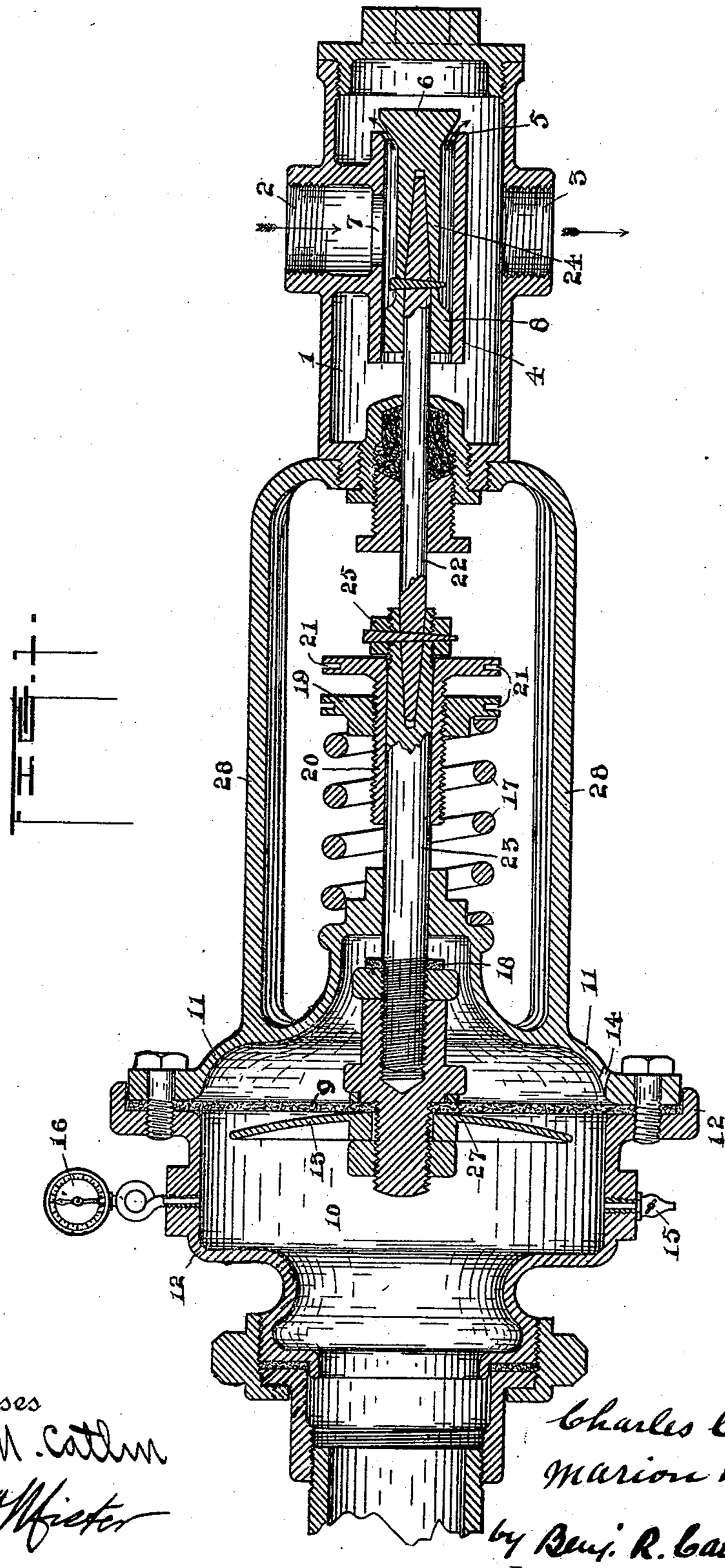
(No Model.)

3 Sheets—Sheet 1.

C. C. PUFFER & M. WARREN.

AUTOMATIC BALANCED STEAM REGULATING VALVE.

No. 512,748. Patented Jan. 16, 1894.



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(No Model.)

3 Sheets—Sheet 2.

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FIG. 2.

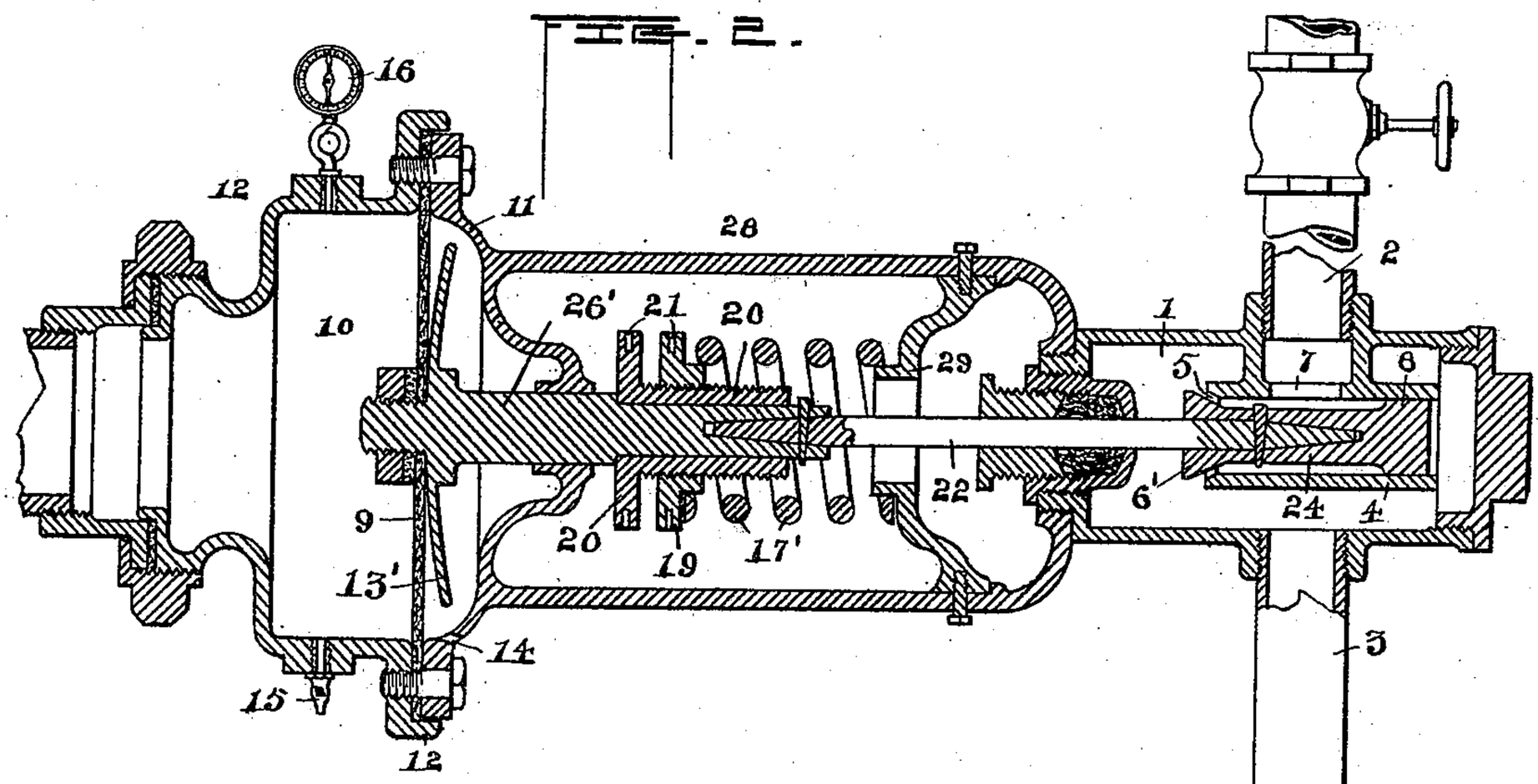
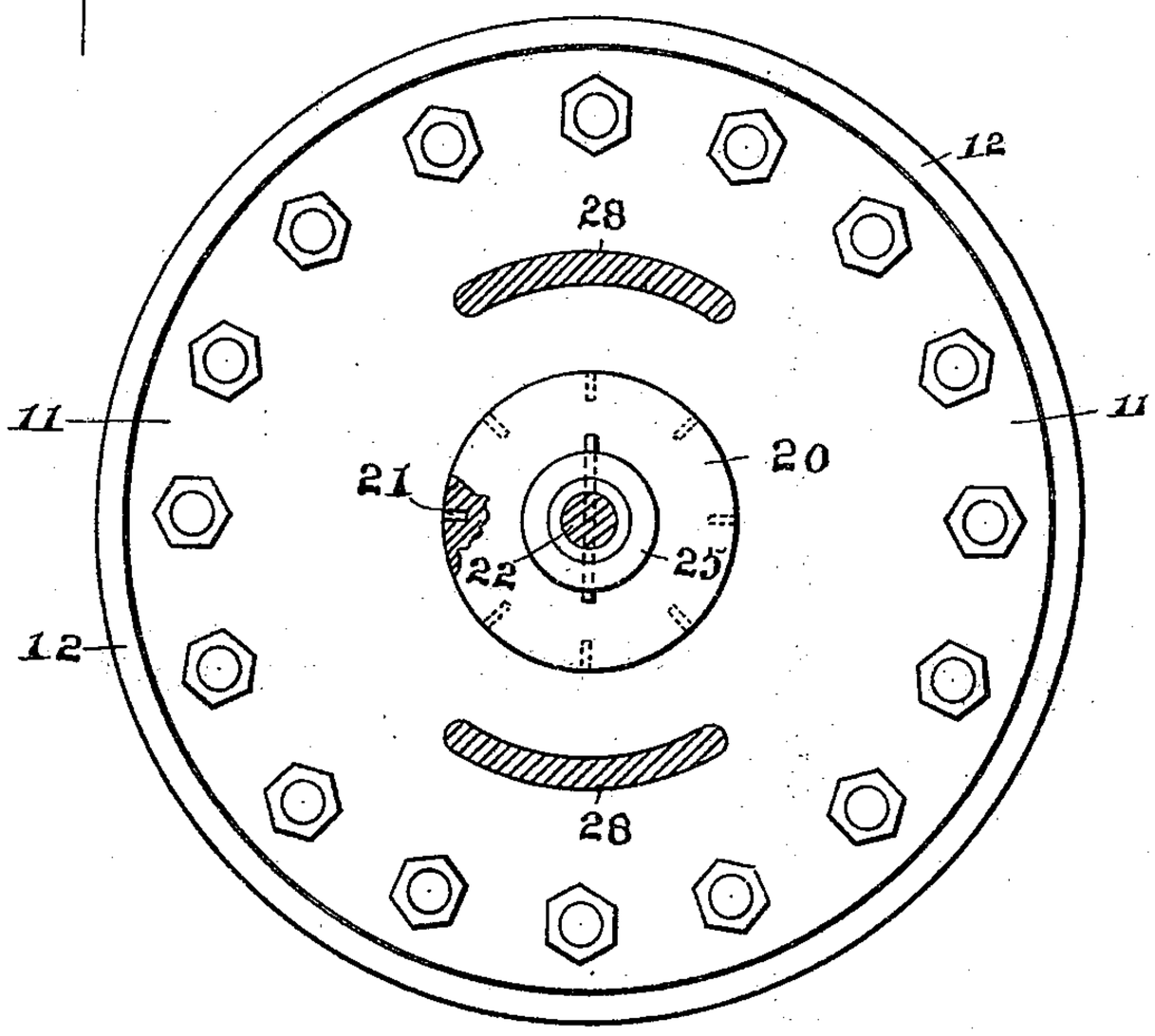


FIG. 3.



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3 Sheets—Sheet 3.

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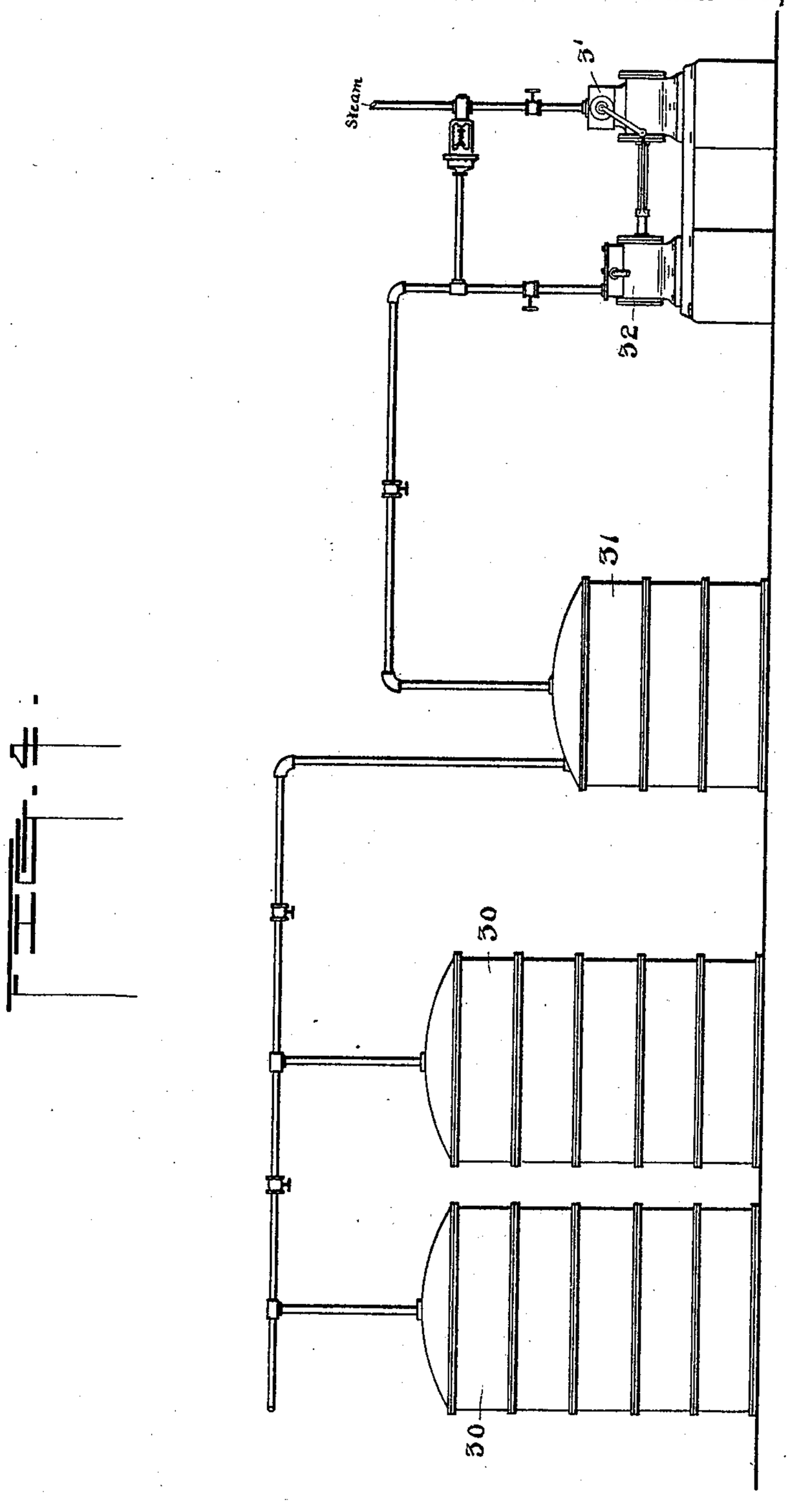

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UNITED STATES PATENT OFFICE.

CHARLES C. PUFFER AND MARION WARREN, OF ROCHESTER, NEW YORK.

AUTOMATIC BALANCED STEAM-REGULATING VALVE.

SPECIFICATION forming part of Letters Patent No. 512,748, dated January 16, 1894.

Application filed October 1, 1892. Serial No. 447,509. (No model.)

To all whom it may concern:

Be it known that we, CHARLES C. PUFFER and MARION WARREN, of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Automatic Balanced Steam-Regulating Valves; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

The object of the invention is to automatically regulate the supply of steam or other fluid under pressure to an engine cylinder operating a pump to maintain a predetermined degree of pressure either above or below the normal or atmospheric pressure in a fluid receptacle or series of receptacles.

In the accompanying drawings: Figure 1 is a central section of the device constructed and arranged to operate in connection with means for effecting a partial vacuum and maintaining the pressure in the vacuum chamber and its communicating receptacles if such be used at a predetermined degree below the normal. Fig. 2 is a similar section of the device constructed and arranged to automatically regulate the supply of steam or the like to operate mechanism for compressing a fluid and maintaining it at a pressure above the normal; and Fig. 3 is a section on line 3—3 of Fig. 1. Fig. 4 is an elevation of a diagrammatic character of an entire apparatus embodying our improvement.

Numeral 1 denotes a valve chamber, 2 its inlet and 3 its outlet leading to the valve chest 3′ of the engine cylinder indicated in Fig. 2. The inlet 2 communicates in usual manner with a source of steam or other fluid under pressure as by a pipe and the pipe may be furnished with the usual adjuncts such as a globe valve and oiling device.

Within the valve chamber 1 is a tube 4 provided with a valve seat 5. This chamber has a removable screw plug at each end to provide for easy access to its interior.

A valve is denoted by 6 and upon its stem on the opposite side of the inlet port 7 is a piston 8 working freely in the tube. The construction is such that the steam balances the valve whether, closed or open. The valve is moved to and from its seat to regulate the amount of steam admitted to the chamber 2 and valve chest 3 by means of a diaphragm 9 situated in a chamber 10 and made fast on the valve stem. Chamber 10 is inclosed by two hollow shells 11 and 12 which are bolted together and hold the flexible diaphragm between them.

13 is a rigid concavo-convex disk adapted to support the diaphragm when the pressures on the vacuum and plenum sides of the same differ sufficiently to render such support desirable.

14 denotes an air inlet also adapted to drain moisture from the chamber on one side of the diaphragm.

15 denotes a petcock and 16 a pressure gage.

As shown in Fig. 1 the chamber 10 on the left of the diaphragm will communicate with a receptacle or receptacles such as indicated at 30 and 31 in Fig. 4 in which it is desired to maintain a partial vacuum having any desired degree of pressure below the normal. Such vacuum existing the air pressure on the opposite side of the diaphragm tends to move it to the left and the spring 17 is arranged to counteract this tendency. One end of the spring is made to bear on a part or extension 28 connected to the wall of the diaphragm chamber and the other upon the valve stem substantially as shown and so that it tends to open the valve.

18 indicates an elastic washer or cushion adapted to lessen concussion when testing the apparatus.

In the present instance the tension of the spring can be adjusted by moving the screw collar 19 with reference to the sleeve 20 on the valve stem. For this purpose both the collar and the sleeve can be turned if desired by means of suitable levers or pins inserted in the sockets 21.

As shown the valve stem is made in sections, the section 22 being attached to the sections 23 and 24 by keys or pins or in any suitable manner.

25 is a nut screwed into one of the sections which as well as the nut is slotted to receive a fastening pin. The section 22 passes through a stuffing box in the valve chamber 1 and is connected within said chamber to

section 24 upon which is formed a piston and a valve above described. Section 23 screws into a stem 26, upon which is secured the disk 13 by means of a nut. 27 is a washer.

In Fig. 2 is represented an arrangement adapted to regulate the movements of the valve 2 by a pressure above the normal maintained in the diaphragm chamber on the side opposite the valve chamber and in a communicating receptacle or receptacles. In this construction the valve 6′ is made to open in an opposite direction and the spring 17′ is arranged to bear on a cross bar or spider 29 supported in the frame 28 and its end opposite the valve bears upon the valve stem, its function being to counterbalance the pressure on the opposite side of the diaphragm and to open the valve when such pressure falls below that predetermined. The diaphragm-supporting disk 13′ is situated on the side next the spring and is made integral with a socketed stem 26′ which receives one section of the valve stem.

At 3′ is indicated the valve chest of a steam cylinder adapted to operate an air compressing or air exhausting device such as indicated at 32 in Fig. 4 to maintain any desired pressure on the side of the diaphragm opposite the steam valve 1 and in all receptacles communicating therewith. As shown in Fig. 2 when the pressure rises on the left of the diaphragm higher than the desired pressure the spring is compressed and the valve partially or fully closed and when the pressure falls the valve is opened by the spring, the effect being to automatically regulate the supply of steam to run an air compressor and maintain approximately constant pressure in the receptacle for air or other fluids. Substantially the same operation is effected by the construction indicated in Fig. 1 except that it is arranged to regulate the pressure in a partial vacuum the spring being designed to open the valve when the pressure in the fluid receptacle falls below that predetermined and which is below that of the atmosphere. The valve is instantaneously moved toward its closed position when the pressure on the vacuum side of the diaphragm falls below that for which the device is set and the spring is adjusted to open the valve when the pressure on the vacuum side is at or near the degree desired. The movements of the valve will closely follow the slightest fluctuations of pressure and will so effectually limit them as to maintain what may be regarded as a practically constant pressure.

In testing the apparatus the pressure may be suddenly varied in such manner as to produce rapid or extreme movements of the diaphragm in which case the elastic washer 13 will be useful to prevent injurious or disagreeable pounding.

The particular form of the diaphragm case, and the arrangement and mode of connecting the valve stem sections, and the special form of balanced valve and other parts may be varied provided substantially the same principles of construction and operation are preserved.

We are aware that the water of condensation upon a diaphragm has been utilized to open a steam valve connected to said diaphragm at intervals to operate a pump said valve being closed by a spring acting underneath the diaphragm whenever the superincumbent water was pumped off. Such construction is not adapted to regulate the action of an air and gas compressor by means of pressure in the receptacle acted upon by such compressor. Further in such construction the valve stem was prolonged beyond the valve and the valve casing provided with a guiding socket, which latter features are avoided in the present device in which a piston 8 is guided in the valve tube itself which latter has a single valve seat in its end instead of the oppositely situated openings of the prior construction.

We are aware of a prior construction consisting of a pump provided with a steam supply pipe having a balanced valve and a diaphragm chamber and weighted lever so arranged that pressure produced by the pump acts upon the diaphragm to raise it and the weighted lever with the effect to close the valve, said valve being adapted to be opened by the weight. Such construction is not adapted to pressures below the normal since such pressure would permit the atmosphere or weight to open the valve and the lower the pump pressure the more positively would the valve be held open, and furthermore in such prior construction no means were disclosed for maintaining an equable pressure in receptacles such as beer casks otherwise subject to considerable injurious variations of pressure from causes outside the apparatus. In the prior apparatus a subsidiary air pump operated stroke for stroke with a main pump was designed to keep the work of the latter constant by suitable regulation of the steam supply. Such construction is radically unlike ours in which the only pump or engine used is employed directly to maintain a constant pressure in a series of receptacles otherwise subject to considerable variations and in which said pump or engine being the sole one required must be varied in speed to secure the object of the invention.

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

1. In an apparatus wherein an engine is employed to maintain a constant pressure in a closed receptacle or communicating series of receptacles, the combination of the valve chamber having steam inlet and outlet, a steam balanced valve, a diaphragm secured on the valve stem within a chamber which chamber on one side of said diaphragm communicates with the upper part of a fluid receptacle, or series of receptacles, and on the other with the atmosphere, a spring on said

valve stem arranged to open the valve, and the engine communicating with said receptacles and adapted to vary the pressure therein whereby the supply of steam to the engine can be automatically regulated by the variations of the pressure originating in said receptacle and such variations immediately counteracted by the engine and the valve opened when required by atmospheric pressure; substantially as set forth.

2. In an apparatus wherein an engine is employed to maintain a constant pressure in a closed receptacle or communicating series of receptacles, the combination of the valve chamber having steam inlet and outlet, a steam balanced valve, a curved diaphragm-supporting plate, a diaphragm secured on the valve stem within a chamber which chamber on one side of said diaphragm communicates with a fluid receptacle, or series of receptacles, and on the other with the atmosphere, a spring on said valve stem arranged to open the valve, and the engine communicating with said receptacles and adapted to vary the pressure therein whereby the supply of steam to the engine can be automatically regulated by the variations of the pressure in said receptacle and such variations immediately counteracted by the engine and the valve opened when required by atmospheric pressure; substantially as set forth.

3. The combination of the valve chamber having each end closed by a removable screw plug and having a steam inlet and a steam outlet, a tube situated in said chamber adapted to communicate freely at all times with said inlet, a diaphragm and diaphragm chamber, a frame connecting the chambers, a valve having a seat in said tube and provided with a piston also within the tube and situated on the opposite side of the tube inlet port, a rod made in detachable sections one of which carries the valve and its piston, said rod being connected to the diaphragm and passing through a stuffing box in one of the screw plugs and a spring bearing on the rod and on a part connected to the wall of the diaphragm chamber; all constructed and combined substantially as set forth, whereby the parts can be readily assembled and are made easy of access.

4. The combination of the valve chamber having steam inlet and outlet and an interior tube, a diaphragm and diaphragm chamber, a frame connecting the chambers, a valve having a seat in said tube, a rod connected to the diaphragm, a spring bearing on the diaphragm chamber and rod and adapted to open the valve, the sleeve 20, the nut screw threaded on said sleeve whereby the spring is held at one end and whereby its tension may be adjusted, the diaphragm-holding stem and an elastic washer 18 on the valve rod between said stem and the diaphragm case to prevent concussion; substantially as set forth.

In testimony whereof we have signed this specification in the presence of two subscribing witnesses.

CHAS. C. PUFFER.
MARION WARREN.

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