(No Model.)

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PRESSURE REGULATOR FOR CARBONIC ACID GAS.

No. 375,837. Patented Jan. 3, 1888.

Fig. 1.

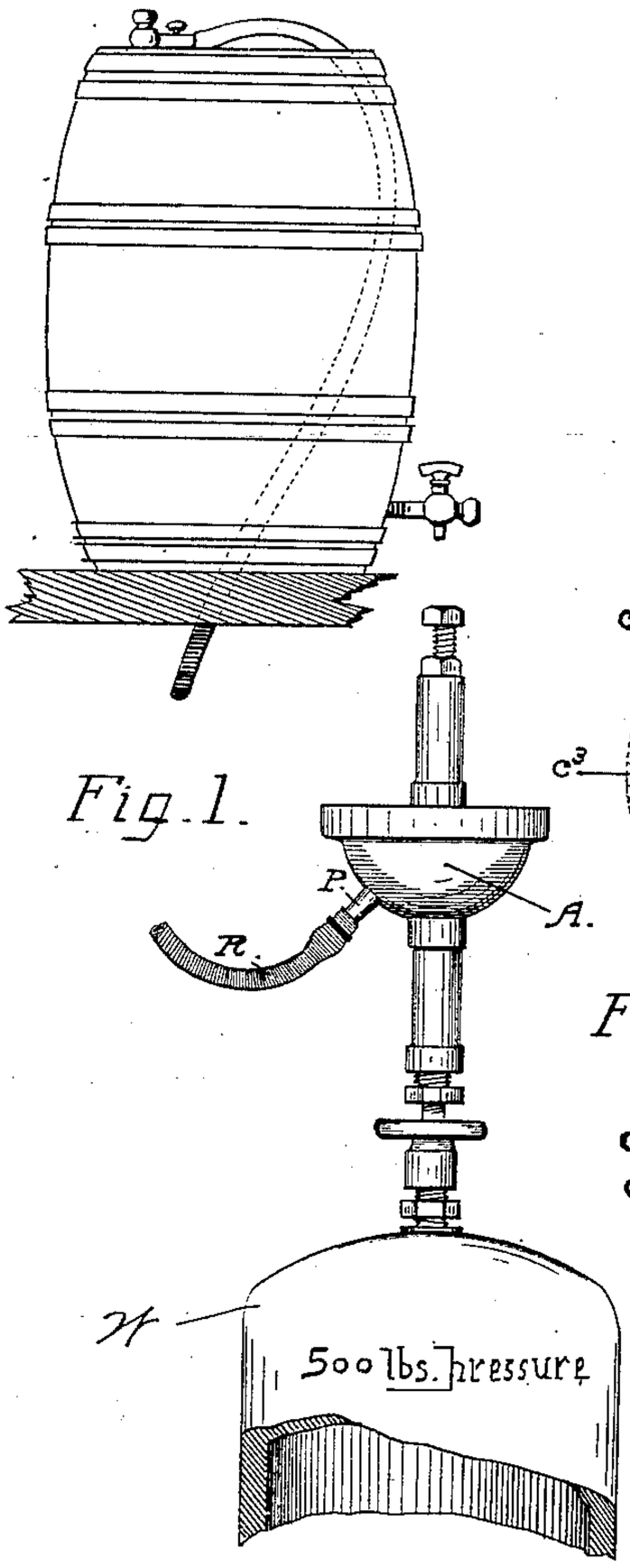

Fig. 2.

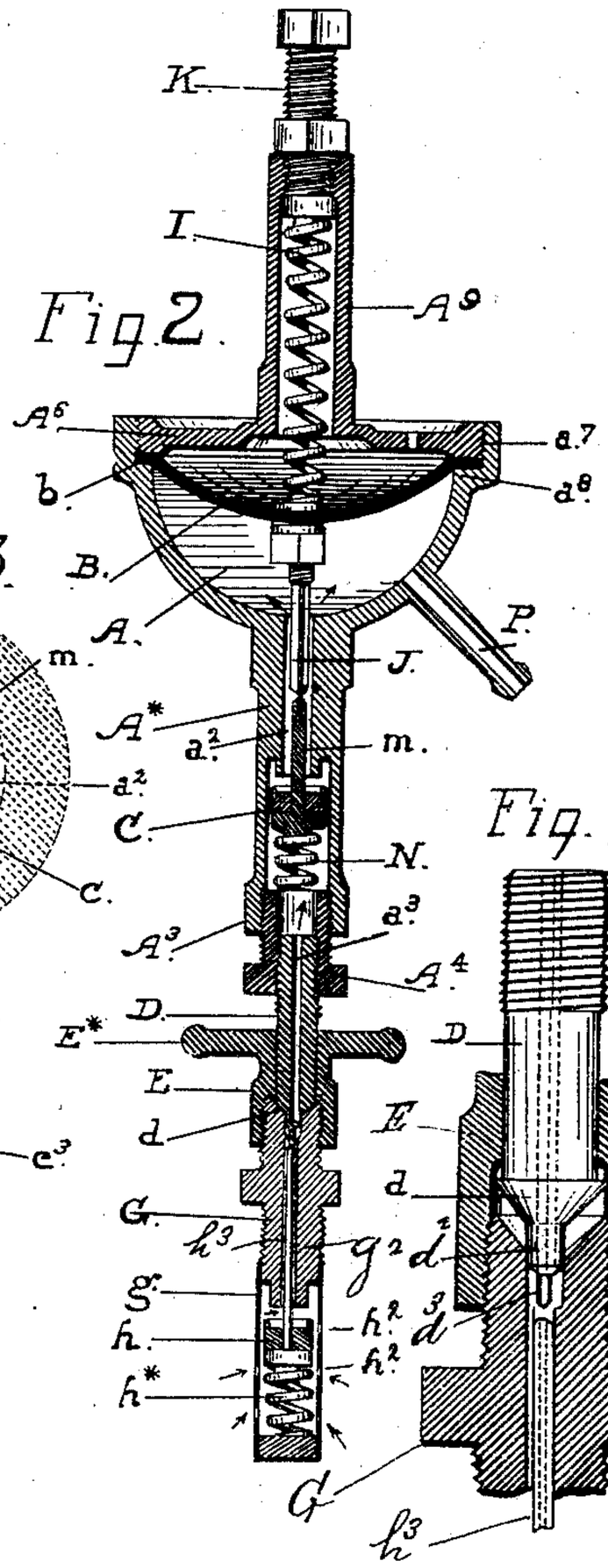

Fig. 3.

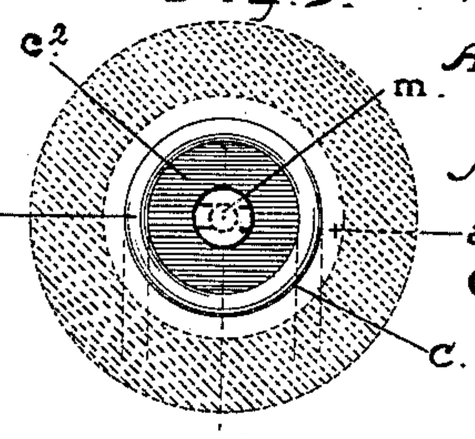

Fig. 4.

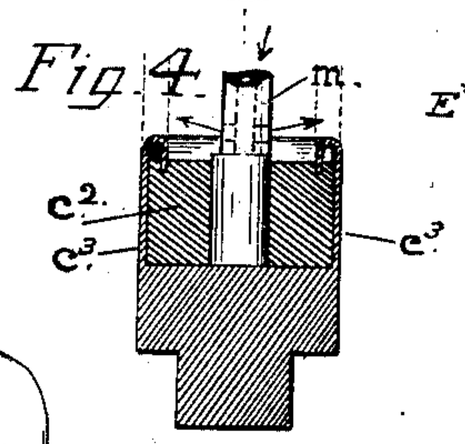

Fig. 5.

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UNITED STATES PATENT OFFICE.

ETHAN A. SCOTT, OF SAN FRANCISCO, CALIFORNIA; ELIZABETH ADELAIDE SCOTT EXECUTRIX OF SAID ETHAN A. SCOTT, DECEASED.

PRESSURE-REGULATOR FOR CARBONIC-ACID GAS.

SPECIFICATION forming part of Letters Patent No. 375,837, dated January 3, 1888.

Application filed March 21, 1887. Serial No. 231,782. (No model.)

To all whom it may concern:

Be it known that I, ETHAN A. SCOTT, a citizen of the United States, residing in the city and county of San Francisco and State of California, have invented certain new and useful Improvements in Pressure-Regulators for Carbonic-Acid Gas; and I do hereby declare that the following is a full, clear, and exact description of my said invention, reference being had to the accompanying drawings, that form a part of this specification.

My invention relates to devices for regulating the supply of carbonic-acid gas to beer-casks in apparatus of the kind now in use for securing continuous pressure and keeping up the degree thereof upon lager-beer and similar beverages on draft, the object of such apparatus being to preserve the life, sharpness, and other qualities.

The invention, embracing certain improvements in pressure-regulators for apparatus of this kind, includes a construction and combination of pressure-chamber, elastic diaphragm, valves, and valve mechanism, as hereinafter described and set forth, producing an improved regulator of the kind in which the valves are acted on by the change or variation in the pressure within the keg and the area of the supply-passage is affected accordingly. There is also included an improved construction of elastic valve to secure a tight seat and ready action and to prevent it sticking to its seat, also, certain improved adjusting means to increase or to reduce the resistance of the diaphragm to the gaseous pressure in the keg and the consequent sensitiveness of the regulator to variations in such pressure.

The following description fully explains the nature of these improvements and the manner in which I construct, combine, and make use of the same, the accompanying drawings being referred to by figures and letters.

Figure 1 is a general outside view of a regulator constructed according to my invention and applied, for operation between a receiver containing carbonic-acid gas and a keg of beer. The stem of the regulator is screwed into the head of the receiver, and is connected with the space in the keg above the liquid by means of a flexible tube. Fig. 2 is a sectional view on a larger scale. Fig. 3 is a plan view of one of the valves employed. Fig. 4 is a central vertical section of Fig. 3. Fig. 5 is a detail view of a portion of the device, showing the stem in elevation and the casing in section.

The diaphragm-chamber A has the space above the diaphragm B open to atmospheric pressure, and the space below it is in connection both with the gas-receiver W and the pressure-space above the liquid in the keg. The pressure of both receptacles is therefore against the same side of the diaphragm.

The neck A* of the chamber A has a central passage, a^2, the lower portion of which is enlarged to provide a seat and chamber for a downwardly-acting valve, C, and a spring, N. The lower end, A^3, is also threaded, and is fitted with a screw-coupling, A^4, by which a stem, D, with a conical head, *d*, is secured in this end of the part A*. Upon the lower end of this part D, which has a central passage through it in line with the passage, is a rotating threaded socket, E, with a hand-wheel, E*, constituting a coupling that attaches the regulator to a screw-threaded plug, G. This part G is screwed into the gas-holder, and while it may be of the ordinary form, with an ordinary threaded nozzle and a stop-cock below it to control the outlet, I have found it of advantage to furnish and employ for use in this particular application of my improved regulator to gas-holders an automatically-closing valve. The end of the plug G, as shown in Fig. 2, is therefore provided at the lower end with a valve-chamber, *g*, containing a downwardly-acting valve, *h*, and a spring, *h**, below it to bring it up to its seat. The top A^6 of the diaphragm-chamber is removable. It has a threaded edge, a^7, that sets into the rim of the body A and screws down against a shoulder, a^8. The diaphragm B is a concave elastic disk, with its outwardly-bent edge *b* setting between and held by these two surfaces.

A tubular extension, A^9, open at both ends and extending above the screw-cover, forms a chamber for the coil-spring I, of which the lower end rests upon the top of the diaphragm and the upper end sets against the flat end of

an adjusting-screw, K, in the top of the spring-chamber. This spring gives pressure upon the top of the diaphragm and in line with a three-cornered pin, J, carried by the lower face of, or depending from, the diaphragm and setting into the passage a^2. The head of this pin rests upon the top of the valve-spindle *m*. The valve is an upwardly-acting one, and is thrown up to its seat by a coil-spring, N, beneath it. It will be seen, therefore, that by such construction and arrangement the valve is pressed away from its seat and the gas let into the chamber by the pressure of the spring I, and that when the gaseous pressure beneath the diaphragm exceeds the energy of the spring I against the valve C the diaphragm will be pressed upward and the valve moved toward its seat by the spring N. The spring I is adjustable to different degrees of power by means of the screw K, so that the valve can be made to close at any excess of gaseous pressure in the diaphragm-chamber above a given amount.

The outlet for the gas is through the nipple P and the conducting-tube R, the latter being a length of ordinary rubber tubing capable of standing the greatest pressure at which the gas is required to be used. It is of advantage in such apparatus to have the strength of the tubing but little, if any, above the greatest working-pressure of the gas, as in such case the tube will be ruptured and the keg relieved if through any disarrangement of the regulator or its valve the latter should fail to work.

In regulators of this kind I have found in practice that the failure of the valves to act promptly and regularly is often and most generally caused by the valve sticking to its seat, and when such is the case it happens that the valve in opening will tear the seat away with it and so allow the gas to rush into the keg uncontrolled. The rubber tube R will therefore burst under the excessive pressure and prevent explosion of the keg; but to overcome this injury to the inlet-valve and consequent derangement of the regulator I construct the valve, as shown in Figs. 3 and 4, with a cylindrical recess to hold an elastic packing composed of the disk c^2, the face of which forms the bearing-surface of the valve. The body of the valve shell or rim C^3 surrounds the packing and stands above it. After the disk is set into this rim the edge of the metal is turned inward and downward and the packing is caught all around the edge, as shown in Fig. 4, and tightly held in place. The valve-seat is suitably shaped to fit inside the rim and let the standing edge pass beyond the face. Whatever tendency there may be in the packing to adhere to the valve-seat it will quickly leave its seat when the valve is moved back, as it is confined by the turned rim and cannot swell or be drawn out of shape.

The plug G is furnished with a self-closing valve of the same construction, with a coil-spring, *h**, to throw it up to its seat, and a spindle, h^3, to hold it open. The valve-chamber is a tube, *g*, fixed over the bottom end of the plug. The bottom of the plug forms the valve-seat, and the top upper end has a conical depression or cavity terminating in a cylindrical chamber, *f**, with which the tubular passage g^2 through the plug is in line and of which it is practically an enlargement. These parts correspond in shape with the end of the stem D, that is fixed to the plug by the screw-coupling E when the regulator is attached, for operation, to the gas-receiver; and as the conical end of the stem is forced down to its seat on the plug, the pin d^3, pressing upon the end of the spindle h^3, opens the valve. Fig. 5 shows the form and illustrates the action of this end of the stem at such time, as well as the object of giving the end of the stem and the recesses in the head of the plug these shapes. It will be noticed that the cylindrical end d^2, fitting closely into the chamber, enters it before the conical head *d* comes to its seat and before the point d^3 touches the end of the valve-spindle. The passage through the plug and that through the part D are consequently in connection before the valve *h* is moved. No escape of gas can take place at the point of union between the plug and the stem of the regulator, even though the conical head is not close to its seat at the time when the gas begins to flow. So, in removing the regulator from the gas-receiver at any time, the valve *h* is allowed to close before the end d^2 leaves its chamber in the plug. This construction gives a self-closing valve, effectively controlling the discharge of the gas from the receiver, and permits the regulator to be uncoupled without inconvenience or danger.

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

1. The combination of the diaphragm chamber and diaphragm, the chambered and bored neck A*, the valve working in said chambered neck, the stem D, and connection, as A^4, whereby stem D is connected with said neck, and having the conical head *d*, shouldered upon the stem D, as described, and provided with the cylindrical end d^2 and pin d^3, the coupling E, holding the shouldered head, and the plug G, having the chamber *f**, conforming to the shape of the head *d*, and a bore fitting the end d^2, and the valve working against lower end of plug G, said valve having a stem to press against pin d^3, as and for the purpose set forth.

2. In a gas-pressure regulator, the combination of the diaphragm-chamber and diaphragm, a neck, A*, connected to the diaphragm-chamber and provided with a valve-chamber and valve-seat projecting from the upper end of said valve-chamber, a stem, J, on the diaphragm projecting down into the neck, a valve consisting of a body, C, elastic packing c^2, and shell C^3, extending above the packing and having its edges turned over and

projected down into the packing, whereby a rounded edge is extended above the packing to serve as a guide to center the valve upon its projecting seat, a stem, *m*, projecting upward from the valve, and a spring, N, on which the valve is mounted, as set forth.

3. The screw-plug G, having the valve seat in the lower end, with chamber, valve, and spring, and the passage and enlarged chamber, and conical seat adapted to receive the head of a stem of corresponding shape and having a cylindrical end fitting into a cylindrical bore to keep the valveway closed for a time after the head is removed from the seat, substantially as described.

In testimony that I claim the foregoing I have hereunto set my hand and seal.

ETHAN A. SCOTT. [L. S.]

Witnesses:
CHAS. E. KELLY,
C. W. M. SMITH.