O. ONSRUD.

PRESSURE REGULATING DEVICE.

APPLICATION FILED NOV. 30, 1908.

931,334. Patented Aug. 17, 1909.

Fig. 3

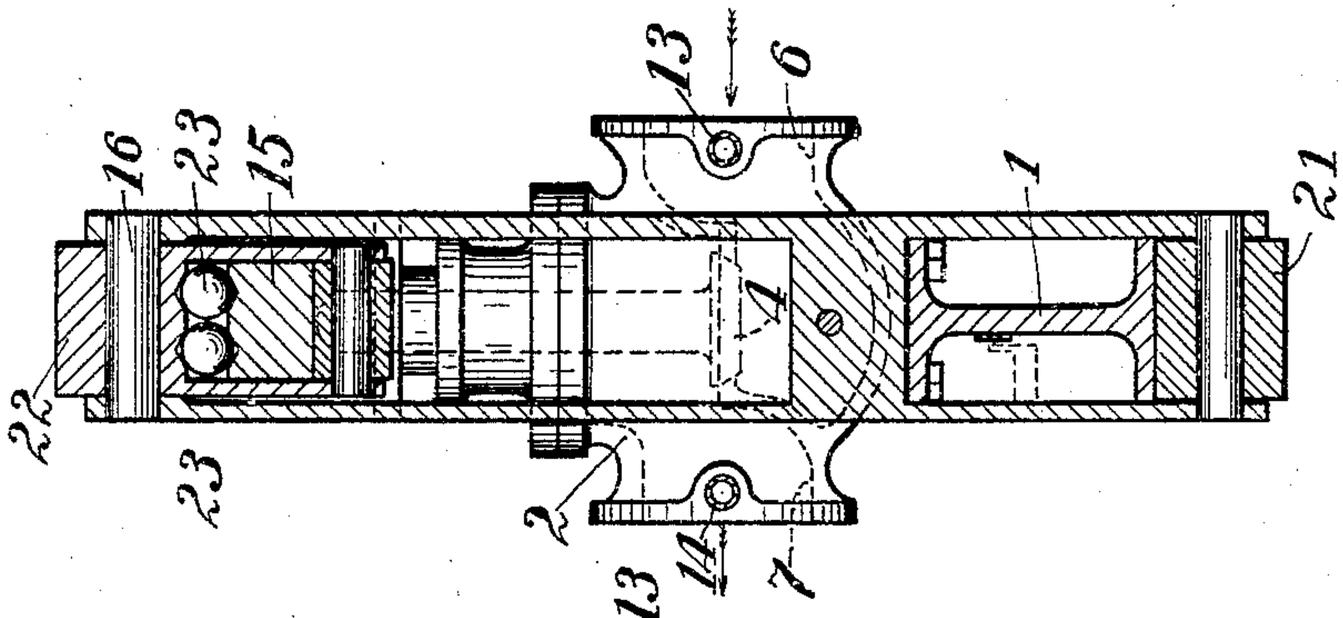


Fig. 2

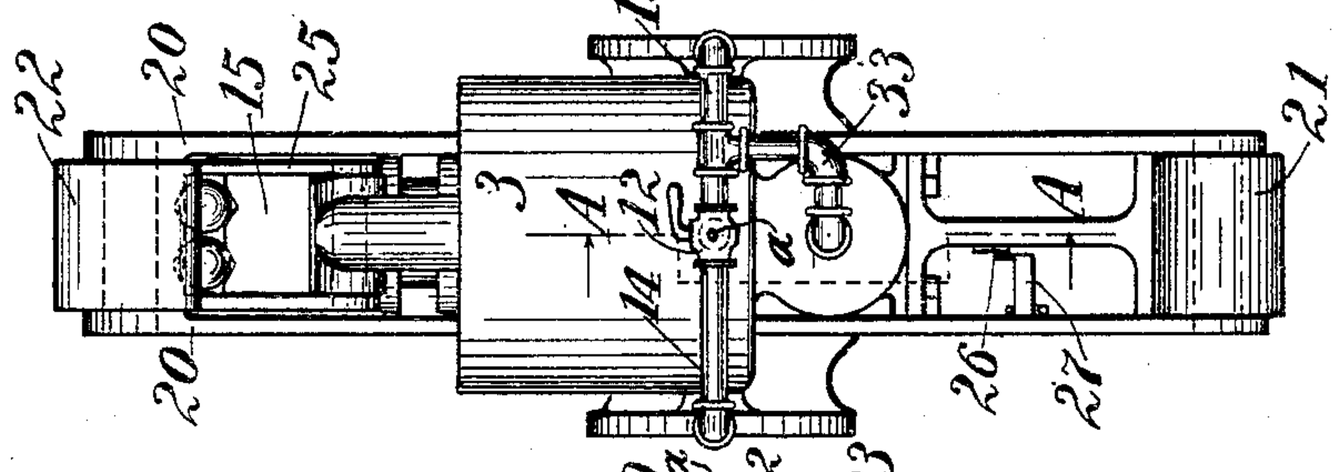
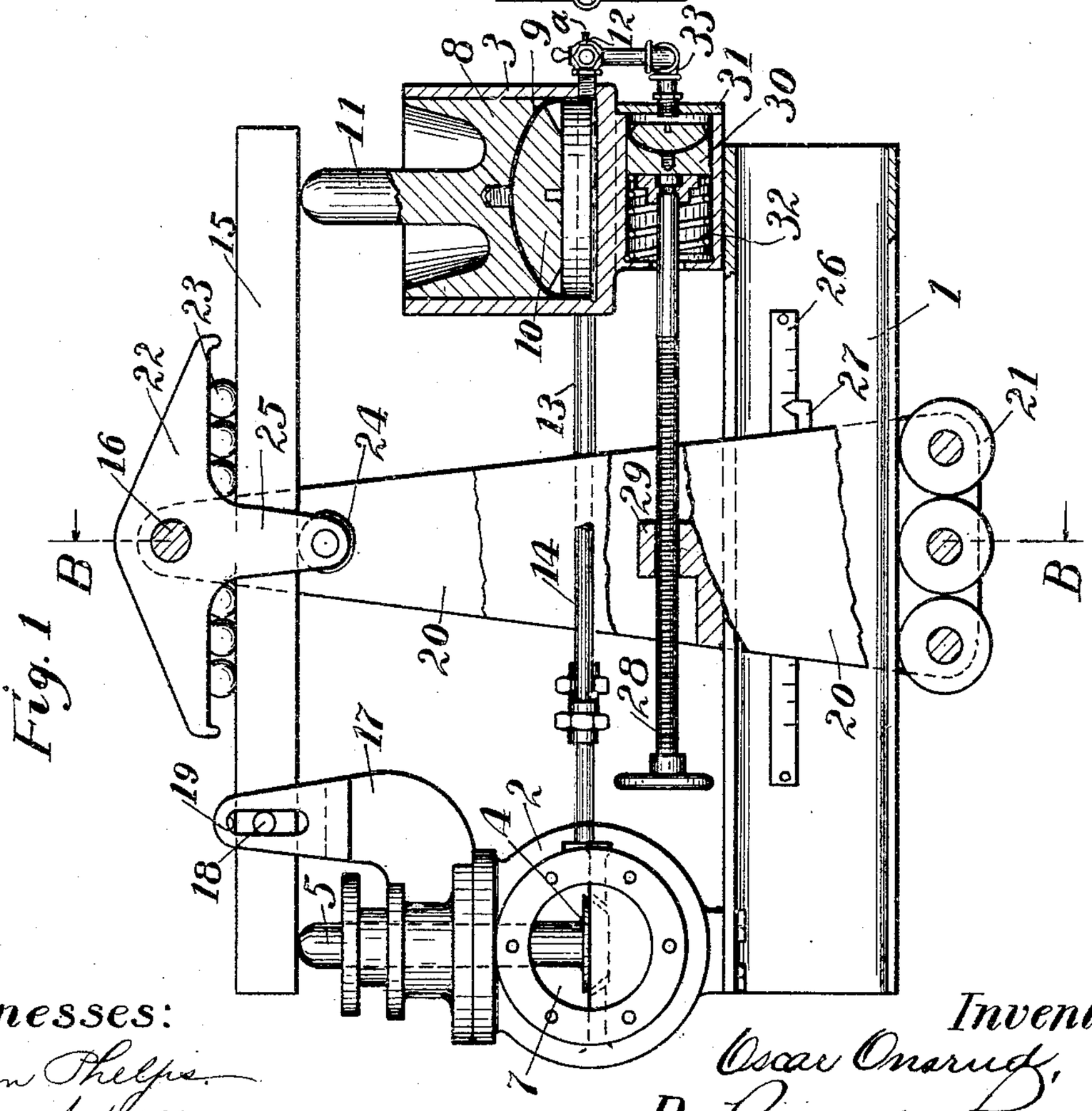


Fig. 1



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UNITED STATES PATENT OFFICE.

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PRESSURE-REGULATING DEVICE.

No. 931,334. Specification of Letters Patent. Patented Aug. 17, 1909.

Application filed November 30, 1908. Serial No. 465,183.

To all whom it may concern:

Be it known that I, OSCAR ONSRUD, a citizen of the United States of America, and a resident of Chicago, Cook county, State of Illinois, have invented certain new and useful Improvements in Pressure-Regulating Devices, of which the following is a specification.

The main objects of this invention are to provide an improved form of pressure regulating device for reducing fluid pressure; to provide a device of this class in which the pressure of the source may be used for either opening or closing the regulator valve; to provide improved and automatic means for maintaining a predetermined low pressure, regardless of fluctuations of the pressure at the source of supply; to provide improved means for adjusting the ratio of the high and low pressures without interfering with the operation of said automatic means; and to provide a pressure reducing valve which may be readily adjustable, even when the pressures to which it is exposed are comparatively high.

These objects are accomplished by the device shown in the accompanying drawings, in which:

Figure 1 is a side elevation, partly broken away and partly in section, of a pressure reducing device embodying this invention, the sectional parts being shown on the line A—A of Fig. 2. Fig. 2 is an end elevation of the same, viewed from the right of Fig. 1. Fig. 3 is a section on the line B—B of Fig. 1.

In the construction shown in the drawings, the supporting frame comprises a beam 1, upon opposite ends of which are mounted a valve casing 2 and a cylinder 3. The valve casing 2 is similar in form to the well known globe valve, and it contains a conical lift valve 4 which is carried by a vertically disposed stem 5 slidably mounted in the casing 2. The seat of the valve 4 is located in a partition which extends across the interior of the casing 2 between the inlet opening 6 and the outlet opening 7, so that the valve 4 will be normally urged toward an open position by the pressure of the fluid at the inlet side of said valve. (See Fig. 3.)

The pressure cylinder 3 is vertically disposed and has a piston 8 mounted therein. The piston 8 is provided with a cup-shaped packing 9 which may be of leather, thin sheet metal, or other suitable material so shaped that its edges will tend to lie closely against the bore of the cylinder 3 and will be urged into tight contact therewith by the fluid pressure below the piston. This packing is held in position by means of a disk 10 which is threaded into the piston 8. The piston has a vertically disposed stem 11. The cylinder 3 is closed at its lower end, and the space below the piston is connected through the 3-way valve 12 with the inlet and outlet sides of the valve casing 2 by means of the pipes 13 and 14 respectively, said 3-way valve being arranged to connect either of the pipes 13 or 14 with the cylinder 3 at will. The 3-way valve should preferably have a drip outlet *a* for draining the cylinder 3 when the valve is set to close both of the pipes 13 and 14. Such 3-way valves are in common use, and for this reason its internal construction is not illustrated herein.

The piston 8 is preferably of larger diameter than the valve 4, and it is so arranged that the pressure below it will tend to urge the valve 4 to a closed position through the action of an interposed lever 15 which is provided with a movable fulcrum 16, as will hereinafter appear. The lever 15 is guided by means of a forked bracket 17 mounted on the valve casing 2, and is secured against longitudinal shifting by means of studs 18 which play in slots 19 in the forks of the bracket 17.

In order to insure that friction will offer a minimum amount of resistance to the shifting of the fulcrum of the lever 15, said fulcrum is mounted in a carriage 20 which is slidable longitudinally upon the beam 1, there being anti-friction rollers 21 interposed between said carriage and the lower side of said beam 1. The fulcrum 16 is in the form of a pivot journaled between uprights on the carriage 20. A balance beam 22 carried by the fulcrum 16 extends longitudinally along the top of the lever 15. A series of balls 23 are seated in suitable ball races in the adjacent surfaces of the lever 15 and beam 22, so as to provide an anti-friction bearing between them. The beam 22 also carries a roller 24 which engages the lower surface of the lever 15, being journaled in depending arms 25 which extend downwardly at each side of the lever 15. The roller 24 prevents the possibility of the lever 15 falling sufficiently far below the beam 22 to allow the balls 23 to escape when there is no pressure in the apparatus.

By shifting the fulcrum 16 through the movement of the carriage 20, the respective

arms of the lever 15 which are acted upon by the valve stem 5 and piston rod 11 are lengthened or shortened. A change in the ratio of the lengths of these arms causes a corresponding change in the relative effects of the upward thrust of the valve 4 and the piston 8. The fulcrum may therefore be set to such position that there will be any desired ratio between the pressures at the inlet and outlet sides of the valve 4. The pressure ratios corresponding to positions of the carriage may be indicated by a scale 26 on the beam 1 and a pointer 27 carried by the carriage.

The carriage 20 may be shifted manually by means of an adjusting screw 28 which has threaded engagement with the carriage 20 at 29, and which has its other end connected with the supporting frame.

In order that the fluctuations of pressure in the system will automatically shift the carriage and change the leverage of the piston 8 so as to maintain a substantially uniform pressure at the low pressure side of the valve 4, regardless of fluctuations of pressure at the high pressure side, the screw 28 is connected with the supporting frame in the following manner.

The end of the screw 28 which is at the right of Fig. 1 has swiveled connection with a piston 30 which is mounted in a horizontally disposed cylinder 31. A spring 32 normally urges the piston 30, and through it the carriage 20, toward the right. The right-hand end of the cylinder 31 is connected by a pipe 33 with the pipe 13, which in turn connects with the inlet or high pressure side of the valve 4.

The operation of the device shown is as follows: The parts should preferably be so proportioned that when the carriage 20 is shifted to the limit of its movement toward the right of Fig. 1, the resultant pressure upon the piston 8 will be overbalanced by that upon the valve 4, and said valve will remain open when the pressures on the outlet and inlet sides of it are equal. If the carriage is shifted toward the left from this position, the lever-arm of the piston 8 increases as that of the valve 4 decreases, and their ratio may be changed so that any desired pressure at the low pressure side of the valve 4 will cause the piston 8 to close the valve 4.

If the initial or inlet pressure of the fluid remains constant, then a reduction of the pressure in the system at the outlet or low pressure side of the valve 4 will cause said valve to open wider, while an increase of the outlet pressure will close the valve 4. Thus, with uniform initial pressure, the low pressure will remain substantially constant, regardless of fluctuations in the consumption of fluid.

The piston 30 normally assumes a position where the pressure of the high pressure fluid on one side thereof will balance the pressure of the spring 32. Any fluctuation of pressure of the high pressure fluid causes a shifting of the piston 30 and thereby shifts the fulcrum 16 so as to counteract the effect of the change of initial pressure. This action tends to maintain a constant pressure at the delivery side of the valve 4, regardless of changes of pressure at the inlet side.

When the 3-way valve 12 is so set as to open communication between the cylinder 3 and the inlet side of the casing 2, the pressure of the fluid upon the piston 8 will hold the valve 4 in a closed position.

It is manifest that the specific embodiment of this invention which is herein shown and described may be modified in numerous ways without departing from the spirit of this invention.

I claim:—

1. A pressure reducing device, comprising a casing having inlet and outlet openings, a valve controlling the passage of fluid between said openings and normally urged by the pressure on the inlet side thereof toward an open position, means adapted to be actuated by the fluid pressure for urging said valve toward its closed position, a lever interposed between said valve and pressure operated means, a movable fulcrum for said lever, and means adapted to automatically shift said fulcrum through changes of pressure at one side of said valve.

2. A pressure reducing device, comprising a casing having inlet and outlet openings, a valve controlling the passage of fluid between said openings and normally urged by the pressure on the inlet side thereof toward an open position, means adapted to be actuated by the fluid pressure for urging said valve toward its closed position, a lever interposed between said valve and pressure operated means, a movable fulcrum for said lever, means adapted to automatically shift said fulcrum through changes of pressure at one side of said valve, and means for manually shifting said fulcrum.

3. A pressure reducing device, comprising a casing having inlet and outlet openings, a valve controlling the passage of fluid between said openings and normally urged by the pressure on the inlet side thereof toward an open position, means adapted to be actuated by the fluid pressure for urging said valve toward its closed position, a lever interposed between said valve and pressure operated means, a movable fulcrum for said lever, means adapted to automatically shift said fulcrum through changes of pressure at one side of said valve, and means for manually shifting said fulcrum, each of said fulcrum shifting means being adapted to operate without interfering with the operation of the other.

4. A pressure reducing device, comprising

a casing having inlet and outlet openings, a valve controlling the passage of fluid between said openings and normally urged by the pressure on the inlet side thereof toward an open position, means adapted to be actuated by the fluid pressure for urging said valve toward its closed position, a lever interposed between said valve and pressure operated means, a movable fulcrum for said lever, means adapted to automatically shift said fulcrum through changes of pressure at one side of said valve, and yielding means resisting the action of said fulcrum shifting means and normally urging said fulcrum toward a certain position.

5. A pressure reducing device, comprising a casing having inlet and outlet openings, a valve controlling the passage of fluid between said openings and normally urged by the pressure on the inlet side thereof toward an open position, means adapted to be actuated by the fluid pressure for urging said valve toward its closed position, a lever interposed between said valve and pressure operated means, a movable fulcrum for said lever, means adapted to automatically shift said fulcrum through changes of pressure at one side of said valve, and a spring resisting the action of said fulcrum shifting means and normally urging said fulcrum toward a certain position.

6. The combination of a frame, a valve casing having inlet and outlet openings, a valve mounted in said casing and normally urged toward an open position by the pressure at the inlet side thereof, a cylinder, a piston mounted therein, a connection between said cylinder and the outlet side of said casing, whereby said outlet pressure will act upon said piston, a lever interposed between said piston and valve, a carriage slidably mounted in said frame and movable along said lever, a beam fulcrumed on said carriage and extending along said lever, anti-friction rollers interposed between said lever and beam, and means for shifting said carriage.

7. The combination of a frame, a valve casing having inlet and outlet openings, a valve mounted in said casing and normally urged toward an open position by the pressure at the inlet side thereof, a cylinder, a piston mounted therein, a connection between said cylinder and the outlet side of said casing whereby said outlet pressure will act upon said piston, a lever interposed between said piston and valve, a carriage slidably mounted on said frame and movable along said lever, a beam fulcrumed on said carriage and extending along said lever, anti-friction rollers interposed between said lever and beam, and means actuated automatically by the fluid pressure at one side of said valve for shifting said carriage.

Signed at Chicago this 27th day of November, 1908.

OSCAR ONSRUD.

Witnesses:
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