(No Model.)

E. J. FROST.

DEVICE FOR AUTOMATICALLY REGULATING QUALITY OF ILLUMINATING VAPOR.

No. 282,069. Patented July 31, 1883.

Fig. 1.

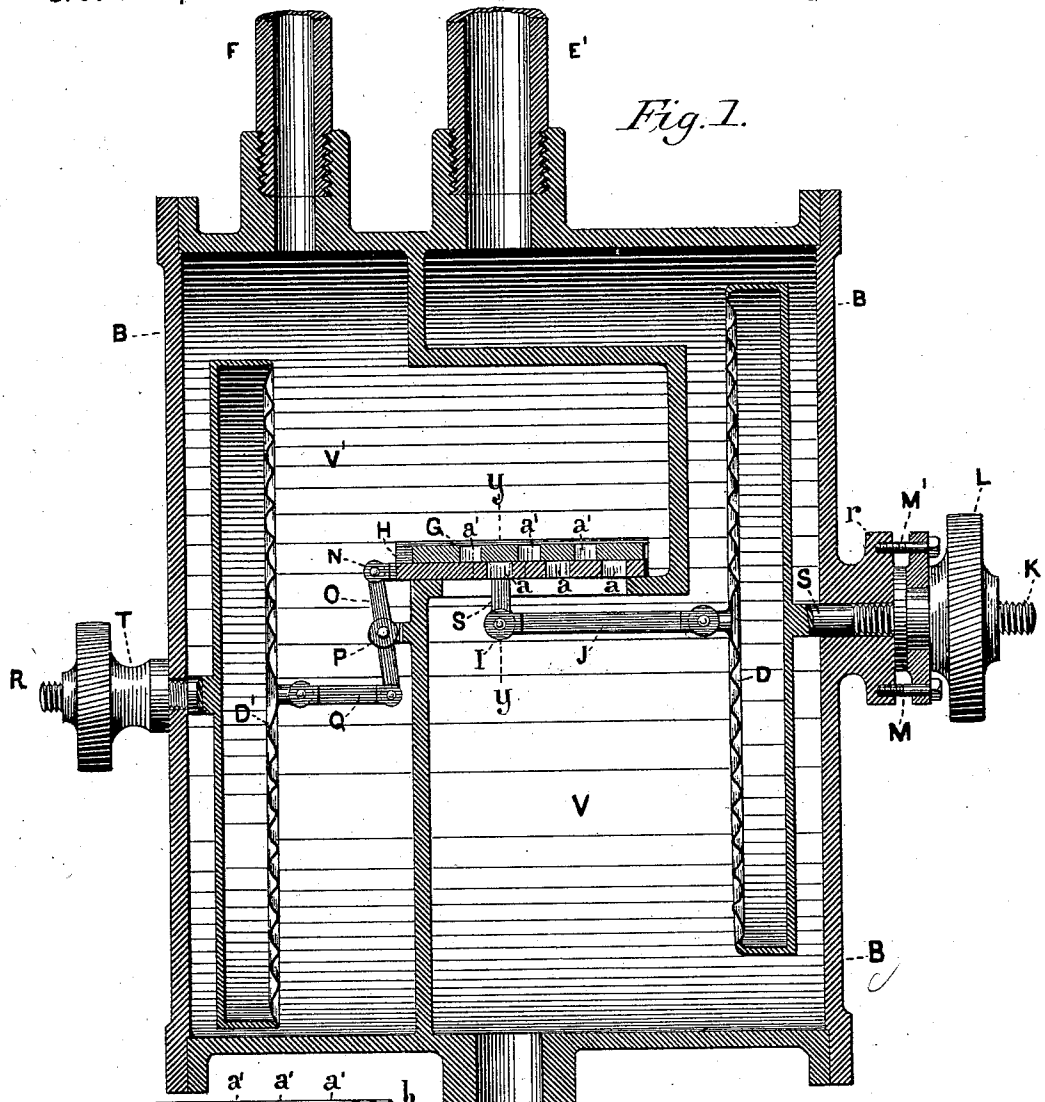


Fig. 2.

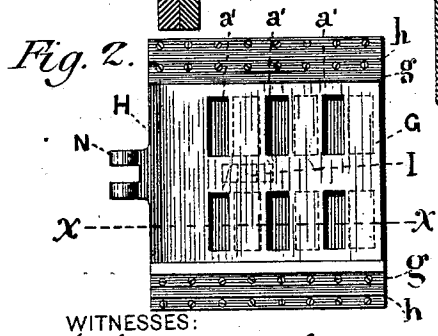
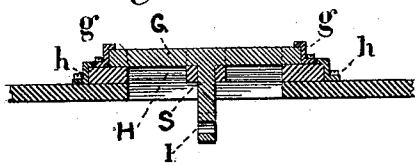


Fig. 3



WITNESSES:

J. Walter Douglass.

S. H. Poole

INVENTOR

Edward J. Frost

By M. L. Foley

attorney

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

EDWARD J. FROST, OF PHILADELPHIA, PENNSYLVANIA.

DEVICE FOR AUTOMATICALLY REGULATING QUALITY OF ILLUMINATING-VAPOR.

SPECIFICATION forming part of Letters Patent No. 282,069, dated July 31, 1883.

Application filed October 31, 1882. (No model.)

To all whom it may concern:

Be it known that I, EDWARD J. FROST, of the city and county of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Devices for Automatically Regulating the Quality of Illuminating-Vapor.

The following is a specification of my improvements, reference being had to the accompanying drawings, wherein—

Figure 1 is a longitudinal section through the center of the apparatus. Fig. 2 is a top or plan view of the regulating-valve, and Fig. 3 is a section through the valve and its seat at right angles to the line of movement.

My invention is intended for use in connection with carburetors or other devices for producing illuminating-gas by charging an air-current with the vapor of a volatile liquid. In the practical use of such apparatus it is found that the degree of saturation of the current varies from time to time, and thus produces irregularities in the flame. Thus, for some time after the commencement of operation of the carburetor, the current is apt to be too highly charged with vapor, and a dull flame of but little illuminating power is in consequence produced. Even after the apparatus has been running steadily for some time accidental causes may occasion a similar result, so that it has been found advantageous to provide a means for diluting the charged current by admixture of air. For this purpose the blast-pipe of the apparatus has been connected by a branch pipe with the exit-pipe leading from the carburetor, so that air could be forced into the vapor. Apparatus have been devised for automatically moving the air-inlet valve by means of the variations in the heat of a flame produced by burning the vapor itself; but as such variations of heat do not necessarily correspond to changes in illuminating power of the mixture, and as the maintenance of a flame is attended with waste, and, if in the vicinity of the apparatus, with danger, it is desirable that some other factor should be relied on to effect the automatic control. I have discovered that in the use of such vapors as that of gasoline, for instance, the variations in weight of the vapor, which correspond to these inequalities of illuminating power, are so considerable that they may be used for effecting the movements of the regulating-valve.

My invention therefore consists, primarily, in combining with the exit-pipe of the carburetor a barometric device, which moves in correspondence with changes in the density of the charged current a valve actuated by the movement of the barometric device and an air-inlet controlled by said valve.

It further consists in providing this automatic regulator with a secondary barometric device so arranged as to compensate for atmospheric changes, which might injuriously affect the working of the regulator. The only condition essential to the working of the apparatus is the existence of a column of vapor of such height above the barometric device as that the changes in relative weight of the column shall occasion changes of pressure thereon sufficient to move the valve, and therefore the shorter the column the greater must be the delicacy of the barometric regulator. As these carburetors, when used for domestic purposes, are generally placed at below the level of the ground, while the pipes extend to the upper part of the house, a column of vapor of more than the necessary height is thus afforded and the movements of the valve are easily effected.

In the accompanying drawings, E represents the exit-pipe leading from the carburetor, which latter may be of any of the well-known forms. The pipe E communicates with an air-tight box, B, on the opposite side of which is an exit-pipe, E′, leading to the burners. A rigid diaphragm, C, divides this box into two compartments, one of which, V, forms a continuous passage between the pipe E and E′, while the other, V′, communicates, by means of pipe F, with the inlet or air-blast pipe of the carburetor at a point before the entry into the evaporating-tank. Communication between these two compartments in the box B is controlled by means of a sliding valve, G. This valve I prefer to construct as shown in the form commonly known as

"gridiron-valve," so that a passage of large area may be uncovered by a slight movement.

The valve-seat H consists of a flat plate with a number of rectangular ports, *a a a*, and is mounted in guideways *h h*, which permit its free longitudinal movement. The valve G, having similar ports *a' a' a'*, slides freely upon the seat H in guideways *g*, and is moved by means of a stem, S, which extends down through a slot formed in the seat. The stem S is pivoted at I to a link, J, which is connected at L with an aneroid-plate, D, constructed in the usual manner. The valve-seat H is connected at N with the lever-arm O, supported upon the diaphragm C by a fulcrum-pin, P. A link, Q, connects the other end of the lever-arm O with the secondary aneroid-plate D'. As the aneroids D and D' face each other, it will be seen that when both are depressed by a simultaneous increase of pressure in both compartments, the valve G and seat H will be moved in the same direction, the movement of D' being reversed by the lever-arm O, and thus no change in the relative positions of valve and seat will be occasioned. The aneroid-plate D is capable of minute adjustment, being mounted upon a stem, S, which terminates in a threaded portion, K, provided with jam-nuts M M', the latter secured by screws into a box or projection, *r*, of the box B. The other aneroid, D', need not be adjustable, but is held in position by means of the threaded stem R and nut T.

The operation of the device is as follows: The aneroid D is set, by means of its adjusting device, in the proper position. This of course depends upon the amount of positive pressure exerted by the blower of the carburetor, and also upon the character of the vapor which is to be produced, which conditions must be ascertained by actual test. The amount of depression of the aneroid D corresponding to these elements having been ascertained, the aneroid D is adjusted so that when in operation the valve G shall just cover the ports *a a a* of the seat H, the ports *a' a' a'* of the valve-plate G being (when seen from the standpoint indicated in Fig. 1) to the left of the ports *a a a*. The air-blast being then turned on through the carburetor, the charged vapor enters the compartment V of the box B through pipe E, and passes thence out by the pipe E' to the service-pipe, which leads upward to the burners. So long as the density of the vapor of the blast remains normal the valve does not move; but should the current become too highly charged the weight of the column in the service-pipe increases and the pressure upon the aneroid D depresses its diaphragm, thus moving the valve G to the right and uncovering more or less of the ports *a a a*, according to the amount of this increase in density. The pipe F, being in communication with the inlet-pipe of the carburetor, receives the full force of the blast undiminished in velocity by the friction of the evaporating-surfaces, and consequently when the ports *a a a* are uncovered by the movement of the valve G, the air rushes into the compartment V with a velocity slightly greater than that of the charged current. The direction of the two currents being, however, the same, they mingle freely and without interference, so that the charged current is diluted and its density gradually decreases, when, the pressure upon the aneroid D being diminished, it moves outward, (or toward the left, as seen in Fig. 1,) and the valve G again closes the ports *a a a*. Thus an automatic control of the degree of saturation is established more or less minute, according to the sensitiveness of the aneroid D. The purpose of the other aneroid, D', is as follows: The actual atmospheric pressure being of course a factor in determining the position of the aneroid D, variations due to changes in the condition of the outside air might disarrange the set of the valve G and require corresponding adjustments of the aneroid D toward or away from the valve-seat H. The secondary aneroid D' acts to compensate these variations and remove this element of inequality as it moves simultaneously with such movements of the aneroid D, and, as its motion is reversed by means of the lever-arm O, the sliding-valve seat H is moved by changes of atmospheric pressure to exactly the same extent and in the same direction as is the valve G, so that their relative positions remain unaltered. It is to be observed, however, that the employment of the secondary aneroid is not absolutely essential, since the same result could be effected by setting the aneroid D from time to time to correspond with the changed conditions; but I consider its use a valuable adjunct, in that it renders the regulation automatic in the highest degree.

It is obvious that the details of construction and arrangement can be varied greatly without affecting the principle and mode of operation of the device. I therefore do not limit my claim to the use of the particular form of valve nor to the particular aneroid shown; but

I desire to secure by Letters Patent—

1. In an apparatus for producing illuminating gas or vapor, the combination, with the delivery or service pipe, so arranged as to contain a column of vapor, of a subjacent mixing device consisting of the following elements, viz: an air-inlet pipe leading from a blast-producing apparatus into said delivery-pipe, a valve controlling the admission of air from said inlet into said delivery pipe, an aneroid or equivalent device exposed to the said column of vapor and moving in accordance with changes in the density thereof, and suitable connection between said aneroid and valve, whereby the orifice for the admission of air shall be automatically increased in proportion to the richness of the vapor in said column, substantially in the manner set forth.

2. In an apparatus for automatically regulating the admixture of atmospheric air and

illuminating-gas by means of an aneroid or equivalent barometric device moving in accordance with variations in the density of the mixture and controlling the air-inlet, the combination, with the regulating-valve, of a secondary barometric device exposed to the air alone, and adapted to compensate such variations in the density of the mixture as are due to variations in the density of the air, the whole operating substantially in the manner specified.

EDWARD J. FROST.

Witnesses:
J. WALTER DOUGLASS,
CHARLES F. ZIEGLER.