I. COOK.
Gas-Regulator.

No. 196,196. Patented Oct. 16, 1877.

FIG. 1.

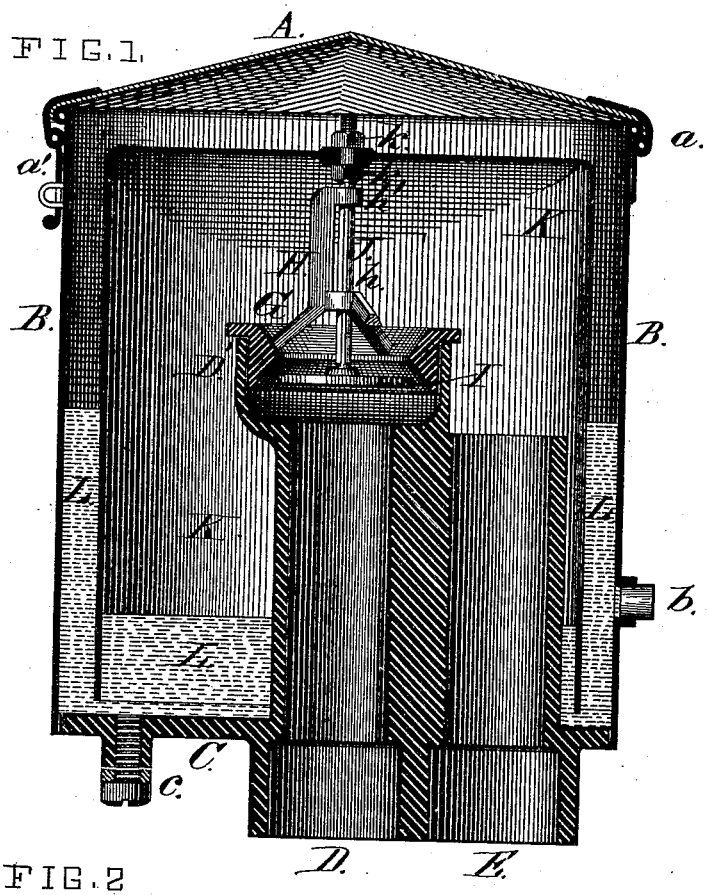


FIG. 2

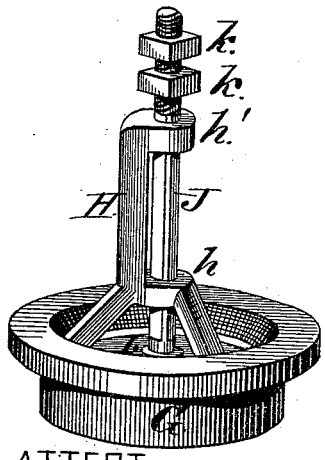
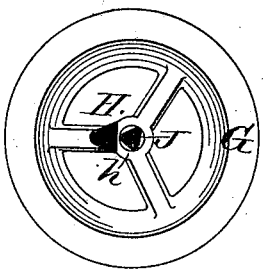


FIG. 3.



ATTEST.
Chas. Hall
Chas. J. Gooch.

INVENTOR.
Isaac Cook
By Knight Bros.
Attys.

UNITED STATES PATENT OFFICE.

ISAAC COOK, OF ST. LOUIS, MISSOURI, ASSIGNOR OF TWO-THIRDS HIS RIGHT TO PHILO M. CLARK AND BENJAMIN R. LIPPINCOTT, OF SAME PLACE.

IMPROVEMENT IN GAS-REGULATORS.

Specification forming part of Letters Patent No. **196,196**, dated October 16, 1877; application filed September 3, 1877.

To all whom it may concern:

Be it known that I, ISAAC COOK, of the city of St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Gas-Regulators, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making a part of this specification.

This improvement relates to that class of regulators in which the valve-stem is attached to an inverted cup whose cylindrical part works in an annular chamber filled with liquid.

My improvement consists, first, in the combination, with the valve-stem and cup, of a standard attached to the valve-seat and forming a guide alike to the cup and the valve.

The second part of my improvement relates to the construction of the valve-stem, which is made angular and works in circular guides, so that the corners of the stem scrape away the gummy matter with which the parts are liable to become incrusted.

The third part of my improvement consists in the combination of the cup, valve-stem, valve, and valve-seat with the valve-chamber-casting, when the valve-seat is fitted into the casting with a ground joint, to allow the cup and other parts to which it is attached to be removed together and replaced by a simple upward and downward movement.

In the drawings, Figure 1 is an axial section. Fig. 2 is a perspective view of the valve-seat, valve, and guides. Fig. 3 is a top view of the valve-seat ring, showing the stem and guide-standard in horizontal section.

The outer case is closed at top by a lid, A, shown hinged at *a* with a lock-hasp at *a'*.

B is the cylindrical part of the case, with a plug at *b*, to indicate the height of glycerine when filling it into the regulator before use.

The bottom C has a plug, *c*, which may be withdrawn to allow the escape of the liquid.

The induction-pipe D and eduction-pipe E are, preferably, cast in one piece with the bottom plate C, but they may, if preferred, be made separate, and soldered or otherwise attached thereto.

The lower ends of these pipes are fitted to receive the ends of either gas-pipes or ordinary lead pipes, through which the gas passes in entering and leaving the regulators.

The top D' of the pipe D is cup-formed, to receive the valve-seat G, which is fitted therein with a gas-tight joint, so that it can be fixed in or removed from the cup by a simple vertical movement.

Attached to the top of the valve-seat is the guide-standard H, having two guide-sockets, *h* and *h'*, through which the stem J of the valve I passes.

The valve-stem is angular or star-formed in transverse section, so that its corners alone have bearing against the interior of the sockets, which are circular, so as to allow the valve-stem free rotary movement. The purpose of making the valve-stem of this form is to insure freedom of movement, as gummy matter is apt to collect on any surfaces exposed to coal-gas, and where a snug fit is made between surfaces moving against each other the movement is impeded by the adherent. The corners would have contact against so small a part of the socket that this adherent (adhering material) is rubbed away, and so the bearing-corners and the part of the sockets with which they come in contact are kept clear.

The valve I is a simple disk, with an angular (say, rectangular) corner coming in contact with the valve-seat when the valve is closed.

The upper end of the valve-stem is screw-threaded, and passes through the top of the inverted cup K, to which it is secured by nuts *k k* and gasket or gaskets, forming a gas-tight joint. The sides of the inverted cup are vertical, and extend down to near the bottom of the case A. The lower portion of the case is filled with glycerine, L, so as to form a gas-tight joint at the bottom of the cup, the cup rising and falling freely. The cup K is made of considerable height, (say, about four inches,) so as to allow of the use of a lighter and cheaper material than mercury for the liquid-joint.

It will, of course, be understood that the liquid must rise to a sufficient height outside the cup to counterbalance the pressure of the gas inside the cup, and from this cause, with the use of glycerine or other liquid of about

the same gravity, provision should be made for a rise of about three inches. It is a special advantage resulting from the use of cheap liquid of much less specific gravity than mercury that the impurities of the gas may mix with such liquid, (instead of collecting on the surface, and becoming attached to the surfaces of the case and cup, as with mercury,) and from time to time the liquid may be changed, without any cost of moment.

The operation is as follows: The gas enters through pipe D, and passing through the valve-port raises the inverted cup (more or less) by pressure beneath its top, thus partly closing the valve-port. The pressure of the gas tends to raise the inverted cup and close the valve-port, and the weight of the cup tends to open the valve-port. It follows that the pressure of the gas within the cup is in proportion to the weight of the cup, and this is adjusted to the desired weight by the placing of a weighted object upon the top of the valve-stem. The gas escapes from the regulator through pipe E.

I claim as my invention—

1. The combination of valve-stem J, standard H with guides *h h'*, and inverted cup K, substantially as and for the purpose set forth.

2. The combination, with the round guides *h h'*, of the stem J with angular or rib bearings, substantially as and for the purpose set forth.

3. The combination of cup D', valve-seat G, valve and stem I and J, and inverted cup K, substantially as set forth.

4. The combination of the bottom plate C, provided with vertical pipes D and E, forming the inlet and outlet for the gas, the cup D', valve I, stem J, and inverted cup K, as and for the purpose set forth.

ISAAC COOK.

In presence of—
SAML. KNIGHT,
CHAS. HALL.