No. 668,094. Patented Feb. 12, 1901.

W. T. CROSLEN & J. W. McMILLEN.

FLUID PRESSURE REGULATOR.

(No Model.) (Application filed Mar. 26, 1900.)

2 Sheets—Sheet 1.

Fig. 1

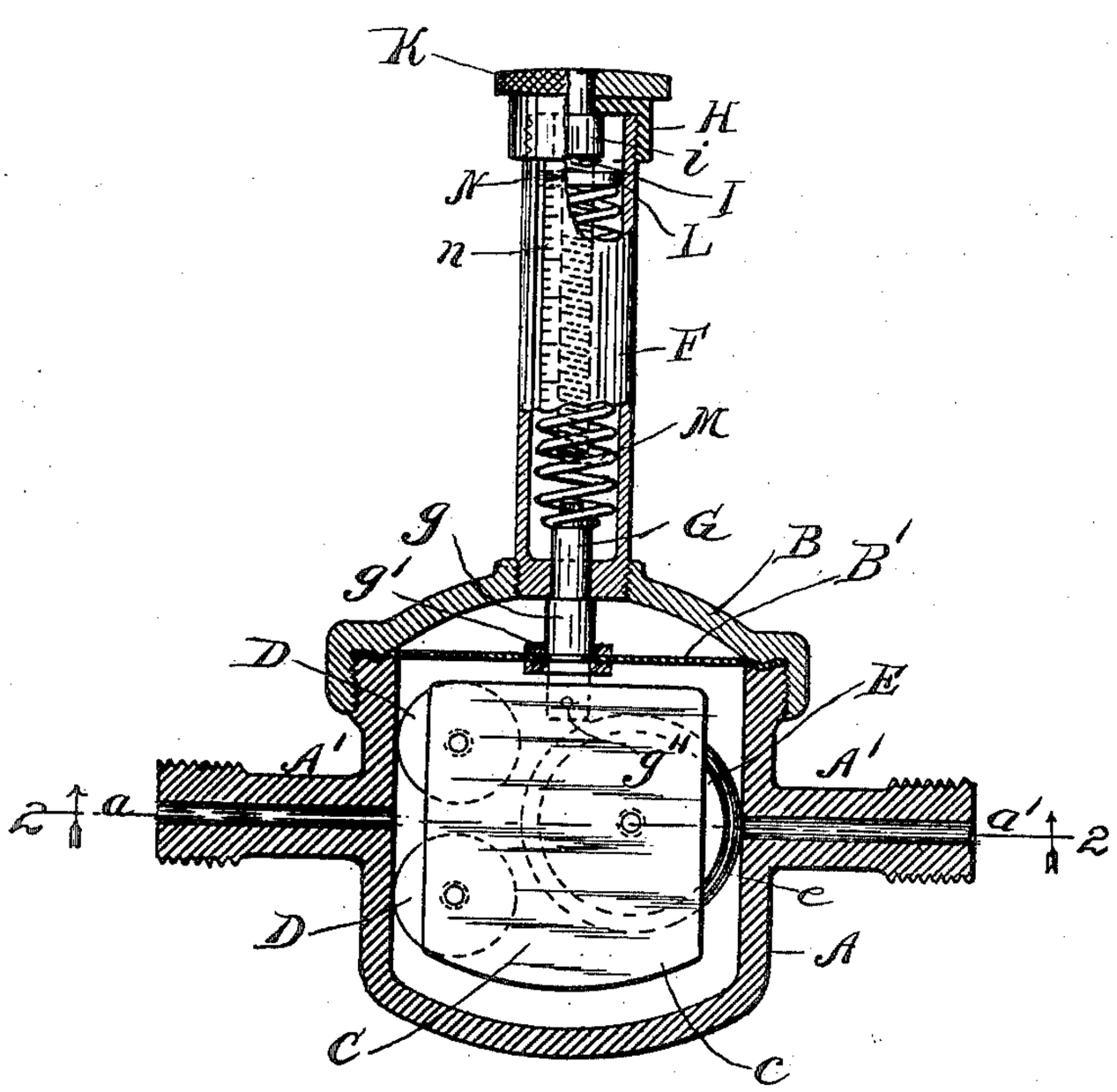

Fig. 2.

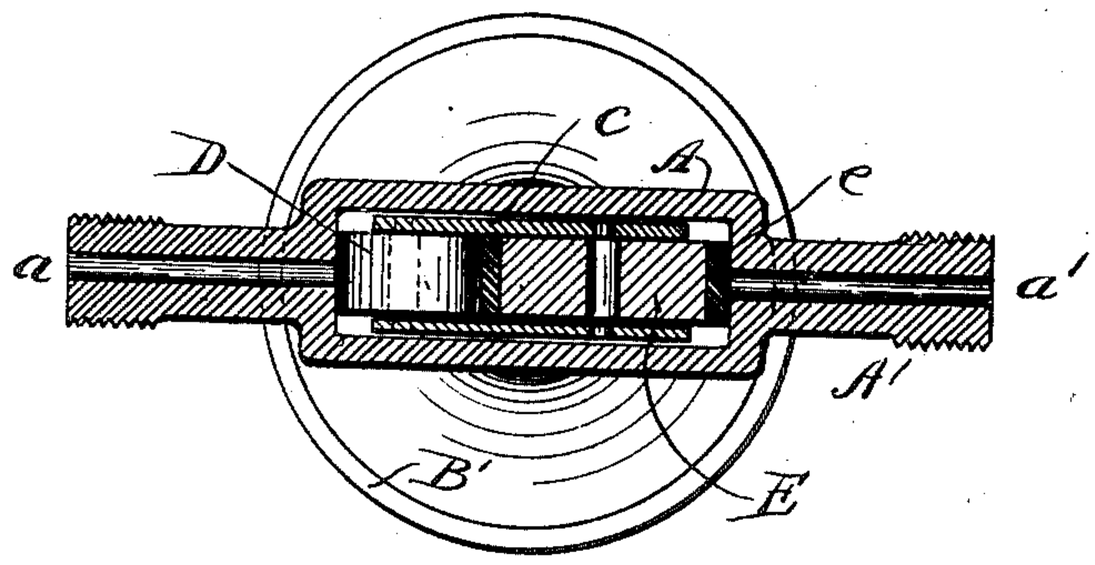

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Fig. 3

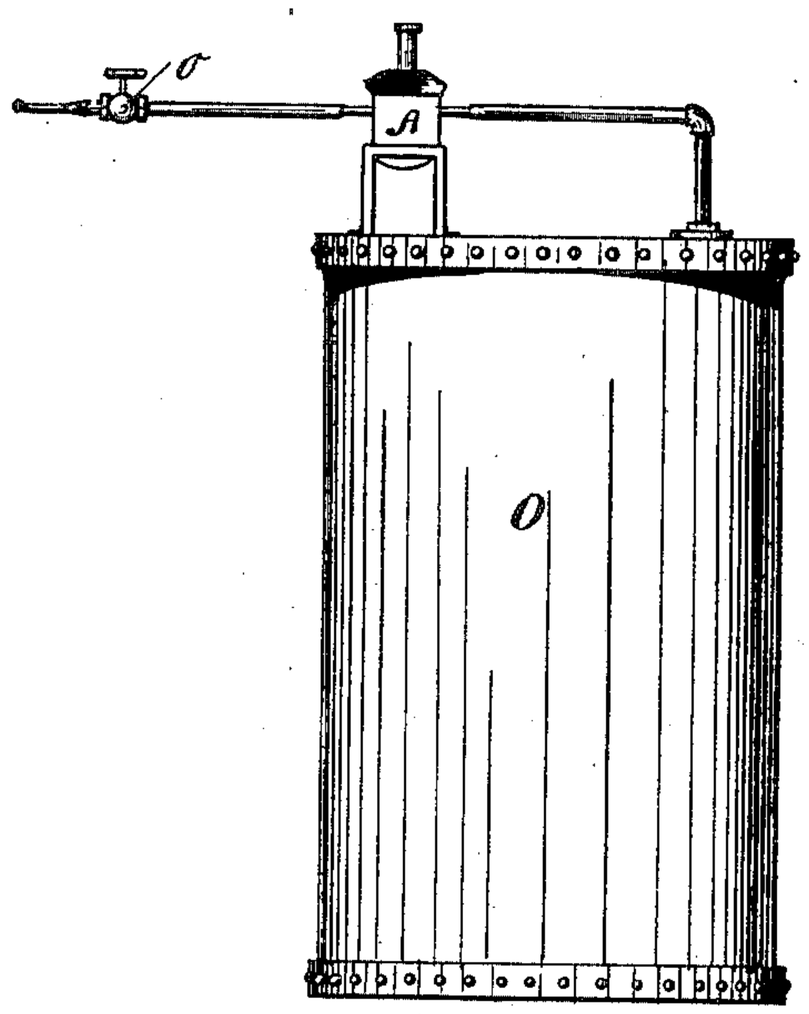
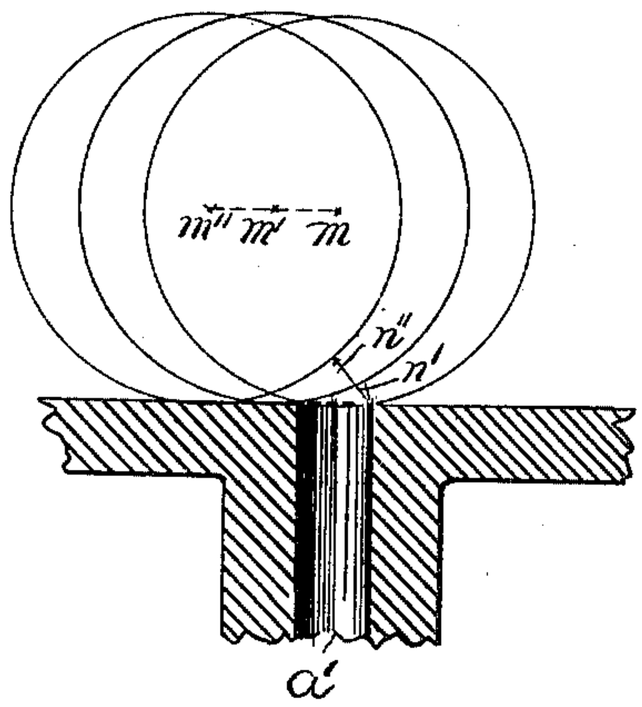


Fig. 4



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UNITED STATES PATENT OFFICE.

WILLIAM T. CROSLEN AND JOHN W. McMILLEN, OF CHICAGO, ILLINOIS, ASSIGNORS, BY MESNE ASSIGNMENTS, TO THE McMILLAN MANUFACTURING COMPANY, OF WEST VIRGINIA.

FLUID-PRESSURE REGULATOR.

SPECIFICATION forming part of Letters Patent No. 668,094, dated February 12, 1901.

Application filed March 26, 1900. Serial No. 10,145. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM T. CROSLEN and JOHN W. McMILLEN, citizens of the United States, and residents of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Fluid-Pressure Regulators, of which the following is a specification.

Our invention relates to fluid-pressure regulators, and has for one object to produce a regulator which shall be simple and economical in construction, practically frictionless in operation, and exceedingly sensitive to variations of pressure, so that it responds quickly to such variations, however produced.

Our invention is applicable to a wide variety of uses, such as the controlling of fluids of all kinds and at widely-varying pressures and whether stored or supplied directly from a generator, and its operation is such as to deliver the fluid at the point of use at a reduced and uniform pressure.

The device by reason of its highly-sensitive character is especially adapted for use in controlling the flow of illuminating-gas or of compressed air when used as a motive power for machinery or for other purposes, the maintaining of a constant current of atmospheric air or other fluid through carbureters, and the maintaining of uniform pressure upon beer stored in casks and the like.

Further objects of our invention are to avoid leakage and back pressure and to provide a regulating mechanism which may be used to completely throttle the flow, as well as to effect its regulation.

To these ends our invention consists in certain novel features, which we will now proceed to describe and will then particularly point out in the claims.

One form of mechanism for carrying out the principles of our invention is shown in the drawings, in which—

Figure 1 shows a side view of our device, partly in perspective and partly in vertical section. Fig. 2 shows a cross-section of the same, taken on the dotted line 2 2, looking in the direction of the arrows. Fig. 3 shows the same as applied to the regulation of the pressure of illuminating-gas stored in a portable tank; and Fig. 4 is a diagrammatic representation of the closure used in our device, showing different positions thereof with reference to the inlet-opening.

Further referring to the drawings, in which like letters of reference denote like parts throughout, A is a frame or casing having the connecting-tubes A′, which may be seen, as shown, formed integrally therewith. Openings *a* and *a′* therethrough provide outlet and inlet openings communicating with the interior of the casing A. The upper portion of the casing A is expanded to a circular section, the outer edges of which are threaded to permit a correspondingly internally threaded cap B to be screwed thereon. A diaphragm B′ is seated on the upper end of the expanded top of the casing A, so that the edge or margin of the said diaphragm forms a tight joint when the cap B is screwed in place.

C is a carrier having wheels D or other suitable antifriction devices which rest upon and travel in contact with the wall of the casing A. The said wheels or other suitable devices should be mounted so as not to interfere with the free passage of fluid through the outlet-opening *a*. The inlet-opening *a′* on the opposite side of the pressure-chamber is preferably made of as small section as is sufficient to accommodate the ingress of the desired amount of fluid to the chamber. A closure for the said inlet-opening is provided, in the form of a disk, wheel, or cylinder E, which should be of large size with reference to the inlet *a′*, so as to bridge across the same, and is mounted on the carrier C, so as to revolve backward and forward over the inlet-opening with the motion of the carrier.

The material of the wheel or cylinder E may be varied according to the pressure or character of the fluids which are to be dealt with, and it may be either of solid or elastic material or may be formed, as indicated in the drawings, with a solid core and an elastic face or rim.

The diaphragm B′, placed as hereinbefore described, forms a movable wall for one side of the pressure-chamber and is utilized to regulate the inflow of fluid into the pressure-chamber by being connected to the carrier C

by the plunger G, to which the latter is pivoted at g''. A means for varying the pressure is arranged within the tube F, which is screwed into the central portion of the cap B. The lower extremity of said tube is connected so that the shouldered portion g of the plunger G is seated thereon, so as to support the outward thrust of the said plunger, caused by the pressure of fluids within the pressure-chamber acting upon the diaphragm B'. The upper portion of the said tube F is provided with a cap H, threaded so as to be securely seated thereon, and is centrally apertured to permit the passage of the shouldered screw I, so that when in place the shoulder i bears upon the under side thereof. A milled disk K is secured to the upper extremity of the screw I above the cap H. A centrally-perforated and threaded disk L is carried on the screw I, and an indicator N, attached thereto, indicates the position thereof upon the scale n and prevents rotation of the disk by its engagement with the slot through which it passes. A spiral spring M is interposed between the disk L and the upper portion of the plunger G, so that the upward or downward movement of the disk when acted upon by the screw I varies the pressure upon the plunger G.

Fig. 1 in the drawings shows the normally-closed position of our apparatus. When the same is desired for use, it may be mounted as shown in Fig. 3, which illustrates the application thereof on a storage-tank of illuminating-gas O. Whatever the pressure may be within the tank, the inlet-opening a' will remain closed by the wheel E, the pressure thereon being supported by the carrier C and the wheels D. Upon turning the screw I by means of the milled head K pressure is brought to bear upon the plunger G, which communicates its movement to the carrier C, thereby moving the closure E and uncovering the opening a', so as to allow an amount of fluid porportionate to the movement of the adjusting mechanism to flow into the pressure-chamber. If the stop-cock o remains closed, only enough fluid will pass to fill the pressure-chamber to the pressure indicated, whereupon the movable wall or diaphragm B' will be driven outwardly, carrying with it the carriage and closing the opening a'. Upon opening the stop-cock o and allowing the pressure within the pressure-chamber to decrease an inward motion of the diaphragm and corresponding movement of the closure E takes place under the pressure of the spring M, permitting a further ingress of fluid to the pressure-chamber, so that a constant pressure is maintained at all times therein and a correspondingly constant flow of fluid therethrough.

We have described our pressure-regulator and the operation thereof with reference to the admission of fluid thereto through the closure-controlled opening. It will be seen, however, that an action similar to the one described will be produced and the quantity of fluid which passes be regulated if the other opening is used as the inlet, the discharge being controlled at the outlet-opening.

We consider the rolling closure disclosed herein to be an essential feature of our invention, in that it aids materially in giving the delicacy of control and adjustment referred to. If the rolling closure E shown in the drawings was replaced by a sliding closure moving across the inlet-opening, the latter would be uncovered in direct proportion to the movement of the carriage; but when a cylinder placed upon a tangential plane is rolled thereon for short distances the point of original contact exhibits a differential movement with reference to the axis of the cylinder, which at first is very slight and which increases until the opening is entirely disclosed—that is, assuming constant successive movements of the cylinder through equal spaces—the original point of contact will move away from the tangential plane for a very small distance at the first space traversed by the cylinder. The next movement of the point is greater than the first, and so on. These differential distances for practical purposes represent the relations of the openings to each other made by different movements of the wheel or carrier. The law of movement being as stated, it will appear that when our apparatus is set to permit the flow of very small quantities of fluid the movement of the closure is very closely and accurately gaged, being represented by a correspondingly much greater movement of the diaphragm and carrier; but when the apparatus is set for a large flow therethrough the action of the closure is much more rapid under the movement of the diaphragm. When the passage of large quantities of fluid is involved, the valve acts with greater speed. When small quantities of fluid are involved, the valve acts with greater accuracy. The service in either case meets and corresponds to the practical requirements thereof.

The operation of the rolling closure described may be supplemented by making the same of elastic material or providing the same with a yielding or elastic face, so that the flattening thereof when properly adjusted upon its seat over the inlet-opening prevents any leakage which might occur by reason of the contact of rigid circular and plane faces.

Having described our invention and illustrated the same by a practical and operative example thereof, we wish it to be understood that we do not limit ourselves to the precise construction and arrangement of parts shown and described, nor to the special uses above enumerated.

We claim—

1. In a pressure-regulator, a pressure-chamber having an inlet-opening and an outlet-opening, a flat valve-seat at one of the said openings, a flexible diaphragm on one side of the pressure-chamber, and a rolling closure

bearing directly on said valve-seat controlled by said diaphragm and adapted to occlude the said opening when internal pressure is exerted upon the diaphragm, substantially as set forth.

2. In a pressure-regulator, a pressure-chamber having an inlet-opening and an outlet-opening, a flat valve-seat at one of the said openings, a flexible diaphragm in one side of the pressure-chamber, a carrier located in said pressure-chamber and controlled by said diaphragm, and a closure mounted upon said carrier and having a curved face which bears directly on the valve-seat and which is adapted to be rolled over the opening by the traverse of the carrier, substantially as set forth.

3. In a pressure-regulator, a pressure-chamber having an inlet-opening and an outlet-opening, a flat valve-seat at one of the said openings, a flexible diaphragm in one side of the pressure-chamber, means for adjusting said diaphragm to move at predetermined pressure, a carrier located in said pressure-chamber and controlled by said diaphragm, and a closure rotatably mounted upon said carrier and having a curved face which bears directly on the valve-seat and which is adapted to be rolled over the said opening by the traverse of the carrier, substantially as set forth.

4. In a pressure-regulator, a pressure-chamber having an inlet-opening and an outlet-opening, a flat valve-seat at one of the said openings, a flexible diaphragm in one side of the pressure-chamber, means for adjusting said diaphragm to move at predetermined pressure, a carrier having antifriction-mountings bearing upon the walls of the pressure-chamber, said carrier being connected with said diaphragm, and a rolling closure for the said opening which bears directly on the valve-seat and which is mounted upon said carrier, substantially as set forth.

5. In a pressure-regulator, a pressure-chamber having an inlet-opening and an outlet-opening, a flat valve-seat at one of the said openings, a flexible diaphragm in one side of the pressure-chamber, means for adjusting said diaphragm to move at predetermined pressure, a carrier located in said pressure-chamber and controlled by said diaphragm, and a rolling closure mounted upon said carrier and provided with an elastic face of curved form which bears directly on the valve-seat and which is adapted to be rolled over the said opening by the traverse of said carrier, substantially as set forth.

6. A pressure-regulator comprising in combination a pressure-chamber having an inlet-opening with a flat valve-seat and an outlet-opening and a movable wall, and means for controlling the inlet, said means comprising a rolling closure located within the pressure-chamber and bearing directly on said valve-seat and so connected with the movable wall that an increase of pressure tends to move said wall, and thereby roll the valve to occlude the inlet, substantially as set forth.

7. In a device for controlling the flow of fluids, a valve-chamber with an inlet-opening and an outlet-opening, a diaphragm in one side of said chamber, a valve-seat about one of the said openings, a rolling closure resting directly on the valve-seat so as to open or close the opening by traverse thereover, and means for controlling the traverse of said closure by the action of the diaphragm.

In testimony whereof we sign our names to this specification in the presence of two subscribing witnesses.

WILLIAM T. CROSLEN.
JOHN W. McMILLEN.

Witnesses:
M. H. CAZIER,
ANNIE PHILLIPS.