

No. 694,374.

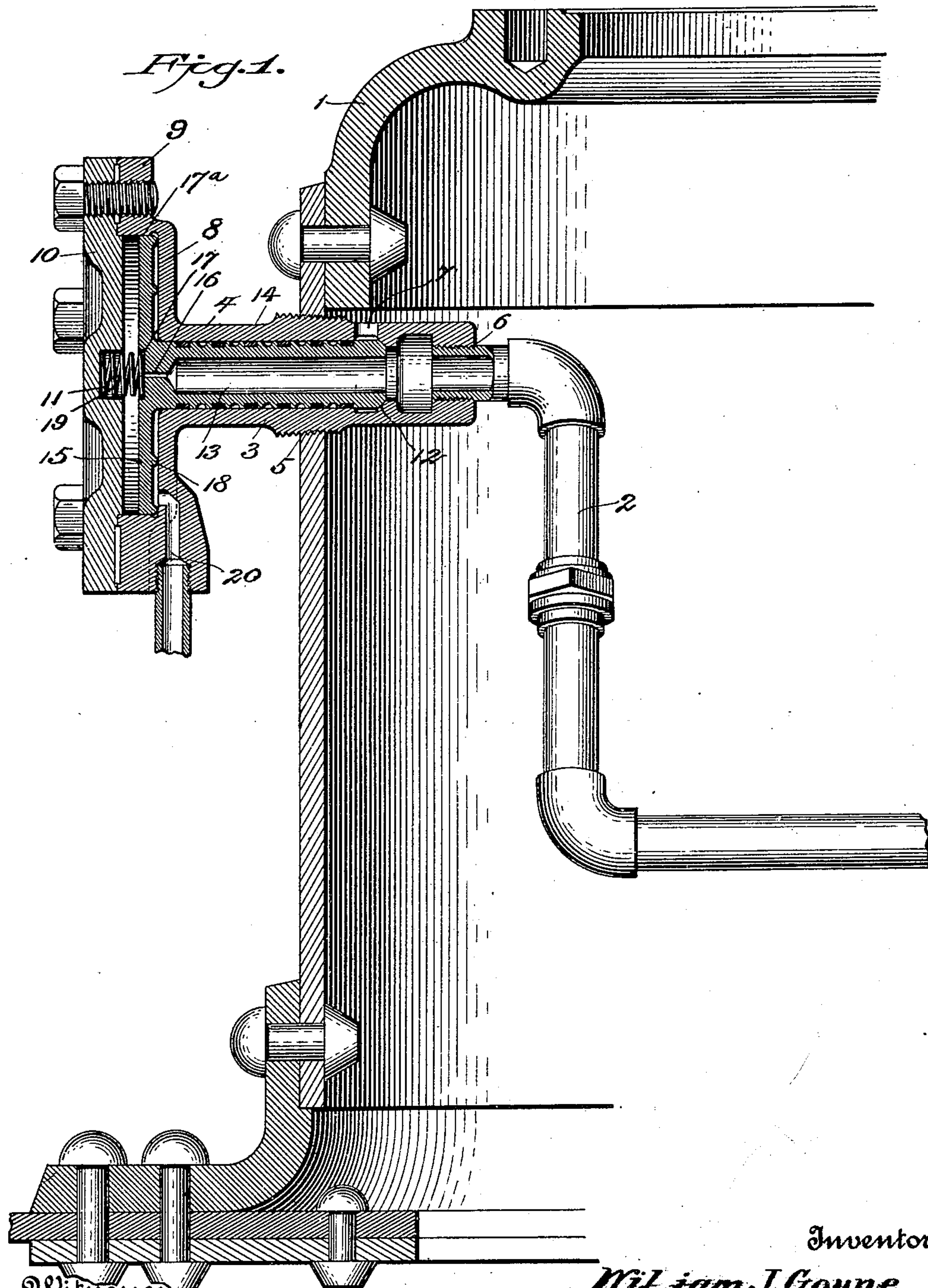
Patented Mar. 4, 1902.

W. J. GOYNE.
RELIEF VALVE.

(Application filed Oct. 26, 1900.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses
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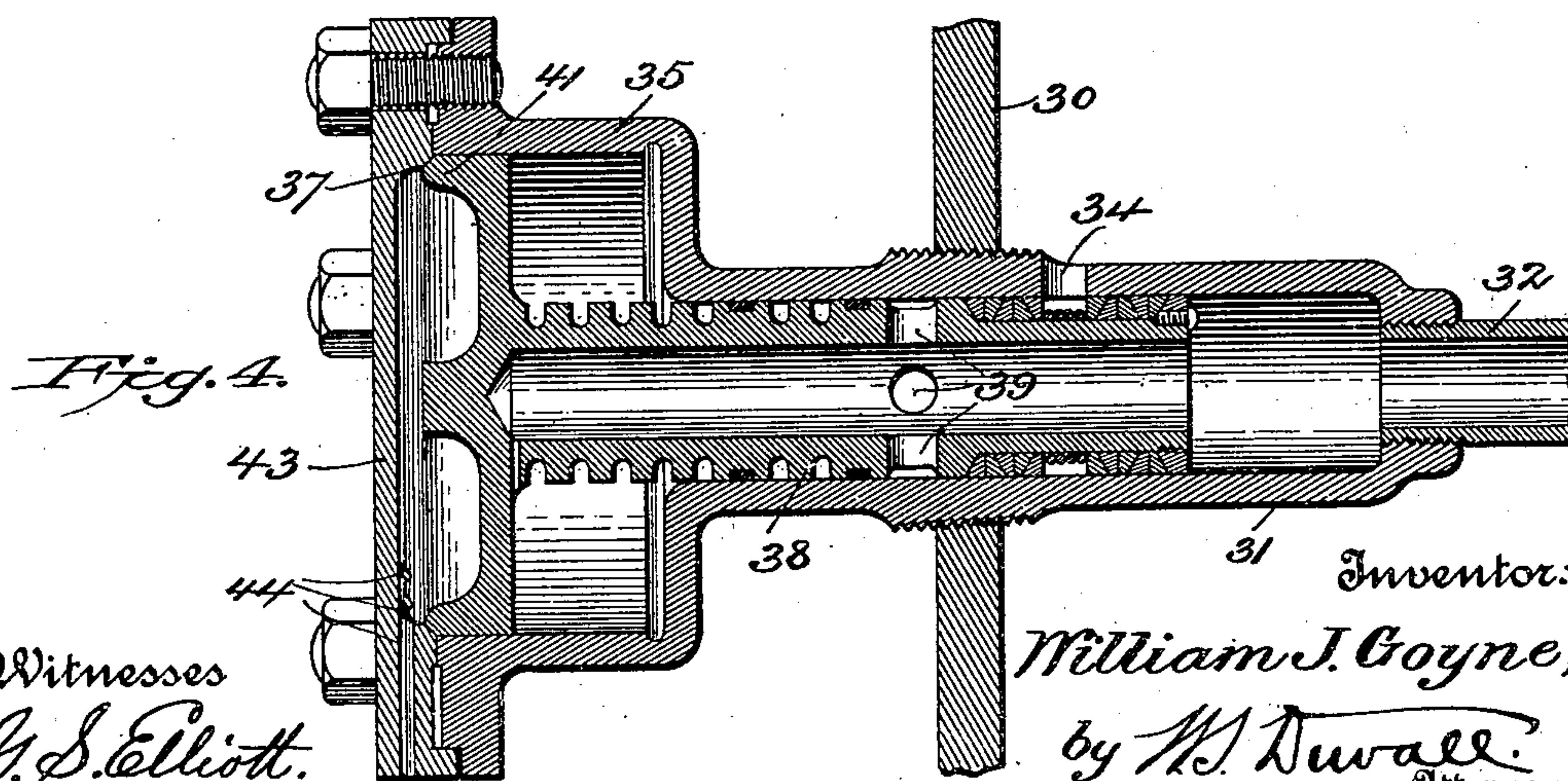
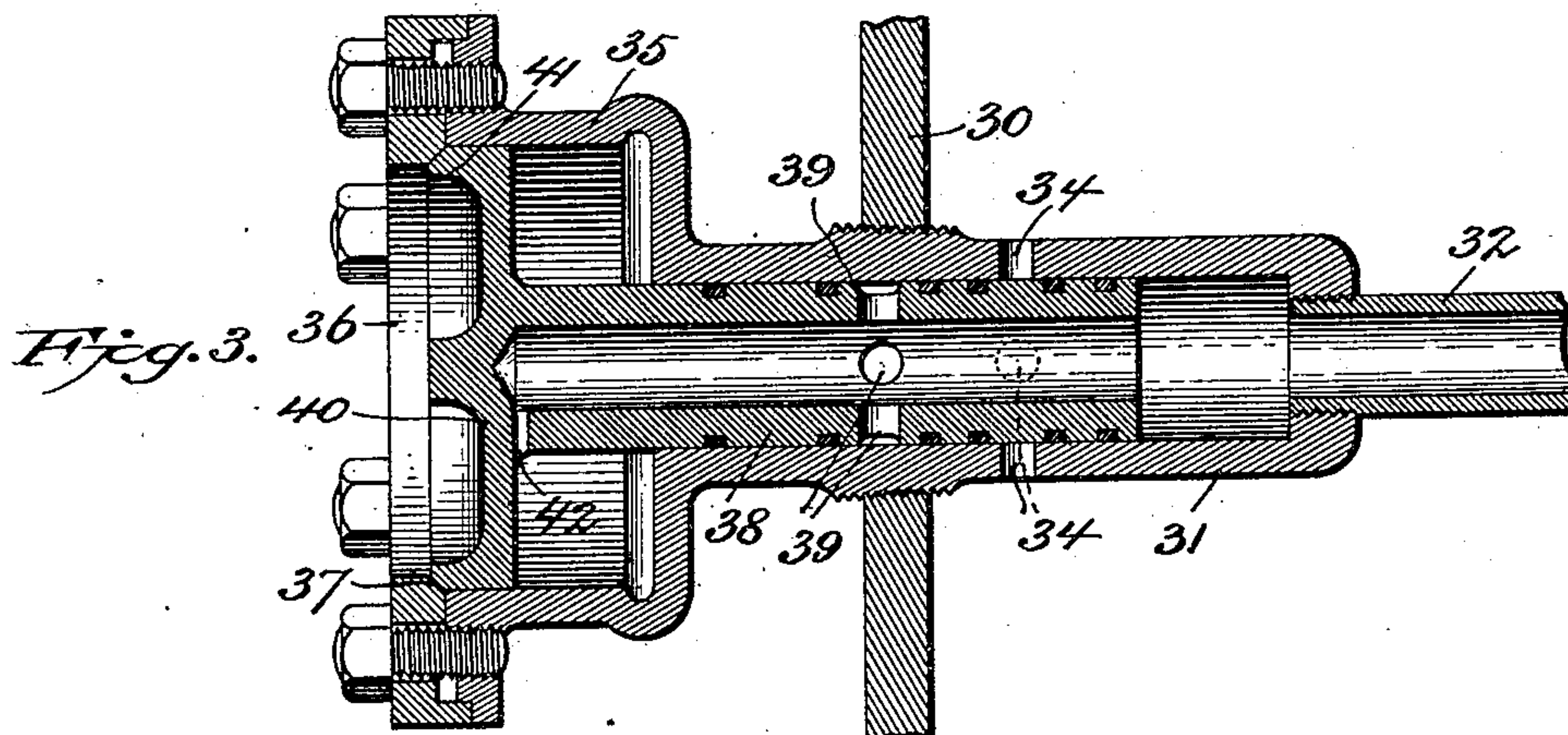
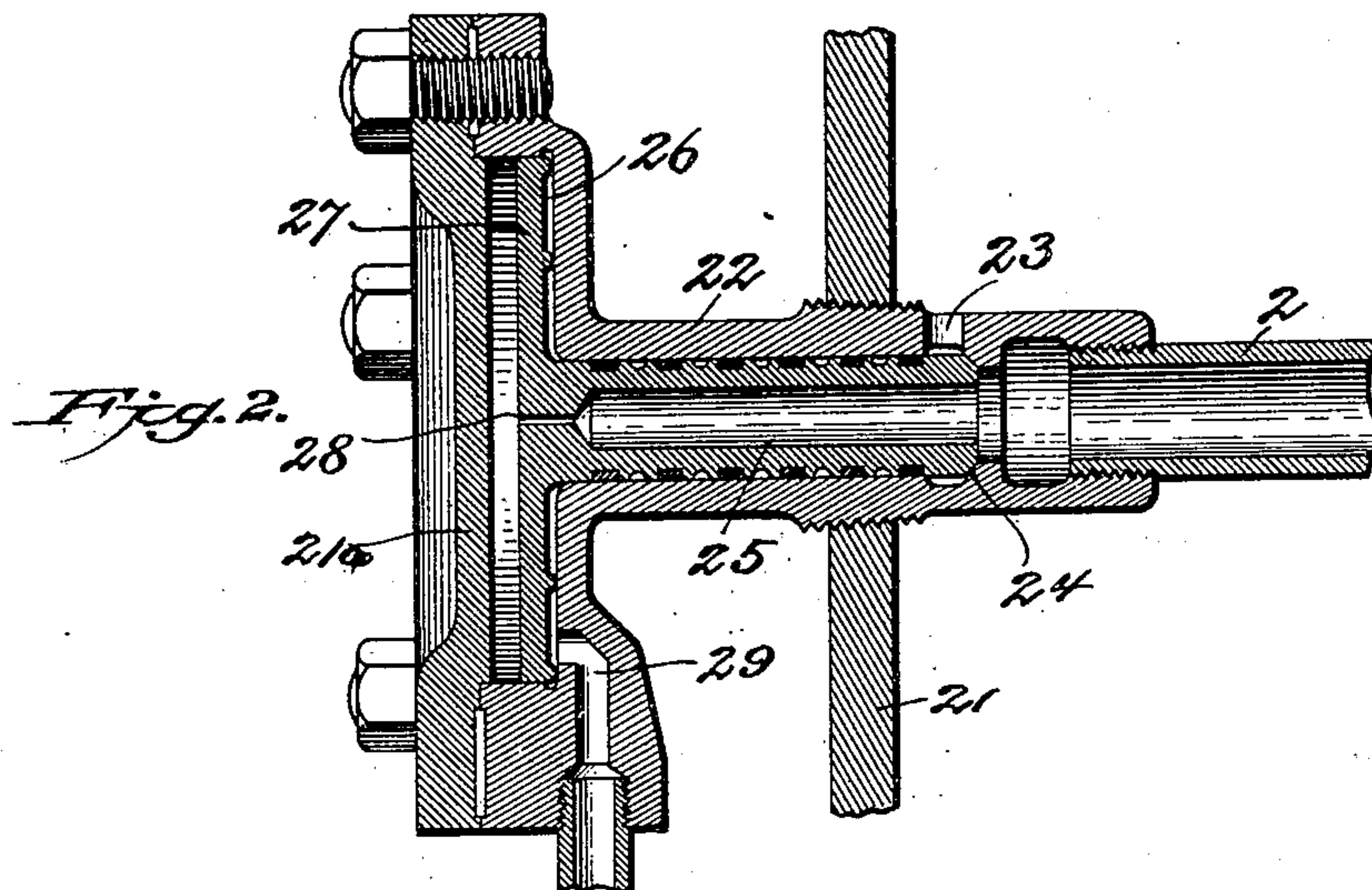
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W. J. GOYNE.
RELIEF VALVE.

(Application filed Oct. 28, 1900.)

(No Model.)

2 Sheets—Sheet 2.



Witnesses
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UNITED STATES PATENT OFFICE.

WILLIAM J. GOYNE, OF BARTONHEIGHTS, VIRGINIA.

RELIEF-VALVE.

SPECIFICATION forming part of Letters Patent No. 694,374, dated March 4, 1902.

Application filed October 26, 1900. Serial No. 34,493. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM J. GOYNE, a citizen of the United States, residing at Bartonheights, in the county of Henrico and State of Virginia, have invented new and useful Improvements in Relief-Valves, of which the following is a specification.

My invention relates to relief-valves for steam-cylinders of locomotive and other types of engines; and the objects in view are to produce an automatically-operating steam relief-valve for preventing the formation of a vacuum in cylinders of engines after the steam has been shut off at the throttle-valve or otherwise.

Various other objects and advantages of my invention will hereinafter appear and the novel features thereof will be particularly pointed out in the claims.

Referring to the drawings, Figure 1 is a vertical sectional view through the dome of a steam-boiler, (that of the locomotive type,) the same being provided and connected up with a relief-valve constructed in accordance with the preferred embodiment of my invention. Figs. 2, 3, and 4 are longitudinal sectional views of modified embodiments of my invention.

Similar numerals of reference indicate similar parts in all the figures of the drawings.

1 designates the shell of a boiler, in this instance the dome of a locomotive-boiler, and 2 a steam relief-pipe, which leads to a steam-cylinder (not herein shown) and connects the same with the inner end of a valve-case 3.

The valve-case 3 comprises a cylindrical tubular portion 4, which at an intermediate point may be externally threaded in an opening 5, formed in the boiler, and at its inner end or that within the boiler is coupled at 6 to the steam relief-pipe 2; before mentioned. At an intermediate point within the boiler the valve-case 3 is provided with a steam-port 7, and outside of the boiler said case terminates in an enlarged chamber 8, having a surrounding flange 9, to which may be bolted or otherwise secured a cover 10, which may have formed on its inner side a centrally-located cavity or seat 11. The valve-case 3 is further provided immediately in rear of its steam-inlet port 7 with an internal annular valve-

seat 12, which communicates with the steam relief-pipe 2.

Mounted and adapted to reciprocate within the valve-case 3 and while shorter than yet conforming to the same in cross-section is the hollow or tubular stem 13 of the valve. The rear or inner end of this stem is beveled to conform to the seat 12, with which it communicates, while at its outer end the stem carries or merges into an annular piston 15, provided at its center with a small exhaust-port 16, which forms a means of communication between the interior of the tubular valve and the said chamber 8 and is surrounded by a countersink or seat 17.

Between the periphery or edge of the annular piston and the surrounding wall of the enlarged chamber 8 a ground joint 17^a is formed, and between this joint and the center of the piston the latter may be provided at its rear side, if desired, with a superficial ring 18. The piston is preferably made slightly flexible, so that it will fit accurately the chamber 8 and at the same time its stem at its rear ground end will accurately fit the seat 12, and it is to insure this accuracy of the parts that I prefer to provide the ring 18. Ordinarily the ring does not touch the wall of the valve-case; but should the pressure become so great as to spring the light piston then, and then only, will the ring bear against the valve-case and prevent the piston from springing any farther. I also prefer to employ a spring 19, seating the ends of the same in the opposite countersinks 10 and 17, formed in the cover and piston, respectively. The spring is light and is intended to keep the valve closed against its seat, notwithstanding any slight imperfection that may exist between the rear end of the stem and the seat 12. Should this spring be omitted and such an imperfection in the valve-seat exist, steam might enter at the seat and having a small area upon which to act might accidentally open the valve and admit steam when it was not desirable. The stem between its ends may be provided with any desired style of packing to insure close contact between the stem and the valve-case, such being mere detail of workmanship.

At a suitable point the chamber 8 is pro-

vided with an air-inlet 20, the same being located in rear of the piston of the valve for the purpose of admitting air at that point.

The operation of the invention in its preferred embodiment may be briefly stated as follows: By closing the throttle or operating any other mechanism for cutting off the supply of steam to the cylinder a partial vacuum is formed therein and in the steam relief-pipe 2, and air entering the chamber through the air-port 20 and acting against the rear face of the piston 15 of the valve causes the latter to move forward, thereby uncovering the steam-inlet port 7 and admitting live steam from the boiler to the valve, steam relief-pipe 2, and the steam-cylinder. The steam instantly destroys the vacuum and exhausts from the valve through the small port 16 to the chamber 8 in front of the piston, and therefore to the opposite side of the piston to where the air-pressure exists, so that the steam thus exhausted serves to close or return the valve to its seat and close the steam-inlet port 7, the steam being subsequently exhausted back through the port 16 when a vacuum or any other means may be provided for this purpose.

In Fig. 2 the same construction is employed as before described, except that the spring 19 and its seats in the cover 10 and piston 15 are omitted; also, the operation is the same. In said figure of the drawing, 21 designates the boiler; 22, the valve-case, located and threaded in the latter and within the boiler provided with the steam-inlet port 23. The case of the valve terminates at its outer end in the enlarged chamber 26, to which is bolted or otherwise secured the cap or cover 21^a, and in rear of the steam-inlet port the case is further provided with the internal valve-seat 24. The hollow stem 25 of the valve is ground at its rear open end to fit the seat 24 and terminates in the chamber 26 in a piston 27, the edge of which is accurately fitted to the said chamber. The piston is provided with the steam-exhaust port 28, and the wall of the chamber 26 is provided with an air-inlet 29, communicating with said chamber in rear of the piston.

In the embodiment of my invention illustrated by Fig. 3, 30 designates the boiler; 31, the valve-case, threaded or otherwise secured at an intermediate point therein and having connected to its rear or inner end the steam-relief pipe 32, leading to the steam-cylinder. (Not shown.) The valve-case is provided at a point within the boiler with a steam-inlet port or ports 34, and at its outer end beyond the boiler with an enlarged annular chamber 35, at the extremity of which may be bolted or otherwise secured a flanged ring 36, provided with an internally-beveled seat 37, which forms a stop or seat for the valve. The valve comprises a tubular stem 38, open at its rear end and suitably packed and located for reciprocation within the shell or casing 31 and provided with steam-inlet ports

39, which are closed when the valve is in its forward position, but which are in open communication with the boiler by registering with the steam-inlet ports 34 when in its rear-most position. At its front end the stem merges into or carries a piston 40, which accurately fits the annular chamber 35 and may be provided with a ground beveled flange 41, which accurately fits against the stop or seat 37, thereby forming a ground joint. The operation of this embodiment of my invention is as follows: A partial vacuum being formed in the relief-pipe 32 and steam-cylinder, atmospheric pressure acting against in this instance the outer face of the piston 40 causes the valve to move inward until the ports 34 and 39 register. This allows steam to enter the valve, steam-relief pipe, and cylinder, immediately destroying the vacuum, the steam gaining access to the chamber 35 and the rear of the piston, whereby the latter is acted upon through the small exhaust-port 42, formed in the valve-stem immediately back of the piston. In this manner the steam acts to close the valve against atmospheric pressure.

In Fig. 4 the construction and operation of the embodiment shown therein are the same as those just described, with the exception that for the ring 36 in Fig. 3 is substituted the cap or cover 43, which may be either bolted or otherwise secured to the chamber of the valve. With this exception, therefore, the same description applies to both constructions. The cap 43 precludes the possibility of dust entering and interfering with the free movements of the valve, and for the purpose of admitting atmospheric pressure it may be provided with one or a plurality of air-inlets 44.

My improved valve, it will be observed, is intended to replace the air relief-valves usually employed in steam chests and cylinders of locomotive and other types of engines. It is well known among those conversant with the subject that the sudden change of temperature caused by letting cold air into the cylinder through the usually-employed relief-valve causes an unequal contraction or shrinkage of the same and many times resulting in a fracture or cracking of the cylinder, usually through the saddle, and also results in a loosening of the bolts in the frames. In addition to these disadvantages or objections there is the condensation of steam and the drying up of oil to be considered, which disadvantages and objections become most important in the locomotive type of engine, which is subject to long fast runs downgrade when the throttle is closed. A further disadvantage and objection to the usual type of relief-valves is the quantity of dust drawn into the cylinders, resulting in the early cutting out of the valves, pistons, cylinders, packings, and rods.

With my improved steam relief-valve as

soon as the throttle is closed and a partial vacuum, however small, is formed the valve automatically opens to admit live steam to the relief-pipe and cylinder and again automatically closes as soon as the pressure in the relief-pipe and cylinder goes up a fraction of a pound, thereby retaining about atmospheric pressure in the steam relief-pipe and cylinder. The result is that the cylinders are kept hot, and when the throttle is again opened there is not the condensation that now takes place nor the unequal contraction nor the admission of dust and air to injure the working parts, and finally the steam assists in lubricating instead of drying up the oil.

It is to be remembered that I prefer to merely substantially maintain in the cylinders about atmospheric pressure, and consequently but little steam will be exhausted when condensation takes place, which is unobjectionable.

Having described my invention, what I claim is—

1. The combination with a boiler, a valve connected therewith and adapted to receive steam therefrom, and a steam relief-pipe leading therefrom and to a steam-cylinder, of means for opening the valve automatically by atmospheric pressure at one side of the valve and admitting steam thereto and to the relief-pipe from the boiler when a partial vacuum is formed in said relief-pipe, and means for directing said steam to the opposite side of said valve for closing the same after such admission of steam.

2. The combination of a boiler, a relief-valve connected therewith, a steam relief-pipe connected to the valve and leading to a steam-cylinder, means for opening the said valve by atmospheric pressure so as to admit steam from the boiler to the valve and relief-pipe upon the formation of a partial vacuum, and for closing the same by steam-pressure after a destruction of said vacuum, said exhaust-steam pressure acting upon the opposite side of the valve to that acted upon by said steam.

3. The combination with a boiler, a valve connected therewith and adapted to receive steam therefrom, and a relief-pipe leading from the valve to a steam-cylinder, of means for opening the valve automatically by atmospheric pressure by air admitted in rear of the valve, and for closing the same automatically thereafter by steam admitted in front of said valve.

4. The combination with a boiler, a valve-case located in the wall and extending at each side thereof and provided within the boiler with a steam-inlet port, and a relief-pipe connected with the casing back of the port, of a reciprocating valve mounted to slide in the case and adapted to close said port, means for automatically opening the valve to admit steam from the boiler to the pipe when a partial vacuum is formed in the latter, and for

automatically closing the valve against its seat subsequent to such opening.

5. The combination with a boiler, a valve-case provided with a steam-inlet port in communication with the boiler, and at its front or outer end terminating in an enlarged chamber, and at its rear inner end connected with a relief-pipe leading to a steam-cylinder, of a valve terminating in a piston fitting said chamber and having a stem fitting the case and adapted to open and close the steam-inlet port, and means for admitting atmospheric pressure to one side of the piston to move the same in a direction to uncover the port when a partial vacuum is formed in the relief-pipe, and means for conducting steam to the opposite side of the piston to effect a closing of the said port after the destruction of said vacuum.

6. The combination with a boiler and a cylinder relief-pipe, of a valve-case located in the wall of the boiler and extending to each side of the same and connected at its inner end to said pipe, said casing being provided within the boiler with a steam-inlet port, and at its opposite or outer end provided with an enlarged closed chamber in communication with the outer atmosphere, a hollow valve mounted to slide in the case and adapted to close the said port thereof, and provided with a piston fitting the said chamber and with an exhaust-port at the piston end thereof also in communication with the chamber but at an opposite side of the piston at which the chamber communicates with the atmosphere, whereby, upon the formation of a partial vacuum in the relief-pipe the atmospheric pressure will act against the piston to move the valve from over the steam-inlet port, and subsequently the steam exhausting in the chamber will act on the opposite side of the piston to close said steam-inlet port.

7. The combination with a boiler, a steam-relief pipe, and a valve-case located in the wall of the boiler and connected to said pipe, said valve-case having the internal valve-seat 12, steam-inlet port 7, and enlarged chamber 8, having an air-port at the rear side thereof, and the cap or cover for said chamber, of the tubular open-end valve 13 adapted to close against said seat and cover said steam-port, and having the piston provided with the steam-exhaust 16.

8. The combination with a boiler and a relief-pipe leading to a steam-cylinder, of a valve-case located in the wall of the boiler and provided within the same with a steam-inlet and seat and at its outer end terminating in an enlarged chamber provided with an air-port, a valve located in the case and adapted for reciprocation, said valve acting to close the port and adapted to bear against the seat of the case and at its front end carrying a piston fitting the said chamber of the case, and a spring interposed between the front wall of

the case and the face of the piston, whereby any inaccuracy in the fitting of the rear end of the valve against the seat is provided for and the valve cannot be accidentally opened.

- 5 9. The combination with a boiler, a relief-pipe, and a valve-case terminating in an enlarged chamber, said case being in communication with the boiler, of a valve mounted for reciprocation in the case and adapted to close
10 the seat of the said case and the inlet-port

thereof and terminating within the chamber in a piston provided with superficial ribs 18, and means for automatically opening and closing the valve by fluid-pressure.

In testimony whereof I affix my signature 15
in presence of two witnesses.

WILLIAM J. GOYNE.

Witnesses:

MILLARD F. COX,
C. J. MELLIN.