(No Model.)

G. A. GESSNER.

GAS GOVERNOR.

No. 386,809. Patented July 31, 1888.

Fig. 2.

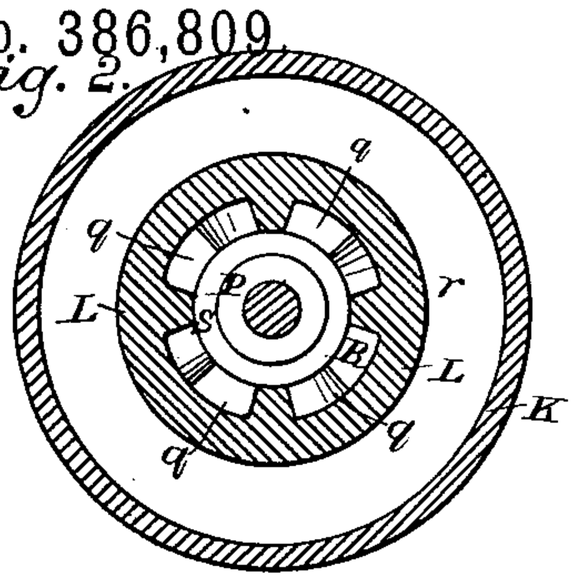


Fig. 1.

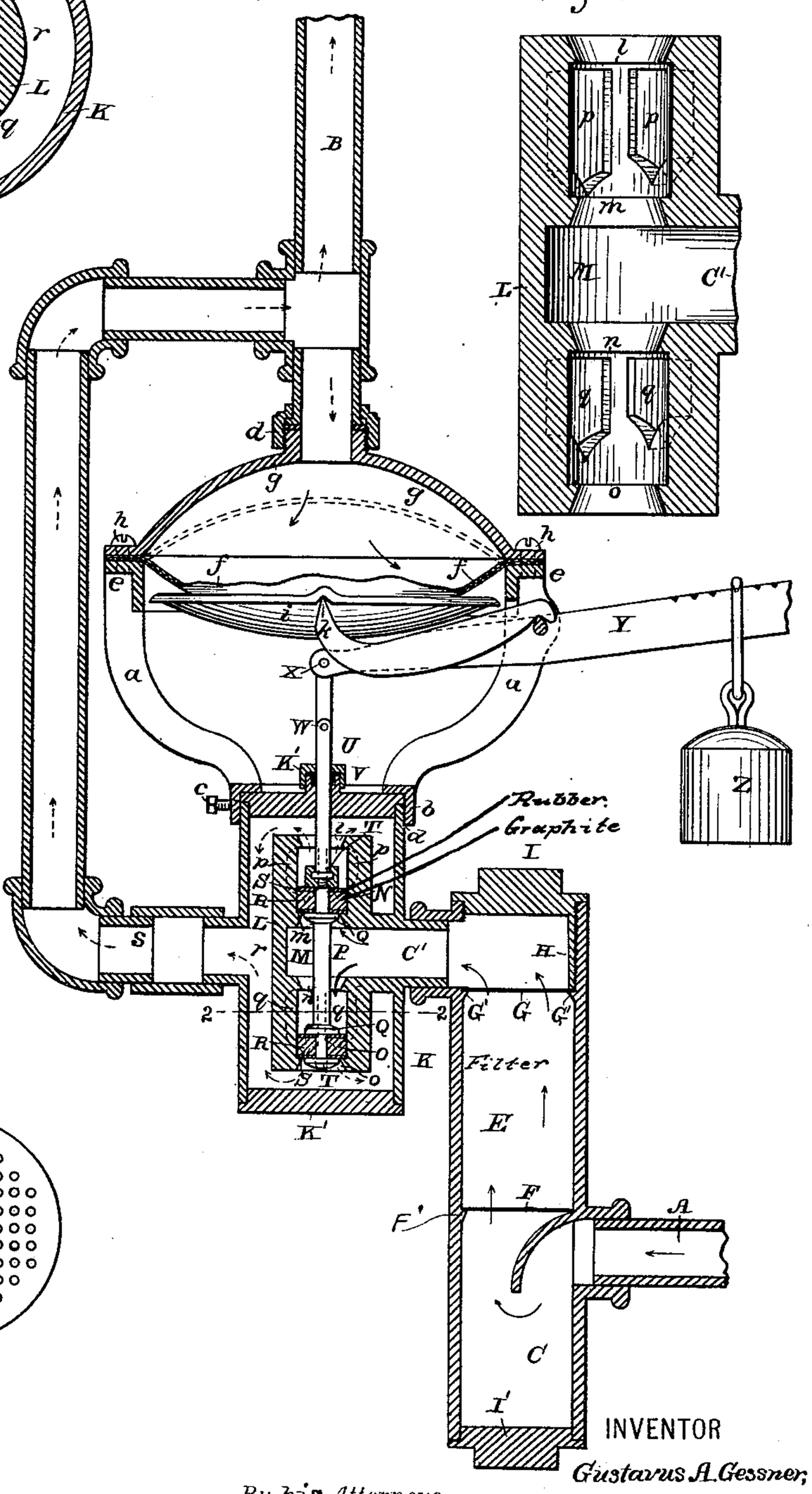
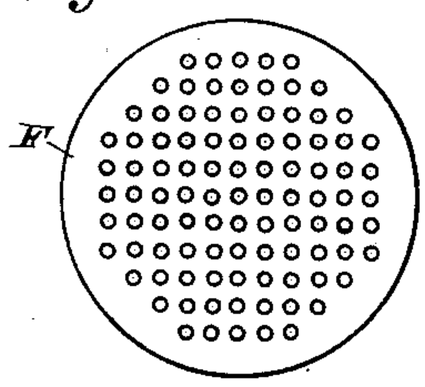


Fig. 4.

Fig. 3.



WITNESSES

E. A. Newman.
C. M. Newman

INVENTOR

Gustavus A. Gessner;

By his Attorneys

Baldwin Hopkins & Peyton

UNITED STATES PATENT OFFICE.

GUSTAVUS A. GESSNER, OF FREMONT, OHIO.

GAS-GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 386,809, dated July 31, 1888.

Application filed August 26, 1887. Serial No. 247,965. (No model.)

To all whom it may concern:

Be it known that I, GUSTAVUS A. GESSNER, of Fremont, in the county of Sandusky and State of Ohio, have invented certain new and useful Improvements in Gas-Governors, of which the following is a specification.

The object of my invention is particularly to provide an automatic gas-governor or pressure-regulator suitable for controlling the distribution of natural gas, the pressure of which sometimes varies largely and reaches a high degree; but my pressure-regulator is also adapted for other uses.

My improvements consist in the organizations and combinations of parts hereinafter described, and succinctly specified in my appended claims.

In the accompanying drawings, Figure 1 is a vertical central section of my improved gas-governor. Fig. 2 is a section on the line 2 2 of Fig. 1. Fig. 3 shows one of the perforated partitions of the filtering-chamber detached. Fig. 4 is a view, on an enlarged scale, of the inner cylinder, L, to better illustrate the gas-ports.

Referring to the letters upon the drawings, A indicates the high-pressure street-main, from which the gas enters, and, passing through the central part of the apparatus, as indicated by the arrows, comes out through the low-pressure main B and is distributed. The governor mechanism proper consists of two central cylinders, one within the other, the inner one provided with a double-headed piston and valve mechanism. Over these cylinders is a frame supporting a rubber diaphragm filled with liquid, the upper part of which communicates with the low-pressure main, and the under part of which is connected to the piston-rod and pistons by means of weighted-lever mechanism.

With this general outline of the structure in view, I proceed now to describe my apparatus more in detail.

From the pipe or street-main A the gas enters a chamber, C, downwardly, into which it is directed, as indicated in Fig. 1. The chamber C is for receiving the deposits of condensed moisture, sand, scale, &c.

E indicates the filtering-chamber, provided with perforated partitions F and G and with suitable filtering material. The lower partition, F, rests upon an inwardly-projecting flange, F′, and the upper one, G, rests upon a suitable support, G′, and is held in place by a leg, H, projecting down from the upper removable screw-plug, I, which gives access to the filter.

I′ indicates the lower removable screw-plug, by means of which access may be had to the chamber C. The gas passing from the chamber C through the filter enters, as indicated by the arrows, through the inlet-pipe C′, into the central structure of the apparatus, which consists of an outer cylinder, K, closed at both ends, and an inner cylinder, L, open at both ends.

K′ indicates screw-threaded removable heads of the outer cylinder. The gas first enters what I term the "high-pressure chamber" M, which includes the inlet C′ and that portion of the inner cylinder between the under face of the upper valve, N, and the upper face of the lower valve, O.

P indicates a rod connecting the upper and lower valves, provided with shoulders Q to hold the valves in place. The valves are composed of graphite rings R, faced above and below with rubber washers S, as shown. The rings and washers are held in place by means of the screw-caps T. The graphite rings are slightly greater in diameter than the rubber rings, and are made to closely fit the bore of the inner cylinder. They will not corrode, and their movements up and down in place soon coat the surfaces of the cylinder against which they impinge, so as to protect them also against corrosion and to serve the purpose practically of a lubricant. The graphite rings may be either solid or split rings.

U indicates a valve-stem properly packed in any ordinary manner at V, jointed at W and pivoted at X to the end of a weighted lever, Y, having the movable weight Z. This lever is pivoted to one of the supports *a*, of which I prefer to have five to constitute the diaphragm-supporting frame-work. These supports rest upon a flanged ring, *b*, fitting loosely upon the top of the outer cylinder, as illustrated, and provided with a set-screw, *c*, so that the frame can be turned to any desired position and secured there. There is an or-

dinary joint at *d*, adapted to permit such turning. *e* indicates another similar flanged ring, to which the supports *a* are connected at their tops by bolts and held in place.

f indicates the rubber diaphragm composed of two disks united at their peripheries and containing suitable liquid, such as diluted alcohol.

g indicates a cap constituting a continuation or expansion of the low-pressure main extending over the diaphragm and clamped down tightly upon its margin by means of screws *h*, as illustrated. The space between this cap and the upper part of the diaphragm constitutes what I term a "low-pressure" reservoir.

i indicates a pan supported on the pivots *k* of the weighted lever and bearing up against the under side of the diaphragm.

l indicates the upper and *m* the lower valve-seat of the upper valve, N.

n indicates the upper and *o* the lower valve-seat of the lower valve, O. When the valves are at the extremes of their movements up or down, the proper washers, S, will be pressed against these seats and close the openings through them.

p p indicate recesses or gas-ports in the inner cylinder, of which there may be four or more, where the upper valve, N, is located. These ports are tapered at their lower ends, and one of them is longer than the others and extends down to the valve-seat *m*, while the others terminate above the seat.

q q indicate recesses or gas-ports, of which there may be four or more, in the inner cylinder, where the lower valve, O, is located. These ports are also tapered at their lower ends, and one is longer and extends down lower than the others; but they are neither of them as long, nor do they extend down as near the valve-seat below them, as the ports *p p*. The result of this construction is that as the valves rise from the position they are shown as occupying in Fig. 1 (in which the flow of gas is cut off from the low-pressure main) the flow begins first and very gradually through the lower end of one of the ports *p*, then begins gradually through the other ports *p*, and when these ports are in operation it will begin to pass gradually through one of the ports *q*, and afterward, as the valves rise, gradually through the other ports *q*. Thus the ports are opened gradually and successively until they are all in full operation. When the valves move down in the opposite direction, the ports will be gradually and successively closed in a corresponding manner. When the ports are opened, or when any one of them is open, the gas will then pass into the low-pressure chamber *r*, which includes that portion of the inner cylinder above the upper and below the lower valve and around the inner cylinder and the outlet *s*. On account of this construction and arrangement of the ports the aperture of communication between the high and low pressure chambers may be very gradually increased or diminished, according to the relative consumption and supply of gas, as will presently appear more fully.

The diameters of the openings through the valve-seats *m* and *o* are the same; but the diameters of the openings through the valve-seats *l* and *n* are different, that through the valve-seat *l* being larger than that through the valve-seat *n*.

The operation is as follows: Suppose the weight be properly adjusted upon the lever Y and the gas to be passing through the apparatus into the low-pressure main. It will enter the low-pressure reservoir above the diaphragm and press down upon the diaphragm with a force corresponding to the area of surface of the diaphragm. This surface is such that the pressure upon it may ordinarily be counterbalanced by the weighted lever, and when the weight is properly adjusted the pressure in the low-pressure reservoir will operate to automatically move the valves and open or close the ports more or less in order to preserve a regular and proper flow of gas. When the valves are in the position shown in Fig. 1, the gas-pressure upon them is equal and the back-pressure upon the diaphragm exceeds the force of the weighted lever, so that there is an automatic cut-off; but when raised so as to be seated on the seats *l* and *n*, then, from the fact that the opening through the seat *l* is larger than that through the seat *n*, there is an excess of pressure on the under side of the upper valve, N. Such excess of pressure, together with the action of the weighted lever, tends to keep the valves in that elevated position, and such position will be assumed whenever the supply of gas ceases.

The packing at V may be very light around the valve-stem, where it is convenient to use a lubricant, so that the minimum resistance by friction is encountered at that point. By using valves formed in the manner I have described of graphite I reduce friction to the minimum within the inner cylinder, where it would be difficult to satisfactorily apply a lubricant. Besides this, I prevent the bearing-surfaces from being injuriously attacked. I thus secure a sensitive pressure-regulator with ample movement of parts to accommodate all the extremes of variation of pressure of natural gas, which is often quite fitful in its flow.

By the use of the chamber C, I clear the gas of much of the solid matter that would clog the valve mechanism; but by also using, in connection with the chamber C, a filter, I still further cleanse the gas. Thus I prepare the gas not only to pass through the pressure-regulator without the usual difficulties, but also for burning with much better effect.

I construct my entire apparatus so that its interior is readily accessible and so that it is adapted to be applied in all situations, the diaphragm frame-work turning freely, so as to let the lever and weight project from any side, and thus avoid any obstacle.

I do not confine my invention to the form of embodiment illustrated in the drawings, as

numerous formal changes might be made without departing from its substance, and some parts of it might be used without others; but

What I claim is—

1. In combination with the two valves N and O, connected by the shouldered rod P, the inner cylinder provided with the valve-seats *m*, *n*, and *o*, and the gas-ports *p p* and *q q*, tapered at their lower ends and arranged on different levels, as described, whereby they come into operation and go out of operation successively, substantially as set forth.

2. In combination with a gas-pressure regulator, a rotary frame-work supporting a diaphragm and weighted lever, substantially as and for the purpose set forth.

3. In an automatic gas-governor and cut-off mechanism, the combination of the cylinder L, valve-stem U, the weighted lever, the flexible diaphragm, and the rotary frame-work, substantially as set forth.

In testimony whereof I have hereunto subscribed my name.

GUSTAVUS A. GESSNER.

Witnesses:
M. G. SHRAVES,
G. W. KING.