C. M. LUNGREN.

PLURAL JET BURNER.

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928,527.

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Fig.1

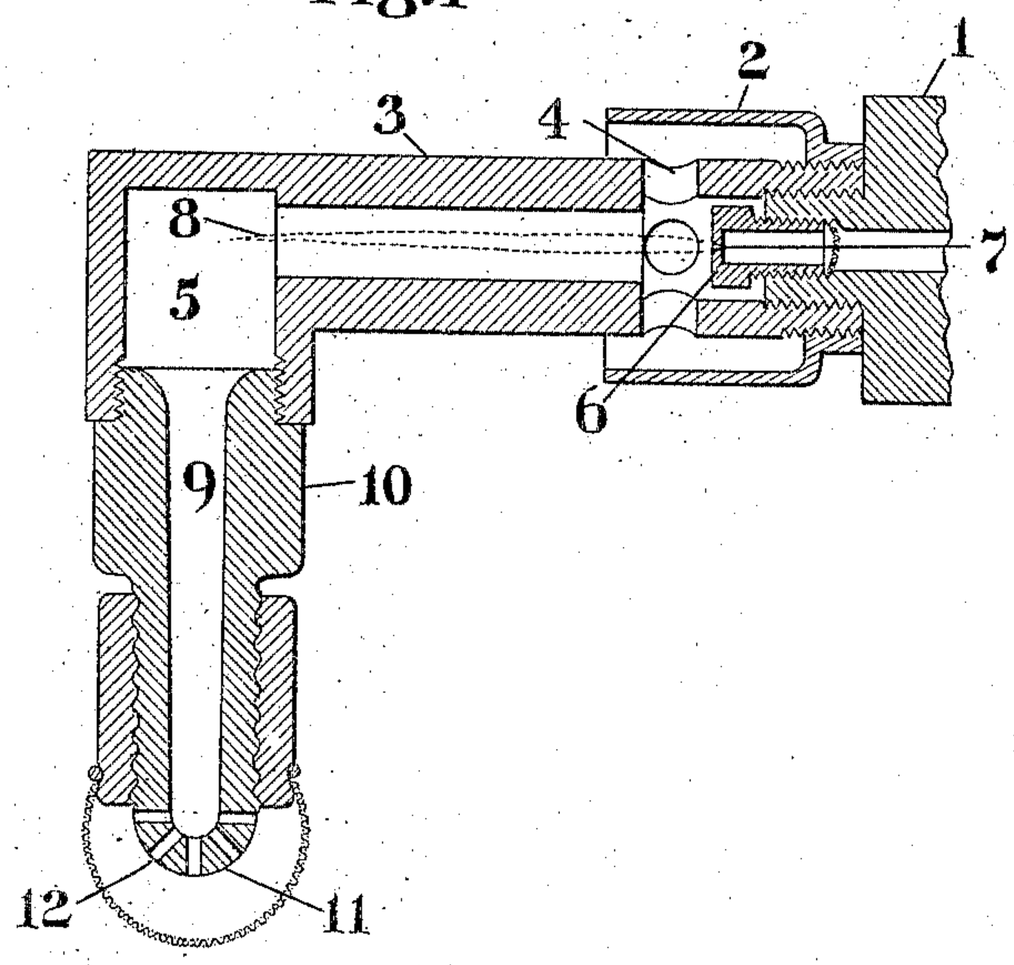


Fig.2

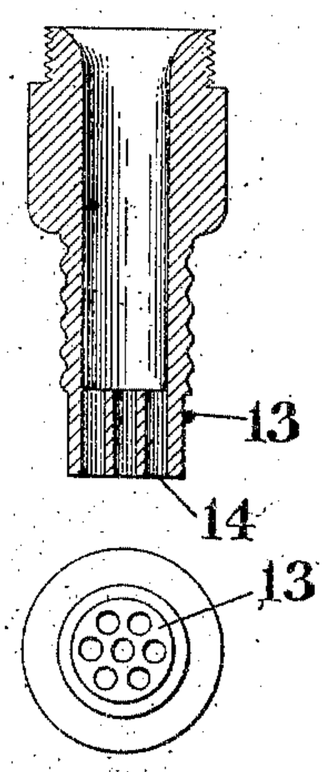
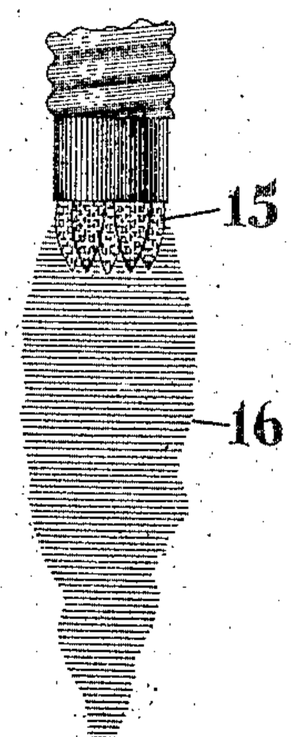


Fig.3

Fig.4



WITNESSES.

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PLURAL-JET BURNER.

No. 928,527. Specification of Letters Patent. Patented July 20, 1909.

Application filed February 20, 1906. Serial No. 302,007.

To all whom it may concern:

Be it known that I, CHARLES M. LUNGREN, residing at Bayonne, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Plural-Jet Burners, 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 broadly relates to systems of gas-burning apparatus, but it more particularly concerns gas-illuminating systems in which provision is made for maintaining a part, such as a mantle, at an incandescent temperature.

This invention has in view, among other objects, the provision of an improved means for effecting complete combustion of gases as they issue from their conduits.

Another object residing within the contemplation of this invention is to provide a means for maintaining a zone of uniform incandescent temperature immediately adjacent all the working parts of the mantle, whereby the illumination afforded by the same will be as uniform and intense as possible consistent with the full utilization of the heat of combustion of the gases.

This invention also seeks to provide a means for ejecting and burning combustible gases in such a way that the hottest zone of the resultant flame will have a configuration very nearly in exact conformity with the shape of the selected mantle.

Another object within the purpose of this invention is to provide a means especially adapted for efficiently transforming the calorific power of the gas into a serviceable illumination, through the instrumentality of mantles of any desired contour, especially when of the inverted type.

Another object is to provide a burner nozzle which will deliver a flame adapted for maintaining a mantle at incandescence within a high temperature zone and without being subject to material fluctuation as a result of ordinary variations in the pressure of the gas or from other changes in conditions.

Another object is to devise a means of the class described which will effect a thorough mixing of the gas with air preliminary to its discharge from the nozzle and which will subsequently effect a complete combustion of said gas without permitting the flame to strike back into the mixing chamber, even when the parts are relatively hot.

Another object is to formulate a means which will more thoroughly diffuse the gas and air prior to ejection into the burning zone, and thus enable the utmost calorific effect to be obtained from the combustible mixture.

Another object is to provide an instrumentality of the class specified which, from an operative standpoint, will in usage possess a high degree of efficiency and effectiveness, and which, structurally considered, will be of the greatest possible simplicity, being composed of but few parts, all adapted for being made at a minimum of cost and individually so formed as to be capable of being readily assembled into a neat and compact arrangement for accomplishing the purposes intended.

Other objects and advantages will be in part obvious and in part pointed out hereinafter.

With these and other ends in view, this invention accordingly consists in the features of construction, combination of parts, and arrangement of elements which will be exemplified in the embodiment thereof hereinafter described and the scope of the application of which will be indicated in the following claims.

In order that this invention may be more fully understood and made comprehensible to others skilled in its relating arts, drawings illustrating a convenient manner of carrying out the same are appended as a part of this specification, and, while the controlling principles of the invention may be otherwise applied by modifications falling within the scope of the claims, the herein disclosed embodiment is that which it will ordinarily be preferable to employ in practice, and is regarded as representing substantial improvements over many of the seemingly obvious variations of the same.

In such drawings, it is to be noted that like numerals refer to corresponding parts throughout all the figures, of which—

Figure 1 is a sectional elevation showing details of one embodiment of this invention

as employed in connection with a burner terminating in a plurality of elongated radiating nozzles. Fig. 2 is a view showing in sectional elevation a preferred form of burner conduit terminating in a plurality of elongated parallel nozzles. Fig. 3 is a lower end view of Fig. 2 showing more clearly the disposition of the nozzles. Fig. 4 is a side elevation illustrating the manner in which the gases ejected from the device shown by Fig. 2 burn in actual operation.

As tending to render better understood the essential features of this invention, it may be briefly pointed out that, in apparatus employing mantles for purposes of illumination, it is requisite that all portions of the mantle be located within the hottest zone of the burning gas, since the illuminating properties of the mantle largely vary in proportion to the extremes of temperature to which it is brought. In the usual construction, this desideratum is seldom attained because the mantle itself is quite thin and varies in configuration, so that it is difficult to so precisely locate it in the flame as to realize the desired effect. Furthermore, the flame itself varies greatly in temperature throughout its extent, and in the case of the old style burners, the shape of the maximum temperature zones seldom conforms closely with the shape of the mantle. Obviously, the best practice would dictate that a mantle be shaped so as to occupy the hottest portion of the flame, but it has been found to be difficult to maintain the proper relationship, particularly when the mantle is generally of a spherical shape and is inverted. A further difficulty that has been encountered in prior constructions resides in the fact that the combustion of the flame has not heretofore taken place in the most complete manner on account of the solid nature of the flame and, as a consequence, the highest heat in a relatively extensive region has not been realized. Moreover, the flame has a most annoying way of "striking back," both at the moment of initial ignition and also subsequently thereto, especially in the case of inverted lamps, in which the burner nozzle and mixing and expansion chamber frequently become highly heated by the escaping products of combustion.

The above mentioned defects are in a great measure obviated by this invention in which the gas is intimately mixed with the proper amount of air and the resultant carbureted mixture is ejected as a flame having a comparatively extensive zone of greatest temperature closely conforming in configuration with a globular inverted mantle. The nature of this flame and the relation of the apparatus thereto is such that it is not only comparatively insensitive to ordinary pressure fluctuations, but it does not "strike back" in the manner common to other types. This will be better appreciated by referring to the accompanying drawings, in which—

1 denotes a conduit leading from the gas supply or reservoir. This conduit provides a bore into which is screw-threaded the injector nipple 6 having an orifice 7 adapted to deliver a fine very elongated jet 8 which issues at a very high velocity and preserves its shape for a very considerable distance. Surrounding this nipple and jet, is a tube 3 having air inlets 4 and leading to a mixing and expansion chamber 5. The air inlets 4 are perfectly encompassed by a shield 2 which is screw-threaded to the periphery of the tube 3, as shown. The orifice 7 has a relatively fine bore and the gas pressure is relatively high and such that the escaping gas jet cannot of itself be ignited on account of its high velocity. In coursing by the aperture 4, such gas jet draws in the requisite amount of air which is carried along tube 5 and with which it is ultimately intimately diffused in the mixing and expansion chamber 5 which diffusion is further accomplished in the channel 9 of the burner conduit 10. The latter, as shown by Fig. 1, terminates in a tip 11 of semi-spherical or other bulging shape, provided with a plurality of radiating or otherwise disposed, elongated apertures 12. It will be observed that the walls of the tip 11 are of a considerable thickness and that the apertures constitute elongated nozzles, though the walls of the nozzles themselves, as distinguished from the tip, may be relatively thin, if desired, to secure better heat radiation.

Figs. 2 to 4 illustrate a modified form of tip 13, in which the apertures 14, of which seven will be a convenient number for small-sized lamps, extend parallel to one another and produce a flame as illustrated in Fig. 4.

While the tip is here shown as of similar material and integral with the gas conduit, it will be apparent that the same may be a feature distinct therefrom and may be fixed to said conduit either in a permanent or detachable relationship. Furthermore, such tip may be of a different material suitable for the purpose and of refractory, non-conducting, or other nature.

In operation, it will be found that the combustion of the gases will take place substantially as shown by Fig. 4, in which a cluster of short blue cones 15 will be emitted from the reticulated tip and said cones will be enveloped by a very light gaseous flame 16 which, when capped by a suitable mantle, will be deflected along the periphery thereof.

This invention is to be distinguished from the wire mesh which has heretofore been applied over the delivery orifice of gas burners. Such expedient has been resorted to in an endeavor to prevent the gas from "striking back" into the burner, but all users of man-

tle burners are cognizant that such objectionable action is not, in fact, prevented thereby, particularly when the burner is ignited. In this invention, on the contrary, practice has demonstrated that such "striking back" does not take place, even if the parts become highly heated. It is also to be noted that the wire mesh causes the gas to escape in the form of a thick stream having a single, extensive central core, thereby producing a flame in which the combustion does not take place in such a manner as to realize that localization of high temperature necessary to the obtainment of the greatest illuminating efficiency of the apparatus, while in this invention, the gas issues in a series of distinct streams, each having an individual cone and adapting an intimate combustion of the total gas to take place, resulting in a maximum temperature localized with a zone including the mantle, thus realizing a more efficient illumination from a given supply of gas. It will thus be seen that this invention is one well adapted to attain the foregoing objects and advantages.

Without attempting to entirely explain the phenomena exhibited by this invention when in use, as it has been demonstrated in practical use, that the same operates in a greatly improved capacity, it may be suggested that its improved operation follows, in part, from the multiplicity of narrow, elongated flames resulting from the peculiar shape of the nozzle. It will be clear that such brush-like stream of gas is capable of a more complete combustion on account of the fact that the oxygen has a more thorough access to all parts of the flame than in the broad bulky flame of the prior devices.

Among other remarkable properties exhibited by this invention, may be emphasized the fact that it is far more free from fluctuations than has been hitherto obtainable in devices of this character. Supposedly, this is due to the fact that the effective burning zone of the gas is nearer the nozzle than in the case of the old broad flame. In the latter, the gas begins to burn at a considerable distance from the nozzle, as shown by the familiar, elongated blue cone, and the combustion ends at the tip of the flame, which, relatively speaking, is not a great distance from the aforesaid cone. The result of this is that a relatively slight diminution in the gas pressure will cause the cone to approach the burner and, similarly, the tip of the flame will rapidly recede, causing marked variations in the temperature of the stationary mantle. In the case of this invention, however, the cone will be found to occupy a substantially constant position very close to the burner orifices, irrespective of ordinary fluctuations in the gas pressure, and the burning portion of the flame will similarly tend to remain constant. As a consequence, the effective heating zone remains practically invariable.

A further advantage possessed by this invention resides in the fact that the flame may not so readily strike back, as in the case of prior constructions. This is partly due to the action of the elongated nozzles, which serve to absorb excessive heat and cool the gases below the flash point at a distance from the mixing chamber. Another reason why the flame may not strike back lies in the peculiar injector nipple construction and operation whereby the gas is forced through the nipple in the form of a fine stream moving at a velocity greater than the rate of combustion, as has hereinbefore been explained. This is a very important consideration, since a much greater temperature of combustion may be maintained beyond the nozzle than could be the case if such improved nozzle were not employed. Moreover, in passing through said nozzle, the gases tend to become still more thoroughly mixed, with the result that better ultimate combustion is had.

By the term "mantle", as employed in this specification, is meant any means which is adapted to emit luminous rays under the influence of gas of various sorts.

In carrying out this invention, some parts might be employed without others, or might be employed to carry out modified functions thereof, and new features thereof might be combined with elements old to the art in other ways, although the hereindescribed type is regarded as embodying substantial improvements over such changes, as are obvious.

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

1. A gas illuminating apparatus comprising, in combination, a conduit in communication with a gas supply having a tube provided with a series of radially disposed air inlets and extending from said conduit, a nipple in communication with said conduit and provided with a fine delivery aperture adapted to project, at a high velocity, a fine elongated jet of gas past said air-inlets into and along the bore of said tube and into a mixing expansion chamber located at the end of said bore whereby air may be drawn through said inlets and carried along the bore of said tube into said expansion and mixing chamber and there intimately diffused with said gas, a delivery nozzle having an elongated bore leading vertically downward from said expansion chamber and terminating in a multiplicity of relatively fine elongated delivery apertures, a mantle support in relatively tight engagement with said nozzle, and a depending globular mantle secured around the end periphery of said mantle support and arranged to completely en-

compass said delivery end of said nozzle whereby all the gases discharged from the delivery end of said nozzle will be permitted to pass through the meshes of said mantle prior to their ultimate discharge.

2. A gas illuminating apparatus comprising, in combination, a gas conduit, a member horizontally extending therefrom and internally provided near its extremity with an enlarged mixing and expansion chamber, and having a straight passage leading directly to its opposite end, a nipple secured in said gas conduit and having a fine delivery aperture adapted to project an elongated conical stream of gas midway through said passage and into said expansion chamber, said member having air inlets leading toward the delivery end of said nipple for the infusion of fresh air, a depending burner tube leading from said expansion chamber and terminating at its lower end in a plurality of narrow elongated delivery apertures arranged to deliver a corresponding plurality of gas jets in the form of a composite flame, and an inverted substantially spherical mantle mounted adjacent the end of said burner tube within the zone of maximum temperature of said composite flame.

3. A gas illuminating apparatus, comprising, in combination, a member having an enlarged expansion chamber and a straight channel leading therefrom, a gas conduit having a nipple provided with a fine delivery aperture adapted to project an elongated conical stream of gas midway through said channel in unbroken form and into said expansion chamber, means for admitting fresh air by injection into said channel near said nipple, a burner tube leading downwardly from said expansion chamber and having at its lower extremity a symmetrical cluster of fine elongated delivery apertures whereby the gas will escape in the form of a composite flame, and an inverted mantle completely encompassing the lower end of said burner tube and having its wall positioned at a predetermined distance from said end and within the zone of maximum temperature of the burning composite flame whereby said mantle will be maintained throughout in a highly incandescent condition.

4. A gas illuminating apparatus comprising, in combination, a member having an expansion chamber and a straight channel leading therefrom, a nipple having a fine delivery aperture opening into said channel and directed toward said expansion chamber, adapted under normal pressure to project an elongated stream of gas midway through said channel at a velocity sufficiently great to prevent combustion, means for admitting fresh air by induction into said channel near said nipple, a burner tube leading downwardly from said expansion chamber, and an inverted mantle encompassing the lower end of said burner tube and having its globular wall positioned within the zone of maximum temperature of the burning flame.

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

CHARLES M. LUNGREN.

Witnesses:
FRANK STUART,
ROBERT S. BLAIR.