2 Sheets--Sheet 1.

H. J. FERGUSON.

Gas-Governor.

No. 160,409. Patented March 2, 1875.

FIG. 1.

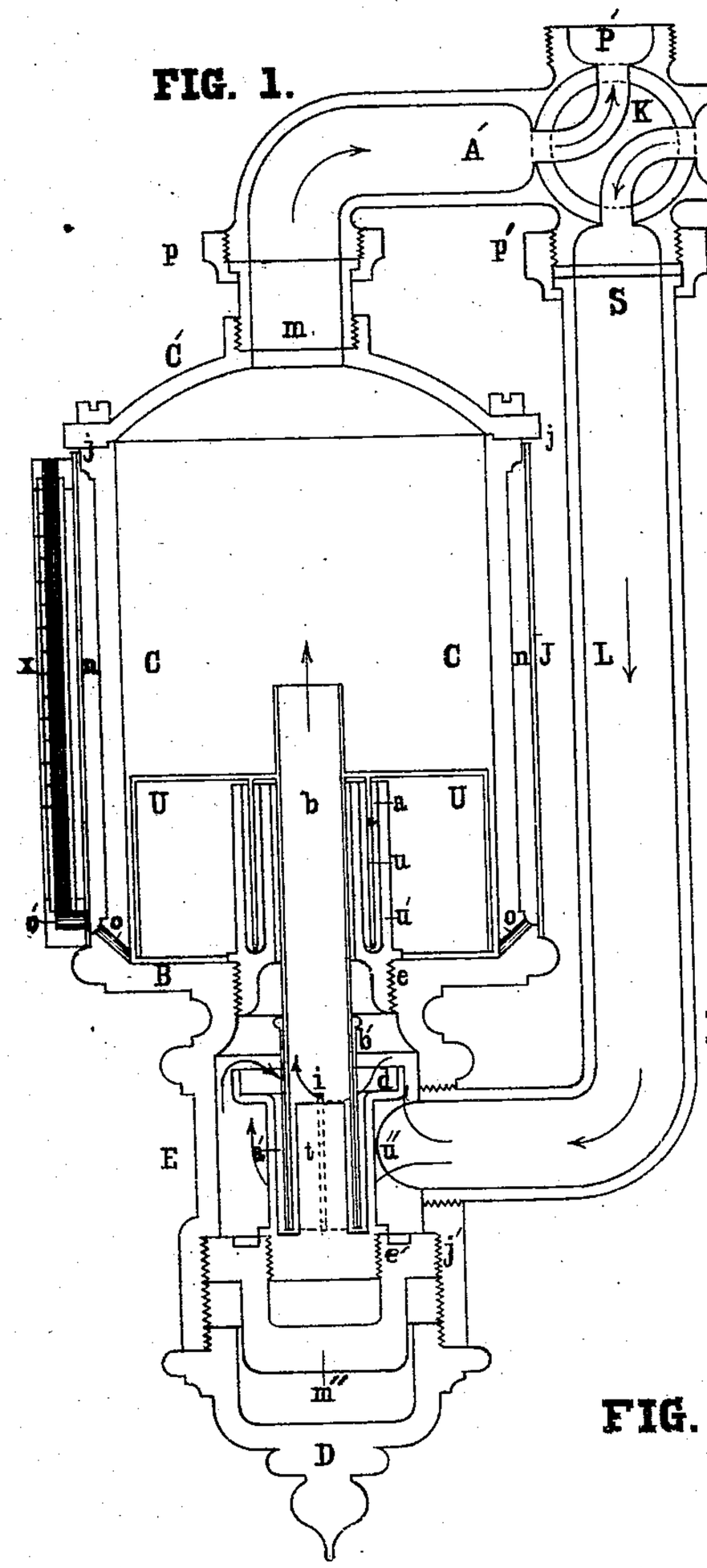


FIG. 2.

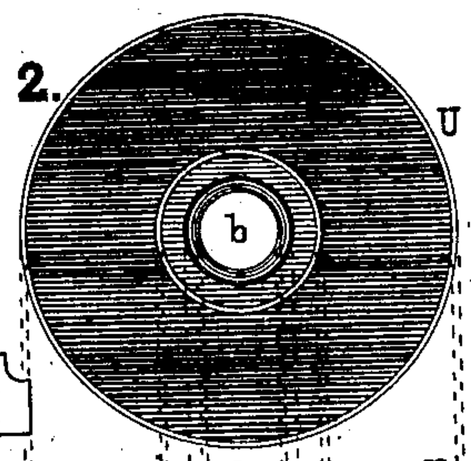


FIG. 7.

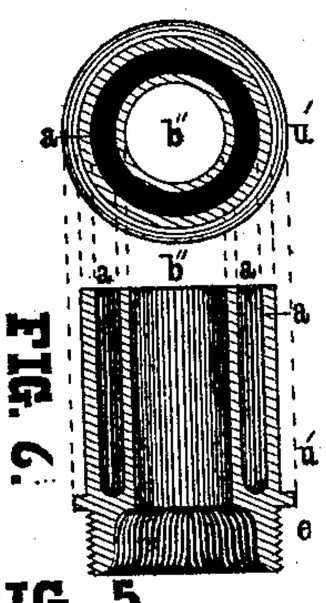


FIG. 6.

FIG. 5.

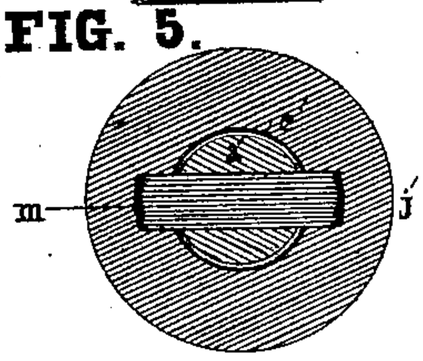
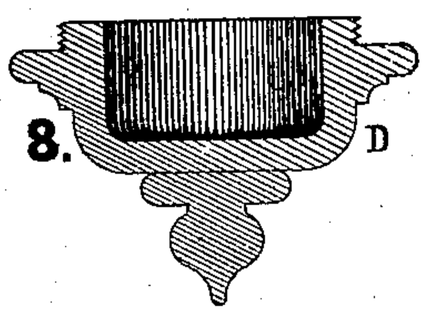


FIG. 8.



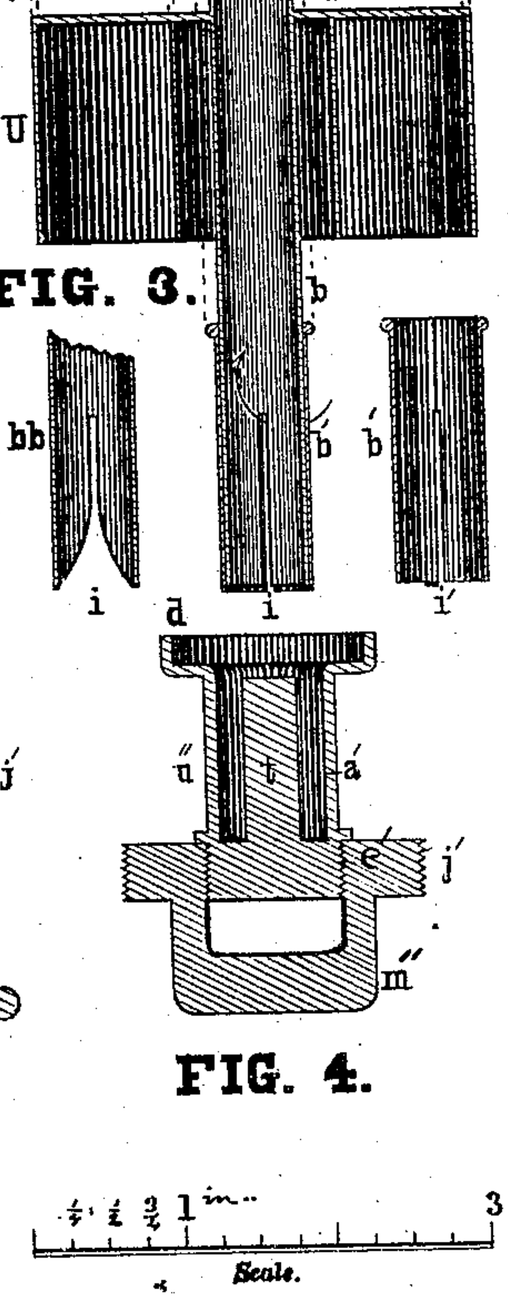


FIG. 3.

FIG. 4.

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2 Sheets--Sheet 2.

H. J. FERGUSON.

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FIG. 9.

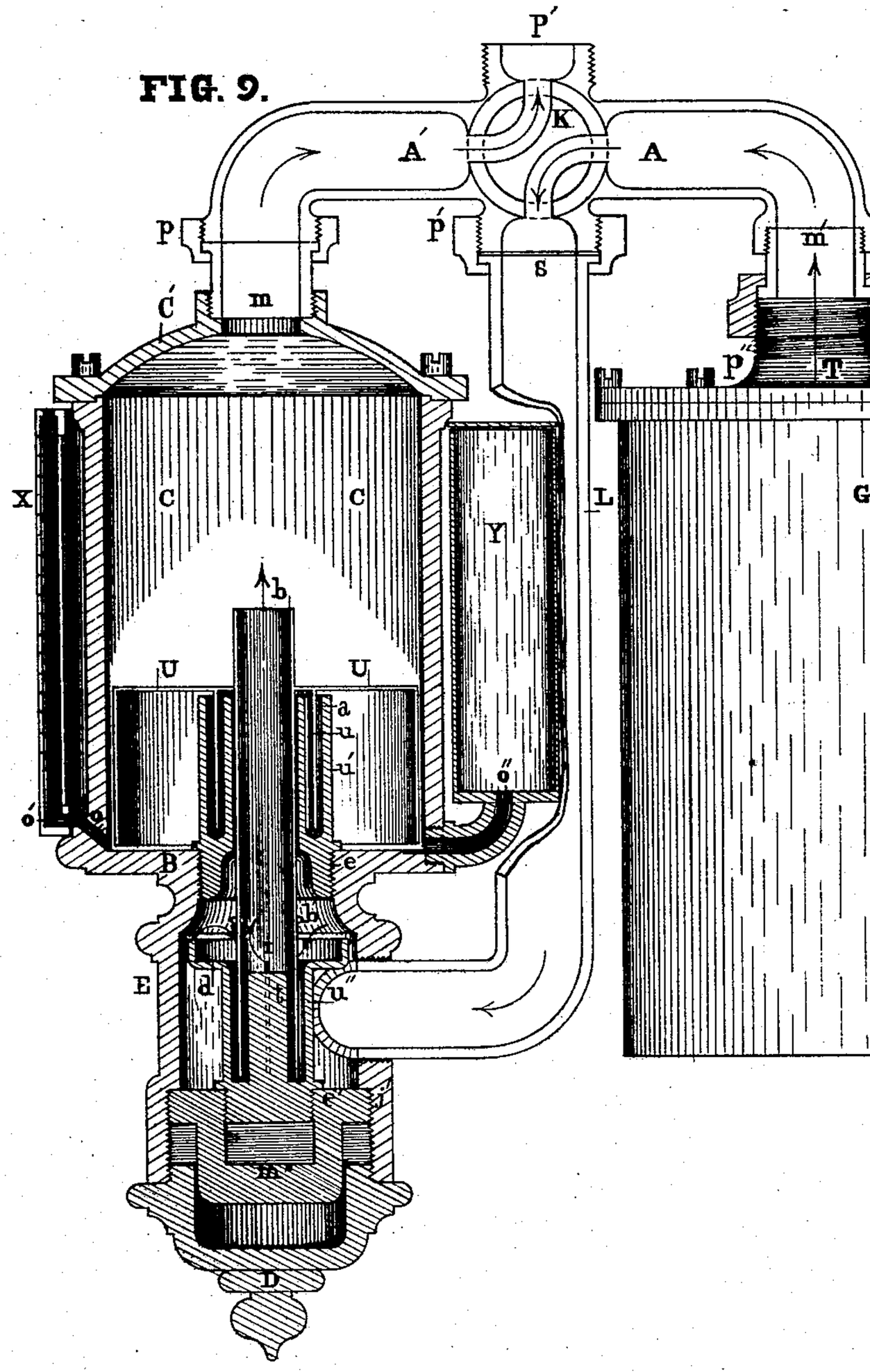
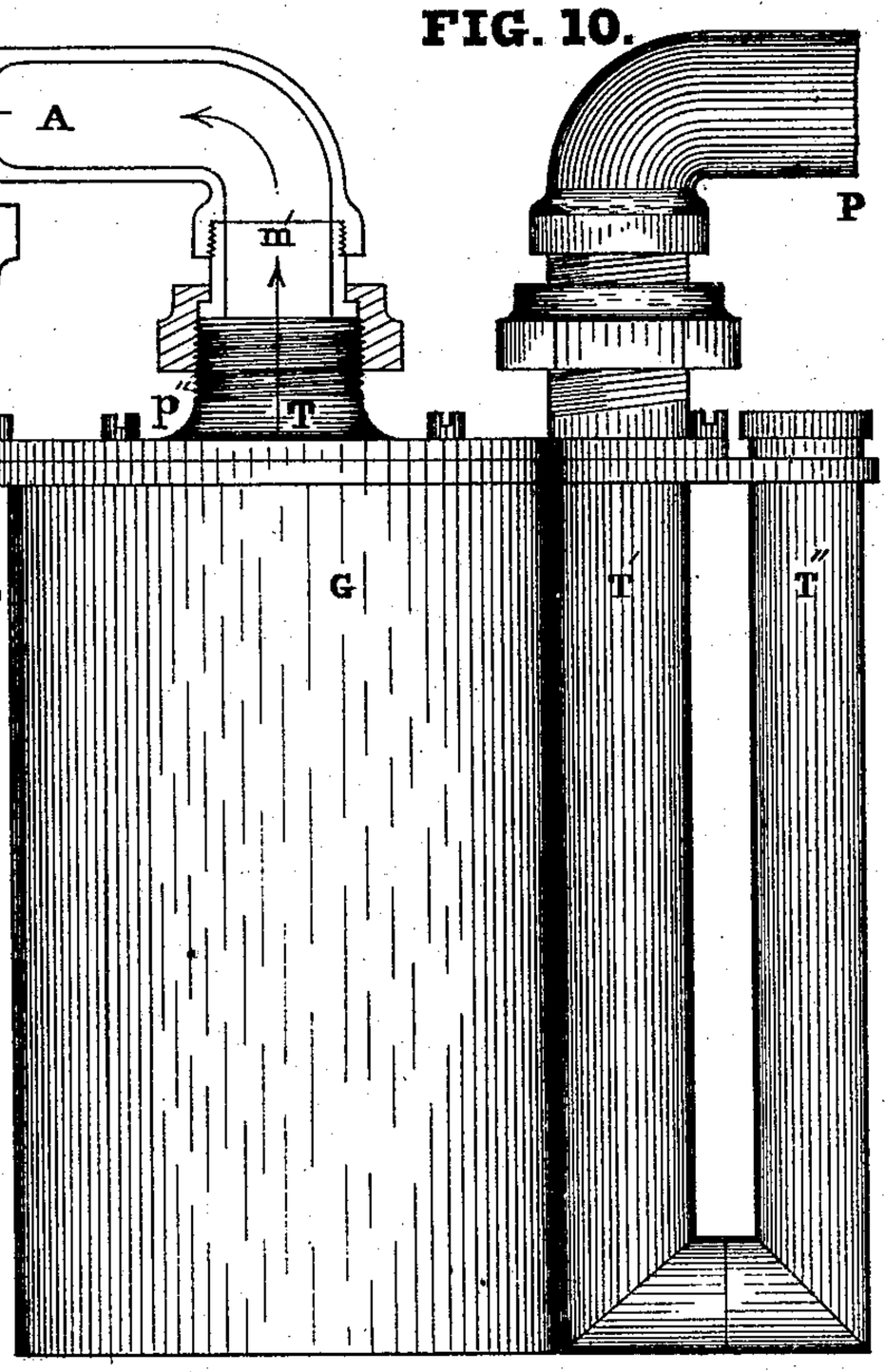


FIG. 10.



Witnesses. { John R. Kimball
Charles E. Kimball

INVENTOR.

Henry J. Ferguson.

UNITED STATES PATENT OFFICE.

HENRY J. FERGUSON, OF NEW YORK, N. Y.

IMPROVEMENT IN GAS-GOVERNORS.

Specification forming part of Letters Patent No. **160,409**, dated March 2, 1875; application filed October 16, 1874.

To all whom it may concern:

Be it known that I, HENRY J. FERGUSON, of the city and county of New York and State of New York, have invented certain Improvements relating to Gas-Governors, of which the following is a specification:

The object of my invention is to provide gas-consumers with a reliable and efficient means of regulating with precision the flow of gas to their respective burners, and whether to one or many, and to any degree of pressure less than that at which they are served by the producers.

The first part of my invention consists in a jacket or outer envelope larger than the body of the governor, forming a concentric annular space or reservoir around said body, communicating with the interior of the governor, the two spaces or chambers being reciprocally occupied by a suitable fluid; the object of these related chambers and the contained fluid being to make them, by their inversed relation, as respects the pressure of gas upon the fluid within the cylindric chamber, to operate a tubulated float-valve, also contained within the cylindric chamber and resting freely upon its contained fluid. By reason of the inverse level of the fluid in the outer or concentric chamber when the surface of the fluid within the cylindric chamber is acted upon by the gas-pressure, the tubulated float-valve may be carried upward or downward by the varying degrees of gas-pressure, and this reciprocal motion be made to open or close a suitable orifice formed by the juxtaposition of the slitted edge of the lower extremity of the tubular part of the float-valve with the horizontal surface of mercury contained in a relatively stationary but adjustable vessel, and so affect the passage of gas, all of which parts and operations are hereinafter fully shown and described.

The second part of my invention consists in constructing said jacket or outer casing of a suitable height, and protecting the top of the same by a flange projecting outwardly from the cover of the main vessel, and in providing suitable orifices at the bottom of the inner vessel or body of the governor, as will be hereinafter more fully explained.

The third part of my invention consists in a central float-tube, provided with a movable jacket of peculiar construction, combined with a float-valve at the upper end of the tubular stem, the bottom of which dips into a mercury-vessel made vertically adjustable.

The fourth part of my invention consists in so constructing the upper mercury-vessel as to be vertically adjustable within the central part or body of the governor.

The fifth part of my invention consists in the peculiar construction of the lower mercury-vessel, in which the lower end of the tubular valve-stem rests.

Figure 1, Sheet 1, is a vertical transverse skeleton section of the entire instrument and parts *in situ*. Fig. 2, Sheet 1, is a transverse perspective bottom view of the float-valve, looking upward. Fig. 3, Sheet 1, is a vertical transverse perspective section of the float-valve. Fig. 4, Sheet 1, is a vertical transverse perspective section of the lower mercury-vessel. Fig. 5, Sheet 1, is a transverse perspective bottom view of the lower mercury-vessel. Fig. 6, Sheet 1, is a vertical transverse perspective section of the upper mercury-vessel. Fig. 7, Sheet 1, is a horizontal transverse perspective section of the upper mercury-vessel. Fig. 8, Sheet 1, is a vertical transverse perspective section of the bottom closer of the instrument. Fig. 9, Sheet 2, is a vertical transverse section of the governor; and Fig. 10, Sheet 2, is a vertical perspective view of the carbureter; and the two figures constitute a view of the two devices in combined relation.

On Sheet 1, A is a branch of connection leading from the meter to the governor, and is attached to the meter by the coupling p''.

A′ is a branch of the connection leading from the governor and to the service-pipes and burners. The passages of both branches are governed by the four-way cock K. K also governs the passages of P′ and L. P′ is the point of connection with the service-pipe, and L conveys the entering gas to the antechamber E of the governor, and to where it is subjected to the governing operation of the float-valve U. B is the bottom of the cylindric vessel C. C′ is its detachable upper closer. It has a central passage in common with that of A′ and P′. C′ is detachable for continued manipulation of valve U. A′ and C′ are connected by coup-

ling *p* and thimble *m*. *m* confines *p*, and permits it suitable slack, for the purpose of making connection or disconnection. D is the bottom closer of the instrument. J is the jacket, and *n* is the space or chamber concentrically formed between the jacket and body of the cylinder C, and communicates with the chamber *c* by the passages *o o*. *n* is freely open at the top with the atmosphere. The chambers *c* and *n* contain a definite quantity of a mixture of glycerine, water, and alcohol, and on which, within the chamber *c* and by its outer rim, the float-valve is made to rest freely, and its outer rim only engaging the surface of the fluid mixture. It is thus made to inclose a volume of air equal to itself, as a cup would likewise situated, the inclosed air making the float-valve sufficiently buoyant for the use intended for it.

It will be seen that when pressure accumulates within the chamber C the valve U must move downward with the expulsive force of the pressure, and the same force expels also at the same time the fluid mixture within C and beneath U, through the passages *o o* into the chamber *n*, and there accumulates it to a height equivalent to the gas-pressure. As pressure is removed or relieved from within C—as, for instance, by lighting one or more burners—the inverse action upon U and the fluid contents of C results, and consequently U now rises, and as it does so the gas-passage, slit *i*, is made to elongate, enlarge, and therefore to adapt itself automatically to the fresh requirement. This force so resulting is quite sufficient for the operation of U, for it incurs no friction as related to the mercury, but thus permits perfectly the important operation of the slit *i*, the outer rim only of U resting on the fluid mixture, its inner rim dipping into the mercury of the upper vessel *u'*, and its lower tubular extremity dipping into the mercury of the lower vessel *u''*; but the preferably practicable relation of the lower end of the float-valve tubular extremity is merely to be in complete contact by its edge with the surface of the mercury when the valve is at its lowest point and under the greatest degree of gas-pressure, and having but a small portion of slit *i* presented to the gas-chamber, so much only as would permit a supply of gas to one burner, or to two at most, the passage of supply to additional burners, however, arising by disengagement between the tube's edge and the surface of the mercury, and would be proportionate to the recedence of the tube's edge; but I am not confined to the concentric chamber as a form or mode of the fluid counter-balance. I may use a simple cylindric counterpart of C, as shown by Y in Fig. 9, Sheet 2, the chambers thus arranged communicating as before, but Y is made detachable. The object of the upper mercury arrangement is to prevent the gas from getting under the float portion of the valve, and to confine it to its passage through the tubular portion *b*, and to prevent also the fluid mixture from passing over into the antechamber E; and the object of the lower mercury arrangement is to afford a frictionless and a certain valvular action of *b*. The bore of *b* is entirely open throughout, is slitted at *i* diametrically, and for a given distance upward. When the instrument is in operation, and a further demand is made for more gas, the entire valve is caused to rise, and consequently the dipping extremity of *b* correspondingly slips out from the mercury contained in *u''*, thereby elongating the free space of the slit *i*, and therefore the gas-passage, to meet the fresh demand. The lower extremity of *b* has a short duplicate of itself, *b'*, loosely incasing it, and operating with horizontal rotation, and for the purpose of more closely adjusting the initial passage. This relation and operation is further seen by reference to Fig. 3, and in *b b* may be seen a still further modification of *i*. *i b* and the mercury of *u''* have still another adjustment in the threaded seat of *u''*: by taking hold of *m''* and turning, *u''* may be moved upward or downward, as desired, and thus made to effect the gas-passage also.

a' of *u''*, Fig. 4, is an annular space occupied by the mercury. *t* is a guide to *b*, and serves also to economize the quantity of mercury. *d* is a dish-like expansion of *a'* to receive the overflow of mercury as *b* passes down into it. The upper mercury-vessel *u'* is tapped centrally into B at *e*, its concentric space *d* containing the mercury and its bore *b''*, Fig. 7, giving passage to *b* of the valve. *u* will be further understood by referring to Figs. 2 and 3. In Fig. 2 is a bottom transverse view, and in Fig. 3 a vertical transverse section. The upper mercury-cup is made, as shown and described, for purposes of facility and economy of manufacture, and also to be enabled to use a material not having any affinity for mercury, as iron or ebonite, &c.; and, furthermore, to be enabled to make the body portion of the instrument of any cheap, but suitable, material. These reasons apply also to the lower mercury-cup, and with the additional one, that of its threaded and necessarily adjustable seat with reference to its relation with the float-valve tubular extremity. *j* is projecting extension of the flange of the upper closer, related and in combination, for the purpose of preventing dust and like particles from falling into the free annular space *n*, but is sufficiently above contact with the upper edge of J to allow free ingress and egress of air to *n*. *m* and *m'* are thimbles, related and in combination, for purposes of facility and economy in the manufacture of the instrument, and also for the better convenience for its adjustment or detachment. *s* is a swivel and washer, related and in combination, for the purpose of enabling the instrument to be swung around to a right angle, and away from its closer and connection when it is needful to examine or adjust its internal parts. *j'* is the threaded flange of the lower mercury-vessel *u''*, which, in combination with the thumb-extension *m'' u''* and its mercury surface is enabled to be brought into adjusted relation with the

lower edge of tube *b*. *e'* is the threaded neck of the vessel *w''*, and is so constructed for reasons similar to those for *e* in the vessel *a'*. X is an index, communicating with concentric chamber *n* at *o'*, and records the degree of pressure at which the instrument is serving the gas.

In cases where an increased gravity of gas is needful, and for the better distributive effect of the governor, connection is made with my improved hydrocarbon-diffuser, as shown at *m'* and *p''*, Figs. 9 and 10, Sheet 2, and P, Fig. 10, is made to join the meter. The gas therefore on leaving the meter first travels spirally through the diffuser, and then enters the governor charged with the hydrocarbon vapor, is thereby increased in gravity, and advances to each burner with an equal pressure irrespective of altitude, or whether burners are lighted in different sections of altitude.

I make no claim, broadly, for a gas-governor, nor for the object of one, nor for the connections taken separately; but

I claim as my invention—

1. In a gas-governor, the jacket J, forming external of the body of chamber C the annular space *n*, substantially as herein shown and set forth.

2. Jacket J, forming space *n*, in combination with flange *j*, orifices *o o*, and chamber C, substantially as shown and set forth.

3. The central float-tube *b* and movable jacketed counterpart *b'*, in combination with float-valve U, slits *i* and *i'*, and the adjustable mercury-vessel *w''*, substantially as herein shown and set forth.

4. The threaded neck *e* of the mercury-vessel *w'*, in combination with the bottom of chamber C, substantially as herein shown and set forth.

5. The threaded neck *e'*, threaded flange *j'*, and thumb-piece *m''* of the mercury-vessel *w''*, in combination, substantially as herein shown and set forth.

HENRY J. FERGUSON.

Witnesses:

MARTHA J. HOUGHTON,

THOMAS HOUGHTON.