No. 715,548. Patented Dec. 9, 1902.

H. B. CARY.

BURNER.

(Application filed Apr. 11, 1901.)

(No Model.)

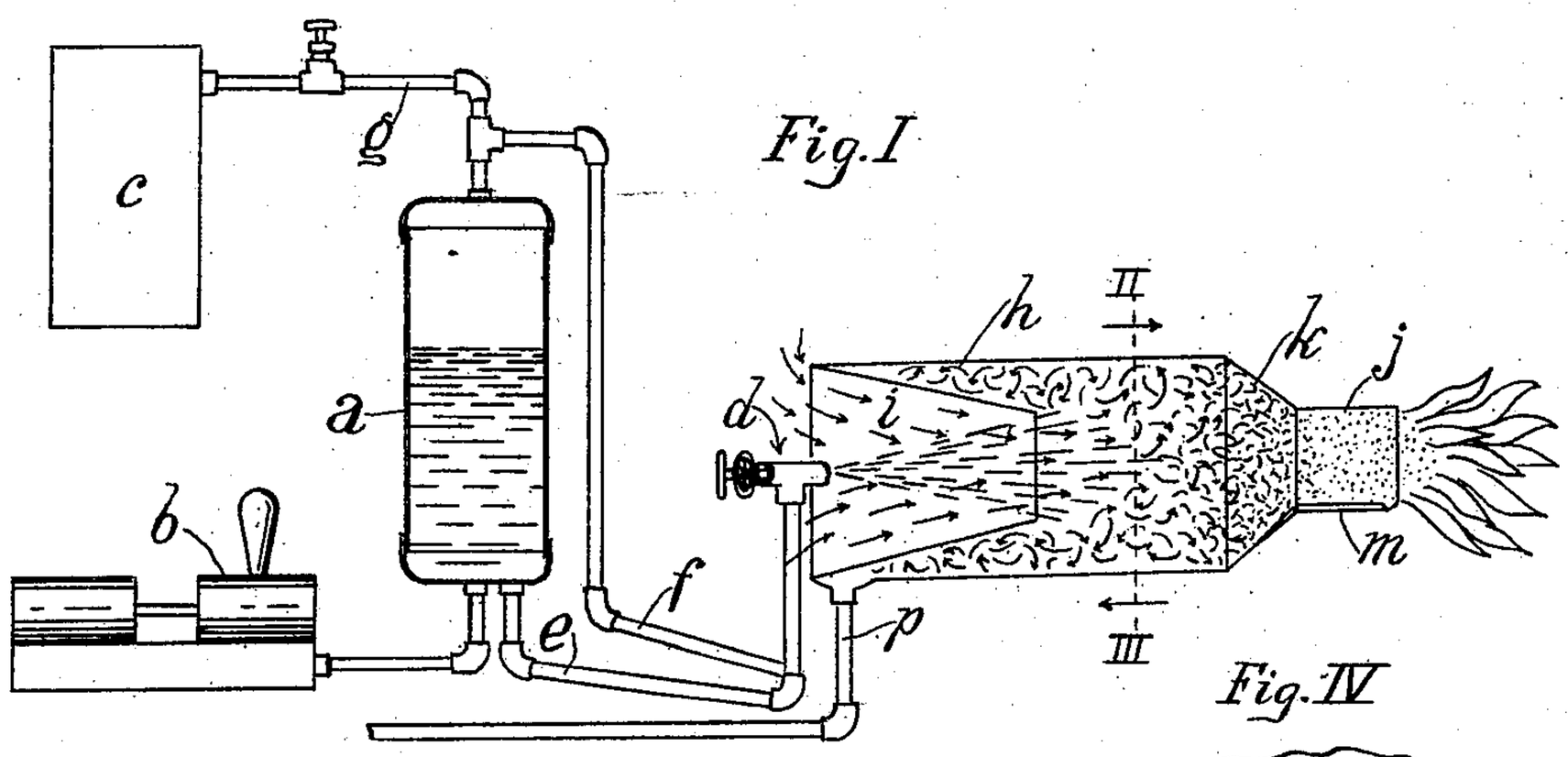


Fig. I

Fig. II

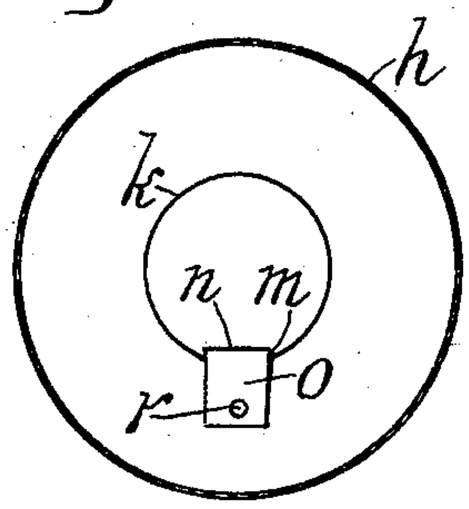


Fig. III

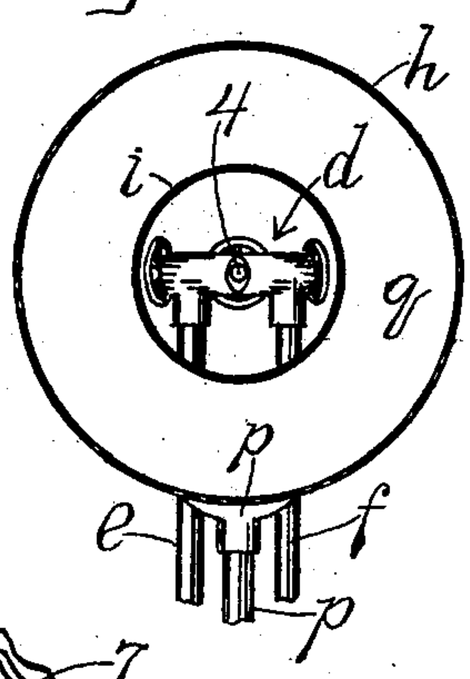


Fig. IV

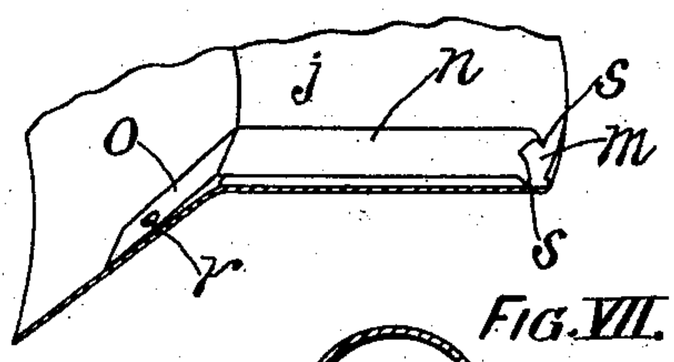


FIG. VII.

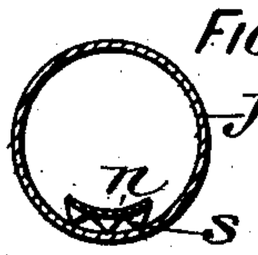


Fig. V

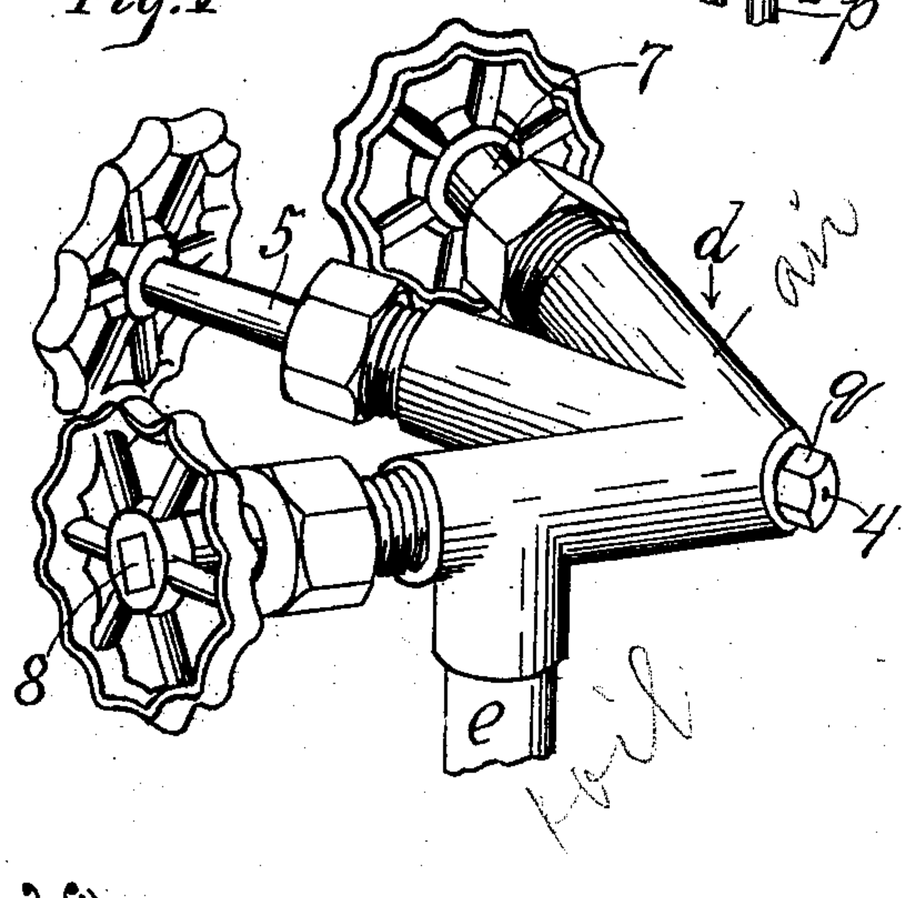
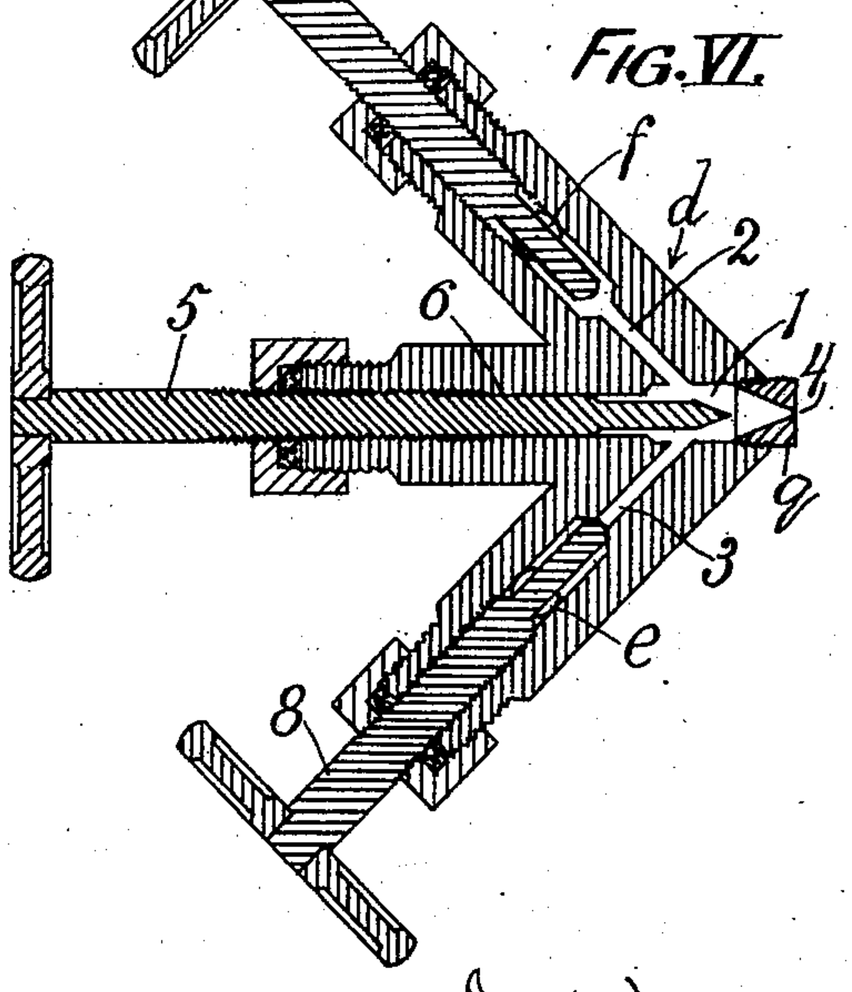


FIG. VI.



Witnesses
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UNITED STATES PATENT OFFICE.

HENRY BOUNDS CARY, OF LOS ANGELES, CALIFORNIA.

BURNER.

SPECIFICATION forming part of Letters Patent No. 715,548, dated December 9, 1902.

Application filed April 11, 1901. Serial No. 55,404. (No model.)

To all whom it may concern:

Be it known that I, HENRY BOUNDS CARY, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Burner, of which the following is a specification.

My invention has for its object to provide a burner especially adapted for carrying the improved method of burning liquid fuel described and claimed in a divisional application filed by me on the 29th day of May, 1902, Serial No. 109,535, which method involves the generic principle of mixing liquid fuel and oxygen in predetermined and regulated proportions and thoroughly and intimately associating and mixing said constituents before delivering the same within the fire zone, as fully described in the application herein referred to.

An object of this invention is to provide a burner which is adapted for burning liquid and fluid combustibles and which is capable of being adjusted at the pleasure of the attendant to produce different characters of fire for different kinds of work. For example, by means of this invention the same burner may be adjusted to burn crude petroleum with air or steam pressure and can be adjusted for burning any of the distillates of crude petroleum or other combustible oils. The burner can also be adjusted to burn gas intermingled with atmospheric air, or it can be used for burning a mixture of combustible gases and also for burning powdered fuel with steam, compressed air, or gas.

An object in view in this invention is to preserve the highest economy and to produce a fire of the exact character required for the work in hand—that is to say, by means of this burner it is possible to produce with combustible oil under air-pressure a deoxidizing-flame or an oxidizing-flame, obtaining the effects of a coke fire or of long-flame steam-coal at the pleasure of the attendant.

It is a further object to avoid the danger of clogging or gumming up of the jet-piece or other parts of the burner with asphaltum or other impurities carried by petroleum and other liquid fuels.

This burner can be variously constructed and is adapted for producing a fire in a fire-box or in the open air indiscriminately, and said fire can be changed in its character and used for heating and for illuminating at pleasure.

An important object to be gained by my invention is to use the petroleum in its liquid form for saturating a large proportionate volume of atmospheric air and to bring such mixture to the place where ignition is effected without any excess of the petroleum being so delivered, so that there is no particle of the oil admitted to the flame except it be accompanied and intimately commingled with a volume of oxygen sufficient for producing the character of fire required.

Different modes of connecting the burner with the fluid and liquid supplies to be used in operating the burner can be employed, and no attempt will be made herein to illustrate all of such modes.

The accompanying drawings illustrate my invention as applied for use with oil and air under pressure.

Figure I is a sectional elevation of the burner ready for operation. Fig. II is a section on line II III, Fig. I, enlarged scale, looking to the right. Fig. III is a section on line II III, Fig. I, enlarged scale, looking to the left. Fig. IV is a fragmental detail, enlarged scale, of the discharge extension of the tube, showing the shielded drain therefor. The shield is shown intact. Fig. V is a perspective detail view of the jet-piece. Fig. VI is a mid-sectional plan of the same. Fig. VII is a cross-sectional view of the tube extension.

a is an oil-reservoir supplied with oil under pressure by any suitable means, such as the pump *b*, and with air under pressure from a suitable source of supply, (indicated by the tank *c*.)

d is the jet-piece, furnished with a chamber 1 and with two valve-controlled inlets 2 3, opening into said chamber, preferably at right angles to each other, and with a jet-outlet 4, opening from the angle between said inlets.

5 indicates a valve-needle extending between the inlets to control the jet-outlet 4. The liquid-fuel-supply tank *a* is connected with one of said inlets by a pipe *e* to supply the liquid fuel thereto, and the source of

compressed air is connected by the pipe *f* with the other of said inlets to supply air under pressure thereto. The source of compressed air *c* is preferably connected with the tank *a* by pipe *g*, so that the pressure of the air and oil in the two inlets 2 3 is equalized. The inlets 2 3 discharge into the chamber 1 and the outlet 4 opens from said chamber. The valve-needle 5 passes through said chamber 1 and forms a cylindrical abutment or fluid-impeding device between the inlets, so that the air or other fluid under pressure will be kept from preventing the oil from flowing into said chamber.

It is desirable in order to avoid clogging or gumming up that the outlet from the jet-piece through which the oil passes shall be as large as possible consistent with the quantity of oil required to produce the flame desired—that is to say, a difficulty to be overcome with burners adapted for using petroleum fed under pressure is that any opening small enough to deliver the requisite amount of liquid is so small as to readily become clogged with any impurities which may be in the petroleum. I overcome all difficulties of this kind by passing through the outlet, together with the liquid fuel, a sufficient quantity of an expansive fluid to occupy a considerable portion of the space in the passage and outlet of the jet-piece, thereby to take the place in the passage of the liquid fuel which would otherwise pass therethrough, thus reducing the amount of liquid in proportion as the amount of air is increased, and vice versa. Owing to the greater mobility of the expansive fluid as compared with the liquid, the liquid is carried through the outlet-orifice with greater velocity than the liquid alone would be carried under the same pressure. The fluid will carry the liquid through the nozzle and will pulverize the liquid as it issues from the nozzle. The outlet 4, however, is small enough to cause a back pressure within the chamber 1, and this acts to retard the flow of oil from the passage 3. In order to obtain the best results, the passages 2 and 3 preferably enter the chamber 1 at right angles to each other and obliquely to the outlet 4, thereby accomplishing the most effective operation of the jet-piece in the act of supplying the pulverized fuel at the mouth of the nozzle. This arrangement also has a tendency toward mixing of the combustibles within the jet-piece before the same are discharged from the jet-outlet. The inlets are therefore preferably arranged at a right angle with each other, and the jet-outlet opens from the angle between the two inlets, and the valve-needle is arranged to project between the inlets to close the outlet. The jet-outlet preferably tapers outwardly, and the valve-needle which controls the same is pointed to fit said taper, this construction being designed, among other purposes, for the better breaking up and commingling of the liquid and fluid with which the burner is operated. *h* indicates a tube to receive the jet from said jet-piece. Said tube, which receives and delivers the liquid fuel and expansible fluid, is furnished at its inlet end with an inwardly-tapering passage *i* of less cross-sectional area at its inner end than the tube *h*, and said tube *h* is furnished at its outlet end with a discharge extension *j* of less cross-sectional area than said tube *h*. The tube *h* tapers at *k* to connect with the extension *j*.

m indicates a shielded drain for the tube extension *j*. The shield *n* of said drain terminates near the outlet end of the extension *j* and extends into the tube *h*, being bent down at its inner end *o* over the tapering wall *k* of the tube. The tube *h* is provided with a drain *p* for the final escape of precipitated liquid.

The inlets enter the chamber of the jet-piece preferably at an angle of ninety degrees with each other, and the jet-piece is provided with three passages, two of which, 2 and 3, are preferably at right angles with each other and the third of which, 6, is midway between said other passages and coaxial of the jet-outlet, so that the inlets are oblique to the jet-outlet. The chamber at the junction of the three converging passages 2, 3, and 6 opens outwardly therefrom and is screw-threaded at its outer end. *q* indicates a screw-threaded jet-nipple furnished with the jet-hole 4 therethrough and screwed into the screw-threaded opening.

For the operation of this burner with oil it is preferred to use a distillate of a suitable gravity for the work in hand. Under the force of air-pressure this oil is fed through the other inlet, and the two mingle with each other in the chamber 1. Within the jet-piece the air impinges upon the valve-needle 5, said needle having been unscrewed sufficiently to open the jet-outlet to the proper degree. The air and liquid fuel will thus be carried through the opening and through the funnel or tapering passages *i* and into the tube *h*, where it expands in the body of the tube. An air-pressure of, say, fifty pounds, more or less, per square inch is preferably employed, and with such pressure the liquid will be broken up into minute particles or mist as it passes through the tapering passage *i* of the tube *h* and expands on its way to the inside of tube *h*. The tapering funnel-shaped inlet *i* of the tube *h* allows the expanding jet of oil and air to entrain a proper amount of atmospheric air, which is carried into the chamber of the tube *h*, there to expand and commingle, where it expands and passes on to the contracted or tapering portion *k* of the tube, which tapering portion of said tube causes the oil and air constituents to be rolled or deflected toward the longitudinal center of the chamber *h* and rearward toward the particles of oil and air successively projected through the contracted or tapering passage *i*, thus thoroughly mixing and associating the constituents and reducing the projectile force exerted through the

extension or delivery end *j*, through which they are delivered into the open air or into the fire-box or other place (not shown) where the fire is to be used. Any liquid fuel which is not sufficiently atomized, broken up, and intermingled with the air to produce the best results of combustion will fall in the tube or the extension thereof and will drain back to a reservoir, (not shown,) from which it will be pumped back again into tank *a* to be again used. The liquid which thus collects in the tubular extension *j* will flow down under the cover of the shield *n* of the drain *m* and will thence flow down into the main body of the tube *h*, whence it flows out through the drain *p*.

The shield or wind-break *n* is preferably a strip of sheet metal bent to conform practically to the lower inside face of the tube extension *j* and the tapering portion *k* of the tube. It is fastened to the tapering portion *k* by a rivet or bolt *r*. The drain is formed by the lower inside face or floor of the tube extension, and the front corners of the shield *n* are bent down, as shown at *s s*, to rest on said floor and to hold the edges of the shield up off of the floor, so that the liquid can flow freely into the space beneath the shield, where it will be protected from the outward current of air and vapor, which would otherwise drive a portion of the oil out of the discharge end of the tube extension *j*.

The different characters of fire will be produced as occasion requires by the appropriate adjustment of the several needle-valves 5, 7, and 8.

In Fig. VI the needle-valve 7, which controls the air-inlet, is shown opened to its full extent, while the needle-valve 8, which controls the oil-inlet, is shown almost closed. When the air-inlet is thus opened, the quantity of oil to be supplied to the flame can be accurately adjusted by turning the valve-needle 8, and thus opening or closing the oil-passage 3. If at any time more oil is required to be delivered than is being delivered by having both of the valves open to their full capacity, (the air and oil passages,) the volume of oil being delivered can then be further increased by adjusting the valve of the air-passage, thus diminishing the amount of air admitted to the chamber 1, and thus decreasing the air-pressure on the oil-inlet 3, thereby allowing the oil to flow more freely into the chamber 1 and also to occupy a larger space in the jet-outlet 4, so that a greater amount of oil will be supplied to feed the flame. By these adjustments the character of the flame can be changed through a wide range. When the greatest proportion of air is supplied from the jet-outlet 4, a proportionately greater amount of air is entrained into the tube *h*. When a less amount of air is delivered from the air-inlet, a less amount of air is entrained into the tube *h*. When the mixture which issues from the tube extension *j* is high in air or oxygen, the flame will be an oxidizing-flame, and when the mixture is rich in hydrocarbon the flame will be a deoxidizing-flame.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. The combination of a jet-piece furnished with a chamber and with two valve-controlled inlets opening into said chamber at right angles to each other, and with a jet-outlet opening from the angle between said inlets; a valve-needle extending between the inlets to control the jet-outlet; a liquid-fuel-supply tank connected with one of said inlets; a source of compressed air to supply air under pressure to the other of said inlets and to said tank; a tube to receive the jet from said jet-piece and furnished at its inlet end with an inwardly-tapering passage of less cross-sectional area than the tube, and at its outlet end with a discharge extension of less cross-sectional area than the tube; a shielded drain being provided to drain said extension; and a drain being provided to drain said tube.

2. A burner comprising a jet-piece; a tube to receive the jet from the jet-piece and furnished at its inlet end with an inwardly-tapering passage of less cross-sectional area than the tube, and at its outlet end with a discharge extension of less cross-sectional area than the tube; a shielded drain being provided to drain said extension, and a drain being provided to drain said tube.

3. The combination of a jet-piece furnished with a central valve-controlled discharge-chamber, and two valve-controlled converging inlets communicating with the central discharge-chamber; a liquid-fuel tank connected with one of the converging inlets; a compressed-air tank communicating with the other converging inlet and also with the liquid-fuel tank; a tube adjacent to the jet-piece and provided at its intake end with an inwardly-tapering passage and at its outlet end with a tapering reduction terminating in a discharge extension of less cross-sectional area than the tube, substantially as and for the purpose set forth.

4. The jet-piece provided with converging valve-controlled inlets adapted to conduct respectively liquid fuel and air under pressure; a central chamber between the terminals of the converging inlets and formed with a tapering outlet or discharge, and a centrally-arranged and longitudinally-movable valve adapted to move between the outlet-passages of the converging inlets and into the tapering outlet or discharge, substantially as and for the purposes set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, at Los Angeles, California, this 5th day of April, 1901.

HENRY BOUNDS CARY.

Witnesses:

JAMES R. TOWNSEND,

JULIA TOWNSEND.