F. C. BLANCHARD & E. B. CROCKER.

GAS REGULATOR.

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1,030,967. Patented July 2, 1912.

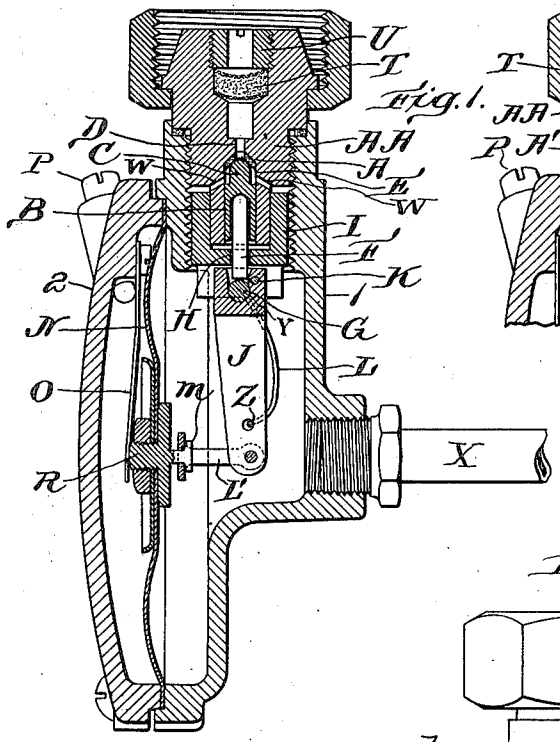


Fig. 1.

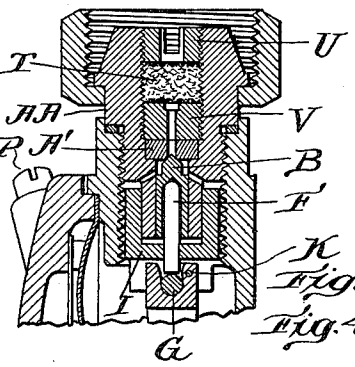


Fig. 5.

Fig. 4.

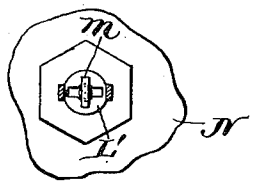


Fig. 2.

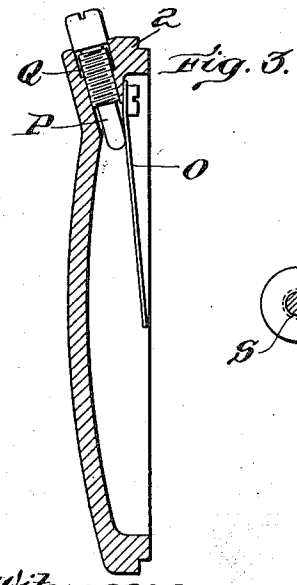
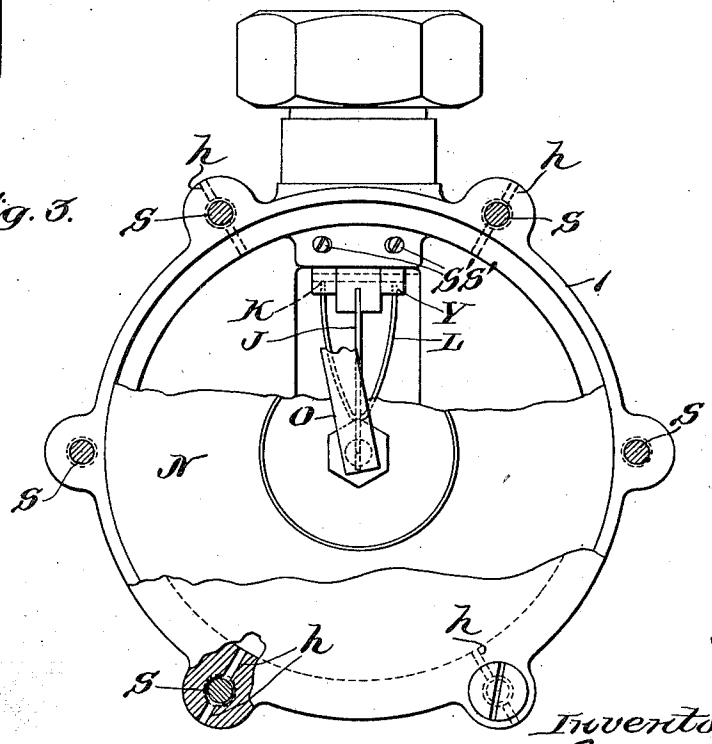


Fig. 3.



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UNITED STATES PATENT OFFICE.

FREDERICK C. BLANCHARD AND ERNEST B. CROCKER, OF BRIDGEPORT, CONNECTICUT, ASSIGNORS TO THE ASHCROFT MANUFACTURING COMPANY, OF BRIDGEPORT, CONNECTICUT, A CORPORATION OF CONNECTICUT.

GAS-REGULATOR.

1,030,967. Specification of Letters Patent. Patented July 2, 1912.

Application filed February 17, 1912. Serial No. 678,327.

To all whom it may concern:

Be it known that we, FREDERICK C. BLANCHARD and ERNEST B. CROCKER, both citizens of the United States, and residents of Bridgeport, in the county of Fairfield and State of Connecticut, have invented new and useful Improvements in Gas-Regulators, of which the following is a specification.

Our invention relates to the construction of gas pressure regulators and consists in improvements of which the chief object is to render an instrument of this character highly sensitive and at the same time permanently reliable.

A characteristic example of gas regulators of the species to which our improvements are applicable is shown and described in United States Letters Patent No. 948,340, dated February 8, 1910, to William R. Park. As a pressure regulator of this general character must deliver gas under substantially uniform pressure regardless of large variations in pressure at the source of supply it must combine quick sensitiveness of operation with substantial design and construction. Moreover since a conspicuous field of utility is to be found in the gas illuminating apparatus carried by the modern motor vehicles it is indispensable to have the regulator so constructed that the shocks and vibrations incident to road travel shall not interfere with smooth and regular operation.

With these objects in view we have invented the improvements hereinbelow described, specific examples of which are shown and illustrated in the drawings hereto annexed in which,—

Figure 1 shows a gas pressure regulator in section; Fig. 2 is a plan view of the instrument with the cover thereof removed and the diaphragm partly broken away to show the interior arrangement; Fig. 3 is a cross section of the cover of the regulator taken diametrically through the entrance for an adjusting screw; Fig. 4 shows details of the connections between the diaphragm and the inlet valve operating mechanism; and Fig. 5 shows in section an alternative construction of valve seat.

The casing for our improved gas pressure regulator is formed of cast metal in two portions, a body 1 and a cover 2; these two portions making a close joint with each other to confine the flexible diaphragm N at its periphery; screws S being employed to set and hold the cover 2 in place. At the inlet opening to the chamber contained in the body 1 and inclosed by the diaphragm there is provided a screw plug A A which is axially bored out to provide a passage for gas from the source of supply and also to furnish suitable bearings for the valve B. At or near the entrance end of this plug the filter T is placed, this consists preferably of a wad of absorbent cotton confined between two disks of wire gauze. The filter T is held in place by a screw plug U which is centrally perforated to allow the passage of gas. Midway between the two ends of the plug A A the aperture therethrough is constricted as at D so as to provide a very small inlet opening for gas and also to furnish a base for the soft metal valve seat A which is preferably composed of pure tin fused into the plug, centrally perforated and shaped to form a conical valve seat. The larger cylindrical bore E constitutes a sliding bearing for the valve B. This valve is preferably composed of a hard brass or bronze and is so proportioned as to have considerable length in relation to its diameter and furthermore is centrally bored out from its rear end to a point in the rear of the conical seating end C. Preferably this central bore extends more than half way to the seating end of the valve. The socket formed by boring out the interior of the valve B terminates in a conical seat against which the round end of the push pin F bears centrally in order to press the valve B to its seat A. In order to insure a close and accurate seating of the valve its seating end C is given a cone shape somewhat more acute than the cone-surface of the seat A so that the center point of the valve B enters the center bore in the seat A and forms a close and accurate seating contact by pressure on the softer metal of which the seat A is composed; contact starts at the rim of the center hole and works outward. The guiding portion of the valve B is for the greater part in the rear of the conical end of the socket formed in the valve itself. If great care be taken to grind the seating surface of the valve B carefully, so that no irregularities will be present to impress themselves in the seat A, the arrange-

ment of hard metal for the valve and soft metal for the seat will be satisfactory. If however the valve B is in the least irregular, its fault will be impressed on the seat A, and as soon as the valve shifts rotatively, as it may in the free cylindrical bearing, the irregularity will be impressed on a different portion of the seat, and leaks will develop. This difficulty is overcome by providing the structure illustrated in Fig. 5, in which a seat A′ of hard rubber is held in place by a centrally perforated screw plug V. The valve B, seating in the rubber A′ may be slightly irregular in shape, but as soon as the valve-pressure is removed from the seat A′, the elastic material of which the seat is composed restores itself, obliterating any irregularity of impression made upon it, so that even if the valve B were to shift relatively, it will always find a tight seat.

The valve operating lever J is fulcrumed on the pin K which passes through the ears of the adjusting block I. Close to the fulcrum pin K a bearing pin G passes transversely through the lever J and this lever is bored out to the transverse hole which accommodates the pin G so that the push pin F which lies partly in the socket in the valve B and partly in the hole H formed in the adjusting block I lies with its rear end lodged in the end cavity of the lever J close to the pin G which thus affords a rounded bearing surface to rest against the end of the push pin F which may be either flat or slightly rounded. The round pin G is so proportioned that a line drawn from the center of the fulcrum pin K to the line where the pin G bears on the butt of the push pin F makes a right angle with the axis of the pusher F, which is practically coincident with a line drawn from this bearing to the center or axis of the valve seat A, when the valve B is just seated. This arrangement eliminates all sliding friction at the end of the push pin F when the valve B is seating. The adjusting block I is made to slip into the threaded aperture which is closed by the plug A A, and is bored out so as to slide over the inner end of the said plug. When the correct position of the adjusting block I is determined as will hereafter be described the set screws S′ S′ are turned down to pin the adjusting block I into place. The two projecting ears of the adjusting block I which provide lodgment for the fulcrum pin K are also perforated as at Y at an angle, to receive the legs of the U-spring L which passes through the hole Z in the lever J. At the end of this lever J the link or stirrup L′ is provided and this link has a slot at its cross-head through which to introduce the T-shaped projection *m* which is secured to the diaphragm N.

In assembling the above described parts of the instrument, the plug A A, being screwed tightly to a packed seat, the valve B is inserted in the aperture in the plug, the push pin F is then placed in the socket of the valve B and the adjusting block I with the lever J (carrying the link L′) attached to it by means of the fulcrum pin K and having also the spring L in position as shown is inserted into the threaded opening closed by the plug A A, at its outer end. The adjusting block L is slid into this opening until the valve B reaches its seat A and then, care being taken to see that the adjusting block I is correctly placed so that the link L′ will make proper connection with the diaphragm, the set screws S′ S′ are screwed down, holding the adjusting block I firmly in place. Then the diaphragm N is placed in position by inserting the T-headed projection *m* into the slot in the cross-head of the link L′ and then giving the diaphragm a quarter turn so as to bring the T-head *m* across the slot in the link as shown in Fig. 4. The securement of the T-head *m* to the diaphragm N is provided by the nut and washer arrangement shown at R. The instrument is now ready for the application of the cover 2. This cover carries the adjusting spring O, which is a leaf spring secured at one side of the cover, and the adjusting screw P which is threaded into a boss and is inclined downwardly so that the inner end of the screw may bear upon the top of the leaf spring O. The inner end of this leaf spring bears upon the center stud attached to the diaphragm N. The screw aperture for the adjusting screw P is shouldered at Q (Fig. 3) so that there may be a prescribed limit to the degree of pressure exerted by the spring O on the diaphragm N.

The adjustment of the apparatus by which the pressure of gas emerging therefrom is determined is brought about by the spring O and adjusting screw P. The spring L performs the function of a take-up to compensate for the slack or backlash between the articulated inner members which for the sake of easy assemblage and the reduction of friction are somewhat loosely put together. The spring L thus guards against damage which might be occasioned by shocks or vibrations. It will be observed that the anchorage of the two legs of the spring L is quite close to the fulcrum axis of the pin K so that the movement of the lever J can produce but little friction between the spring and the lever. As the spring L is designedly very light any frictional element it introduces in the apparatus is negligible. The valve B having ample bearings in the bore E is in no danger of binding or cramping. Its free movement is further insured by the push pin connection between the valve B and the lever J. When the valve is moved toward its seat by this push pin, the rounded end of the pin automatically finds

the center position in the conical base of the socket within the valve B and exerts pressure on the valve quite close to the seating end thereof. In moving the valve inward, the push pin F carries the bearing portions of the valve B in the rear of its operating end. When movement of the valve takes place in the opposite direction it is in response to a subsidence of the diaphragm N which relieves the push pressure transmitted by the push pin F so that the movement of the valve B from its seat under gas pressure from the source of supply is easy and performed with a minimum of friction. The contact bearing between the round pin G and the end of the push pin F further conduces to elimination of friction.

By securing the adjusting spring O and the adjusting screw P to the cover 2 of the apparatus the danger of leakage from the inner chamber is practically eliminated since this inner chamber has no apertures except those which are tightly closed as by the plug A A or the packing of the exit pipe X.

In order to guard against any back pressure on the diaphragm, and also to provide drainage openings for the outer chamber under the cover 2, the flange of the cover is perforated at *h*, the perforations intersecting the holes provided for the screws S; the shanks of these screws being slightly smaller than the cover-holes provide vent while the presence of the screws in the holes furnishes an obstacle to the introduction of any mischevious instrument which might endanger the diaphragm N and put the instrument out of operation.

While the easy sliding fit of the valve B and the parts directly connected with it are such that gas may enter the diaphragm-closed chamber without special provision for its passage, the lateral apertures W will be found desirable so that gas entering the instrument may pass through these apertures and then find its way along the sides of the adjusting plug I into the interior of the regulator.

What we claim and desire to secure by Letters Patent is:

1. In a gas pressure regulator of the character described, the combination with a diaphragm-controlled valve lever, of a plug, perforate to afford gas inlet, and bored to furnish a sliding bearing for an inlet valve with a valve seat at the base of the bore, an inlet valve, elongated to afford large bearing surface, to slide in the said bearing, the valve centrally bored from its rear end to a point near to the seating end and in advance of a material portion of the valve bearing surface, a fulcrum block fitting in the inner end of the gas-inlet plug, provided with a fulcrum pin for the valve-lever and centrally perforated to admit a valve pusher, said valve pusher, consisting of a rod, loosely lodged in the passage composed of the perforations in the block and the central bore of the valve, and means to secure the fulcrum block in place adjustably.

2. In a gas pressure regulator of the character described, the combination with a diaphragm-controlled valve lever, provided with a rounded push-bearing, of a plug, perforated to afford gas inlet, bored to furnish a sliding bearing for an inlet valve, with a valve seat at the base of the bore, an inlet valve, elongated to afford large bearing surface, to slide in the said bearing, the valve centrally bored from its rear end to a conical bearing near to the seating end and in advance of a material portion of the valve bearing surface, a fulcrum block fitting in the inner end of the gas-inlet plug, provided with a fulcrum pin for the valve-lever and centrally perforated to admit a valve pusher, said valve pusher, consisting of a rod, loosely lodged in the passage composed of the perforations in the block and the central bore of the valve and rounded at the end engaging the conical bearing to transmit movement from the lever to the valve, and means to secure the fulcrum block in place adjustably.

3. In a gas regulator of the character described, the combination with a diaphragm-controlled valve lever, of a plug perforated to afford gas inlet, bored to furnish a sliding bearing for an inlet valve with a valve seat at the base of the bore, an inlet valve, elongated to afford large bearing surface, to slide in said bearing, the valve centrally bored from its rear end to a point near to the seating end and in advance of a material portion of the valve bearing surface, a fulcrum block fitting in the inner end of the gas-inlet plug, provided with a fulcrum pin for the valve-lever and centrally perforated to admit a valve pusher, said valve pusher, consisting of a rod, loosely lodged in the passage composed of the perforations in the block and the central bore of the valve to transmit movement from the lever to the valve and means to secure the fulcrum block adjustably, and a take up spring, anchored in the fulcrum block close to the fulcrum axis and bearing on the valve lever, to take up slack between the parts connecting the diaphragm with the valve lever.

4. In a gas pressure regulator of the character described, the combination with a diaphragm-controlled valve lever, provided with a rounded push-bearing, of a plug, perforated to afford gas inlet, bored to furnish a sliding bearing for an inlet valve, with a valve seat at the base of the bore, an inlet valve, elongated to afford large bearing surface, to slide in the said bearing, the valve centrally bored from its rear end to a conical bearing near to the seating end and in

advance of a material portion of the valve bearing surface, a fulcrum block fitting in the inner end of the gas-inlet plug, provided with a fulcrum pin for the valve-lever and centrally perforated to admit a valve pusher, said valve pusher, consisting of a rod, loosely lodged in the passage composed of the perforations in the block and the central bore of the valve and rounded at the end engaging the conical bearing to transmit movement from the lever to the valve, and means to secure the fulcrum block in place adjustably, the parts being so proportioned that when the inlet valve is seated, a line drawn from the fulcrum center to the tangent of contact between the bush-bearing and the pusher is substantially at right angles to a line drawn from said tangent of contact to the center of the inlet valve seat.

Signed by us at Bridgeport, Connecticut this 6th day of February 1912.

FREDERICK C. BLANCHARD.
ERNEST B. CROCKER.

Witnesses:
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