

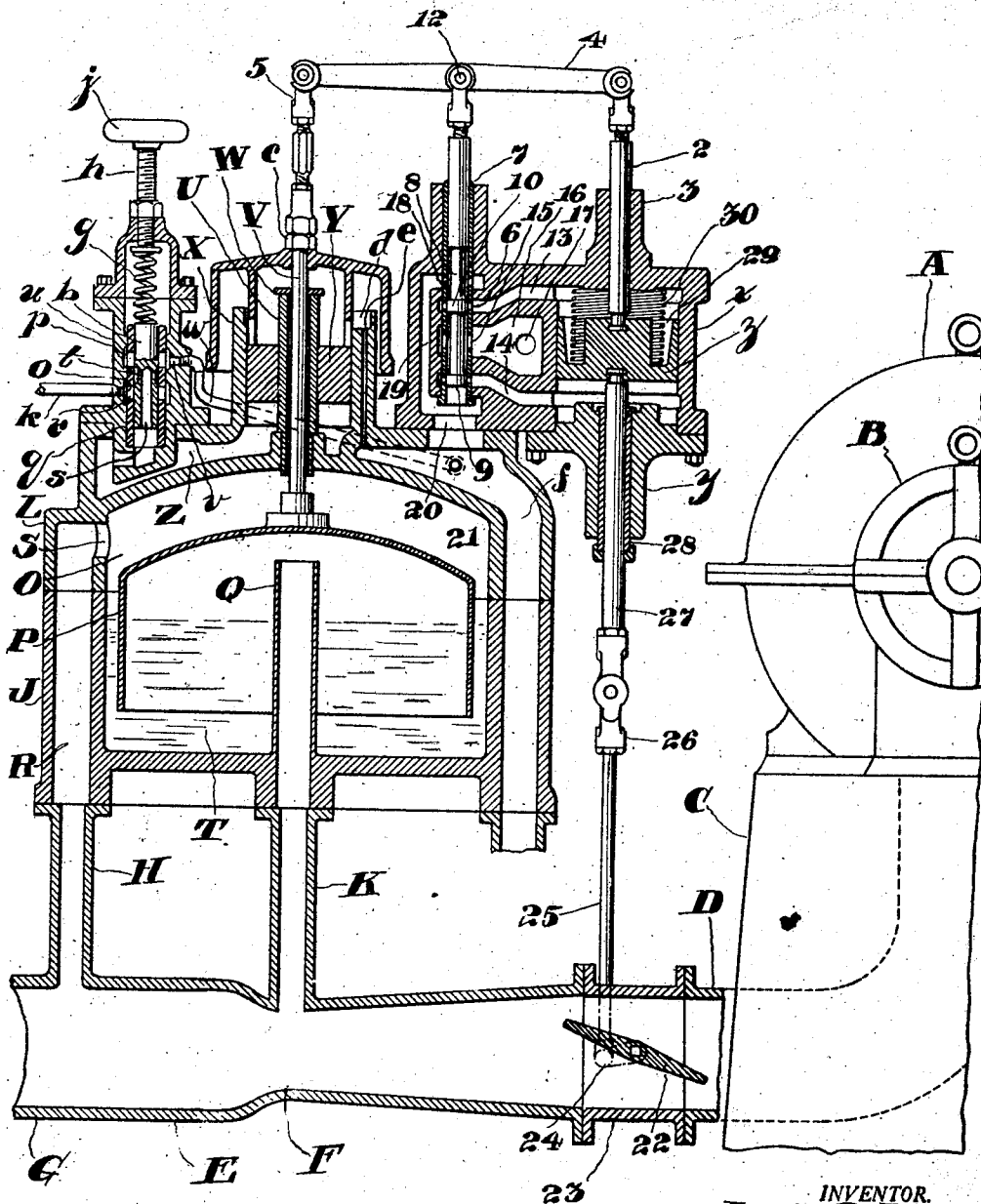
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CONSTANT VOLUME REGULATOR

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CONSTANT-VOLUME REGULATOR.

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To all whom it may concern:

Be it known that I, LESLIE R. HUFF, a citizen of the United States, and a resident of Phillipsburg, county of Warren, and State of New Jersey, have invented a certain Constant-Volume Regulator, of which the following is a specification accompanied by drawings.

This invention relates to volume regulators, but more particularly to a constant volume regulator for turbo blowers, turbo compressors, and the like.

The objects of the invention are to insure a constant intake volume of air to a turbo blower or other similar machine irrespective of any fluctuations which may occur in the discharge pressure of the machine, and produce such regulation by simple and efficient devices including a valve in the intake.

Other objects will be in part obvious and in part pointed out hereinafter.

The invention consists of the combinations of elements, features of construction, and arrangement of parts having the general mode of operation substantially as hereinafter described and more particularly pointed out in the appended claims and illustrated in the accompanying drawing.

The figure in the drawing is an elevation, partly in section, of a constant volume regulator constructed in accordance with the practice of the invention and shown connected to the intake conduit of a turbo blower.

Referring to the drawing, A indicates a turbo blower connected to be driven by a constant speed motor B. The turbo blower A and the motor B are in this instance mounted on a foundation C through which extends a connection D of an intake conduit E. The intake conduit E in this instance is in the form of a Venturi tube and accordingly has a restricted portion F and an enlarged portion G. A pipe or tube H preferably formed integrally with the enlarged portion G extends upwardly therefrom to support one end of a base J. At the juncture of the enlarged portion G and the restricted portion F another pipe K extends upwardly to a level with the upper end of the pipe H and also forms a support for the base J. Arranged on the top of the base J and secured thereto in any suitable manner is a cover L which cooperates with

the base J to form a chamber O in which is arranged a bell float P. Formed integrally with the base J and extending upwardly into the interior of the bell float P is a hollow tube Q which registers with the pipe K so that during the operation of the turbo blower A, a suction may be created in the interior of the bell P by the velocity of the air flowing through the restricted portion F of the conduit E.

In order to exhaust or draw the air from the outside of the bell P, a passage R is formed in the base J to register with the pipe H at one end, and at the other end is in communication with the chamber O through a port S. The interior of the bell P and the chamber O are preferably held against communication by any suitable liquid, as for instance, water T.

Supported by the cover L and preferably coaxially with the tube Q is a hollow sleeve U which may act as a guide for a rod V to one end of which the bell float P is secured. Any suitable means may be provided for securing the bell float P to the rod V, but such means preferably consist of a loose joint as for instance a ball joint, so that the bell float P may automatically adjust its position with respect to the level of the water T. By thus providing pivotal movement of the bell float P, the necessity of mounting the rod V in a perfectly vertical position, as well as undue friction of the rod V against the sleeve U will be eliminated. A ring or washer W secured to the top of the sleeve U to slidably engage the rod V serves to seal the top of the chamber O.

Suitable means are provided for counterbalancing the force of the suction acting on the bell P. To this end a cylinder X is formed on the cover L to receive slidably a regulator piston Y which is adapted to be actuated by oil under pressure admitted into a chamber Z by a control valve b. The piston Y encircles the sleeve U and is secured fixedly to the rod V. Upward movement of the piston Y with respect to the rod V is limited by a nut c carried by the rod V. The upper or outer end of the cylinder X is preferably recessed as at d to receive any oil which may leak past the piston Y, and a passage e leading from the recess d to a drain passage f formed in the cover L and the base J provides a path for such leakage

oil. The drain passage *f* preferably leads to an oil reservoir so that the oil may again be used if desired.

In order to adjust the control valve *b* so that a suitable pressure may be maintained within the chamber *Z* at all times to retard downward movement of the bell float *P*, a compression spring *g* is arranged to act against the upper end of the valve *b* and bears at its upper end against an adjusting spindle *h*. The adjusting spindle *h* is preferably in the form of a screw and has a hand wheel *j* for manipulating the spindle *h* to adjust the tension of the spring *g* for different intake volumes through the conduit *E*. In this instance fluid under pressure, as for instance, oil, is conveyed from a suitable source of supply through a pipe *k* into an annular groove *o* formed in the valve casing *p*. The annular groove *o* encircles a sleeve *q* which is adapted to receive the valve *b* and is provided with a plurality of ports *r* in constant communication with the annular groove *o*. The valve *b* is preferably provided with a hollow bore *s* which extends partly throughout its length and is adapted to communicate with the ports *r* in the sleeve *q* through a plurality of ports *t*.

To provide for the escape of oil in case of excessive pressure against the valve, a series of ports *u* are formed in the sleeve *q* above the ports *r* to register with an annular groove *v* formed in the valve casing *p*. A pipe *w* connected at one end to communicate with the groove *v* and at its other end with the drain passage *f* provides a convenient means for carrying off the by-passed oil.

Disposed on top of the cover *L* and suitably secured thereto by any suitable means is a cylinder *x* provided at its lowermost opening with a cylinder cover *y*. A piston *z* is arranged to reciprocate within the cylinder *x* and is provided at its upper end with a rod 2 slidable through a guide 3 and is secured pivotally at its outer end to a balancing lever 4 which lever is pivoted at its other end to a fork 5 carried by the rod *V*. Formed integrally with the cylinder is a valve chest 6 provided with a ported sleeve 7 which serves as a guide for a pilot valve 8. The pilot valve is in this instance provided with heads 9 and 10 and extends outwardly through the valve chest to connect pivotally with the balancing lever 4 preferably intermediate its ends as at 12. A pair of passages 13 and 14 in this instance lead from the top and bottom ends of the cylinder *x* to the sleeve 7 and are controlled by the heads 10 and 9 respectively of the valve 8. Formed in the sleeve 7 between the passages 13 and 14, is a port 15 which affords communication between the interior of the sleeve 7 and a chamber 16 having a connection 17 through which pressure fluid,

such as oil, may be admitted into said chamber from a source of supply.

In order that any oil which may be admitted to the top end of the cylinder *x* may be readily exhausted therefrom to the drain passage *f*, a port 18 is formed in the sleeve 7 directly above the passage 13 and communicates with a passage 19 leading to a port 20 which registers with a port 21 leading from the drain passage *f*.

To the end that a constant volume of air through the conduit *E* may at all times be maintained irrespective of the resistance created by the discharge pressure of the blower *A*, a throttle valve 22 is arranged pivotally in a valve seat 23 interposed in the conduit *E*. The throttle valve 22 is preferably provided with a crank 24 to which is secured pivotally a rod 25 carrying at its upper end a fork 26. Connected pivotally to the fork 26 is a rod 27 which extends through a sleeve 28 arranged within the cylinder cover *y*. The rod 27 is in this instance secured to the lower end of the piston *z* and is guided by the sleeve 28. If desired, a recess 29 may be formed in the top of the piston *z* to receive a spring 30 which will tend to constantly force the piston downwardly and thus tend to open the valve 22.

The operation of the device is as follows: assuming that the turbo blower *A* is running at its normal speed, air drawn thereby through the restricted portion *F* of the conduit *E* will become sub-atmospheric and due to its increased velocity through said restricted portion will create a suction in the interior of the bell float *P* and constantly tend to draw said float downwardly toward the bottom of the casing *J*. At the same time the passage of the air through the enlarged portion *G* will draw or exhaust the air from the chamber *O* exterior of the bell float *P*. However, owing to the difference in velocities through the enlarged portion *G* and the restricted portion *F*, a slightly higher pressure will exist exterior of the bell float *P* than within said float. With the turbo blower *A* running at normal speed, the pressure of the oil entering the chamber *Z* will also have attained its maximum pressure and, acting against the bottom of the piston *Y*, will tend to force said piston upwardly and thus counterbalance the force of the suction acting on the float *P*. During the time that the forces acting against the float *P* and the piston *Y* are equal, the valve *b* will remain approximately in the position indicated in the drawing, that is, the port *t* will be in registration with the port *r* so that the piston *Y* will be exposed directly to the line pressure of the oil. Whenever the resistance in the discharge pressure decreases so that in consequence the velocity in the conduit is in-

creased, the suction acting on the bell float P will be correspondingly greater and thus overcome the pressure acting against the piston Y thereby displacing to some extent the oil in the chamber Z. The oil thus displaced will force the valve *b* upwardly until the port *t* registers with the port *u* and a portion of the oil will pass into the drain passage *f* through the pipe *w*. Reciprocation of the piston Y and the bell float P will rock the balancing lever 4 which in turn will reciprocate the pilot valve 8. Therefore, if the velocity of the air through the conduit E is sufficiently great to draw the float P downwardly, the valve 8 will accordingly be pulled downwardly and uncover the passage 14. Oil will then flow from the chamber 16 beneath the piston *z* and force the said piston upwardly thereby rocking the throttle valve 22 towards its closing position and reducing the volume of air to the turbo blower A. After the resistance in the discharge pressure line again increases, the velocity of air through the conduit E will proportionately decrease, thus permitting the float P to rise in the chamber O. Upward movement of the float will raise the valve 8 and uncover the passage 13 to admit oil to the top of the cylinder X. The pressure of the oil thus admitted will act against the piston and together with the force of the spring 30 will again open the valve. Since in this position of the pilot valve, the passage 14 will also be uncovered, the oil in the bottom of the cylinder X will be forced through the passage 14 and through the sleeve 7 and the ports 20 and 21 into the drain passage *f*.

The advantages of this invention reside in the fact that a constant intake volume of air to the turbo blower is at all times insured irrespective of any fluctuations of the discharge pressure of the blower or any accumulations of foreign matter, such as leaves, dirt or ice which may form in or near the inlet opening of the conduit E.

I claim:

1. A constant volume regulator for a motor driven turbo blower comprising an intake conduit for the blower, a valve in the conduit, and means actuated by the air passing through the conduit for automatically adjusting the position of the valve whereby the intake volume of air to the blower may be controlled.

2. A constant volume regulator for a motor driven turbo blower comprising an intake conduit for the blower, a valve rotatable in the conduit, and means actuated by the air passing through the conduit and connected to automatically oscillate the valve

for controlling the intake volume of air to the blower with respect to the discharge pressure of the blower.

3. A constant volume regulator for a motor driven turbo blower comprising an intake conduit for the blower, a throttle valve rotatable in the conduit, a float actuated by the air passing through the conduit, a regulator piston associated with the float for counteracting movement of said float, and pressure fluid actuated means controlled by the float connected to oscillate the valve for controlling the intake volume of air to the blower with respect to the discharge pressure of the blower.

4. A constant volume regulator for a motor driven turbo blower comprising an intake conduit for the blower, a throttle valve rotatable in the conduit, a float actuated by suction created by the air passing through the conduit, a fluid actuated regulator piston associated with the float for counterbalancing the suction acting on said float, means for automatically controlling the supply of pressure fluid to said piston, a balancing lever connected to be rocked by the float, a piston connected to the balancing lever and to the throttle valve, and a pilot valve actuated by the balancing lever to control the admission of pressure fluid for actuating the said piston in opposite directions whereby the throttle valve may be opened and closed to control the intake volume of air to the blower in accordance with the discharge pressure of the blower.

5. A constant volume regulator for a motor driven turbo blower comprising an intake conduit for the blower, a throttle valve rotatable in the conduit, a float actuated by suction created by the air passing through the conduit, a fluid actuated regulator piston associated with the float for counterbalancing the suction on said float, a control valve for automatically controlling the supply of pressure fluid to said piston, a balancing lever connected to be rocked by the float, a piston connected to the balancing lever and to the throttle valve, a pilot valve actuated by the balancing lever to control the admission of pressure fluid for actuating the said piston in opposite directions whereby the throttle valve may be opened and closed to control the intake volume of air to the blower in accordance with the discharge pressure of the blower, and a spring acting against one side of the piston to augment the pressure fluid for opening the valve.

In testimony whereof I have signed this specification.

LESLIE R. HUFF.