

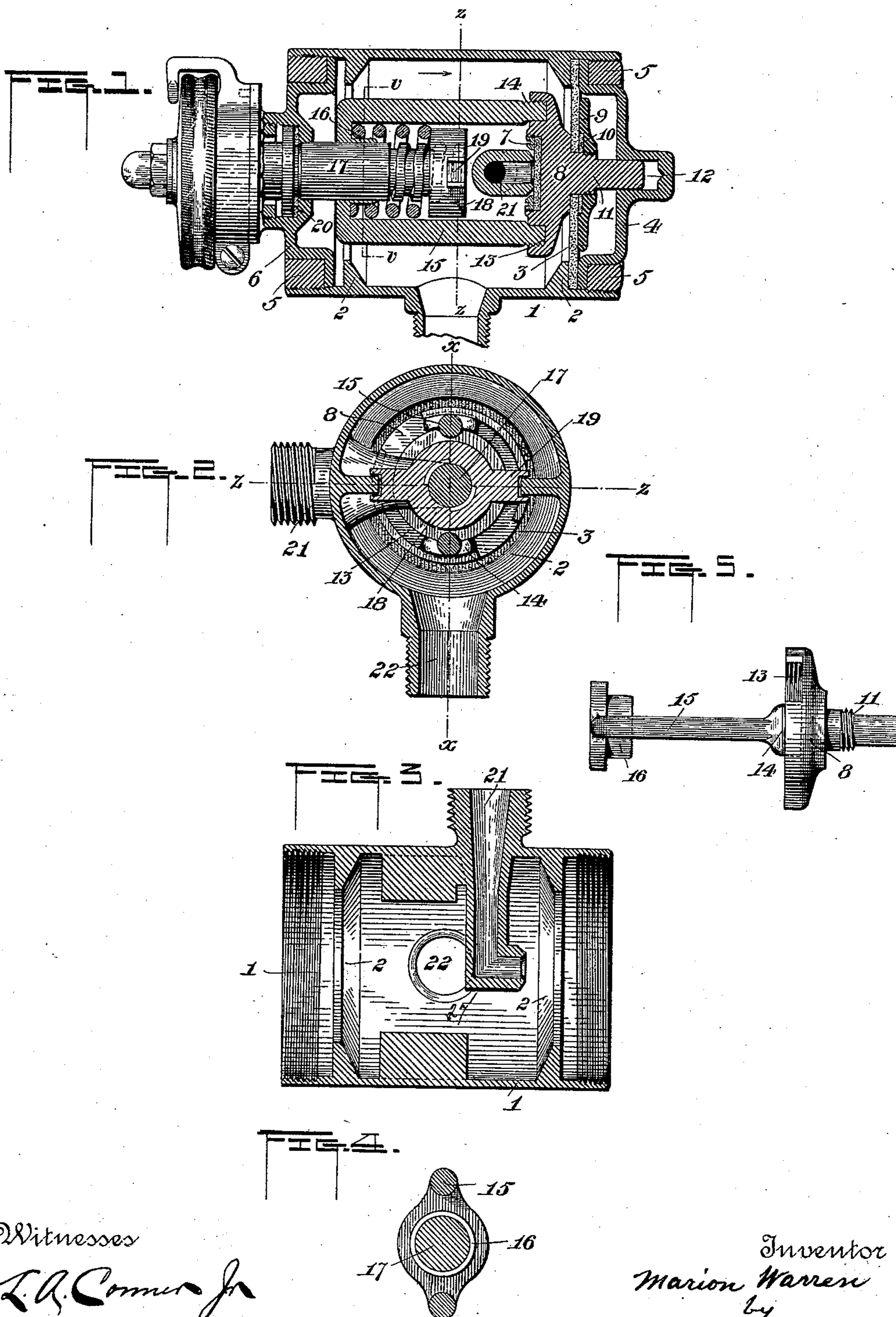
(No Model.)

2 Sheets—Sheet 1.

M. WARREN.  
SAFETY CHECK VALVE.

No. 407,911.

Patented July 30, 1889.



Witnesses

L. A. Comer Jr.  
F. Davis.

Inventor

Marion Warren

by

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Attorney

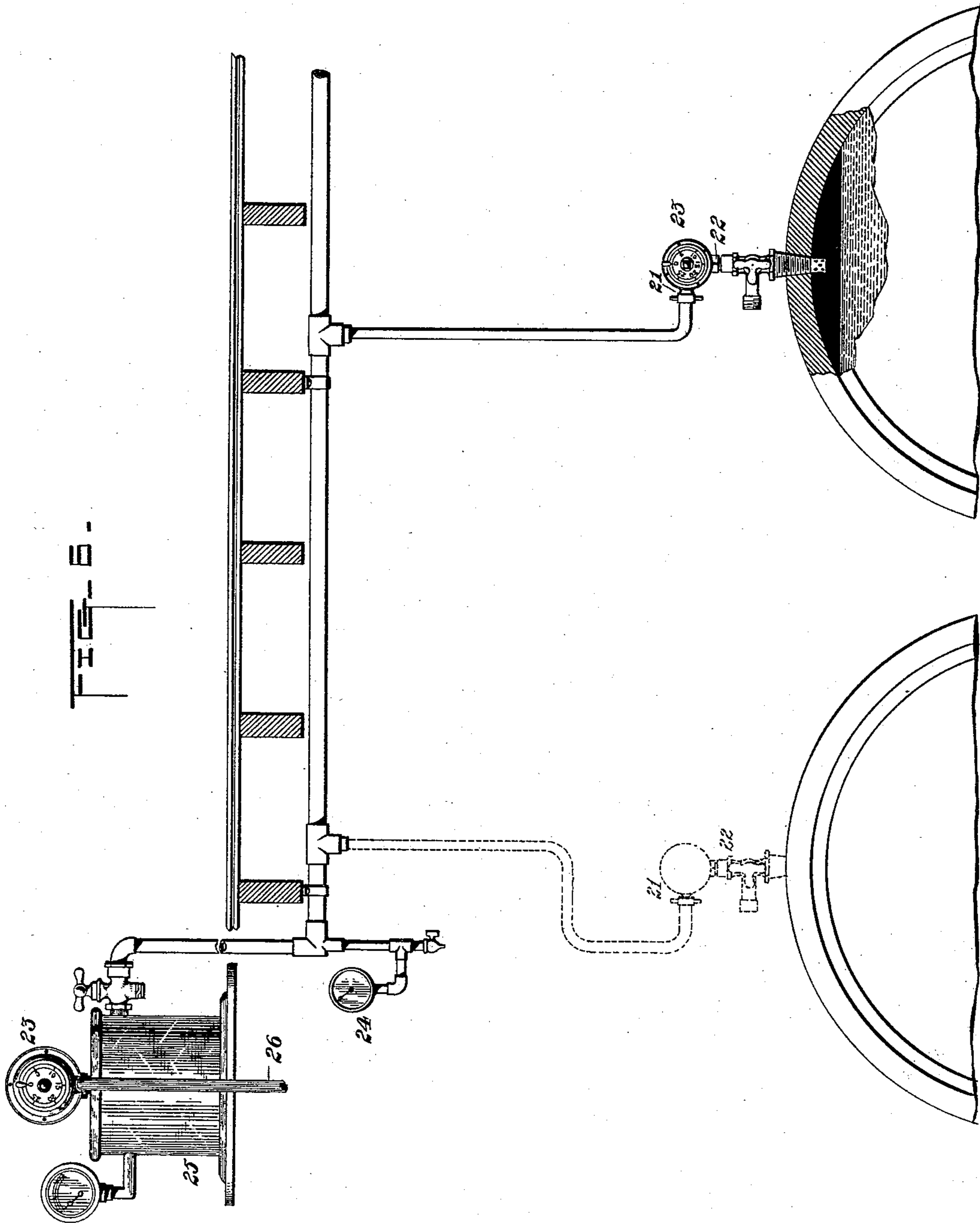
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# UNITED STATES PATENT OFFICE.

MARION WARREN, OF ROCHESTER, NEW YORK.

## SAFETY CHECK-VALVE.

SPECIFICATION forming part of Letters Patent No. 407,911, dated July 30, 1889.

Application filed October 4, 1888. Serial No. 287,151. (No model.)

### *To all whom it may concern:*

Be it known that I, MARION WARREN, a citizen of the United States, residing at Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Safety Check-Valves; and I 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 appertains to make and use the same.

My invention relates to a safety check-valve designed to be used in the process of carrying on the fermentation of beer under a regulated pressure in a series of closed connected casks, and to certain combinations, including a check-valve.

The object of the invention is to simplify the construction of double-acting safety check-valves, and at the same time secure greater certainty and sensitiveness of action. The valve covered by my patent, No. 365,656, dated June 28, 1887, though embodying an improvement in the art, is more complex than necessary, and is not sufficiently certain and accurate in its operation, owing in part to a difficulty in adjusting the relative tension of the two springs employed therein.

In the present construction but one spring is employed, which is located within the diaphragm case or chamber and on the same side of the diaphragm as the valve. It is readily adjustable from the exterior of the case, which latter is provided with two removable heads or ends, both the inlet and a distinct outlet being located on the circumference of the case. The valve is placed in a support distinct from the diaphragm, but secured to it by a screw ring or clamp, affording a wide bearing on the same opposite the side which receives the gas-pressure, the construction being such that the valve is opened by gas-pressure and closed by the spring upon a sufficient reduction of the pressure.

The invention consists in the matters hereinafter more fully described and particularly pointed out.

In the accompanying drawings, Figure 1 represents a longitudinal section on line *x x* of Fig. 2; Fig. 2, a transverse section on line *z z*, Fig. 1; Fig. 3, a longitudinal section on

line *z z*, Fig. 2. Fig. 4 is a sectional detail on line *v v*, Fig. 1. Fig. 5 is a perspective view of valve-seat support and yoke; and Fig. 6, a side elevation, partly in section, showing the check-valve combined with other devices in a pressure-regulating system.

The reference-figure 1 indicates a case inclosing a valve and diaphragm provided with interior rings 2. One of these affords a seat for an elastic diaphragm 3, upon which latter is seated the head or removable end 4, secured in position by a screw-ring 5. A head 6 at the opposite end of the case rests upon a similar ring 2, an annular packing-ring being interposed and a screw-ring 5 employed to secure the parts in position.

A valve-plate 7, preferably elastic, is secured by a screw-ring or otherwise in a depression in the valve seat or body 8. This valve body or support has a screw-threaded extension 11, which passes through the diaphragm and screws into a plate 9, bearing against the rear side of the diaphragm, a washer 10 being preferably seated in a recess in the plate 9, as shown. This washer is provided to prevent injury to the diaphragm when the plate 9 is screwed down tightly upon the same, as the washer is held from rotation on the diaphragm by friction, while plate 9 is revolved in contact with said washer. Beyond the circumference of the washer the friction between plate 9 and the diaphragm will be slight, as at such point the latter can readily yield, since it is not solidly supported there on the opposite side by the valve-body 8.

The extension 11 is prolonged beyond the plate 9, and enters a pocket or recess 12, formed in the head, in such manner as to move freely lengthwise in the same. The valve-support 8 has an annular recess at 13, the exterior wall of which is screw-threaded to engage the segmental screw-threaded parts 14 of a spring-holding yoke 15. A part of the screw-threaded exterior wall of recess 13 is cut away on each side to provide for the introduction of the extremities 14 of the yoke, as indicated in Fig. 5.

The yoke 15 is provided with a tubular bearing 16, which receives on its exterior a spring, and on its interior furnishes a bear-

ing for a stem 17, which passes freely through the head, receiving on its outer extremity a milled head, index, and other parts. This stem is screw-threaded on its inner end to engage a movable bearing 18, provided with arms grooved at their ends to engage guides 19, fixed in the case. At 20 it has integral with it a packed bearing-ring limiting its lengthwise movement in an inner direction through the head. This bearing or joint may be made of conical or other suitable form with ground surfaces to dispense with packing. An annular scale and milled wheel are keyed or otherwise firmly secured to the stem and an index, the parts being suitably arranged to adjust the tension of the spring and to indicate the same. The spring is compressed to increase its tension by revolving the milled head and the threaded stem 17 to screw the same through the bearing 18, which is thereby moved toward the end of the yoke, against which the other end of the spring bears, the part 18 being guided by means of the guides 19 entering the grooves in the arms formed on the part 18.

The diaphragm-case has an inlet 22, by which it communicates with a cask or other vessel, and an outlet 21, by which it communicates with a pipe or conduit leading to any point desired, both being located on or in the circumference of the case. The inlet and outlet are so styled with reference to their usual function, though under circumstances to be hereinafter described the ordinary operation of one or both may be reversed. The outlet-pipe 21 extends radially to a point between the arms of the spring-yoke near the center of the case, and is there bent at 27 to present its end to the valve-plate 7, which latter, together with the valve-support 8 and the yoke, is connected to the diaphragm and moves with the same.

In Fig. 6 two casks are shown, a safety-valve being connected with each at inlet 22 and a pipe or system of pipes at outlet 21. The milled ring and index before mentioned are indicated at 23. At 24 is represented a pressure-gage and draw-off cock. 25 indicates a gas-receiver in communication with the pipe system, to which is attached a pressure-gage and a safety or escape valve having a pressure-regulating device 23. The gage is of any well-known construction, and the safety-valve is preferably of the form above described. This gas-receiver may be located at a distance from the vault or cellar containing the casks, preferably in an office on an upper floor. The gage indicates the pressure in the main pipe and its connections, and the safety-valve prevents the rise of pressure in said pipes above the desired limit, being regulated to open and discharge gas through pipe 26 when the limit is exceeded.

The gas-receiver, though represented as placed on the floor, can of course be located in any convenient position, as on a shelf or stand.

Having thus described my improved apparatus, the operation may be briefly stated as follows: In the absence of sufficient pressure in a cask and its valve and diaphragm case to overcome the spring the valve will be held in closed position. The tension-regulating devices enable the spring and valve to be adjusted or set so that the valve shall open under the desired pressure of gas acting upon the diaphragm, which action tends to move the valve from its seat on the mouth of 27, the spring being thereby compressed. The escape of gas having reduced the pressure in the case and cask below the predetermined limit, the spring closes the valve. Various devices for a similar operation are in common use, and fuller description in this particular is unnecessary. If the gas from one of the casks escapes into the main pipe or pipe system, tending to raise the pressure therein, this effect is prevented by the safety or relief valve of said pipe, which is located in the office or elsewhere. Should any accident occur by which pressure in a cask is reduced below the limit desired and to which the tension of the spring is adjusted, as by leakage or by the bursting of a cask, the valve is instantly closed by the spring and the escape of gas from the main pipe and from other connected casks below the fixed limit of pressure is prevented. On the other hand, if a leak or break occurs in the main pipe or in a branch thereof, and gas escapes so as to unduly reduce the pressure in said pipe, the valve in each case connected with the separate casks will continue to be held in closed position by its spring until the pressure in that cask rises above the desired limit and becomes sufficient to compress the spring and open the valve.

It follows from the above that leakage in one cask cannot affect the pressure in the others or in the main pipe, and that leakage in the latter cannot affect the pressure in any cask. It will also be obvious that valves connected with separate casks can be set by regulating the tension of their respective springs to open at different pressures. A fixed pressure cannot be maintained in a cask below that in the main pipe, for the reason that if the pressure in the main pipe is above that in the cask its valve will be opened and will admit gas from the pipe into the case and cask, the spring not being regulated to resist the higher pressure.

I am aware that a case having removable heads and diaphragm, said diaphragm being connected to a yoke carrying a valve, and the arrangement being such that gas-pressure in the case closed the valve against the action of a spring, is not broadly of my invention, such devices having before been described.

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

1. In a safety check-valve, the closed case having an inlet and a separate outlet, a flexi-

ble diaphragm secured in said case and closing one end of the same, the valve-support secured directly to the diaphragm and provided with the spring-holding yoke, the stem 5 17, normally held against an inward lengthwise movement, and the spring between said stem and the movable yoke, the latter being connected to the valve-support. substantially as specified.

10 2. In a safety check-valve, the closed case having an inlet and a separate outlet, a flexible diaphragm secured in said case and closing one end of the same, the valve-support secured directly to the diaphragm and provided 15 with the spring-holding yoke, an adjustable stem normally held against an inward lengthwise movement, guides for the inner end of the stem adapted to prevent its rotation, and the spring between said stem and the movable yoke, the latter being connected to the valve-support, substantially as specified.

3. In a safety-valve apparatus, the closed case, the flexible diaphragm secured between a valve-seat support and a clamping-plate, the 25 extension of the support having a screw-thread connection with said plate, and a washer resting in a recess in said plate and bearing against the diaphragm and adapted to protect the diaphragm from injury when the plate is screwed 30 down upon the diaphragm and washer, substantially as specified.

4. In a safety-check-valve apparatus, the closed case, combined by means of an inlet or inlet-tube with a beer-cask or like vessel containing gas under pressure, the flexible diaphragm having fixed thereto the valve-seat and adapted to be exposed to gas-pressure within the case and cask in both the open and closed positions of the valve, the spring- 40 holding yoke secured to the support, the outlet-tube entering the side of the case and bent near its inner end in the direction of the valve, the spring tending to move the diaphragm and valve toward the outlet, and a distinct gas-inlet, substantially as specified.

5. In a safety-valve apparatus, the combination of the closed case having an inlet and a separate outlet, a valve for the outlet, the flexible diaphragm having affixed thereto a

valve-seat and adapted to be moved by gas- 50 pressure, and also adapted to be exposed to the pressure in the case and in the inlet or inlet-tube in both the open and closed positions of the valve, and the spring adapted to move the diaphragm and valve toward the outlet to 55 close the same, with a pipe provided with a relief-valve, substantially as specified.

6. In a safety-valve apparatus, the combination of the closed case having an inlet, a separate outlet, a valve for the outlet, the flexible 60 diaphragm having affixed thereto a valve-seat and adapted to be moved by gas-pressure, and also adapted to be exposed to the pressure in the case and in the inlet or inlet-tube in both the open and closed positions of the valve, and 65 the spring tending to move the diaphragm and valve toward the outlet to close the same, with a pipe provided with a relief-valve and a gage, substantially as specified.

7. In a safety-valve apparatus, the combination of the closed case having an inlet, a separate outlet, a valve for the outlet, the flexible diaphragm having affixed thereto a valve-seat and adapted to be moved by gas-pressure, and also adapted to be exposed to the pressure in 75 the case and in the inlet or inlet-tube in both the open and closed positions of the valve, and the spring tending to move the diaphragm and valve toward the outlet to close the same, with a pipe provided with a relief-valve and a gage, 80 said relief-valve and gage connecting with a cylinder or receiver, substantially as specified.

8. In a safety-valve apparatus, the combination of a cask, a main pipe having a safety or relief valve, a valve-seat secured to the diaphragm and inclosed in a case communicating 85 with the cask, said diaphragm being exposed to gas-pressure from the cask in both the closed and open positions of the valve, and a spring adapted to close the valve in opposition to the 90 gas-pressure, substantially as specified.

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

MARION WARREN.

Witnesses:

G. E. GREEN,  
BENJ. R. CATLIN.