No. 694,611. Patented Mar. 4, 1902.

# G. H. BURROWS.

## AIR AND GAS MIXING AND SUPPLYING APPARATUS.

(Application filed Nov. 29, 1901.)

(No Model.)

FIG. 2.

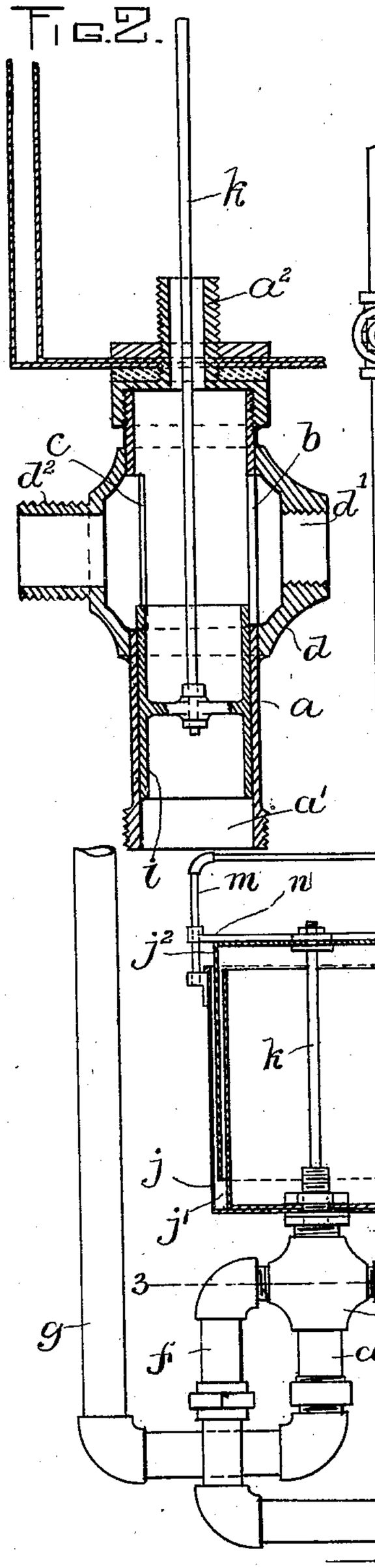



FIG. 1.

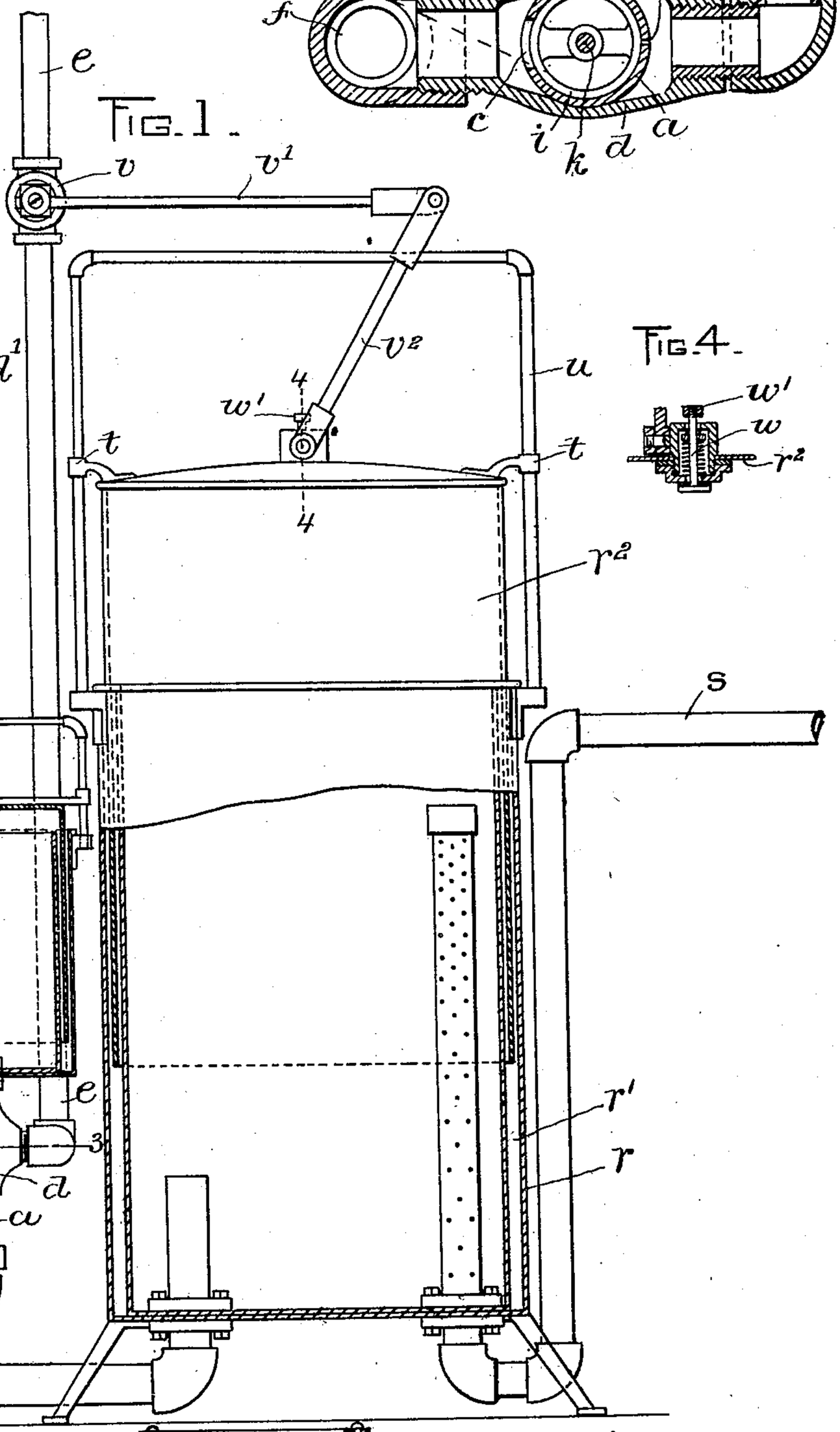



FIG. 3.

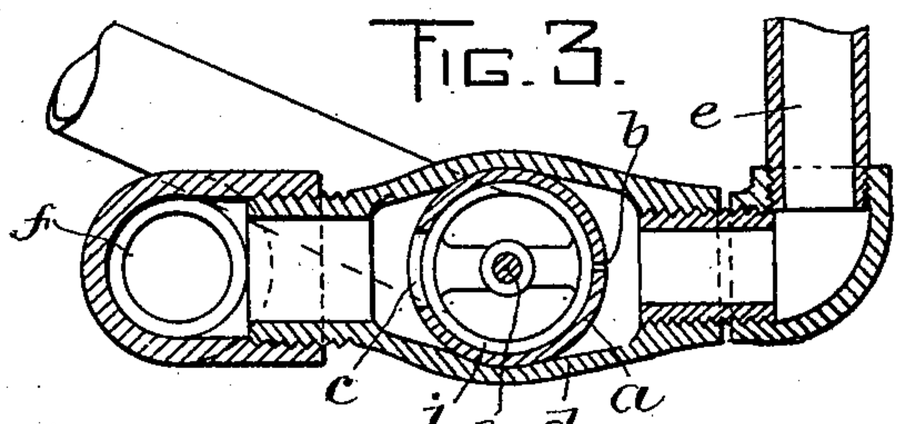
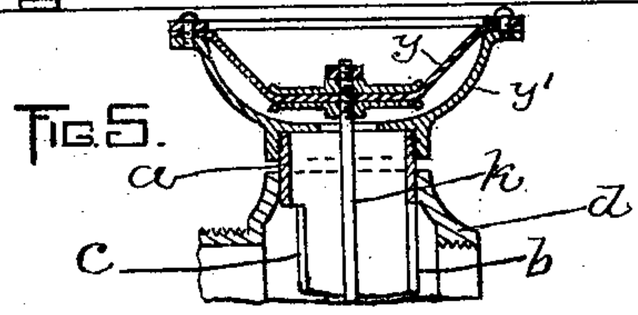



FIG. 4.




FIG. 5.

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# UNITED STATES PATENT OFFICE.

GEORGE H. BURROWS, OF SOMERVILLE, MASSACHUSETTS.

## AIR AND GAS MIXING AND SUPPLYING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 694,611, dated March 4, 1902.

Application filed November 29, 1901. Serial No. 84,126. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE H. BURROWS, of Somerville, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Air and Gas Mixing and Supplying Apparatus, of which the following is a specification.

This invention relates to apparatus for forcing a mixture of air and gas in predetermined proportions to a series of gas-burners and having means for insuring the desired proportional mixture of gas and air under any pressure that may exist in the burner supply-pipe or system of pipes and to enable the quantity of gas and air supplied to be regulated automatically by the pressure in said burner supply-pipe.

The invention has for its object to provide a simple and effective apparatus of this class; also, to enable the supply of gas to be automatically shut off in case the supply of air fails for any cause, and, finally, to provide for the escape of any excess of air-pressure.

To these ends the invention consists in the improvements which I will now proceed to describe and claim.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a partial side elevation and partial vertical section of an apparatus embodying my invention. Fig. 2 represents an enlarged sectional view of the mixing-chamber and parts of the pressure-controlled regulating apparatus. Fig. 3 represents a section on line 3 3 of Fig. 1. Fig. 4 represents a section on line 4 4 of Fig. 1. Fig. 5 represents a sectional view of a modification.

The same reference characters indicate the same parts in all the figures.

In the drawings, *a* represents a mixing-chamber, which is provided at one side with a gas-inlet *b* and at the opposite side with an air-inlet *c*. Said mixing-chamber is preferably of tubular form, and the inlets *b* and *c* are preferably elongated slots extending longitudinally of the chamber, the latter being vertically arranged, and the inlets *b* and *c* located at the same height. A sleeve or casing *d* is secured to the exterior of the chamber *a*, said casing having an internally-threaded socket *d'* to receive a gas-supply pipe *e* and an externally-threaded nipple $d^2$ to engage the air-supply pipe *f*. The gas-supply pipe *e* delivers gas to the inlet *b*, and the air-supply pipe *f* delivers air to the inlet *c*. The gas-inlet *b* is of considerably smaller capacity than the air-inlet *c*, the two inlets being preferably relatively proportioned, so that the volume of air admitted is about ten times as great as the volume of gas.

*g* represents the burner supply-pipe, which is connected with the outlet end *a'* of the mixing-chamber and conducts the mixture of air and gas to the burners.

Means are provided, as hereinafter described, for forcing air under pressure through the pipe *f*. The gas supplied through the pipe *e* is or may be effected by the pressure existing in the gas-main with which the pipe *e* is connected.

Means are provided whereby the quantity of gas and air admitted to the mixing-chamber *a* is determined by the pressure of the mixture in the mixing-chamber and in the burner supply-pipe. In this embodiment of my invention said means comprise a valve *i*, which is here shown as tubular and having a sliding fit in the interior of the mixing-chamber *a*, and a telescopic chamber composed of a fixed member *j*, having an annular space *j'*, containing a sealing liquid, and inverted vertically-movable member $j^2$, floating in the said liquid, and a rod *k*, connecting the head of the member $j^2$ with the valve *i*. The member *j* is suitably affixed to the upper end of the mixing-chamber *a*, the latter having a tubular neck $a^2$, containing a passage through which the rod *k* extends, said passage being of sufficient size to afford a communication between the mixing-chamber and the interior of the telescopic chamber. The pressure of the gas-and-air mixture in the mixing-chamber is therefore communicated to the interior of the telescopic chamber, the member $j^2$ of which is supported at a height determined by said pressure. It will be seen, therefore, that the height of the valve *i* is determined by the height of the floating member $j^2$ and that as said member rises the inlets *b* and *c* are shortened or contracted and as the member $j^2$ descends the said inlets are extended or lengthened. When the maximum quantity of gas is being consumed at the burners, the valve *i* drops to its lowest position, and as the

quantity of gas consumed is decreased the valve *i* proportionately rises, so that the volume of gas and air admitted to the mixing-chamber is directly proportioned to the pressure in the mixing-chamber and in the burner supply-pipe.

The floating member $j^2$ of the telescopic chamber is guided in its vertical movements by means of the upright members of a guiding-frame *m*, affixed to the fixed member *j*, and arms *n*, having guide-eyes adapted to run upon said vertical member.

The air-supply pipe *f* is connected with the interior of a telescopic chamber or aerometer composed of a fixed member *r*, having an annular space *r'*, containing sealing liquid, and an inverted member $r^2$, floating in said liquid. Air is forced into said telescopic chamber or reservoir through a pipe *s*, which is connected with a suitable air-forcing apparatus, a portion of said pipe within the reservoir being perforated to distribute the air within the reservoir. The member $r^2$ has eyes *t*, which slide upon and are guided by vertical members of a guide-frame *u*.

*v* represents a cock which controls the passage of gas through the gas-supply pipe *e*. The stem of said cock is connected with the floating member $r^2$ by means of two rods $v'$ $v^2$, jointed together and to the member $r^2$, the arrangement being such that when the floating member $r^2$ falls to its lowest position, in consequence of a cessation of the supply of air, the cock *v* is closed and the supply of gas to the mixing-chamber is shut off.

The top of the floating member $r^2$ is provided with a safety or blow-off valve *w*, which is normally closed by a spring, and has an upwardly-projecting stem *w'*, which is arranged to abut against the cross-bar of the guide-frame *u* when the floating member $r^2$ rises to a given height, the valve *w* being thus opened, so that an escape of air is permitted.

It is obvious that a diaphragm *y* may be substituted for the floating member $j^2$, to which the valve-stem *k* is connected, said diaphragm being flexible and forming the top of a chamber *y'*, communicating with the mixing-chamber *a*, as shown in Fig. 5.

I claim—

1. An apparatus of the character specified comprising a mixing-chamber having air and gas inlets and an outlet for the air and gas mixture, air and gas supply pipes connected with said inlets, a mixture-delivery pipe connected with said outlet, means controlled by the pressure of the mixture in the chamber and delivery-pipe for regulating the admission of air and gas to the mixing-chamber, and a telescopic air-reservoir connected with said air-supply pipe and with a source of air-supply.

2. An apparatus of the character specified comprising a mixing-chamber having air and gas inlets and an outlet for the air and gas mixture, air and gas supply pipes connected with said inlets, a mixture-delivery pipe connected with said outlet, means controlled by the pressure of the mixture in the chamber and delivery-pipe for regulating the admission of air and gas to the mixing-chamber, a gas shut-off, and automatic operating mechanism having provisions for holding the shut-off open when the air-pressure in the air-supply pipe is normal, and for closing the shut-off when the air-pressure ceases or is reduced.

3. An apparatus of the character stated comprising a mixing-chamber having air and gas inlets, and an outlet for the air and gas mixture, air and gas supply pipes connected with said inlets, a mixture-delivery pipe connected with the said outlet, means controlled by the pressure of the mixture in the chamber and delivery-pipe for regulating the admission of air and gas to the mixing-chamber, a telescopic air-reservoir connected with said air-supply pipe and with a source of air-supply, a cock in the gas-supply pipe, and connections between said cock and the floating member of the telescopic reservoir, whereby when said reservoir falls to a predetermined point the said cock is closed.

4. An apparatus of the character stated comprising a mixing-chamber having air and gas inlets, and an outlet for the air and gas mixture, air and gas supply pipes connected with said inlets, a mixture-delivery pipe connected with the said outlet, means controlled by the pressure of the mixture in the chamber and delivery-pipe for regulating the admission of air and gas to the mixing-chamber, a telescopic air-reservoir connected with said air-supply pipe and with a source of air-supply, a safety-valve in the floating member of the telescopic reservoir and a fixed stop arranged to open said valve when the reservoir rises to a predetermined height.

In testimony whereof I have affixed my signature in presence of two witnesses.

GEORGE H. BURROWS.

Witnesses:
C. F. BROWN,
E. BATCHELDER.