequent upon the opening of a sprinkler will
allow the water to open the water-valve and
operate directly upon the reciprocating cut-off.

30 3. The combination of a water-supply pipe,
a distributing-pipe charged with light air-
pressure, an intermediate chamber or casing
between the two pipes normally open to the
atmosphere, a water-valve closing an opening

between the supply-pipe and said chamber, 35
and a reciprocating cut-off closing a larger
opening between the distributing-pipe and
said chamber and connected to the water-valve,
so as to hold it in its closed position by the
40 direct action of the pressure in the distribut-
ing-pipes.

4. The combination, with the water-supply
pipe connected with a source of water under
pressure and the distributing-pipes charged
with air under a less pressure, of an interme- 45
diate chamber having about atmospheric press-
ure, and a differential check-valve or cut-off
interposed in said conduits, the smaller valve
closing a port into the water-supply pipe from
the intermediate chamber, and the larger valve 50
closing a larger port into the distributing-
pipe from said chamber.

5. The combination of a water-supply pipe,
the distributing-pipe charged with light air-
pressure, a valve closing the water-supply 55
pipe and opening by the direct action of the
water-pressure when released, a reciprocating
cut-off connected directly to said valve and
acted on by the light air-pressure to keep said
valve closed, and a check or stop preventing 60
the closing of the valve after it has been opened
by the water-pressure, substantially as de-
scribed.

FREDERICK GRINNELL.

Witnesses:

W. H. THURSTON,

W. H. KNIGHT.