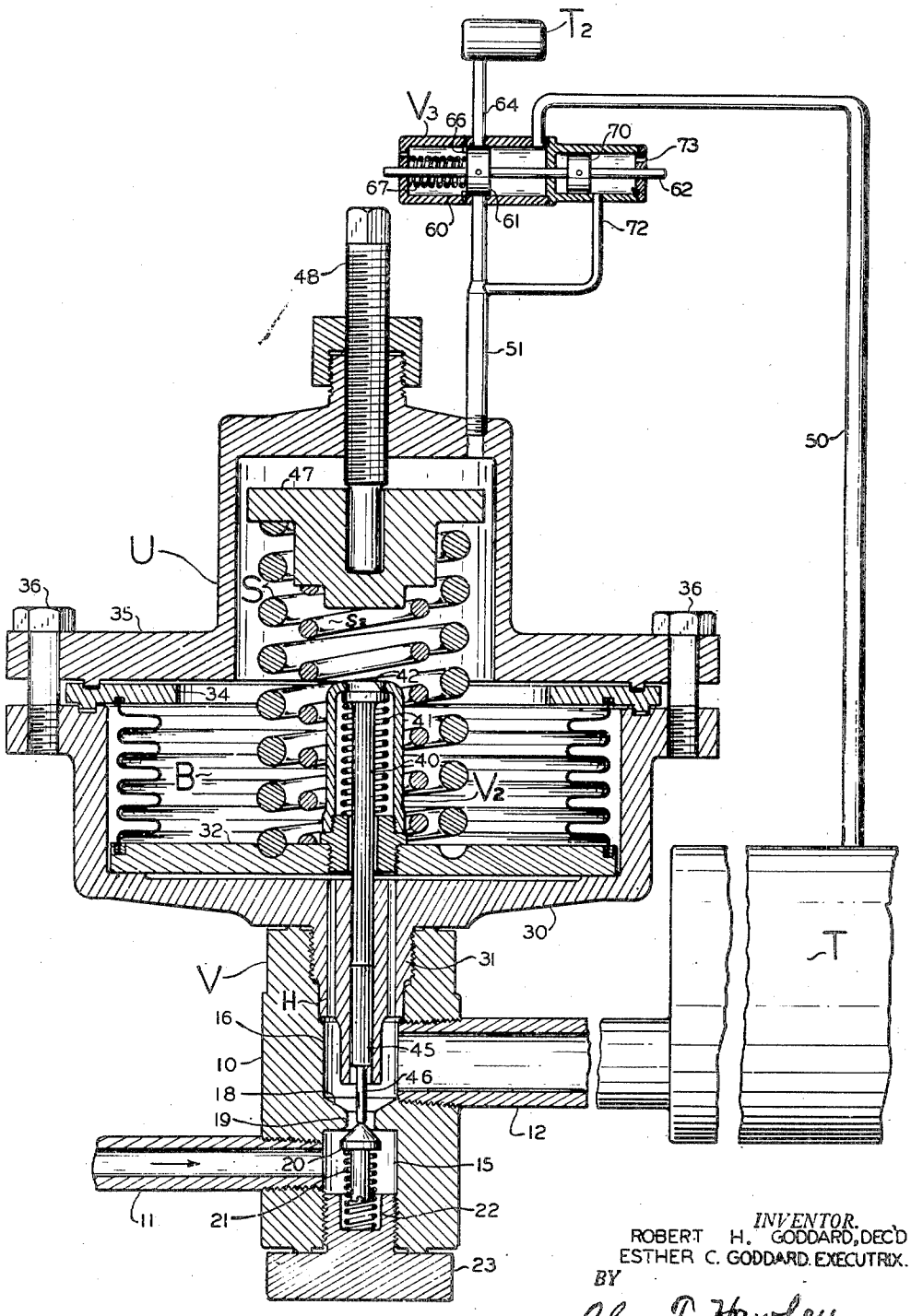
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QUICK-ACTING REDUCING VALVE

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QUICK-ACTING REDUCING VALVE

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1 Claim. (Cl. 137—488)

This invention relates to a valve particularly designed for reducing and controlling heavy gas pressures in combustion apparatus.

It is the general object of the invention to provide a reducing valve which will provide and maintain a heavy uniform operating pressure. A further object is to provide a reducing valve having special provision for quick response to a drop in pressure in the controlled apparatus.

The invention further relates to arrangements and combinations of parts which will be hereinafter described and more particularly set forth in the appended claim.

A preferred form of the invention is shown in the drawing which is a sectional side elevation of the improved reducing valve.

Referring to the drawing, the valve V comprises a body **10** having an inlet pipe **11** and an outlet pipe **12**. The inlet pipe **11** is to be connected to any suitable supply of high pressure gas, and the pipe **12** may be connected to a tank T or to any other apparatus in which a uniform but reduced gas pressure is to be maintained.

The pipe **11** is connected into a lower chamber **15** in the body **10**, and the pipe **12** is connected into an upper chamber **16**. The chambers **15** and **16** are separated by a partition **18** having a reduced connecting opening or port **19**.

A valve member **20** is positioned below the port **19**, and a spring **21** tends to raise the valve member **20** to closing position. The lower end of the spring **21** is seated in a recess **22** in a cap or nut **23** which also closes the lower end of the chamber **15**.

A control unit U is mounted above the valve V and comprises a main casing **30** having a downward projection **31** adapted to be threaded into the upper end of the body **10**. A bellows B is housed in the casing **30**, and the lower or free end of the bellows is firmly secured to a movable bottom plate **32**.

The upper end of the bellows B is secured in a ring **34** which is clamped between the upper surface of the casing **30** and the under side surface of a casing head **35**, these parts being firmly held together by screws **36**.

A casing member V2 is mounted on the bottom plate **32** and encloses a valve-opening plunger **40** pressed upward by a coil spring **41**, so that it normally closes a port **42** in the upper end of the casing member. The lower end of the plunger **40** engages a second plunger **45** slidable in an axial passage in the downward projection **31** of the main casing **30**.

At its lower end, the plunger **45** is reduced, as indicated at **46**, and passes loosely through the port **19** to engage the head of the valve member **20**. When the bottom plate **32** is in its lowest position, as indicated in the drawing, the plungers **40** and **45** are of such length that the valve **20** will be forced downward to open the port **19**.

Relatively heavy springs S and S2 are provided within the bellows B, and at their lower ends they engage and press downward the bottom plate **32**. At their upper ends, they engage a cap **47** loosely mounted at the lower end of an adjusting screw **48** which is threaded into the upper

end of the casing head **35**. By turning the screw **48**, the pressure of the springs S and S2 may be adjusted.

The apparatus thus far described operates as follows:

The valve V is normally open. When pressure is admitted through the pipe **11**, gas under pressure flows through the port **19** to the outlet pipe **12** and tank T.

Small holes H are provided in the casing extension **31**, and as pressure rises in the outlet pipe **12** and tank T, increased pressure is applied through the holes H to the under side of the bottom plate **32**. This pressure eventually overcomes the springs S and S2 and raises the bottom plate **32** and casing member V2. The valve-opening plunger **40** likewise rises and permits the lower plunger **45** and the valve member **20** to rise and to thereby decrease the open area of the port **19**.

In due course, these parts will assume a substantially static position, with the port **19** open just enough to maintain the desired reduced pressure in the tank T or in other apparatus to which the reducing valve V is connected. The exact amount of this reduced pressure may be determined by the setting of the adjusting screw **48**.

Special provision is made for restoring the desired uniform pressure, when an increase in demand on the tank T or other operated apparatus causes a drop in the pressure to be uniformly maintained.

For this purpose, a by-pass connection **50** extends from the tank T to an auxiliary valve V3, which in turn is connected by a pipe **51** into the casing head **35** and hence into the interior of the bellows B. The valve V3 comprises a cylinder **60** having a piston **61** mounted on a piston rod **62** which is freely slidable axially. An auxiliary pressure tank T2 is connected with the cylinder **60** by a pipe **64** positioned opposite the pipe **51** previously described.

When the tank T is under normal reduced pressure, this normal pressure is applied through the pipe **50** to the right-hand end of the cylinder **60** and holds the piston **61** against stop-pins **66**, at the same time compressing a coil spring **67**. In this position, the piston **61** closes the pipes **64** and **51**.

At this same time, a second piston **70** assumes the position shown in the drawing and uncovers the upper end of a by-pass connection **72** between the pipe **51** and a vent **73**, so that the pressure in the interior of the bellows B is atmospheric and there is no downward gas pressure on the bottom plate **32**.

If an increased demand on the tank T or other apparatus causes a drop in the selected reduced pressure, the pressure in the auxiliary cylinder **60** correspondingly drops, so that the spring **67** overcomes the pressure in the cylinder **60** and moves the pistons **61** and **70** to the right. The piston **70** thereupon closes the venting by-pass **72**, and the piston **61** uncovers the auxiliary pressure pipe **64** and opens the connection thereof through the pipe **51** to the interior of the bellows B.

Additional pressure is thus exerted on the bottom plate **32**, forcing it to move downward against the pressure on the under side of the plate and thus further depressing the valve member **20** and increasing the operative area of the port **19**. An increased flow of gas through the outlet pipe **12** to the tank T then takes place, and the desired uniform pressure is restored.

As the action of the relatively large bellows B is rather slow, the casing member V2 and plunger **40** are provided to produce quicker action. As soon as the auxiliary valve V3 has admitted pressure to the control unit, the increased pressure acts directly on the plunger **40**, depressing the valve plunger and promptly pushing the valve member **20** downward without waiting for the relatively slow downward movement of the bottom plate **32**.

Provision is thus made for maintaining and restoring a desired uniform pressure in the tank T or other appa-

ratus, and also for inducing quick action on the event of a sudden drop in pressure on the tank T.

The apparatus above described has been found effective and satisfactory in controlling pressures as high as 800 lbs. per square inch.

Having thus described the invention and the advantages thereof, it will be understood that the invention is not to be limited to the details herein disclosed, otherwise than as set forth in the claim, but what is claimed is:

A quick-acting reducing valve for a controlled pressure system comprising a valve body having inlet and discharge connections, an interposed port and a valve member therefor, a spring to move said valve member in a direction to close said port, a control unit comprising an actuating part movable to engage and shift said valve member to open said port, springs to effect such movement of said actuating part, a pressure connection between the discharge passage of said reducing valve and said control unit, whereby the discharge pressure balances the spring pressure at a predetermined regulating position of said valve member, and said control unit including a bellows member, means to admit auxiliary air under pressure from an auxiliary air supply to said bellows member to further

open said reducing valve on a drop in pressure in the controlled system, and quick-acting auxiliary means to accelerate the valve-opening action of said actuating part, and said quick-acting auxiliary means comprising a member in said control unit, which member is directly exposed to said auxiliary air under pressure and which member acts directly to move said actuating part and to thereby quickly open said reducing valve when said member is moved by said auxiliary air under pressure and before the bellows member completes its relatively slow response to said auxiliary air pressure.

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