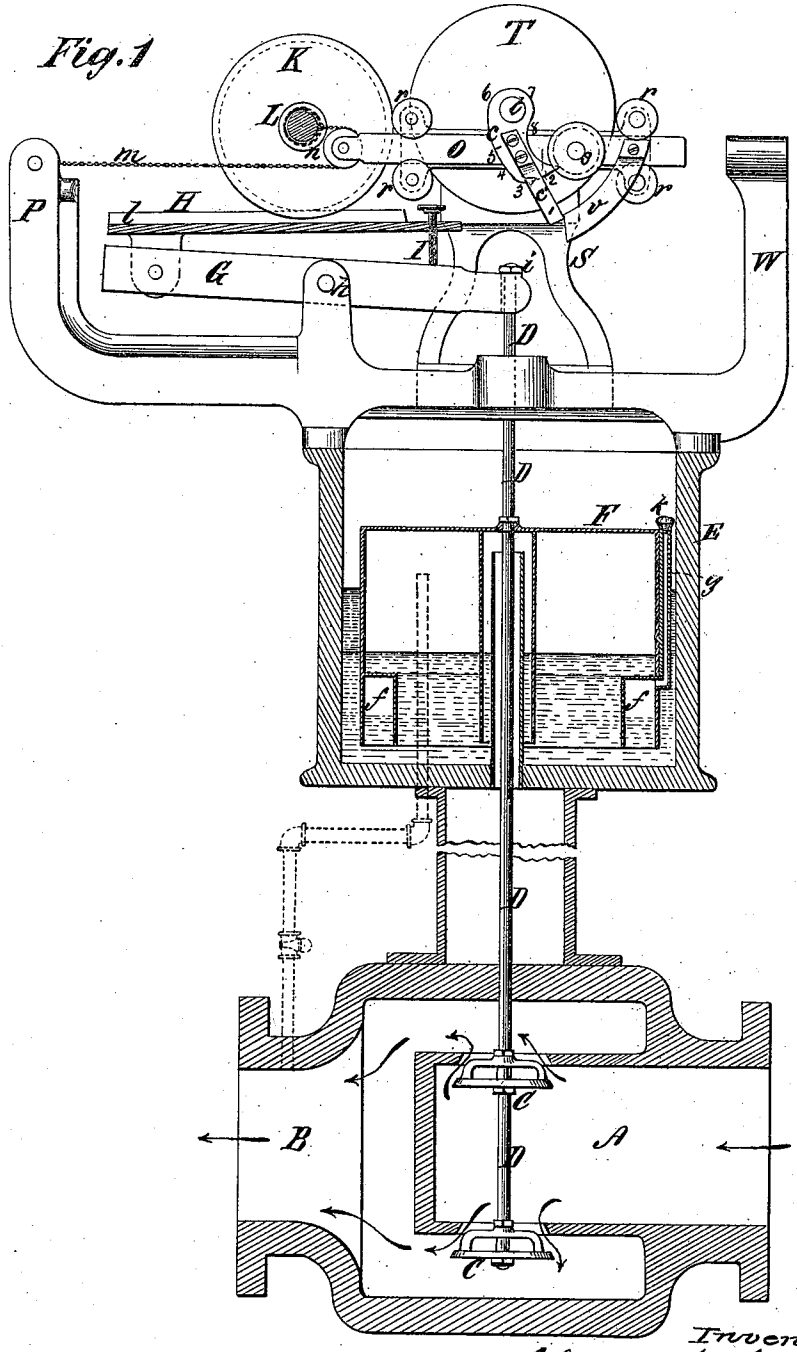
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GAS-GOVERNOR.

No. 193,515. Patented July 24, 1877.

Fig. 1



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2 Sheets—Sheet 2.

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Fig. 2

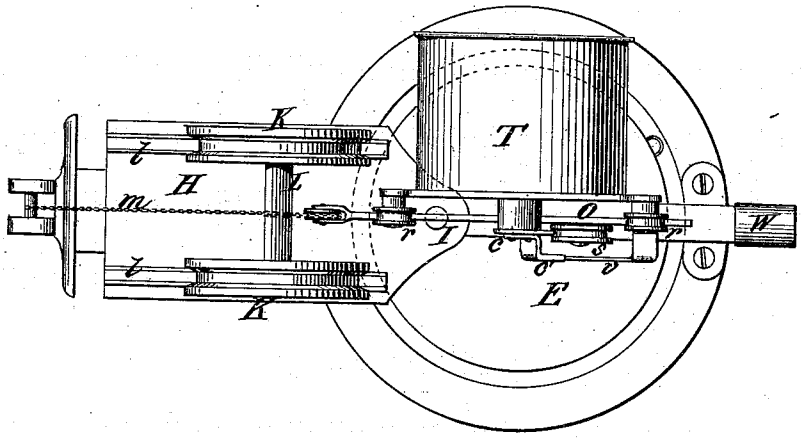
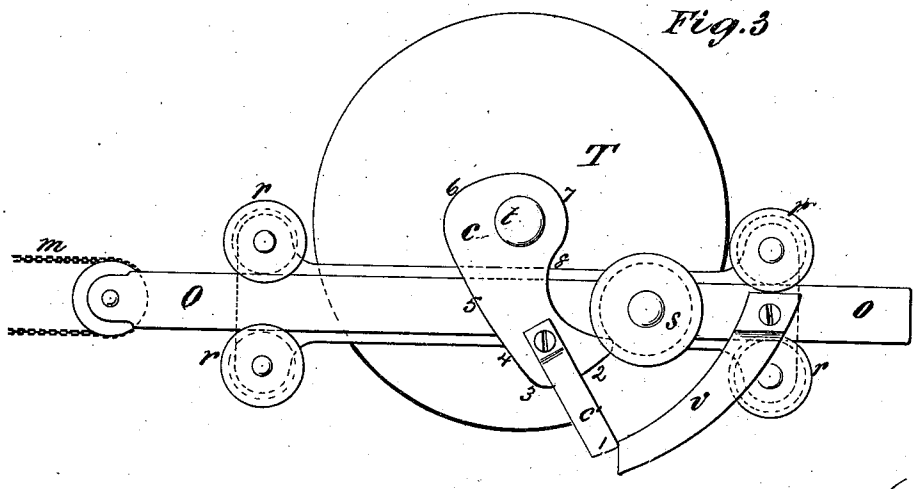


Fig. 3



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UNITED STATES PATENT OFFICE.

CHARLES W. ISBELL, OF NEW YORK, N. Y.

IMPROVEMENT IN GAS-GOVERNORS.

Specification forming part of Letters Patent No. **193,515**, dated July 24, 1877; application filed May 8, 1877.

To all whom it may concern:

Be it known that I, CHARLES W. ISBELL, of the city and State of New York, have invented an Improvement in Gas-Governors; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to the governors employed in gas-works to maintain the proper degree of pressure in the mains; and is designed to almost wholly obviate the personal supervision now required for the proper performance of the function of such governors by the substitution, for the weights now used, (some of which have at stated times to be taken off or put on to meet requirements of pressure in the gas-mains,) of a weight automatically adjusted upon the lever which operates with other parts of the governor to maintain the pressure at the desired degree.

Before reciting the nature of my invention more fully, I will describe the drawings, in order to refer to them in explaining the operation of gas-governors as heretofore constructed, and to show the defect it is the object of my invention to remedy.

Figure 1 in the drawings is a partial side elevation, and a partial central and vertical section, of a gas-governor comprising my invention. Fig. 2 is a top view of such a governor. Fig. 3 is an enlarged detail of the same.

Referring to Fig. 1, A is the entrance of the gas-main B, in which are placed the valves C attached to a common stem, D. Said valves are usually adjusted to open and close simultaneously, and they open downward from their seats.

Inclosed in a suitable case, E, is a gas-holder, F, which is attached to the stem D of the valves C. On the top of one side of the gas-holder case E is pivoted a lever, G, of the first order, its pivot or fulcrum being at *h*, Fig. 1, and its inner end acting under a collar, *i*, at the top of the valve-stem D. Weights are employed on the outer arm of the lever G. A pipe shown in dotted outline in Fig. 1, connects the interior of the main B with the interior of the gas-holder F.

The parts described essentially constitute a gas-governor as hitherto used—a brief general description of its operation being as follows:

The pressure in the main B while gas is flowing through the same depends upon three conditions, to wit: the initial pressure in A, the facility with which the gas in obedience to the laws governing the flow of fluids through pipes and openings can pass from A into B through the valvular openings of the valves C, and the rapidity of the efflux of the gas from the main B to supply the consumers.

It is evident that the greater the rapidity with which gas flows out from the main B, the other conditions remaining unaltered, the less will be the pressure in B; also, the wider the valves are opened within the limit of full supply to the main B, the other conditions remaining unaltered, the greater will be the pressure in the main.

The pressure in A is practically uniform, and the governor is designed to keep the pressure in the main B as nearly uniform as possible for a given amount of consumption to which the governor is set or adjusted.

The valves C and stem D being balanced by the buoyancy of the gas-holder F and action of the lever G, the valves will be lifted toward their seats by any increase of pressure in B transmitted through the aforesaid open pipe connecting the interior of the said main and gas-holder, and said valves will move away from their seats upon any diminution of pressure in B, the obstruction of flow from A to B in the first instance diminishing the pressure in the main B, and the increase of flow A to B in the second instance increasing the pressure in B.

If the demand for gas from the main B were always constant the governor could be adjusted to maintain as nearly a uniform pressure in the main B as needful; but the consumption of gas from said main being subject to rapid and abrupt increase or diminution at certain times of day, to slow increase or diminution at other times, and at still other times remaining nearly constant for several hours together, requires that the governor shall be adjusted at stated times to meet the various, varying or constant, rates of consump-

tion for various hours of the day, and for different days, which, by their relative brightness or darkness, cause a varying demand for gas.

The required adjustments have hitherto been made by placing weights upon or taking off weights from the outer arm of the lever G, which method necessitates the personal supervision of an attendant at the stated hours of the day for such adjustment.

My invention consists in the combination, with the valve or valves of a gas-governor and a lever applied to such valve or valves, of an adjustable weight applied to such lever, and an adjusting device operated by clock-work, and operating upon said weight or weights to produce an automatic adjustment of the adjustable weight, as hereinafter set forth.

The invention also consists in a novel combination of specific devices for carrying out the invention in one way of putting the same into practice.

I will now proceed to describe particularly the means by which the automatic adjustment of the weights is effected.

To the lever G I attach an adjustable inclined way, H, preferably a railway, its inclination to the lever G being regulated by the set-screw I. Upon the said way H rolls a weight, K, preferably made in the form of two wheels, connected by an axle, L, and fitted to roll on the rails *l* on said way. Said way will oscillate whenever the lever G oscillates.

To the central part of the axle K I attach a chain or cord, *m*, by a collar, or in any other way that will not wind the said chain or cord upon the said axle. The said chain or cord passes over a fix d pulley, *n*, and thence to a bent arm projecting from the top of the case E of the gas-holder.

The pulley *n* is attached to the end of a parallel-sided movable bar, O, supported and guided in its movement by grooved friction-rollers *r*, attached to a supporting-frame, S, resting upon and attached to the case E. To said bar O is pivoted a friction-wheel, *s*.

To the main spindle *t* of a train of powerful clock-work, inclosed in a suitable case, T, is attached a cam, *c*, which rotates with said spindle once in twenty-four hours, and which, acting upon the bar O through the friction-roller *s*, or through an arm, *v*, attached to and projecting from said bar, actuates the bar, as hereinafter described.

The inclined way H is adjusted on the lever G in such a manner that when the inner end of the said lever is depressed to its lowest position the weight K will tend, by its gravity, to run out toward the outer end of said inclined way, but with as little force as is consistent with its positive action.

It will now be obvious that, if unrestrained, the roller-weight K will seek the outermost position upon the way, and its weight, acting through the lever G against the collar *i* on the valve-stem D, will force said valves toward their seats independently of the action of the varying pressure in the gas-holder F.

The cam *c* on the main spindle *t* of the clock-work train acting through the bar O, and attachments of said bar draws in said roller-weight on the way H, restrains it from rolling, or permits it to roll out on said way, said cam being constructed to control automatically the movement and position of said weight relatively to the fulcrum *h* of the lever G.

In Figs. 1 and 3 the position of the cam is that assumed at about the end of the time of general lighting of gas in the evening. The elongated part 1 of the cam has acted upon the end of the arm *v*, to give a rapidly-increasing opening of the valves, which will continue till said part 1 passes by the arm *v*. Then the part 2 of said cam will hold the bar O nearly immovable, and permit the increased flow from A into B during the hours of greatest consumption, at the end of which there will be a somewhat sudden partial closing of the valves, gradually increased while the part 3 of the cam passes over the friction-roller *s*. A still more extreme movement of the valves toward their seats occurs when the parts 4 and 5 of the cam pass over the friction-roller *s*, gradually and quite uniformly increased till day-light, when, during the period of turning off gas allowed to burn through the night, a more rapid and still further closing occurs, effected by the passage of the part 6 of the cam *c* over the roller *s*. The part 7 in passing over the roller *s* maintains the opening of the valves nearly constant throughout the day. The part 8 of the cam, reaching said roller a little in advance of the general lighting for the evening, again opens the valves slightly to compensate for the gentle increase in consumption at that period; and, lastly, when the time of general lighting up for the evening arrives, a wide opening of the valves is effected by the action of part 1 of the cam on the arm *v*.

The necessary changes and graduations of the opening of the valves are thus automatically effected by the action of the weight upon the lever G without regular personal supervision, while the minor irregularities in pressure constantly occurring are compensated for by the action of the gas-holder F, as heretofore done.

The tipping of the lever G increases the inclination of the way H to the horizon; consequently the train of clock-work when unassisted will be required to exert a greater force in drawing in the roller-weight the farther said weight is from the fulcrum *h*. The tension exerted by the clock-work may, however, when desired, be rendered nearly constant by a spring connecting the end of the bar O with the upright W attached to the case E.

It will be seen that any desired effect or succession of effects may be produced by changing the position of the cam, or by putting on other cams of different shape, to

adapt the governor to different latitudes and seasons.

If desired, a twenty-four hour dial may be attached to or engraved upon the cam *c*, which, passing under a fixed index, will indicate the degree of accuracy with which the governor performs its functions at the desired stated times.

The cam *c* may be adjustably attached to the spindle *t*, to enable it to be moved forward by hand on dark days, which demand increased flow of gas; but, when this is done, the cam must be set back again to its normal position, at or before nightfall, to insure its proper action through the night; or a compound cam of two parts may be used, which parts may be set to either vary the time of opening or closing the valves, or both.

It is obvious that various devices for operating the weight on the lever G, by the train of clock-work, may be employed without departing from the principle or spirit of my invention. I therefore do not limit myself to the devices intermediate between said weight and the clock-work train, to any particular form of weight, or means for facilitating the movement of said weight upon said lever.

The air-chamber *f*, Fig. 1, is formed on the interior of the gas-holder F, and is preferably of annular form, and situated near the bottom of said holder. Air is forced into said chamber to any required extent through a supply-tube, *g*, provided with a stopper, *k*, or by any other suitable means. The air so forced in displaces a portion of the water from the interior of said air-chamber, which, rising upon the outside of the gas-holder F, buoys up the said holder proportionately to the weight of water so displaced. By thus employing an element of constant pressure to assist in balancing the gas-holder, I render the governor far more sensitive and responsive to varying pressures in the gas-main B.

I claim—

1. The combination, with the valve or valves of a gas-governor and a lever applied to said valve or valves, of an adjustable weight applied to said lever, and an adjusting device, operated by clock-work, and operating upon said weight or weights to produce an automatic adjustment thereof, substantially as and for the purpose herein described.

2. The combination, with the lever G, valve or valves C, and gas-holder F, of the adjustable inclined way H, roller-weight K, chain or cord *m*, bar O, and the cam *c*, driven by a train of clock-work, substantially as and for the purpose specified.

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