

No. 775,412.

PATENTED NOV. 22, 1904.

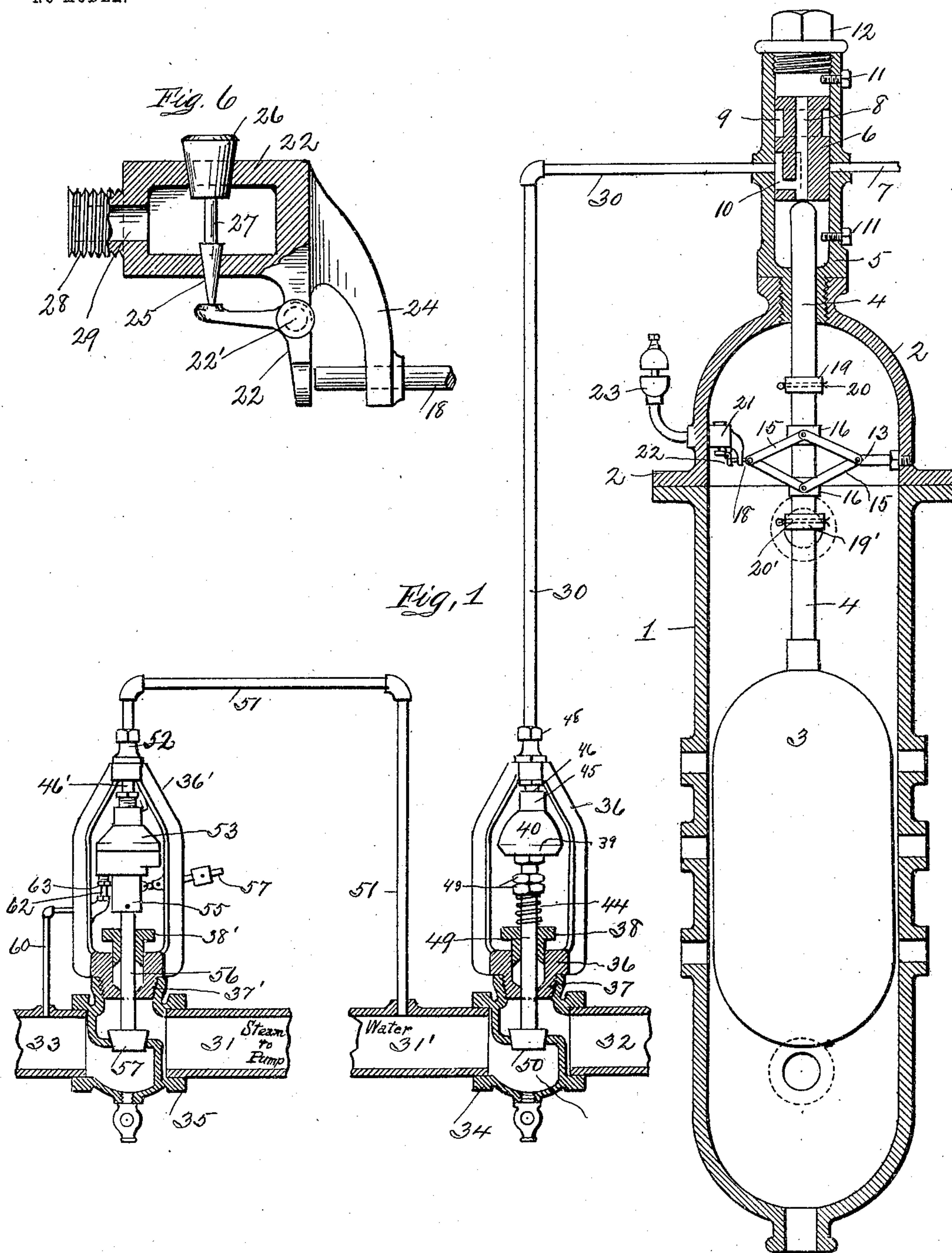
J. WOODS & F. H. GRAVES.

# FEED WATER REGULATOR FOR STEAM BOILERS.

APPLICATION FILED MAR. 23, 1903.

NO MODEL.

2 SHEETS—SHEET 1.



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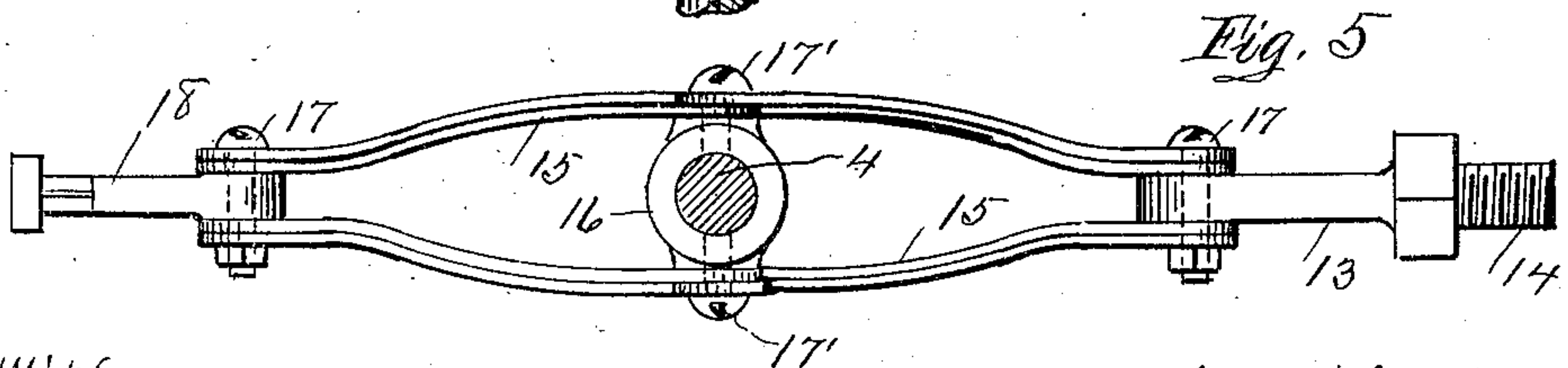
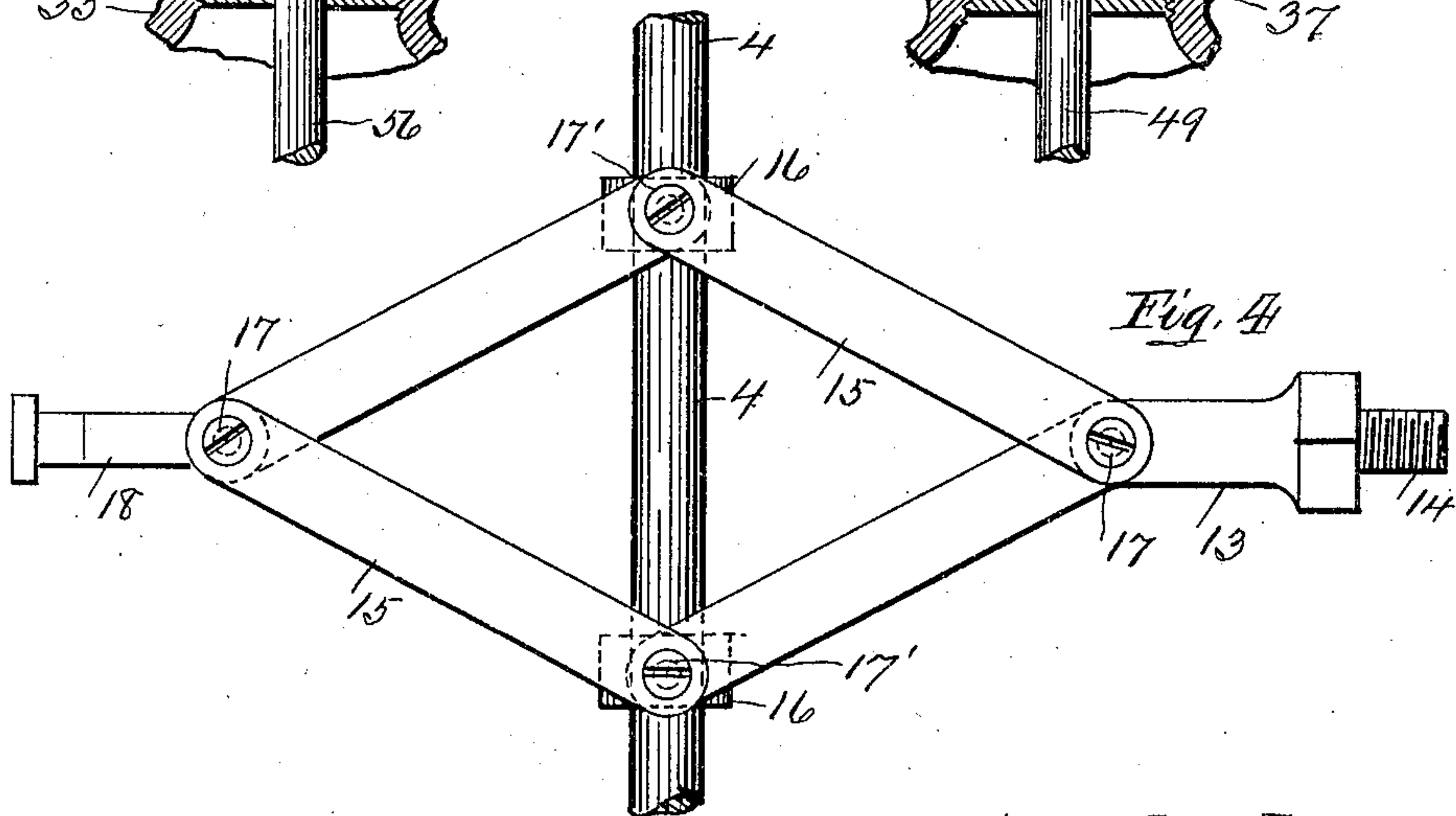
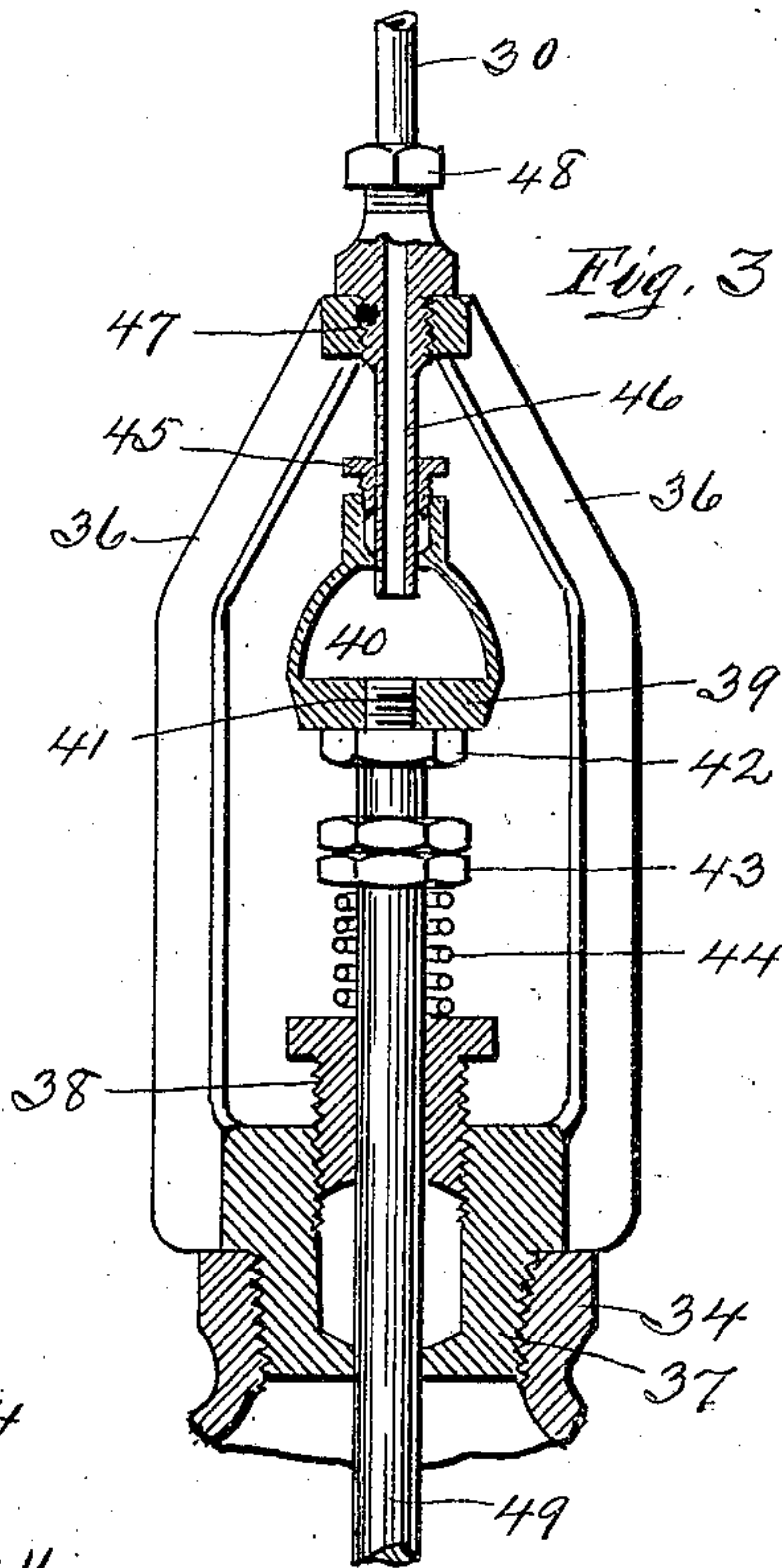
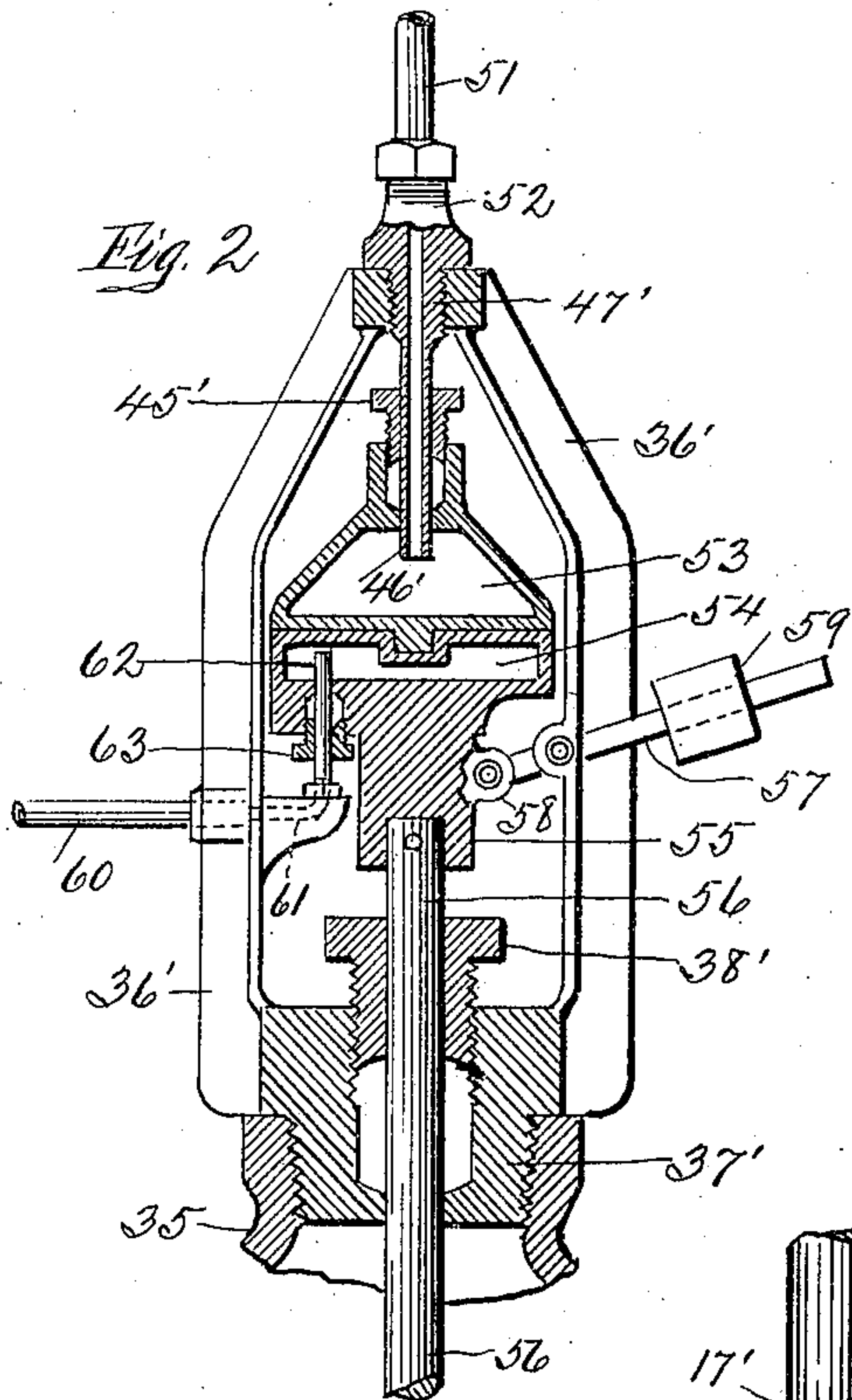
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2 SHEETS—SHEET 2.



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# UNITED STATES PATENT OFFICE.

JOHN WOODS AND FRANK H. GRAVES, OF PITTSBURG, PENNSYLVANIA.

## FEED-WATER REGULATOR FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 775,412, dated November 22, 1904.

Application filed March 23, 1903. Serial No. 149,012. (No model.)

*To all whom it may concern:*

Be it known that we, JOHN WOODS and FRANK H. GRAVES, citizens of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Feed-Water Regulators for Steam Boilers and Generators, of which improvement the following is a specification.

This invention relates to an improvement in feed-water regulators for steam boilers or generators; and it consists in the certain details of construction and combination of parts, as will be fully described hereinafter.

In the accompanying drawings, Figure 1 is a side sectional elevation of a water-column, together with automatic-operating regulating-valves controlling the operation of the feed-water pump, all of which is constructed and arranged in accordance with our invention. Fig. 2 is an enlarged detailed sectional elevation of the automatic-operating valve mechanism located between the boiler and feed-water pump whereby the steam from the boiler is regulated and controlled. Fig. 3 is a similar view of the valve mechanism arranged between the boiler and the discharge end of the pump. Fig. 4 is an enlarged detailed side elevation of the levers and their connections for operating the alarm. Fig. 5 is a plan view of the same. Fig. 6 is an enlarged side elevation of the alarm-valve and chamber, together with the crank-lever for operating said valve.

To construct a feed-water regulator in accordance with our invention, we provide a "water-column" consisting of an annular shell 1, fitted with a cap-piece 2, a float 3, arranged within said shell, a vertically-arranged stem 4, attached to the float, together with the other well-known parts and connections with the boiler. Attached to the top of the cap 2 by means of a threaded socket is a valve-chamber 5, into which the stem 4 projects. This chamber 5 is cylindrical in form and is fitted with a valve 6, having an inner bore 8 to form a steam-balance and having annular

port 9 above and a segmental port 10 near the base, the said port 10 being in communication with the inner bore 8. This valve-chamber 5 is provided with an exhaust 7 at the one side, and directly opposite another connection, 30, is made, the purpose of which will be hereinafter described. Loosely connected to the stem 4 are two sleeves 16, (for details see Figs. 4 and 5,) to which are connected, by means of short screws 17', a series of levers 15, the other ends of which are loosely connected by short bolts 17 to end pieces 13 and 18. One of these end pieces, 13, is formed with a threaded shank 14, by means of which the device is attached to the interior wall of the water-column 1. The other end piece, 18, has a bearing 24 at the opposite side of the column 1, the said bearing being formed integral with a valve-casing 22, attached to the walls of the column 1 by a threaded shank 28. This valve-casing 22 is formed with a double seat in which a puppet-valve is operated, the same consisting of a heavy upper or head portion 26, a lower reduced part 25, and connecting-stem 27, as will be seen by reference to Fig. 6 of the drawings. This valve above described, taken in connection with a pivoted bell-crank 22, operates an alarm 23 by the steam-pressure within the column 1 when the float 3 reaches its highest or lowest point. This operation of the alarm 23 is accomplished by one or the other stops 19 or 19' coming in contact with the sleeves 16 of the levers 15, moving the same up or down to compress the said levers 15, thereby operating the bell-crank 22 to lift the valve 25 from its seat and sound the alarm on the whistle 23.

Arranged in connection with the feed-water pump (not shown) are two automatic-operated valves, the one regulating and controlling the steam from the boiler to said pump and the other controlling the feed-water to the boiler, the latter consisting of the valve 50, suitably mounted and operated in a shell 34, connected at the one end by a pipe 32, leading to the boiler, and at the other side to a



pipe 31', connected to the discharge end of the aforesaid pump. This valve-casing above mentioned is fitted with a stuffing-box 38, through which the valve-stem 49 passes, the same being fitted with a spiral spring 44 and regulating-nuts 43, by means of which the valve 50 will remain seated unless overbalanced by the water-pressure from the pump. This valve-stem 49 is attached to a casting 39 by a threaded shank 41, the said casting being formed with a chamber 40 and steam connection 46, the said connection entering through a stuffing-box 45 and is in communication with the water-column by means of a pipe 30, joined by a union 48, and with the valve-casing 5 (see Fig. 1) in a manner that steam may be admitted to the said chamber 40 from the water-column or through the port 10.

Connected to the steam-pipe leading from the boiler to the feed-water pump is a valve-casing 35, having a valve 57 and valve-stem 56, the said stem passing through a suitable stuffing-box 38' and is connected by a pin to a vertically-moving chamber 54, formed in a casting 55. This chamber 54 is in direct communication by means of pipes 60 and 62 with the steam-pressure in the boiler, the connection being made by a stuffing-box 63, as shown at Fig. 2 of the drawings.

Arranged upon the top of this last-mentioned chamber 54 is another, 53, which is connected by a pipe 51 to the discharge end on the pump, the said pipe joined by a union 52 and entering the chamber 53 through a stuffing-box 45' in a manner that will permit the vertical movement of the chamber 53 without reference to its connected pipe 46'. Attached to the part 55, forming the steam-chamber 54, is a lever 57, having a balance-weight 59, the purpose of which is to accurately balance the parts, as is obvious.

In operation when the water in the boiler becomes low the float lowering with the water will cause a signal to be sounded at a pre-determined moment through the mechanism described, and as the annular port 9 in the valve 6 comes opposite the pipe 30 the steam in the chamber 40 may make exit through the exhaust-pipe 7 and relieving the valve 50 of pressure simultaneously with the introduction of a high pressure of steam through the pipe 60, which will cause the valve 57 to be raised from its seat and allow steam to pass from the boiler to the pump, which latter is not illustrated, but to which the steam passes from the pipe 31. The pressure of water from the pump and through the pipe 31' overcoming the pressure upon the valve 50 will cause the same to unseat and will allow the water to pass to the boiler. When the water rises in the boiler, the float rising to its normal position

will cut off the communication of the pipe 30 with the port 9, and the port 10 will be in communication with the pipe 30, and the steam-pressure from the column acting upon the chamber 40 will cause the valve 50 to seat, and the back pressure of water through the pipes 31' and 51 will cause the valve 57 to seat as said pressure overcomes the pressure of steam passing through the pipe 60, thus shutting off the working of the pump.

Should the water in the boiler drop below the danger-lever, the collar 19 will come in contact with the sleeve 16, moving the same downward and thrusting the connected piece 18 of the levers forward to operate the bell-crank 22, which in its movement will open the valve 25 and sound the alarm 23, and the same will be true should the water-level rise beyond a given or set point, as will be apparent.

It is obvious that various slight modifications and changes may be made in the details of construction without departing from the spirit of the invention. Therefore we do not wish to confine ourselves to the construction shown and described.

Having thus described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In a feed-water regulator, the combination with a water-column, a float therein, a valve-casing communicating with the column, a valve with ports therein positioned in said casing, a valve-regulated water-feeding pipe adapted to communicate between a boiler and pump, a spring-actuated valve in said feed-pipe, a steam-chamber connected to the stem of said valve, a pipe communicating between said steam-chamber and the valve-casing connected to said water-column, a valve-regulated steam-supply pipe adapted to regulate the passage-way for steam leading to the feed-pump, a steam-chest moving with the stem of the valve regulating the supply of steam from the pump, a live-steam-supply pipe leading into said movable steam-chest, a water-pressure chamber moving with said steam-chest, and a water-supply pipe communicating with said water-pressure chamber and said valve-regulated water-feed pipe, as set forth.

2. In a feed-water regulator, the combination with a water-column, a float therein, a valve-casing communicating with the column, a valve with ports therein positioned in said casing, a valve-regulated water-feeding pipe adapted to communicate between a boiler and pump, a spring-actuated valve in said feed-pipe, a steam-chamber connected to the stem of said valve, a pipe communicating between said steam-chamber and the valve-casing connected to said water-column, a valve-regulated steam-supply pipe adapted to regulate the passage-way for steam leading to the feed-pump,

5 a steam-chest moving with the stem of the valve regulating the supply of steam from the pump, a counterbalance-lever pivotally connected to said steam-chest, a live-steam-supply pipe leading into said chest, a water-pressure chamber moving with said steam-chest, a water-supply pipe communicating between said water-pressure chamber and said valve-regulated water-feed pipe, as set forth.

In testimony whereof we have hereunto signed our names in the presence of two subscribing witnesses.

JOHN WOODS.  
FRANK H. GRAVES.

In presence of—  
M. HUNTER,  
H. J. LEVIS.