G. E. HULSE.

CARBURETED VAPOR LIGHTING SYSTEM.

APPLICATION FILED JUNE 9, 1908.

946,901. **Patented Jan. 18, 1910.**

3 SHEETS—SHEET 1.

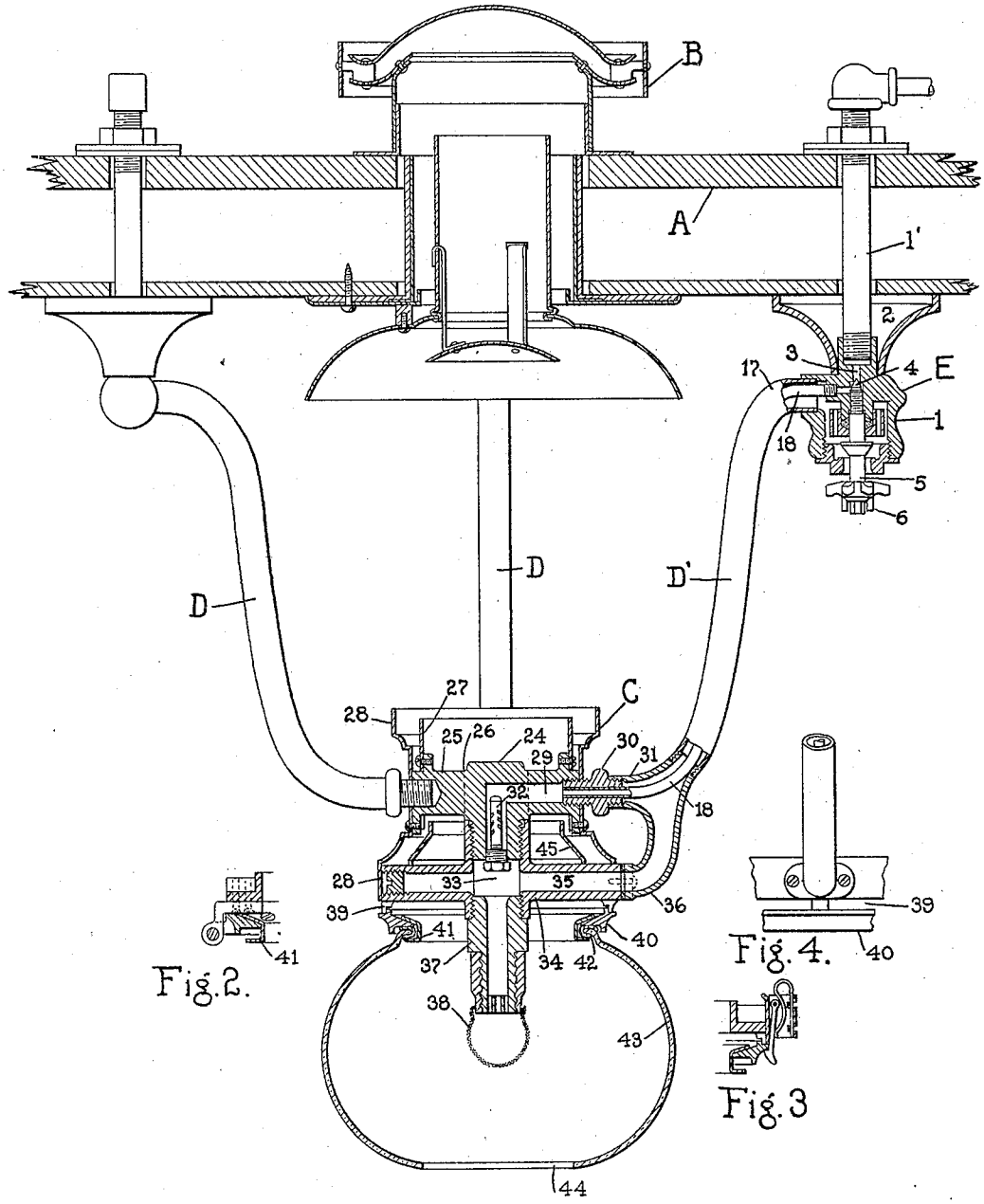

Fig. 1.

Fig. 2.

Fig. 4.

Fig. 3

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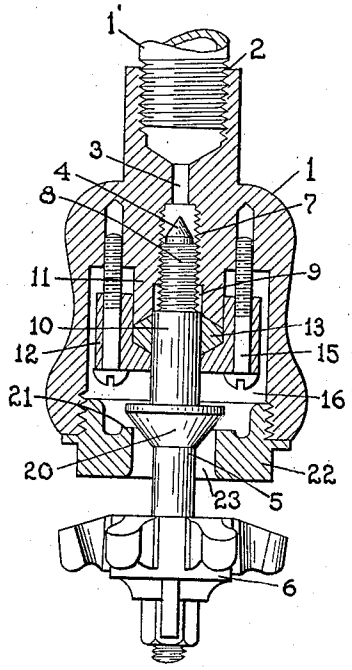

Fig. 6.

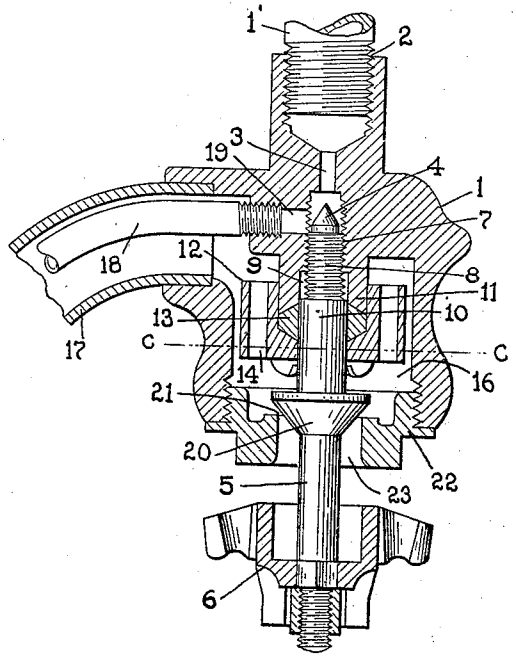

Fig. 7.

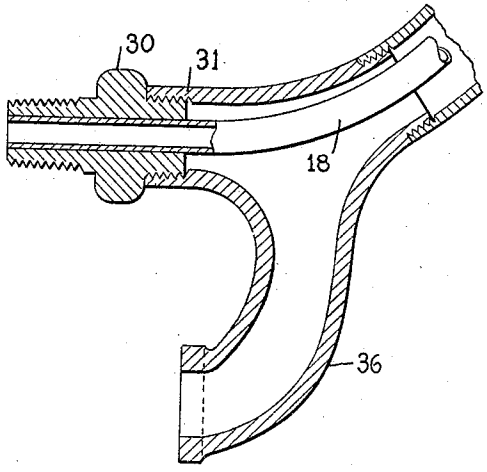

Fig. 5.

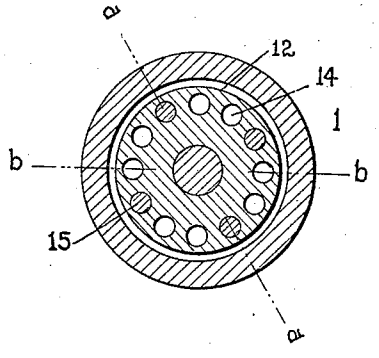

Fig. 8

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3 SHEETS—SHEET 3.

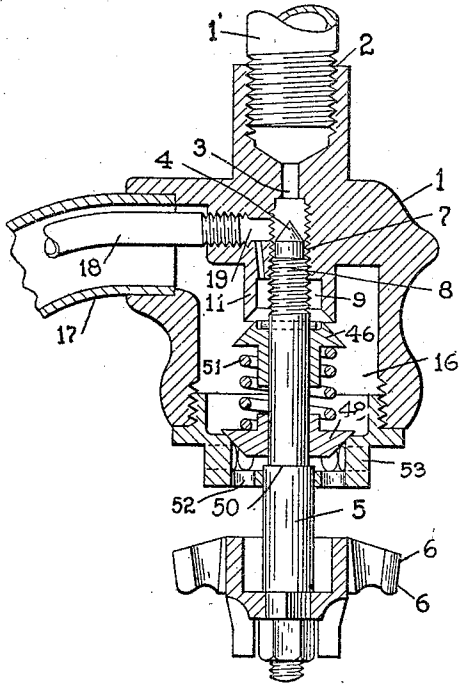

Fig. 9.

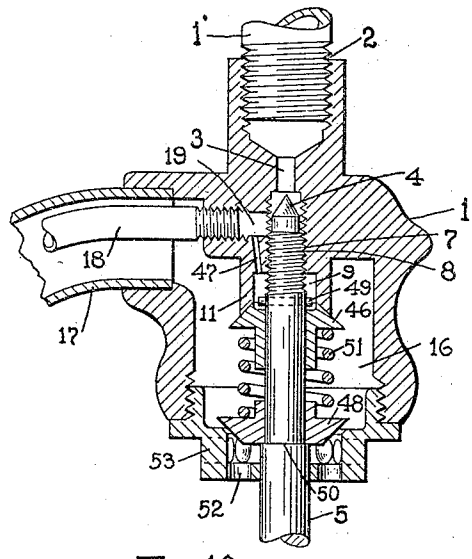

Fig. 10.

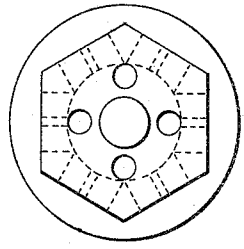

Fig. 11.

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UNITED STATES PATENT OFFICE.

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CARBURETED-VAPOR LIGHTING SYSTEM.

946,901. Specification of Letters Patent. Patented Jan. 18, 1910.

Application filed June 9, 1908. Serial No. 437,486.

To all whom it may concern:

Be it known that I, GEORGE E. HULSE, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Carbureted-Vapor Lighting Systems, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates broadly to vapor lighting devices, but inasmuch as certain advantages characteristic of the invention prominently appear in its more intense aspect as utilized for the combustion of carbureted vapors, this disclosure may be rendered more complete with reference to such embodiment thereof.

With respect to this aspect of my invention, it may be preliminarily pointed out that in one class of illuminating devices, the gas used is made by intimately commingling air with a combustible vapor, which may be done by causing the air to infiltrate through absorbent material, such as cotton wicking, which is saturated with a volatile hydro-carbon, such as gasolene. Commercially available gasolene consists in major part of the desired hydro-carbon, and in minor part of the more volatile oils which have escaped separation during the fractionation of the naphtha distillates. Consequently, the infiltrating air will initially be heavily laden with these more volatile products, but thereafter a more normal condition will come about. And so it is that the carbureted vapor, being unduly rich at the outset in hydro-carbon vapors, will require a considerable addition of air in order to bring the mixed vapors in the correct proportions before being burned, while during the last stages of the run, the percentage of hydro-carbon vapors in the mixture will be so low that little, if any, additional air can be supplied without causing a corresponding dearth of the combustible hydro-carbon vapor.

This invention accordingly has in view, among other objects, the provision of an apparatus adapted to meet the above explained exigencies, and to do so in a simple and effective manner.

Another object within the contemplation of this invention is to devise an apparatus of the foregoing nature, which is especially qualified for withstanding the hard usage of railroad service, and which may be constructed at a minimum of cost.

Other objects will be in part obvious and in part pointed out in the following description.

The invention accordingly consists in the features of construction, combinations of elements and arrangement of parts which will be exemplified in the construction hereinafter set forth, and the scope of the application of which will be indicated in the following claims.

In order that this invention may be the more fully understood and made comprehensible to those skilled in its relating arts, drawings illustrating the preferred adaptation of my apparatus are appended as a part of this disclosure.

In the annexed drawings corresponding parts are similarly referred to by like characters of reference throughout all the views, of which:

Figure 1 is a sectional elevation of a lamp designed for burning carbureted gas as above explained, certain parts thereof being shown in detail. Fig. 2 is a section through the hinge which carries the bezel and globe in the above apparatus. Fig. 3 is a view of the catch for maintaining the bezel and globe in closed relation. Fig. 4 is an elevation of the lower part of the gas arm of the lamp. Fig. 5 is an enlarged section of the lower part of the arm at that point where it is secured to the lamp body showing the gas and air passages. Fig. 6 is a vertical section showing the internal construction of the compensating gas cock, said section being taken transversely to the section of Fig. 7. Fig. 7 is a vertical section of the same taken transversely to Fig. 6. Fig. 8 is a horizontal section taken through line *c*—*c* of Fig. 7. Figs. 9, 10 and 11 show similar sections of a modified construction of the compensating valve employed in this lamp.

Continuing now by way of a more detailed explanation of the illustrated forms of this invention, occasionally referring thereto as indicated by the reference characters, A indicates a ceiling of any desired construction such as that commonly employed in railroad cars. In such ceiling there is arranged a ventilator of suitable construction indicated by B. Underlying

this ventilator, so that the vitiated gases may be received thereby, is a lamp C suspended by one or more arms D. One of these arms, as illustrated, may be utilized as a means of conveying the combustible mixture to the lamp. To that end a supply pipe 1′ may lead from a suitable generator for the initially received carbureted gas, which generator may be of the ordinary construction adapted to impregnate or saturate air drawn therethrough with gasolene or other hydro-carbon vapors. The carbureted air or gas is then ultimately delivered by the supply pipe 1′ to the compensating valve or cock E. This compensating cock comprises a body portion 1 having a screw socket 2, within which is tightly threaded supply pipe 1′. A small channel 3 leads through such body portion and is adapted to be closed to a greater or less extent by the conical end 4 of a needle valve having a stem 5 and a hand grip 6. As a convenient manner of mounting such needle valve so that the same may be easily adjustable to vary the opening of the channel 3, I have provided the body portion with an enlarged bore 7 having a screw threaded relation with a corresponding portion 8 of the shank for the needle valve. In the specific form shown by Figs. 6 to 8 inclusive, the screw threaded bore 7 terminates short of a still further enlarged bore 9, within which the smooth portion 10 of the valve stem finds a free yet gas tight fit. The annular hub 11, which surrounds the enlarged bore 9, forms the inner member of a packing gland comprised of an annular member 12 and an interposed packing 13, as will be understood. The annular member 12 is in turn provided with a peripheral series of upright apertures 14, two of which may be utilized in conjunction with screws 15 having their ends in screw threaded connection with the body portion 1 of the compensating valve, so as to enable the annular member 12 to be telescoped on the annular hub 11 to compress the packing 13 to any desired degree of tightness. The remaining holes of this peripheral series which are unoccupied by the screws 15 serve as additional means for enabling air to flow upwardly through the valve into the air pipe leading therefrom to the lantern. The above-mentioned parts are positioned in a chamber 16 formed in the body portion of the valve. An air supply pipe 17 is in communication with the upper portion of the chamber 16, and so also, a gas supply pipe 18 is, by means of channel 19, in communication with the outlet of the passageway 3 leading from the carbureter.

In conjunction with the foregoing parts, I have provided means for decreasing the available supply of air in inverse proportion as the flow of the carbureted gas is increased by a movement of the hand valve. That is to say, on an intermediate portion of the stem of the hand valve I have arranged a conical collar 20, which collar cooperates with a valve seat 21, provided by a valve member 22 which is preferably in screw threaded connection with the compensating valve, so to speak, and readily removable therefrom. An air admission port 23 is provided in the latter member.

At this point it will be convenient to turn to Fig. 1, and consider the construction of the lamp which is to be used in conjunction with the beforesaid compensating valve. This lamp may comprise a body portion 24, having two or more radiating arms 25, and spaced apart as indicated by the dotted line 26, so as to provide upright channels for the upflow and escape of products of combustion, as will be understood. These radiating arms 25 carry at their extremities a chimney member 27 and an ornamental exterior casing 28. They also serve as the convenient point of attachment for the supporting arms D. One of these arms may be hollow so as to provide a channel 29, which, by means of a plug 30, is secured to one end 31 of the composite arm D′. The gas pipe 18 passes tightly through the plug 30 and admits gas to the chamber 29 in the body portion 24 of the lamp. The carbureted gas then passes downwardly through a strainer 32 and finally emerges from the nipple in a fine stream as indicated by 33. This nipple is surrounded by other parts of the lamp so as to form in effect an inspirator which may be utilized to commingle more or less additional air with the carbureted gas, as will be hereinafter explained. Thus, the sub-portion 34 of the lamp may be attached to the body portion 24, as a convenient method of construction. Such sub-portion 34 may provide a series of radiating arms, one of which may have a channel 35 for the passage of air to the injector. The outer extremity of the arm having the channel 35 is in air-tight connection with the lower member 36 of the arm D′, and receives its air from such arm by way of the compensating valve. A gas nozzle and associated mantle 37 and 38 respectively may be secured to the sub-portion 34 in any desired manner.

Here it may be observed that the casing 28 either stops short or is perforate, so as to provide an air inlet 39, as indicated more clearly by Fig. 4. A bezel 40 is hinged at one side to the sub-body 34 and held in place at the opposite side by any suitable form of clasp. A collar 41 fitting the inner surface of the bezel carries a globe 43 preferably having an opening in its lower end, as indicated by 44. 42 is a flexible packing inserted between the globe and the bezel. To better equalize the escape of the rising products of combustion, I may also employ an inverted funnel member 45.

Considering now the operation of this form of my invention, it must first be assumed that the carbureter or means for initially forming the mixture of air and hydrocarbon vapor is full of gasolene, and thus extremely effective. In this event the gas delivered by the supply pipe 1′ will be very rich in the gasolene or in the other combustible vapor. For this reason it is necessary that a very considerable amount of additional air shall be mixed with the same, in order to form a perfect burning mixture. This will be automatically accomplished by the compensating valve, for, if the valve be only slightly opened, only a small amount of carbureted gas will pass down pipe 18 and through the inspirator of the lamp. This extremely rich gas, will, however, become admixed with a considerable quantity of air, because when the hand of the valve 6 is only slightly opened with respect to the inlet of the carbureted gas, it will be widely opened with respect to the inlet of air in its lower portion. Consequently, a very free supply of air will be available, and such air will flow down the larger tube of the arm D′, will pass through the channel 35 leading to the inspirator, and will be thence commingled with the extremely rich carbureted gas. If, on the contrary, the carbureted gas contains but a small amount of gasolene, then the needle will be opened more widely so as to permit a greater flow of carbureted gas through the injector, but in this event the supply of air will be diminished in inverse proportion as the supply of gas is increased, and consequently, the resultant mixture received by the burner tube will again be of a uniform quality. It is, therefore, evident that to maintain the burning of the lamp at its highest rate of efficiency, it is only necessary to turn the needle of the valve 6 until the maximum brilliancy of the mantle shall be obtained. The adjustment of the admission of gas with respect to the admission of additional air will be automatically taken care of by this simple operation.

Turning now to Figs. 9 to 11 inclusive, there will be seen a modified form of my invention. In point of method of operation this modified form of my invention is, in some respects, different from that shown in Figs. 6 to 8 inclusive. That is to say, in Figs. 6 to 8, the carbureted gas passes through tube 18 alone and does not flow through tube 17 of the arm D′, (the latter being for additional air only), whereas in the modification under present discussion, the carbureted gas may not only flow through the tube 18, but may also flow through the tube 17, in which case the latter will be without further air. This latter result I obtain by providing the down stem 5 with an extra valve 46, which valve controls the flow of carbureted gas into the chamber 16. The construction for doing this may comprise a by-pass 47 leading to the chamber 9 within the annular hub 11. A conical valve 46 is mounted on the stem 5. In like manner, an air valve 48 is mounted on such stem 5. It is to be noted that these valves or collars 46 and 48 are slidably mounted on such stem 5, but are limited with respect to movement thereon by a pin 49 and a shoulder 50, as will be understood. An expansile spiral spring 51 bears at its opposite ends on these two collars or valves, and accordingly urges them apart and toward the stops formed by pin 49 and by the shoulder 50. The effect of this is to open the inlet of air when the gas supply is nearly closed, and to admit gas to the chamber 16 when the air supply is closed. Thus, by referring to Fig. 10, it will be seen that the needle valve is partly opened to admit the flow of a small quantity of gas, which small quantity will only be necessary at the outset, owing to the richness of the gas. By virtue of the shoulder 50, the air valve 48 will be lifted from its seat, thus enabling air to flow upwardly through the apertures 52 and inwardly from the apertures 53 into the chamber 16, and thence down to the lamp through the pipe 17. In this case, none of the carbureted gas will be able to flow into the chamber 16, for the reason that the gas valve 46 will be pressed again to its seat by the spring 51, (the pin 49 being distanced from the end of such valve 46.) On the other hand, if the gas be only moderately rich in hydro-carbons, then the needle valve will be opened still farther until the air valve 48 will press against its seat, thus closing admission of air. In this case, the tube 18 will operate at its fullest capacity to supply the lamp with carbureted air. If, however, such tube 18 should prove insufficient, owing to the small percentage of hydro-carbon in the carbureted gas, then the needle valve would be opened still farther, and the pin 49 would contact against the valve seat 46, thus opening the same, as shown in Fig. 9. As a result, the carbureted gas of poor quality, so to speak, can freely flow to the lamp in apparently large quantities, owing to the fact that not only can it flow through the tube 18 but can also flow into the chamber 16, and thence through the tube 17.

From the foregoing, it will be apparent that I have devised an apparatus well adapted to meet the conditions specified. This apparatus, while simple, is nevertheless very effective, and being composed of but few parts, and in point of operation calling for hardly any manipulation, will be found to be exceedingly well adapted for railroad and transportation service.

As many changes could be made in the above construction and many apparently

widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. A device of the nature disclosed, comprising in combination, a lamp having an inspirator, a gas supply, and a valve interposed between said gas supply and inspirator for admitting air into said inspirator in inverse ratio to the rate of flow of gas admitted thereto.

2. A device of the nature disclosed comprising in combination, a lamp having two distinct channels leading to an inspirator, a gas supply, and a valve interposed between said gas supply and said channels adapted to admit air to one of said channels in amounts inversely in proportion to the quantity of gas admitted to the other.

3. A device of the nature disclosed comprising in combination, a lamp, an inspirator having a gas channel and an air channel, a gas supply, and a valve interposed between said gas supply and said inspirator adapted to be moved to simultaneously vary in inverse ratio the rate of flow of gas and air through said channels of the inspirator.

4. A device of the nature disclosed comprising in combination, a gas supply, a valve connected therewith, an inspirator at a distance from said valve having a gas and an air channel connected respectively with said valve, and means enabling said valve to simultaneously control in inverse proportion the flow of gas and air through said channels.

5. A device of the nature disclosed comprising in combination, a vapor burner having an injector formed with constantly open gas and air ports, a conduit leading from one end of said injector for supplying the same with gas, a conduit leading from the other end of said injector for supplying the same with air, and a valve located at the end of said air conduit and at a distance from said injector.

6. A device of the nature disclosed comprising in combination, a vapor burner having an injector, channels for admitting air and gas to opposite ends of said injector, pipes leading from said channels, and a duplex valve connected to the extremities of said pipes to vary the relative flow of air and gas through said pipes.

7. A device of the nature disclosed comprising in combination, a valve casing having two distinct inlets in longitudinal alinement and one or more suitable outlets, and means for simultaneously and inversely varying the capacities of said inlets.

8. A device of the nature disclosed comprising in combination, a valve casing having a pair of inlets in longitudinal alinement and a complementary pair of outlets arranged one within the other, and means operative to simultaneously reduce one of said inlets and enlarge the other.

9. A device of the nature disclosed comprising in combination, a valve casing having a gas inlet and an air inlet in longitudinal alinement, a needle valve having oppositely secured thereto a conical valve member, the whole being adapted in one extreme position to close said gas inlet and open said air inlet, in the other extreme position to open said gas inlet and close said air inlet, and in any intermediate position to open said gas and air inlets in inverse proportion.

10. In a device of the nature disclosed, in combination, a burner, an inspirator having a central gas passage and a lateral air passage, a valve casing having longitudinally alined gas and air inlets and complementary gas and air outlets, a conduit connecting said gas outlet to said gas passage, a conduit connecting said air outlet with said air passage and a member adapted to vary the capacity of said inlets.

11. In a gas fixture, in combination, a body comprising an inspirator and a burner, said inspirator having a gas passage and an air passage, a valve casing having separate gas and air inlets and complementary gas and air outlets, and supporting arms for said body, one of said arms being formed and adapted to connect said air outlet with said air passage, and to carry therein a conduit connecting said gas outlet with said gas passage.

In testimony whereof I affix my signature, in the presence of two witnesses.

GEORGE E. HULSE.

Witnesses:

JOHN T. CLARK,

E. E. ALLBEE.