

J. S. CONNELLY.

GAS GOVERNOR.

No. 345,369.

Patented July 13, 1886.

Fig. 1.

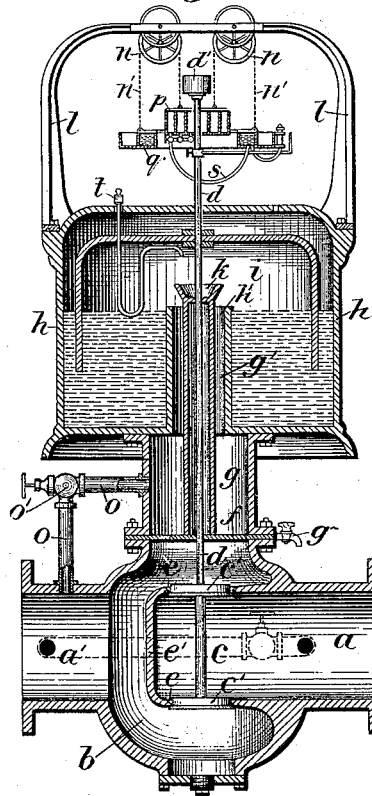


Fig. 2.

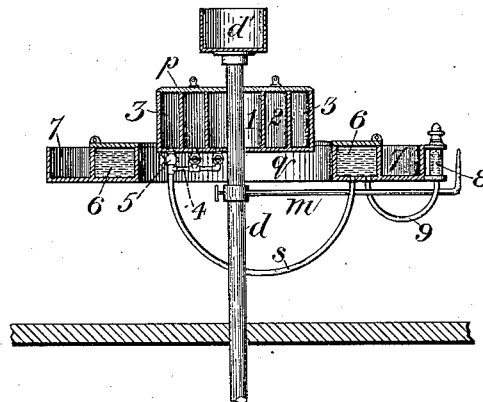
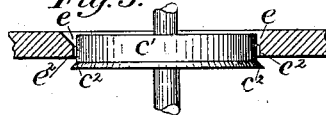


Fig. 3.



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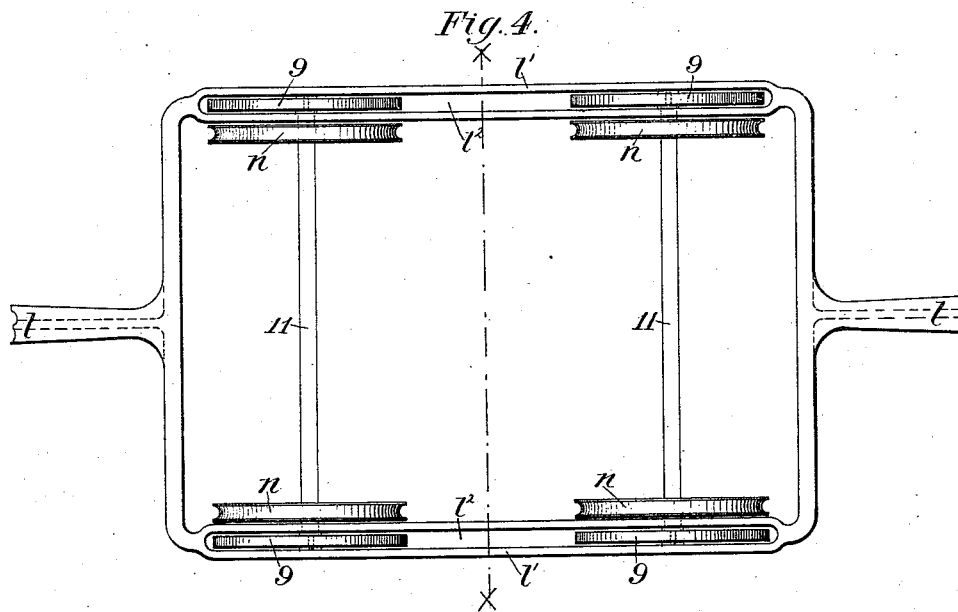


Fig. 5.

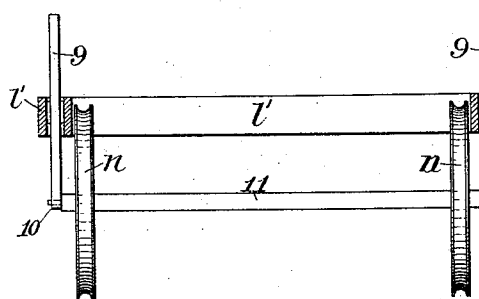


Fig. 6.

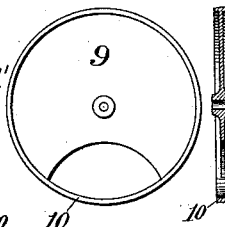
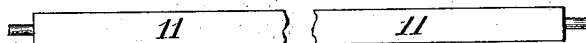


Fig. 7.



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UNITED STATES PATENT OFFICE.

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GAS-GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 345,369, dated July 13, 1886.

Application filed December 8, 1885. Serial No. 185,041. (No model.)

To all whom it may concern:

Be it known that I, JOHN S. CONNELLY, of Brooklyn, in the county of Kings and State of New York, have invented a new and useful Improvement in Gas-Governors; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to improvements on the automatic governor patented to me in Letters Patent No. 316,945, dated May 5, 1885.

No two automatic governors placed in different plants are under the same conditions, owing to the varying elevations, capacity, direction, and size of the mains and their connections, difference of initial pressure at the holders, and consumption of gas in different plants. Consequently each governor, when put in use, must be specially adjusted to suit the conditions of such use. While many attempts have been made to construct the governors so that they may be so adjusted, such attempts have not been attended with entire success, and the result has been that in the great majority of gas-plants now in use there is an excess of pressure on the service-mains during a part of the time, and a loss by leakage occurs.

The main object of my invention is to construct the governor so that it may be adjusted to obtain an automatic variation of pressure in exact accordance with the variations of consumption in any plant to which it may be applied.

Another object is to reduce the friction of the governor in order that it may be more sensitive to changes of pressure. Another is to prevent the valve from sticking in its seat.

To enable others skilled in the art to make and use my invention, I will now describe it by reference to the accompanying two sheets of drawings, in which—

Figure 1 is a vertical section of my improved automatic governor with the valve closed. Fig. 2 is an enlarged sectional view of the fluid-weight-vessels. Fig. 3 is an enlarged view of one of the valve-disks and seat. Fig. 4 is a plan view of the yoke or frame which supports the weight-wheels. Fig. 5 is a cross-sectional view on the line *xx* of Fig. 4. Figs. 6 and 7 are views of details.

Like letters of reference indicate like parts in each.

In the drawings, *a* indicates the main leading from the gas-holder; *a'*, the service-main; *b*, the valve-chamber; *c*, the valve, composed of two disks, *c'* *c'*; *d*, the valve-stem, *e*, the valve-seats or openings made in the diaphragm *e'*; *f*, a plate or disk closing the upper end of the valve-chamber *b*; *g*, a tubular chamber supporting the float-chamber *h*, which contains a float or bell, *i*; *h'*, a central tube, which extends from the bottom of the chamber *h* to a point above the level of the liquid therein; *k*, a tube which extends from the plate *f* up through the tube *h'*; *l*, a yoke surmounting the chamber *h* and provided with friction-wheels or sheaves *n*; *o*, a pipe connecting the service-main *a'* with the chamber *g*, and controlled by a cock, *o'*; *p* *q*, fluid-weight vessels, *p* being fastened to the valve-stem *d*, and *q* suspended therefrom by the chains *n'* extending on the sheaves *n*, and both connected together by the flexible tube *s*; *t*, an oiling-tube; *g'*, an annular passage between the chamber *g* and interior of the float *i*, and *g''* a drain-cock. The valve *c* is suspended from the float *i* by the stem *d*.

The governor thus described is the same as that shown in my Patent No. 316,945, before referred to, excepting as to the construction of the weight-vessels *p* and *q*, the suspension devices, and the valve. The vessel *p* has a central chamber, 1, and one, two, or more annular chambers, 2 3, surrounding it. The compartments are preferably of different capacities, and are connected by a pipe, 4, having a branch opening into each compartment. The branch pipes are controlled by cocks 5, by which communication with any particular compartment may be opened or closed at will. The vessel *q* is provided with two compartments, 6 7, one of which, 6, communicates with the vessel *p* by the flexible tube *s*, and constitutes one of the transfer-chambers, and the other, 7, which is open at the top, is designed to contain a weight-medium to counterbalance the valve being substituted for that purpose for the counterbalanced lever *m* in my said former patent. This is provided because the weight-fluid, when transferred to the vessel *q*,

is not in itself sufficient to raise the valve to give the light day-pressure. The vessel q is provided with a glass-gage tube, 8, communicating with the compartment 6 by a tube, 9, to indicate the weight of the column in the vessel. On the rod d is a gage, m , secured in position by a set-screw, and having a vertical end or point. The purpose of this device and the tube 8 is to enable the movement of the vessels p and q necessary to the transfer of the weight-fluid from one to the other to be accurately determined. The end of the gage m is set to indicate the exact level of the inside of the bottom of the vessel p . The length of the chains n' is then adjusted so that the surface of the weight-fluid in the compartment 6, as shown by the tube 8, will be on a level with the end of the gage m . The object of this is to insure the beginning of the transfer at the proper time, or as soon as the valve begins to descend. No two machines are used with the same quantity of weight-fluid, and hence the length of the chains in each must be adjusted at the place of use.

The purpose of having the separate compartments 1 2 3 in the vessel p is to enable the transfer of the weight fluid to be made in a longer or shorter stroke, as may be necessary to suit the exigencies or conditions of each particular plant. In some plants the valve has a short stroke, and in that case the height of the column of weight-fluid when in the vessel p must be less than when the stroke is greater, in order that its entire quantity may be transferred during the stroke. If the stroke of the valve is long, the height of the column should be correspondingly greater, because the transfer is required to be gradual, so that the full weight may not come on the valve until the end of the downward stroke, and so that the float may be gradually relieved of the weight from the instant it begins to rise. This insures a steady movement and prevents shocks to the lights.

The proper height of column is secured in my improved governor by first setting up the governor with the compartments open, and when the maximum consumption is reached and all the weight-fluid is transferred into the vessel p , and is holding the desired maximum pressure, the exact stroke or opening of the valve is ascertained. It is then easy to determine, from their width and capacity, which one or more of the compartments, 1, 2, and 3, of the vessel p should be used to cause the governor to receive its weighting gradually throughout the entire length of its downstroke, and in like manner be relieved of it gradually throughout the entire length of its upstroke, and thus increase and diminish the pressure in proportion to the volume of gas sent out. The object of thus weighting the float or bell is to overcome the friction of the gas in the pipes, which increases and diminishes proportionately with the amount sent out. When the proper compartment or compartments have been thus selected, the others are cut out

by closing their cocks 5, and then no change of the governor in this respect will need to be made, unless some of the conditions of the plant are changed—as, for instance, by the erection of a heavier holder, or an increase in the capacity of the mains, when all that is necessary is the readjustment of the governor to suit such change, the readjustment being easily made in the same manner as the first adjustment, before described.

I will now describe the construction of the devices by which the vessels p and q are suspended. The crown of the yoke l , Fig. 4, is an open oblong frame, l' , in the sides of which are vertical slots or openings l'' , in each of which are journaled two wheels, 9, those on one side being exactly opposite to those on the other. Resting on the inner surface of the flanges 10 of each two opposite wheels, 9, is the shaft or axle 11 of one pair of grooved wheels or sheaves n , upon which the vessels p and q are suspended by means of the chains n' . When the vessels move, the wheels n turn, and their axles 11, rolling on the flanges 10 of the wheels 9, cause the latter to turn in their bearings. The full stroke of the valve of a governor is three inches, a distance far in excess of the stroke actually made by a governor when in use. I usually make the wheels 9 and n three inches in diameter, so that if the valve made its full stroke of three inches the wheels n would make about one-third of a revolution. The diameter of the reduced end of the axles 11, which rests on the flanges 10 of the wheels 9, is one-sixteenth of an inch, so that the movement communicated thereby to the wheels 9 would be about one sixteenth of an inch at the periphery, and at the axle of the said wheels it would be infinitesimal. In fact, the movement of the wheels 9 in governors I now have in use is imperceptible to the eye of an inexperienced observer. The only friction there is in the movement of the weight-vessels is that of the axles of the wheels 9 in their bearings, and the movement of the latter is so inconceivably small that the friction is practically *nil*. The object of this anti-friction bearing is to render the governor sensitive to the slightest change of pressure in the mains, so that it may respond quickly thereto.

I construct the valve and seat in the following manner, to prevent all danger of the valve sticking in its seat, viz: Each disk e' has a tapering bead or flange, e'' , around its lower edge of greater diameter than the seats e , and the seats are provided with a sharp corner or lower edge, e^2 , so that when the valve closes the inclined surface of the beads e'' shall strike against the sharp edges e^2 of the seats, and thereby all friction between the valve and seat is prevented and all danger of the valve sticking obviated.

The operation of the governor is as follows: The movement of the valve is effected by the float or bell, which is acted on by the pressure of the service-main through pipe o , chamber g , and passage g' . In Fig. 1 the parts are

shown as in position for day service, a minimum quantity of gas passing the valve. The vessel *q*, being below the vessel *p*, contains all the weight-fluid and sustains the valve in this position, either by the weight-fluid in the compartment 6 alone, or by the assistance of a weight-medium in the compartment 7. A reduction of pressure in the service-main, produced by an increased demand thereon, causes the float to descend. The weight-fluid will be transferred evenly and gradually as the vessels *p* and *q* change position. While the movement of the valve is steady it is so constructed that the increase of pressure will not be rapid until the disks *c' c'* are about to pass out of their seats *e*, when the weight-fluid will be about evenly divided between the vessels *p* and *q*. The further descent of the float causes the valve to clear the openings and throw the maximum or night pressure on the service-main. It also causes the entire quantity of weight-fluid to be transferred to the vessel *p*, so as to weight the valve and hold it open. Thus the valve receives its maximum weighting at the same time when the maximum pressure is reached. When the demand on the service-main diminishes by the turning off of the lights, the float gradually raises the valve to its normal position, and the weight-fluid is gradually transferred back to the cup *p*, when it will aid in sustaining instead of depressing the valve. The short taper or bead *c''* on the disk *c'* is sufficient to accommodate the variation of the day consumption without increasing the pressure, and when the consumption exceeds the capacity of the short taper the taper of the sides of the disks *c'* gives a gradually-increasing opening and the required supply.

If desired, the compartment-vessel *p* may be used with a stationary vessel, *q*, so arranged that when the compartment-vessel moves up and down it shall be alternately above and below the normal level of the fluid in the stationary vessel. If desired, the transfer may be effected in such case by a siphon attached to the stationary vessel; but in such case there should be always enough fluid in the compartment-vessel to seal the end of the siphon, as will be understood. I make no claim to such construction, but refer to it only to show that my improved compartment-vessel is of utility in other forms of governors.

I can make the vessel *p* with two compartments; but I prefer to use three, 1 2 3, because it enables me to make a greater variety of adjustments. For instance, the separate use of any one will give a different adjustment from either of the others, and so will the combined use of any two, or the use of all three.

At the upper end of the rod *d*, I have provided a cup, *d'*, for the purpose of weighting the valve.

In some plants a heavier day-pressure is required than in others, and at the same time the machine must be set to give a large margin of increase. In such case the compartment 6 has enough mercury in it to bring the day-pressure down below the desired point, even when the compartment 7 is empty, and consequently place a sufficient weight in the cup *d'* to prevent the valve closing too far.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a gas-governor, the combination of a valve, valve-stem, and float, with compensating weight-vessels and transfer-connection, one of which vessels is provided with several compartments communicating with each other, and is fastened to the valve-stem and connected to the other vessel by chains passing over suitable sheaves, so as to rise and fall alternately therewith, substantially as and for the purposes described.

2. In a gas-governor having a valve, valve-stem, and float, a weight-vessel provided with several compartments attached to the valve-stem, substantially as and for the purposes described.

3. In a gas governor having a valve, valve-stem, float, and compensating weight-vessels suspended by chains, the combination of the weight-vessels and their suspension chains and sheaves with wheels journaled in stationary bearings and having rims or flanges upon which the axles of the suspension-sheaves are loosely journaled, substantially as and for the purposes described.

4. The combination of the suspension-chains *n'*, sheaves *n*, wheels 9, and axle 11, resting on the rims or flanges of the wheels 9, substantially as and for the purposes described.

5. In a gas-governor having a float, valve, valve-stem, and compensating weight-vessels, one weight-vessel being fastened to the stem and the other suspended therefrom on chains over sheaves, a chamber attached to the suspended weight-vessel for containing a counterbalancing-weight medium, substantially as and for the purposes described.

6. In a gas-governor, the combination of a float, valve, valve-stem, compensating weight-vessels, and a weight-holder on the valve-stem, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 28th day of November, A. D. 1885.

JOHN S. CONNELLY.

Witnesses:

H. E. ROTHERY,
JOHN E. BAILLY.