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S. W. WALLIN
VOLUME GOVERNORS

2,765,812

Original Filed Oct. 31, 1949

2 Sheets-Sheet 1

FIG. 1.

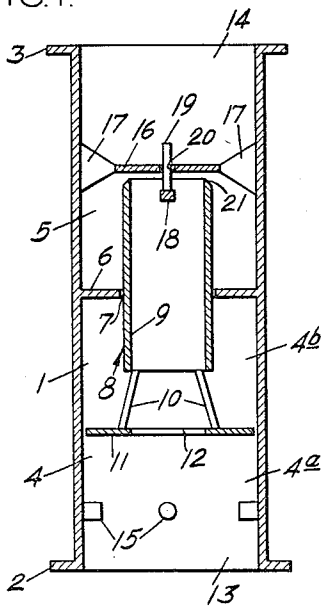


FIG. 2.

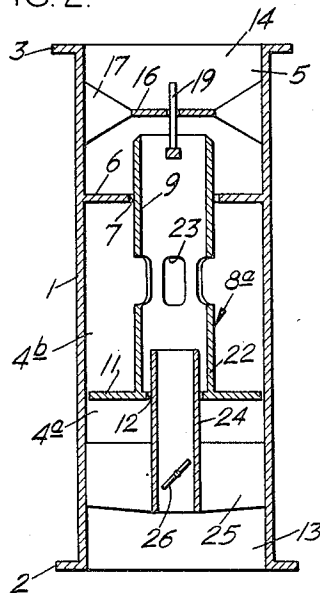


FIG. 3.

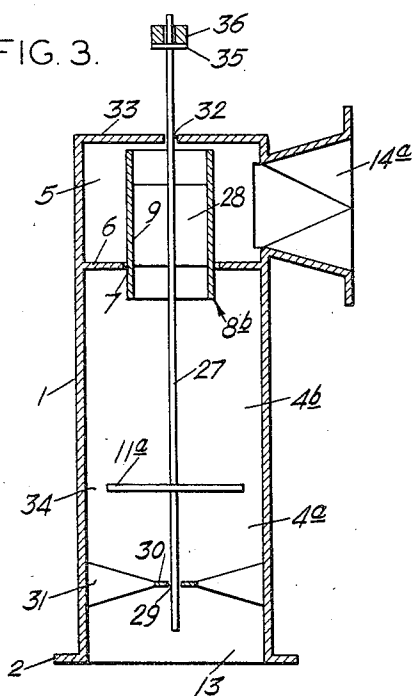
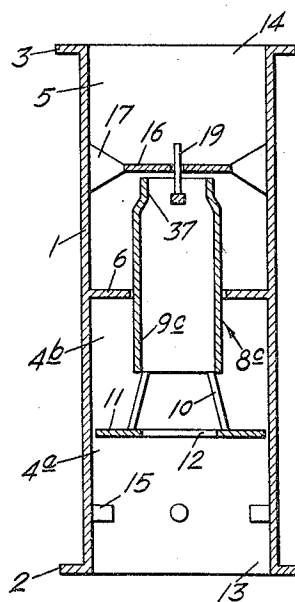


FIG. 4.



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FIG. 4a.

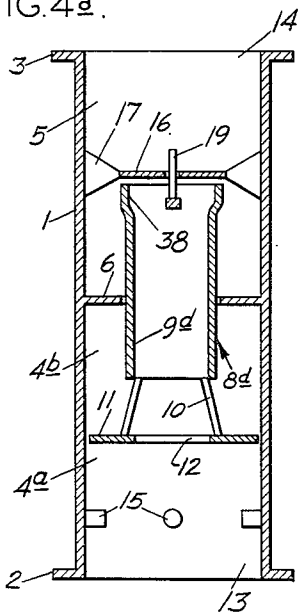


FIG. 5.

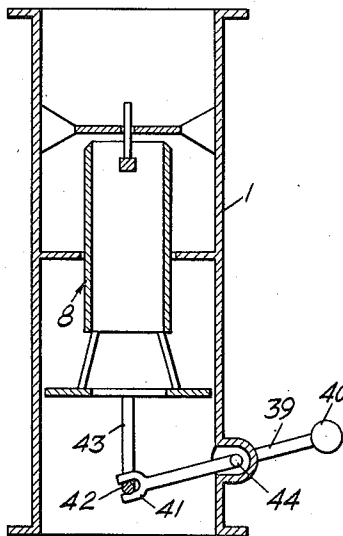
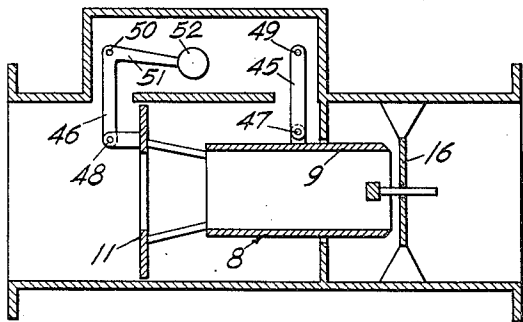


FIG. 6.



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VOLUME GOVERNORS

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Original application October 31, 1949, Serial No. 124,575.
Divided and this application September 22, 1953, Serial No. 384,471

Claims priority, application Sweden November 1, 1948

3 Claims. (Cl. 138—43)

The present invention relates to a volume governor for gases or liquids.

This application is a division of my copending application Serial No. 124,575, filed October 31, 1949, now abandoned.

The purpose of the invention is to produce a flow governor for a gas or liquid which flow governor according to its main embodiment is utilizable for allowing a constant volume flow of the medium to pass independent of the actual counterpressure or, which is the same, independent of the pressure drop through the governor, but which governor according to special designs of only one part of the governor is utilizable for allowing a volume flow for the medium to pass which automatically increases respectively decreases with increasing respectively decreasing counter pressure or, which is the same, with decreasing respectively increasing pressure drop through the governor, or decreases respectively increases with increasing respectively decreasing counter pressure or, which is the same with increasing respectively decreasing pressure drop through the governor.

It is here understood that volume flow is equal to the product of the weight flow and the actual volume flow, i. e. a quantity proportional to the velocity pressure.

The invention is mainly characterised in that it consists of a casing provided with an inlet at one end and an outlet at the other end, a transversal wall arranged in the casing between the inlet and outlet and provided with a through going hole, the wall thus dividing the casing into two chambers, one inlet chamber and one outlet chamber, a member situated in the casing and arranged movable back and forth through the hole in the wall, which member is provided with a tubular piece, extending through the hole in the wall and substantially forming a tight closure to the edges of the hole, the tubular part being fixedly fastened to a disk arranged transversally in the inlet chamber, which disk divides the inlet chamber into two part chambers continuously being in connection with each other, and a seat arranged in the outlet chamber intended for the tubular part, towards and from which seat the tubular part is movable for choking or opening of the pipe connection between the inlet and outlet chambers. Other characteristic features of the invention will be illustrated in some embodiments more fully described in the following.

The accompanying drawings show schematically in cross-section some embodiments of the governor according to the invention, Figs. 1, 2 and 3 of which are vertical designs of a volume governor for constant flowing. Fig. 4 is a vertical design of a volume governor for varying flowing in accordance with the counter pressure. Fig. 4^a is a modified form of vertical volume governor for varying the flow in accordance with the counter pressure. Fig. 5 is a vertical design of a volume governor for constant flowing and balanced choking body and Fig. 6 is a horizontal design of a volume governor for constant flowing.

The volume governor according to Fig. 1 consists of a

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cylindrical casing 1 provided with flanges 2, 3 respectively intended for connection to a fan or pump not shown or to a consumption place for the gas or liquid. The fan or pump may, however, be connected to either end of casing 1. In the embodiment shown a fan is considered to be connected to flange 2 and force a gas through the casing from the bottom and upwards. The casing 1 is divided into two chambers 4 and 5 by means of a transversal wall 6, provided with a centrally located cylindrical hole 7 for a member 8. The member 8 consists of a cylindrical piece of tubing 9 which by means of stays 10 is fixedly fastened to a transversal disk 11. In the disk 11 there is a centrally located cylindrical hole 12. The inlet end of the casing 1 is designated 13 and the outlet end 14. The piece of tubing 9 is connected as tight as possible to the edges of hole 7 and disk 11 likewise in tight contact with the inner walls of casing 1, the member 8 thereby being guided by these parts of casing 1, if member 8 is displaced upwards or downwards in the figure. Disk 11 divides the inlet chamber 4 into part chambers 4a and 4b. In part chamber 4a there are fixed projections 15 in shape of pivots against which member 8 rests in its lower end position. In the outlet chamber 5 there is a seat 16 in shape of a disk fixedly fastened to the casing 1 by means of stays 17. Disk 16 forms a seat for the piece of tubing 9 which may be made to form a tight closure to the seat. On a diametrical stay 18 in the piece of tubing 9 an axial pivot 19 is fastened which extends through a hole 20 in the seat 16. Also this pivot and the edges of the hole 20 form guiding elements for member 8 during the movement of said member upwards and downwards in casing 1.

The arrangement described functions in the following way.

The fan is considered to force air through the inlet 13 and further through hole 12. The pressure will lift member 8 upwards towards seat 16 depending on the arising pressure difference on both sides of disk 11. The pressure then will soon rise in the part chamber 4b and member 8 will sink downwards on account of its own weight. Soon an equilibrium will take place by which member 8 will take for instance the position shown in the figure. Air will then flow from the inside of the piece of tubing 9 through the small distance 21 between the piece of tubing 9 and seat 16 and out into the outlet chamber 5 and further through the outlet 14 to the consumption place. It may be easily proved mathematically that the volume flow through the small distance 21 is a function of the surface of the disk 11, the cross section area of the hole 12 and the weight of member 8. As these quantities have constant values for an arbitrarily chosen device it is clear that the volume flow must be constant through the device independent of which counter pressure is actual in the outlet 14 and thus independent of the pressure drop over the governor.

If it is desired to change the quantity of the volume flow passing through the device this may be effected by changing the hole area 12 in the disk 11 or the weight of the member 8. Figure 2 shows a device in which it is possible to change the area of the hole, and Fig. 3 shows a device provided with an arrangement for changing the weight of the member.

Fig. 2 differs only in some respects from Fig. 1 and the same designations have been kept for those parts which are alike in both figures. In Fig. 2 the tubular piece 9 has been extended with a part 22 directly fastened to the disk 11 and provided with through going apertures 23 in the envelope. The whole member here has been designated 8a and in said member a tube 24 projects, fixedly fastened to the casing 1 by means of stays 25. The tube 24 makes contact as tight as pos-

sible with the edges of hole 12 in disk 11. In tube 24 a rotatable damper 26 or some other choking arrangement is disposed. By adjusting this damper the area of hole 12 in disk 11 may be regulated resulting in an increase or decrease of the volume flow through the whole device.

Fig. 3 also differs in some respects from Fig. 1 and for those parts in the figures which are alike the same designations have been kept. The movable member 8b consists of the piece of tubing 9 and the disk 11a which are fixedly fastened to each other by means of a rod 27. Said rod is by means of arms 28 fastened to the piece of tube 9 and the lower end of the rod 27 extends through a hole 29 in a disk 30 which is fixedly fastened to the casing 1 by means of arms 31, while the other end of the rod extends through a hole 32 in the upper end wall 33 of the casing 1 and reaches slightly outside the casing 1. The edges of holes 29 and 32 thus form guidings for the member 8b. Disk 11a is circular and leaves a free distance 34 between its periphery and the inner wall of the casing 1. The distance 34 corresponds in this design to hole 12 in Fig. 1. Outlet 14a from the outlet chamber 5 is in Fig. 3 arranged on one side of the chamber. The fact is that in Fig. 3 the end wall 33 of this chamber is used as seat for the piece of tube 9. The outer end of rod 27 is provided with a projection 35, which may support one or more weights 36 placed on the rod 27. By increasing or decreasing the number of weights 36 the total weight of the member 8b may be changed and thus the volume flow through the device.

The volume governors illustrated in Figures 1-3 function according to the principle that the pressing quantity of gas or liquid per unit of time is constant independent of the counterpressure in the outlet. This may also be expressed so that the driving member always works with a constant load as the resistance in the volume governor automatically increases respectively decreases with decreasing respectively increasing resistance by a consumption apparatus connected to the outlet pipe.

The volume governors illustrated in Figures 1-3 function however, also be so designed that it increases or decreases the volume flow by an increased pressure drop through the device, i. e. by decreased or increased counterpressure in the outlet pipe. If it is desired to increase or decrease the volume flow, this must be determined beforehand. Figs. 4 and 4a show such a device.

Fig. 4 differs from Fig. 1 only in that respect that the upper end of the movable member 8c has been changed. The same designations have therefore been kept for those parts which are like each other. In Fig. 4 the tubular piece is designated 9c. Said tubular piece has its upper end 37 provided with a decreased flowing cross-section of the rest of the piece of tubing 9c. The decreased cross-section causes a pressure surface to be formed and it may easily be proved mathematically that the passing quantity increases by a decrease of the pressure drop over the volume governor and vice versa. The matter may also be expressed so that the flowing increases by an increased counterpressure and vice versa.

Fig. 4a illustrates a modified form 8d of the movable member 8c and differs from Fig. 4 only in that the upper end of the movable member has been changed. The same reference numerals have, therefore, been kept for similar parts. The upper end of the tubular piece 9d is in this case provided with a widened part 38 instead of the just mentioned decreased part 37. An extra pressure surface is also obtained here on account of the widened part 38 and in this case it may be easily proved

mathematically that the passing quantity decreases by a decrease of the pressure drop over the volume governor and vice versa. The matter may also be expressed so that the flowing quantity decreases by increased counterpressure and vice versa.

Fig. 5 shows a volume governor which is similar to the one in Fig. 1 but which is furthermore provided with an arrangement for balancing the weight of the member 8. This arrangement consists of a two-armed lever 39 which has a fork 41 at one end and supports a weight 40 at the other end. The fork 41 embraces a pivot 42 on a rod 43, fixedly fastened to the member 8. Arm 39 is rotatable around an axis 44 journaled in casing 1. The arrangement according to Fig. 5 may also function in a position in which it is turned 180°.

Fig. 6 shows a horizontal arrangement of the volume governor. This device is also similar to the device in Fig. 1 and differs from said device in the suspension of the member 8. Member 8 is thus in Fig. 6 flexibly suspended in two links 45 and 46, the lower ends of which are by means of pivots 47 and 48 flexibly fastened to the member 8 and the upper ends are by means of pivots 49 and 50 flexibly fastened to casing 1. Link 46 is furthermore provided with a lateral arm 51 supporting a weight 52 for effecting a force counter-directed to the pressure acting on the disk 11, as the device in this case is passed by the medium from the left to the right in the figure.

The heretofore described embodiments of the volume governor according to the invention are only to be considered as examples as the embodiments may be varied within the scope of the invention.

Having now described my invention, what I claim as new, and desire to secure by United States Letters Patent, is:

1. A governor for regulating the volumetric flow of fluids at a predetermined rate comprising a casing having an inlet at one end and an outlet at the other end, a wall extending transversely within the casing and subdividing the same into an inlet chamber and an outlet chamber, said wall having an opening centrally therethrough, a tubular member disposed in said casing and movably coaxially therein through said wall opening and forming a substantially tight closure with the surrounding edge thereof, a transversely disposed apertured disk fixedly mounted with respect to one end of said tubular member for movement therewith and subdividing the said inlet chamber of the casing, and a seat for the other end of said tubular member fixedly disposed transversely in the outlet chamber of the casing and with which the said other end of the tubular member cooperates to control automatically the fluid flow area from the tubular member to the outlet chamber of the casing, said other end of said tubular member being generally cylindrical in form and terminating in a part having a differential cross-sectional flow area facing said seat.

2. A governor as claimed in claim 1 wherein the said other end of the tubular member has a cross-sectional flow area smaller than the remainder of the tubular member.

3. A governor as claimed in claim 1 wherein the said other end of the tubular member has a cross-sectional flow area greater than the remainder of the tubular member.

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