No. 807,725. PATENTED DEC. 19, 1905.

S. E. CRAWFORD.

AUTOMATIC VOLUMETRIC GOVERNOR FOR GAS LINES.

APPLICATION FILED APR. 27, 1903.

Fig. 2.

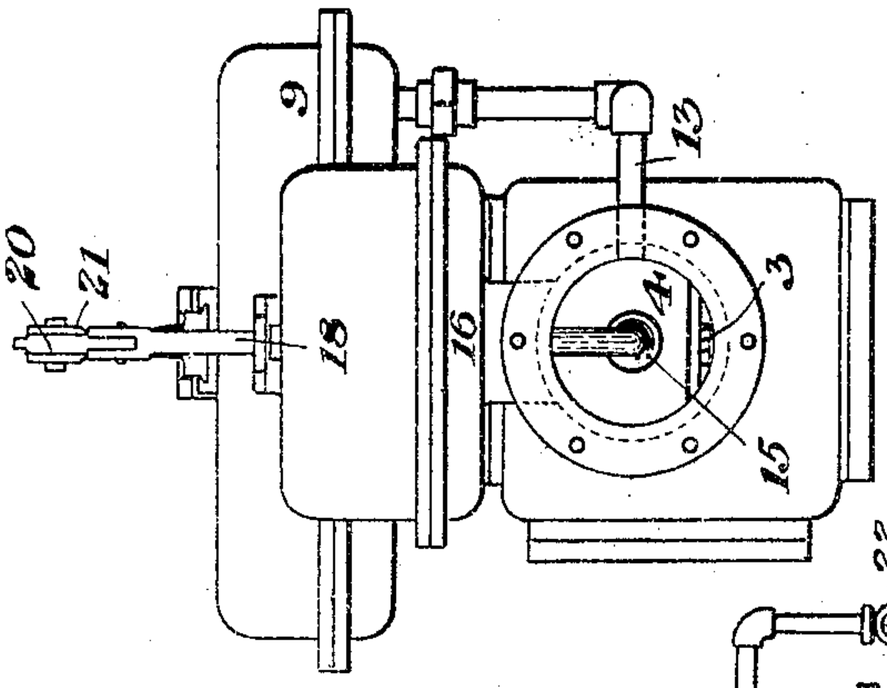


Fig. 3.

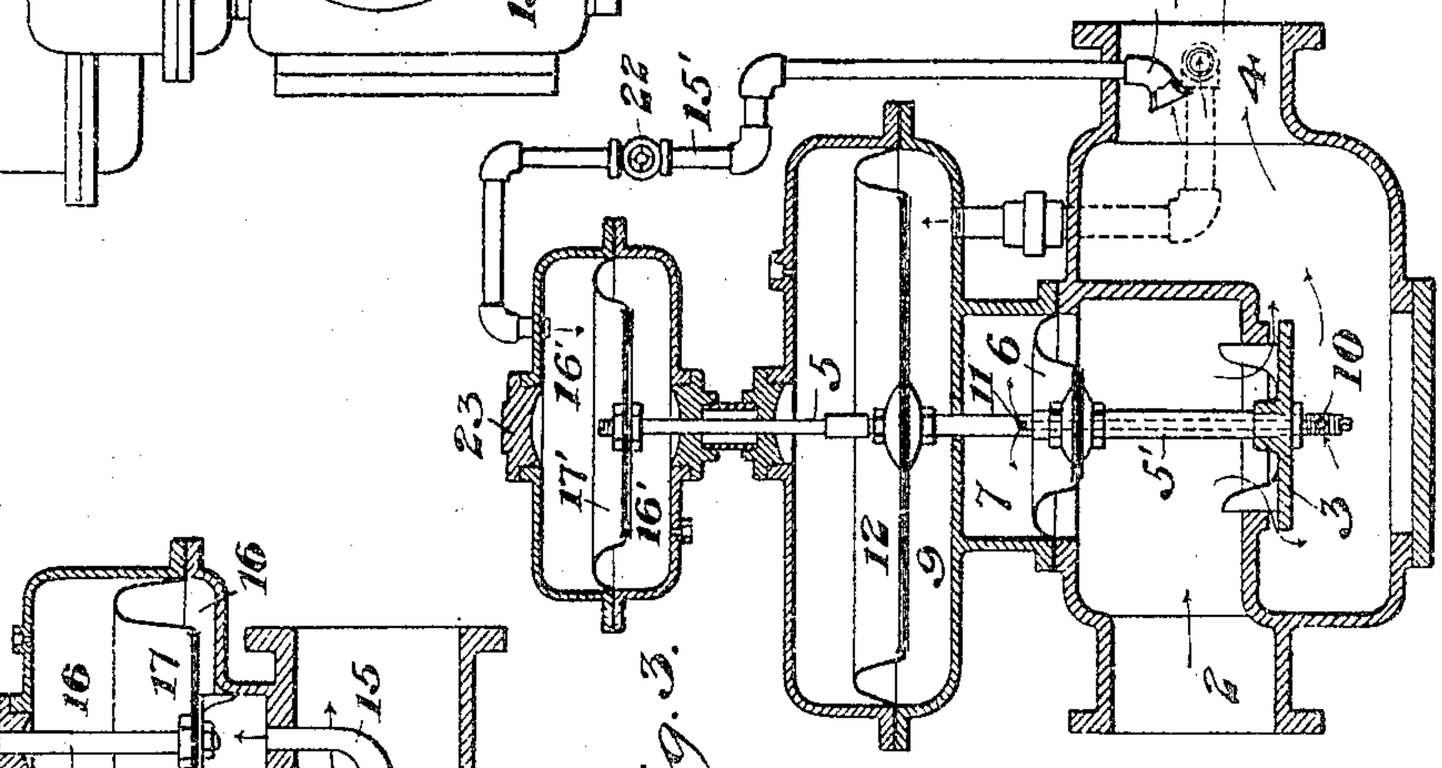
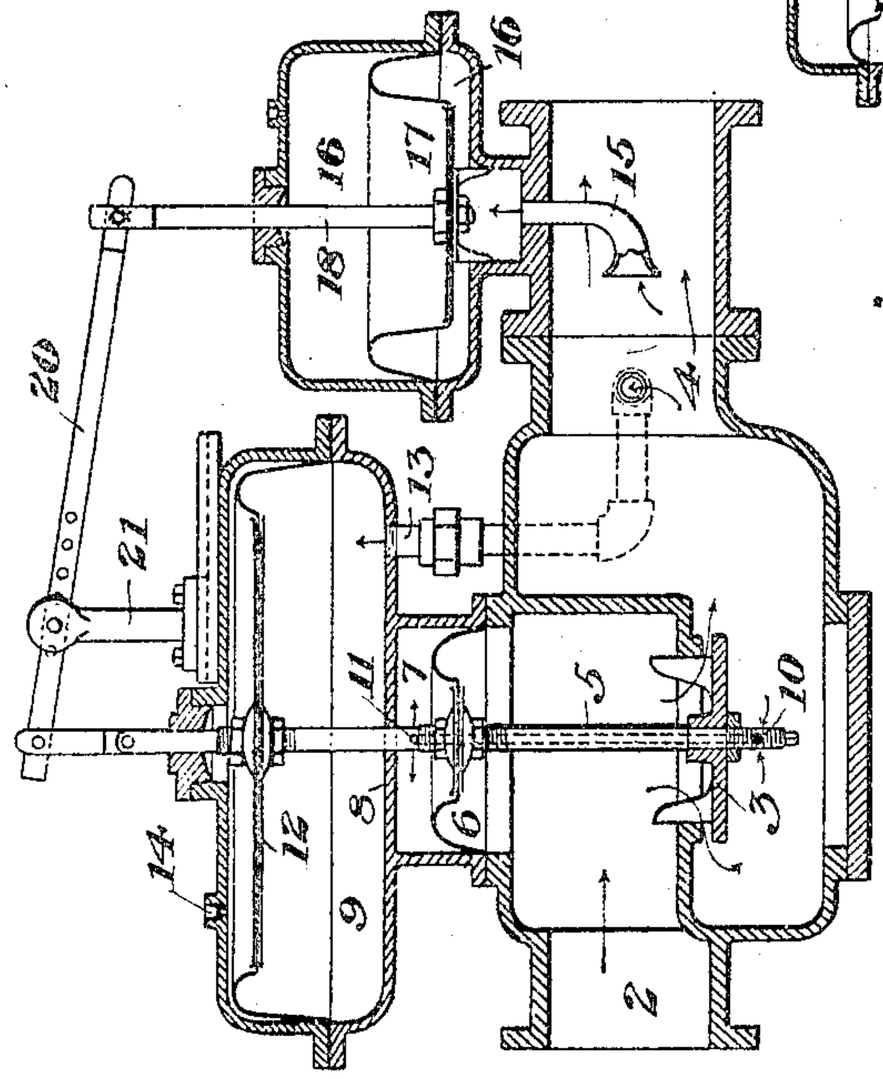


Fig. 1.



WITNESSES

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AUTOMATIC VOLUMETRIC GOVERNOR FOR GAS-LINES.

No. 807,725. Specification of Letters Patent. Patented Dec. 19, 1905.

Application filed April 27, 1903. Serial No. 154,382.

To all whom it may concern:

Be it known that I, SAMUEL EDGAR CRAWFORD, of Avalon, Allegheny county, Pennsylvania, have invented a new and useful Automatic Volumetric Governor for Gas-Lines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a sectional side elevation showing a preferred form of my improved governor. Fig. 2 is an end elevation of the same; and Fig. 3 is a view similar to Fig. 1, showing a modified form.

My invention relates to the governors employed in connection with gas-lines, and is especially applicable to the main-line governors automatically controlling the inlet from a gas-works to the main line, though it may be used in other locations where it is desired to regulate the pressure according to the volume demanded. Heretofore in such types of governors the construction has been complicated and expensive as well as delicate in operation and liable to get out of order.

The devices used for the automatic addition of weight to the controlling-diaphragm of this class of governors for the purpose of increasing the delivered pressure have been confined to a mechanical application of weight-shifting devices conforming to the travel of the valve-stem and valve-opening. It is apparent that a prime essential to the proper application of the functions of such devices is that the inlet-pressure be constantly uniform; otherwise the theoretical position of the valve and stem and their relative position to the shifting weight will be uncertain and erratic.

My invention is not dependent for its automatic adjustment upon the relative position of the valve, which varies with the inlet-pressure for a given delivery volume, but bases all its automatic reinforcing functions on the delivered flow of gas.

My invention is designed to provide a simple and effective mechanism whereby, in connection with an ordinary governor, the pressure of the gas shall be varied according to the volume; and to that end it consists in utilizing the force or velocity of the flowing gas-current, known as "dynamic pressure," to increase the static pressure in the line, thus automatically increasing the supply of gas at the time it is being most heavily drawn upon by consumers.

It further consists in connecting a dynamic-pressure device to the diaphragm of a static governor to reinforce it, and also in the construction and arrangement of the parts, as hereinafter more fully described and claimed.

In the drawings I show a main-line static governor, wherein 2 is the inlet-passage, 3 the vertically-moving control-valve, and 4 the outlet-passage. The valve-stem 5 is secured to the central disk of a separating-diaphragm 6, closing the lower end of a chamber 7, the top of which is closed by the bottom 8 of the upper diaphragm-chamber 9. The stem of the valve is hollow and contains inlet-holes 10 at its lower end below the control-valve and outlet-holes 11 within the chamber 7. The pressure is thus admitted from the outlet-passage, preferably from directly under the valve, to the chamber 7 and causes the diaphragm to balance the control-valve. The valve-stem extends upwardly into the chamber 9 and is therein secured to the disk of the main or governing diaphragm 12, to the lower side of which diaphragm the static pressure is admitted through the branch pipe 13, leading from the outlet-channel. The space above the upper diaphragm is open to the atmosphere through the small hole 14.

The construction above described forms a static governor which does not form the subject of my present invention except as showing one form of static governor with which my improved device is connected.

To utilize the dynamic effect of the current of gas, I provide in the outlet-channel a supply-tube 15, the mouth of which is directed toward the current of gas. For this purpose the tube is preferably bent in a direction opposite to that of the line of flow, and I have shown the mouth of the tube as bell-shaped, though this may or may not be used, as desired. This tube leads upwardly into the lower portions of a chamber 16, containing a diaphragm 17, having a central disk or pressure-plate by which it is secured to a valve-stem 18. I prefer to make the diaphragm of flexible material, such as leather; but a metallic holder may be used in which a liquid seal is employed and a metallic diaphragm is substituted for the flexible one shown in the drawings. The valve-stem 18 projects through the top of this chamber 16 and is loosely and pivotally connected with a lever 20, the other end of which is pivotally and loosely connected with the valve-stem of the control-valve, which is extended through the top of the main-diaphragm chamber for this purpose. The

lever 20 is fulcrumed upon an adjustable bracket 21, which is preferably mounted upon the top of the chamber 9, and the bracket is mounted on a slide which may be adjusted to different points along the lever and secured by screws or bolts. The lever is provided with a series of holes, so that its fulcrum-point may be changed or adjusted to give the proper action.

The supplemental chamber 18 is provided with an air-vent above the diaphragm to allow atmospheric pressure above the diaphragm.

In the operation of this device the supply-valve will be controlled by the static pressure under the main diaphragm in the usual manner of static governors; but this pressure will be opposed by the dynamic pressure caused by the velocity of the current of gas acting through the dynamic supply-tube and against the lower face of the diaphragm in the auxiliary chamber. This dynamic action will actuate the lever connection to the main valve-stem and will hence automatically move the valve to regulate the pressure according to the volume of gas flowing. The action will be the same as though the main diaphragm were successively weighted to successively greater amounts as the volume of flow through the control-valve increases.

The connection between the dynamic control device and the static governor may be varied in many ways. Thus in Fig. 3 I show a form wherein all of the diaphragms are connected to the same valve-stem. For this purpose the stem 5′ is extended upwardly through the top of the upper diaphragm-chamber 9 and into the chamber 16′, which contains the auxiliary volumetric diaphragm 17′. The pipe or tube 15′, whose mouth is directed toward the line of flow, as before, leads upwardly and into the top of the auxiliary chamber 16′, and in this case the air-vent enters this chamber 16′ below the diaphragm.

In order to shut off the dynamic or volumetric governor part of the apparatus when desired, I show in this form a hand-cock 22 in the pipe or tube 15′, by which the pipe may be closed when uniform delivery only is required. In such case the top cap 23 of the auxiliary chamber is removed when the cock is closed. The operation of this form is the same as that of the first form; but no means is afforded for adjusting the action of the dynamic control, such as is attained in the first form by adjusting the fulcrum-point of the lever.

The advantages of my invention result from the addition to a static governor, which gives a substantially uniform delivery-pressure, of a dynamic-control device, which is actuated by the dynamic flow of the gaseous current and acts to reinforce the static governor and to control and change the pressure in accordance with the volume of gas passing. The dynamic-control device is simple, efficient in action, and may be cheaply made and applied. It may also be readily added to existing static governors.

The reinforcing device automatically follows the changes of volume delivery regardless of variations in the inlet-pressure and the corresponding uncertainty of the theoretical position of valve-stem adjustment for any given volume which characterizes all other devices of this class.

Many changes may be made in the form and arrangement of the dynamic-control device and its connection to the static governor without departing from my invention.

I claim—

1. In combination with a static governor for gas-mains, a branch conduit in the outlet from said governor and an auxiliary governor actuated by the dynamic effect of the current in the branch conduit and connected to the static governor; substantially as described.

2. The combination with a static governor for gas-mains, of an inlet-tube opposite to the line of flow of the gaseous current, and a pressure device actuated dynamically by the said flow and connected to the static governor; substantially as described.

3. The combination with a static governor for gas-mains having a valve connected to a diaphragm under a static pressure of the gaseous current, of an auxiliary diaphragm having a supply-channel arranged to receive the dynamic action of the flowing current of gas, said auxiliary diaphragm being connected to the main valve-stem and arranged to oppose the static pressure on such diaphragm; substantially as described.

4. In combination with a static governor for gas-mains, a dynamic governor mechanically connected thereto and means for varying the leverage of said connection; substantially as described.

5. The combination with a static governor of the diaphragm type, of a dynamic governor having a diaphragm arranged to be actuated by the dynamic effect of the gaseous current, and a lever connection between the main and auxiliary diaphragms, arranged to oppose the static pressure on the main diaphragm by the dynamic pressure on the auxiliary diaphragm; substantially as described.

In testimony whereof I have hereunto set my hand.

SAMUEL EDGAR CRAWFORD.

Witnesses:

E. T. SAINT,

C. F. HOLDSHIP.