Nov. 8, 1927. 1,648,304

J. HARRIS

REGULATOR

Filed Sept. 1, 1923 2 Sheets-Sheet 1

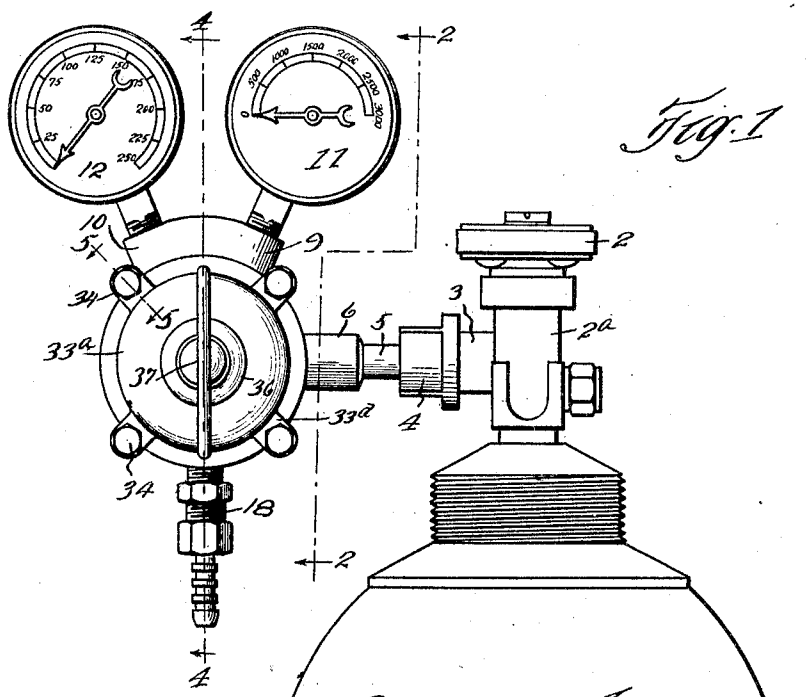


Fig. 1

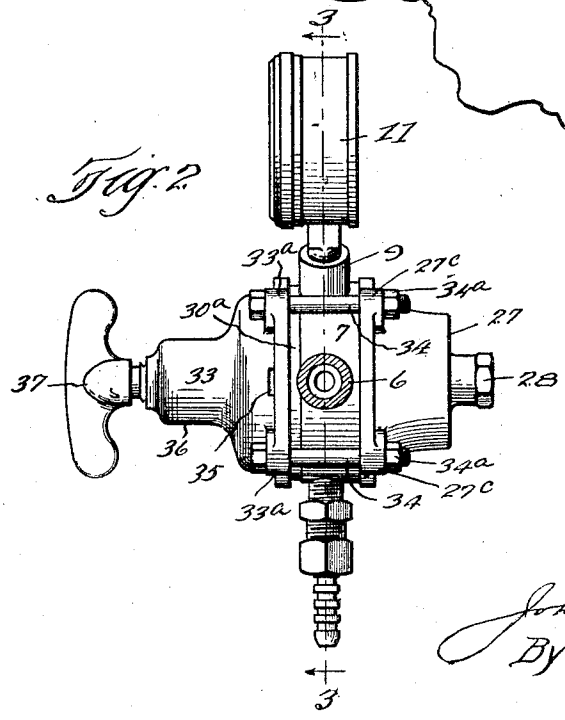


Fig. 2

Inventor
John Harris
By Hull, Brock & Watt
Attys.

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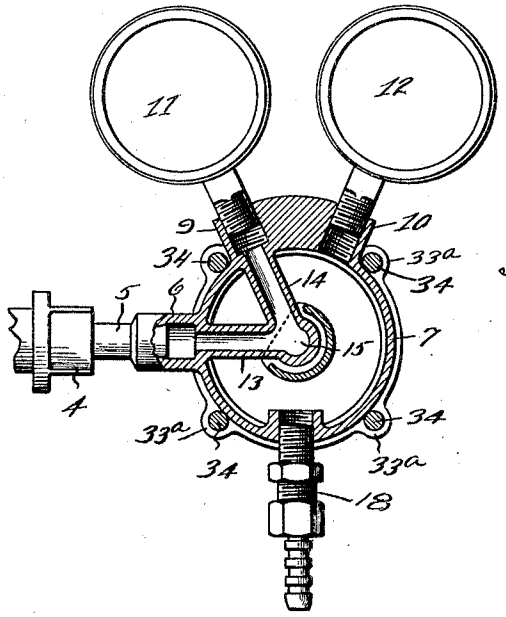
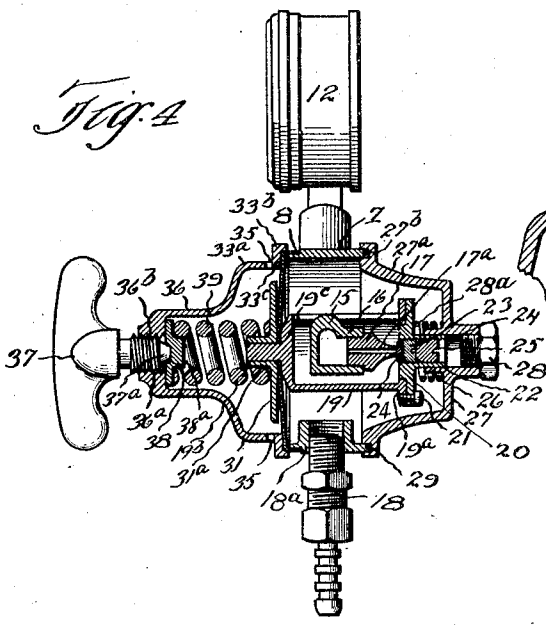


Fig. 3

Fig. 4



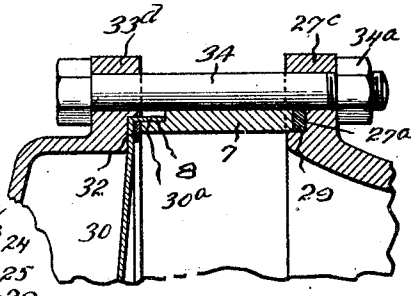


Fig. 5

Inventor:
John Harris,
By Hull, Brock & West
Attys.

Patented Nov. 8, 1927. 1,648,304

UNITED STATES PATENT OFFICE.

JOHN HARRIS, OF CLEVELAND, OHIO, ASSIGNOR TO THE HARRIS CALORIFIC COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

REGULATOR.

Application filed September 1, 1923. Serial No. 660,476.

This invention relates to regulators for gases, and more particularly to a regulator of the type employed in connection with the oxygen and combustible gases used with cutting and welding torches. One of the objects of my invention is to provide a regulator of this character which will be safe and reliable in operation and which, in the event of the dislocation or rupture of the diaphragm, will permit the gas to escape in such manner as to avoid injury to the workmen, or others in the vicinity. Another object of the invention is to provide a construction of regulator which will render it practically impossible for any part of the casing, in which the gas or gases under pressure are normally contained, to be blown off through the development of an abnormally high pressure. A further object of the invention is to improve and simplify the manner of supporting and assembling the diaphragm, whereby the diaphragm may be readily and conveniently applied to and secured in place and may be readily removed, should occasion require. A still further object of the invention is to improve the manner of mounting the diaphragm and the valve, whereby the valve may be rendered reliable in operation through the expansion of the diaphragm. A still further object of the invention is to provide a valve the parts of which are conveniently adjustable and which can be renewed, if desired, with a minimum of time and effort.

Still further and more limited objects of the invention will appear in the detailed part of the specification which follows, the invention being shown in its present preferred form in the drawings forming a part hereof, wherein Fig. 1 represents an elevation of a portion of a gas tank showing my regulator applied thereto; Fig. 2 a sectional elevation corresponding to the line 2—2 of Fig. 1; Fig. 3 a similar view corresponding to the line 3—3 of Fig. 2; Fig. 4 a similar view corresponding to the line 4—4 of Fig. 1; and Fig. 5 a sectional detail corresponding to the line 5—5 of Fig. 1.

Describing the various parts by reference characters, 1 denotes the supply tank, which may contain any gas the pressure of which is to be regulated. This tank is provided at its upper end with the usual valve 2 and casing 2^a whereby the flow of gas from the tank to the outlet connection 3 may be controlled or cut off, as desired. Secured to the connection 3, as by a gland nut 4, is the adjacent end of a regulator connection 5. The short connection 5 is fitted within a nipple 6 projecting from the intermediate or body section 7 of the regulator. This intermediate or body section is provided at its front end with a recessed annular seat 8 for the marginal flange of the diaphragm, which will be described hereinafter. Preferably cast, or otherwise formed with, the body section of the regulator, are the connections 9 and 10 for the gages 11 and 12, which show, respectively, the pressure within the tank 1 and the pressure within the regulator chamber. The connections 6 and 9 are also preferably formed with integral inwardly extending conduits 13 and 14, which communicate respectively with the connections 6 and 9 and are in communication with each other at the center of the body section 7, where a chamber 15 is provided. This chamber is provided with a laterally extending nipple 16 in which there is threaded a tip 17 having a restricted central bore 17^a for the delivery of gas from the tank to the regulator chamber.

Projecting from the regulator body section 7 is a delivery connection 18, to which a suitable hose may be applied, the said connection being threaded into an inwardly extending nipple 18^a, preferably formed with the cylindrical wall of the said section.

The delivery end of the bore 17^a is controlled by means of a valve which is mounted on a yoke and which yoke is connected to the diaphragm. The yoke shown herein has a body 19 which approximates the segment of a cylinder, providing a free outlet for the gas from the bore 17^a into the regulator chamber. This yoke is provided at one end with a flange 19^a to which a plate 20 is secured by means of screw bolts 21. This plate is provided with a sleeve 22, the sleeve and the central portion of the plate constituting an internally threaded bore in the inner end of which there is mounted a valve 23, the said valve comprising an externally threaded cylindrical block having a special seat 24 at the inner end thereof which is adapted to engage the delivery end of the nipple 17. The valve block 23 is provided with a central notch for the reception of a screw-driver or similar instrument and is

locked in its adjusted position by means of a plug 25 having a similar notch. The outer end of the nipple 22 is slidably mounted in and guided by the inner end of a sleeve 26 which is formed with the central portion of the rear wall 27 of the back cover or cap for the regulator. The sleeve 26 is extended outwardly from the rear of the back wall 27 and is there provided with a threaded plug 28. Surrounding said sleeve is a helical spring 28^a which presses at one end against the plate 20 and at its opposite end against the rear wall of the back cap or cover. From this wall, the back cap or cover flares outwardly, as shown at 27^a, being provided at its front edge with an annular recess 27^b constituting a seat for a gasket or washer 29. The front edge of the wall 27^a is provided with radial lugs 27^c (four such lugs being shown) for the reception of bolts, which will be referred to hereinafter and which serve to clamp together the sections of the regulator.

The front portion of the cylindrical wall of the intermediate or body section 7 is provided with the annular recessed seat 8, to which reference has been made hereinbefore. This seat is adapted to receive the cylindrical marginal flange 30^a of the diaphragm 30. The central portion of the diaphragm is perforated for the reception of a central stud 19^b projecting from a head 19^c at the front end of the yoke 19, which stud also supports the front backing plate 31 for the diaphragm, by means of a sleeve 31^a on said plate which is fitted snugly about and preferably secured to said stud. The head 19^c, stud 19^b, plate 31 and sleeve 31^a constitute a leak-proof joint between the central portion of the diaphragm and the parts to which it is connected. Between the front marginal edge of the body section 7 and the cooperating portion of the diaphragm there is interposed a washer or gasket 32.

Cooperating with the parts 7 and 27 of the regulator is the front cap, which is indicated generally at 33. This cap comprises a rear annular body portion 33^a having a marginal flange 33^b, which is provided with an extended annular seat 33^c (angular in section) which is adapted to form an extended bearing for the marginal portion of the diaphragm, within the flange 30^a thereof, and to cooperate with the sections 7 and 27 in effecting a tight and secure joint between the marginal portion of the diaphragm and the body of the regulator. The marginal portion 33^b is provided with radial lugs 33^d which cooperate with the lugs 27^c for the purpose of securing the regulator sections together and the diaphragm in place; four such lugs 33^d are provided, corresponding in number and position to the lugs 27^c; and the lugs are perforated for the reception of strong bolts 34 (preferably of steel) which serve, by tightening up the nuts 34^a thereon, to clamp tightly together the front and rear caps and the intermediate body portion of the regulator. It will be noted that, by reason of the recessed seat 8, ample clearance is provided between each bolt 34 and the marginal flange 30^a of the diaphragm.

Preferably adjacent to the marginal flange 33^b, the front cap is provided with openings 35 providing for the lateral free discharge of gas therethrough in the event that the diaphragm 30 should become ruptured by deterioration or by development of extremely high pressures within the chamber formed on the rear side of the diaphragm. The gases, entering the front cap, can escape freely through the openings 35 and will spread laterally, in such direction as not to endanger or cause any appreciable discomfort to the workmen or other operators in the vicinity. Should there be a leakage of gas past the valve 24, the diaphragm 30 will be bulged at its central portion, exerting a pull upon the marginally clamped parts thereof. By reason of this construction, there will be a tendency for the marginal flange to straighten out and the washer 32 will be forced inwardly away from its seat and permit the gas to escape between the washer and marginal flange. By reason of this construction and manner of mounting the diaphragm and due to the location of the openings 35, double protection against injury will be afforded to the workmen or operators in the vicinity of the regulator. The spacing of the bolts 34 from such marginal flange will allow said flange to be spread outwardly to permit such escape of gas.

The front cap 33 is provided with a reduced neck portion 36 having at its extreme end a cap 36^a provided with a threaded aperture 36^b for the reception of the thread on an adjusting plug 37. The inner end of this plug is tapered, as shown at 37^a, and engages a tapered seat in a disk 38, which disk has a central projection 38^a adapted to receive one end of a helical spring 39, the opposite end of which surrounds the nipple 31^a and presses against the backing plate 31. By adjusting this plug, the pressure of the gas within the chamber at the rear of the diaphragm may be regulated as desired.

Among the advantages which are realized by my construction are the following:

(*a*) Absolute safety to the operators or workmen in the vicinity of the regulator, due to the opportunity which is afforded for the gas to be discharged laterally from the regulator without rupture of any of the parts of the casing thereof.

(*b*) Convenience and ease of assembling and strength of assembly, due to the provision of the bolts 34, and the construction of the caps or covers in such manner as to cooperate with and receive such bolts.

Meanwhile, leak-proof connections are afforded by means of the gaskets or washers 27^b and 32.

(*c*) Durability of the parts. In this connection it should be noted that with regulators as ordinarily constructed, the back cap is threaded onto the body. In operation, the workmen frequently screw home this back so hard that the thread is partly stripped, resulting in the blowing off of the cap under pressure, with resultant injury. The front cap of regulators as ordinarily constructed is also liable to blow off, particularly if it be not screwed home with sufficient tightness; in this case, if the diaphragm should be ruptured, the front cap is liable to be blown off.

(*d*) In the event of rupture of the diaphragm (due to excessive pressure) my construction allows such diaphragm to be very conveniently removed and replaced, as the diaphragm is not soldered in place, as is customary, but is secured by means of bolts and gaskets and the front tension spring 39.

(*e*) The yoke 19 in my construction is materially shortened as compared with the yokes of ordinary regulators, thus minimizing the danger of the valve parts in such yoke getting out of alignment.

(*f*) The valve parts are readily adjustable and can be removed and replaced in a very short time and in a very convenient manner.

(*g*) The spring 29 cooperates with the valve plate 20 to assist the diaphragm in closing the valve 20 against the end of the nipple 17, when the desired pressure in the regulator chamber has been reached.

(*h*) Finally, the bolts which connect the parts together are the only parts which can be tightened by unskilled operators; and this minimizes the chances of injury to regulators of this class.

Having thus described my invention, what I claim is:—

1. A regulator comprising a casing having an intermediate section provided with inlet and outlet connections for gas, one end of the intermediate section being provided with an annular external seat, a diaphragm on such end of said section and having a marginal flange adapted to engage said seat, there being a gasket or washer interposed between such end of the intermediate portion and the adjacent portion of the diaphragm within such flange, a valve cooperating with said diaphragm to control the pressure of the gas delivered from such regulator, a cap section having a marginal portion adapted to engage the marginal portion of the diaphragm and only the portion of the flange adjacent thereto, the said cap section having one or more openings for discharging gas laterally therefrom, a cooperating cap section adapted to be secured to the opposite end of the marginal portion of the intermediate section, and means for securing the said cap sections to the intermediate section, the end of the diaphragm flange being freely accessible to the atmosphere, whereby gas passing between said flange and its seat may escape.

2. A regulator comprising a casing having an intermediate section provided with inlet and outlet connections for gas, one end of the intermediate section being provided with an annular external seat, a diaphragm on such end of said section and having a marginal flange adapted to engage said seat, a valve cooperating with said diaphragm to control the pressure of the gas delivered from such regulator, a cap section having a marginal portion adapted to engage the marginal portion of the diaphragm on the end of the intermediate section and a flange adapted to engage a portion only of the flange of such diaphragm, with the end portion of the flange free, a cooperating cap section adapted to be secured to the opposite end of the marginal portion of the intermediate portion, and means for securing the said sections together, the end of the diaphragm flange being freely accessible to the atmosphere, whereby gas passing between said flange and its seat may escape.

3. A regulator comprising a casing having an intermediate section and a pair of end-cap sections, the intermediate section having at one end thereof an annular external seat, a diaphragm having a marginal flange for said seat, there being a washer interposed between such end and the portion of the diaphragm adjacent to and within said flange, the end cap section for such end of the intermediate section having a marginal portion adapted to engage the marginal portion of the diaphragm on such end and a flanged portion adapted to engage a portion only of the external surface of the flange of said diaphragm, whereby the end of said flange is unsupported, the said end cap sections having laterally extending projections or extensions, and bolts connecting such extensions outside of the intermediate section, the said bolts being spaced from the flange of said diaphragm.

4. A regulator comprising a casing having an intermediate section and a pair of end-cap sections, the intermediate section having at one end thereof an annular external seat, a diaphragm having a marginal flange for said seat, the end cap section for such end of the intermediate section having a marginal portion adapted to engage the marginal portion of the diaphragm on such end and a flanged portion adapted to engage a portion of the external surface of the flange of said diaphragm, whereby the end of said flange is unsupported, the said end cap sections having laterally extending projections

or extensions, and bolts directly connecting such extensions outside of the intermediate section, the said bolts being spaced from the flange of said diaphragm and the end portion of said diaphragm being unenclosed.

5. A regulator comprising a casing having an intermediate section and a pair of end-cap sections, the intermediate section having at one end thereof an external annular seat, a diaphragm having a marginal flange for said seat, there being a washer interposed between such end and the portion of the diaphragm adjacent to and within said flange, the end cap section for such end of the intermediate section having a marginal portion adapted to engage the marginal portion of the diaphragm on such end and a flanged portion adapted to engage a portion only of the external surface of the flange of said diaphragm, whereby the end of said flange is unsupported, the said end cap sections having laterally extending projections or extensions, and bolts connecting such extensions outside of the intermediate section, the said bolts being spaced from the flange of said diaphragm and the end cap section which engages the said diaphragm being provided with one or more apertures for directing gas laterally therefrom.

6. In a regulator, the combination of a casing having an intermediate section and a pair of end cap sections, said intermediate section having at its upper end an external annular depression, a diaphragm fitting over the upper end of said intermediate section, there being an annular washer resting on said upper end, said diaphragm resting on said washer and having an annular marginal flange engaging in said annular depression, the upper cap section having a marginal flange adapted to engage a portion only of the marginal flange of said diaphragm whereby the end of said flange is unsupported, said end cap sections having oppositely disposed apertured projections thereon, bolts connecting said extensions whereby when said diaphragm is deflected to a predetermined extent said washer will be moved to allow fluid to escape between said marginal flange and annular depression.

In testimony whereof, I hereunto affix my signature.

JOHN HARRIS.