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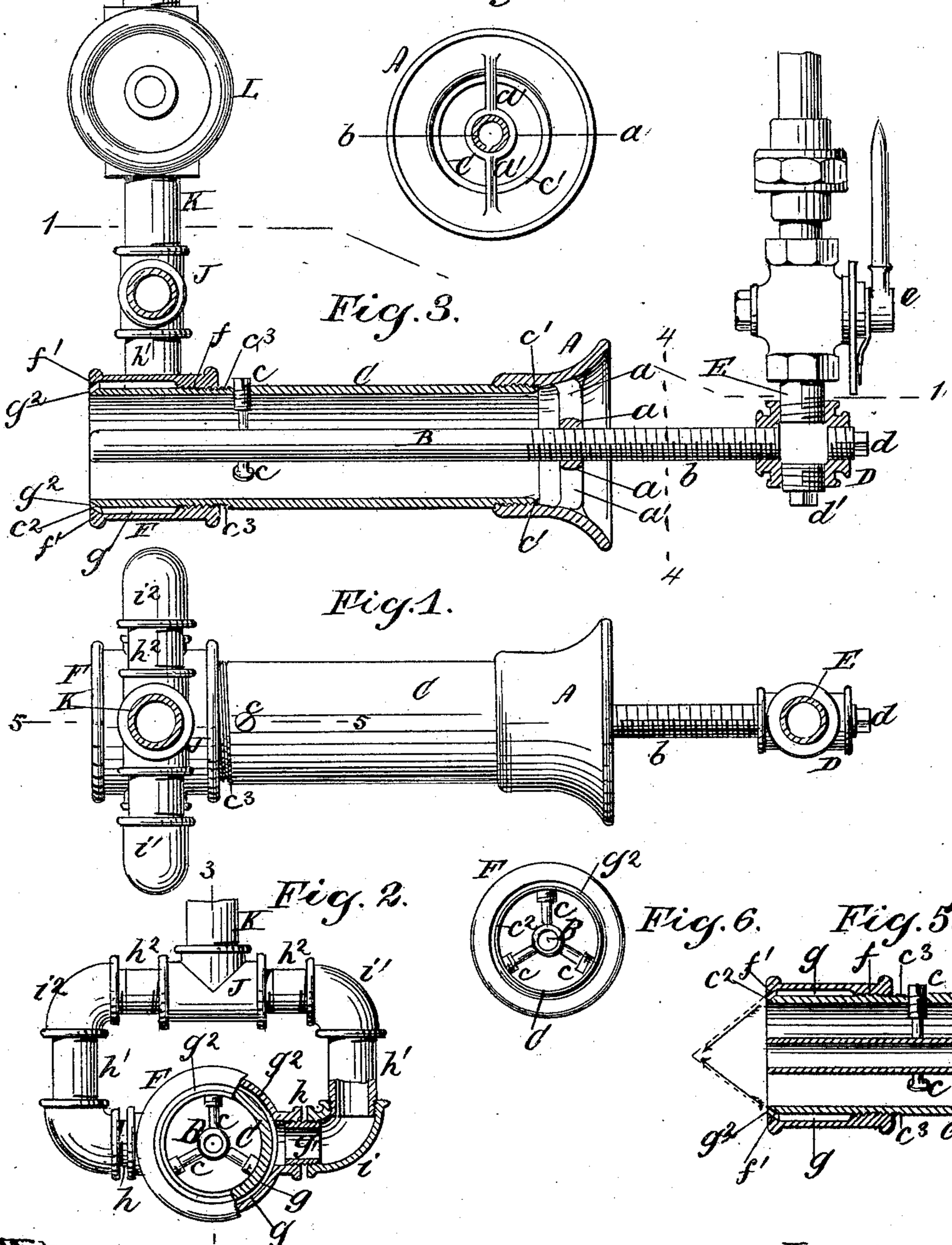
H. R. SEARING.

HYDROCARBON BURNER.

(Application filed Mar. 10, 1902.)

(No Model.)



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UNITED STATES PATENT OFFICE.

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HYDROCARBON-BURNER.

SPECIFICATION forming part of Letters Patent No. 713,697, dated November 18, 1902.

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To all whom it may concern:

Be it known that I, HUDSON R. SEARING, a citizen of the United States, residing in Bayonne city, Hudson county, and State of New Jersey, have invented certain new and useful Improvements in Hydrocarbon-Burners, of which the following is a specification sufficient to enable others skilled in the art to which the invention appertains to make and use the same.

My invention relates to burners for fluid hydrocarbon, and while adapted to effect the perfect and economical combustion of hydrocarbons of higher grade is equally effective for the consumption of the lower grades of hydrocarbons, as fuel-oil, &c.

My invention is designed to afford a simple and cheap burner made almost entirely of commercial fittings that may be easily procured and duplicated when necessary; to attain the perfect combustion of the liquid fuel by causing it to impinge against the apex of a hollow cone of steam or air, or both, so as to completely atomize the oil at the point of ignition; to provide for the convenient and accurate adjustment of the parts with relation to each other, and to afford advantages of construction and operation hereinafter more fully set forth.

The invention consists in the combination and arrangement of parts hereinafter described and claimed specifically.

In the accompanying drawings, Figure 1 is a horizontal section upon plane of line 1 1, Fig. 3, showing a plan of my improved burner. Fig. 2 is an elevation of the inner end of the burner partly in section. Fig. 3 is a sectional elevation taken upon plane of line 3 3, Fig. 2. Fig. 4 is a section on plane of line 4 4, Fig. 3, showing the rear of the burner. Fig. 5 is a section upon plane of line 5 5, Fig. 1; Fig. 6, an elevation of the induction-tube.

In carrying out my invention in actual use I design to use commercial fittings as far as practicable in order to simplify and cheapen the construction and facilitate the duplication or renewal of parts when necessary. Thus in the construction shown in the accompanying drawings the flaring outer end piece A is the only part cast or formed specially for the burner, the other parts consisting of commercial tubing, valves, joints, plugs, &c., adapted to this special use. It is to be understood that I do not confine myself strictly to the identical form and construction of parts shown, since they may be made specially and modified in form without departing from the spirit and intent of my invention, the drawings and description herein for convenience and simplicity being confined to parts which are commercially available, as before stated.

The flaring outer end piece A has a central bearing *a*, supported by the radial arms *a'* and formed with a female screw-thread for engagement with the male screw-thread *b*, formed on the outer end of the oil-tube B, the inner end of which (some distance back of its extremity) is supported and centralized by radial screws *c c c*, engaging with female threads formed in the walls of the air-induction tube C, the outer extremity of which screws fit into the flaring end piece A. In this connection it is to be noted that the extreme outer edges of the air-induction tube C are curved or beveled, as at *c'*, so as to merge gradually with the inner surface of the flaring end piece, and thereby avoid an abrupt annular shoulder at this point, which would tend to create an eddy or disturbance in the air-current passing through the air-induction tube C.

The outer end of the oil-tube B screws into the rectangular union D, provided with the plugs *d d'*, by unscrewing one of which, *d*, access may be had to the oil-tube B for the purpose of cleaning the same, if necessary. Connected with the union D is the supply-pipe E, provided with a graduated valve *e* for controlling the flow of oil.

The annular edge c^2 of the inner end of the air-tube C is beveled or inclined at an angle with relation to the longitudinal axis of the tube, and back of the beveled edge the tube is reduced in diameter externally as far as the screw-thread c^3, which latter engages with the female screw *f*, formed in the jacket F.

The annular inner edge *f'* of the jacket is inclined or beveled to correspond to the annular edge c^2 of the air-induction tube C, and between this beveled edge *f'* and the screw-thread *f* the interior of the jacket is increased in internal diameter, so as to form an annular space or chamber *g*, surrounding the

end of the air-induction tube C. Into this annular chamber *g* open one or more ports *g'*, connected with piping, by which steam or air under pressure may be introduced into said annular space *g*.

The construction of the parts to create the annular space *g* may obviously be varied by resort to many mechanical expedients, and I do not restrict myself in this respect. However, a simple and cheap way of attaining the annular space *g* is to turn down and remove the threaded end of the air-pipe C, leaving only the portion of thread c^3 for engagement with the screw-thread *f* remaining on the jacket F, the greater portion of the internal screw-thread originally formed in the latter having been likewise removed, so that between the two opposed surfaces of air-pipe and jacket an annular cylindrical space of ample area is created. As arranged in the drawings the space *g* is connected by joints *h h' h²* and elbows *i i' i²* with a union J, coupling with the pipe K, which latter is provided with a valve L for controlling the supply of air or steam to the annular chamber *g*.

The adjustment of the beveled edges c^2 and *f'* with relation to each other to control the area of the annular opening g^2 is effected by turning the air-induction tube within the jacket F, and the adjustment of the end of the oil-tube B with relation to the inclined annular opening g^2 is also accomplished by turning the oil-tube B in its screw-bearing *a* in the flaring end piece A. The centralization of the oil-tube B by means of the radial screws *c c c* is obvious. It is to be noted in this connection that the points of connection between the oil-tube and the air-tube and flaring end piece are well back of the point of combustion, and are hence kept relatively cool.

The operation is as follows: The parts being adjusted as required by the conditions of use and the character of the oil to be used being such that air alone is desired to effect the complete combustion of the hydrocarbon, air at the requisite pressure is admitted through the valve L and connections to the annular chamber *g* and passes out through the annular opening g^2, formed by the lips c^2 and *f'* in the form of a hollow cone, impinging at the apex, as indicated by the dotted arrows in Fig. 5. As a result, a partial vacuum or suction is created and maintained in the tube C and the atmosphere rushes in through the flaring end piece A. The fuel-oil being turned on to the proper degree by means of the graduated valve *e* is injected into the hollow cone of escaping compressed air, impinging therewith at the apex of the cone and being thereby effectually atomized and mingled with the air, so that when ignited perfect combustion will occur and will continue so long as these conditions are maintained, the combined effects of the combustion and the air-blast being to draw in and absorb large quantities of air from the atmosphere through the air-tube C and its flaring end piece A. By thus affording what may be designated as an "excess of oxygen" I am enabled to successfully consume certain refractory oils without carbonization or other objectionable products of combustion. Under ordiuary conditions of use, however, I prefer to use steam under pressure in lieu of the compressed air, as above described. In this case the action is substantially the same, excepting that the decomposition of the steam increases the proportion of hydrogen in the flame, the air sucked in through the tube C being relied upon to afford a sufficient supply of oxygen to effect the perfect reduction of all combustible elements present.

By my peculiar construction and arrangement of parts I avoid the carbonization of the oil, since the air drawn in through the tube C keeps the oil-tube B relatively cool, and it will be noted that the area of combustion and intense heat is entirely beyond the burner itself, the currents of air or air and steam, as the case may be, tending to absorb and remove the heat from the burner.

The air-induction tube C performs another important function in that it affords a clear view of the central area of combustion, no peep-holes or other expedients for observation being necessary.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a hydrocarbon-burner, the combination of an oil-supply pipe, an induction-tube concentric therewith and surrounding the same and having beveled annular edge, an end piece on one end of said induction-tube having a flaring outer end, a jacket adjustably secured to the opposite end of said induction-tube and having at its outer end an annular inwardly-projecting edge beveled, means for supporting the oil-supply pipe near opposite ends of the induction-tube, means for introducing steam or air under pressure in the said jacket, said beveled edges forming means for discharging the same from said jacket in the form of a hollow cone whose apex is in line with the axis of the supply-pipe, substantially as described.

2. In a hydrocarbon-burner, the combination of an oil-supply pipe, an air-induction tube surrounding the same, a flaring outer end piece adjustably mounted on said induction-tube and supporting one end of the said supply-pipe, a jacket adjustably mounted on and surrounding the inner end of said air-induction tube, said jacket being formed with an annular chamber having an annular opening the edges of which are inclined to the axis of the oil-pipe and air-induction tube, and means for introducing steam or air under pressure directly into diametrically opposite sides of said annular chamber, and means for ejecting it directly therefrom in the form of a cone intersecting the oil from the oil-tube, for the purpose and substantially in the manner described.

3. In a hydrocarbon-burner, the combination of the oil-supply pipe, the flaring end piece on the air-tube, formed with the central bearing, the air-induction tube, the adjustable jacket, formed with the chamber and annular opening at its extreme outer end and inclined toward the axial center of the supply-pipe, and means for introducing steam or air under pressure directly into diametrically opposide sides of said chamber, for the purpose and substantially in the manner described.

4. In a hydrocarbon-burner, the combination of the oil-supply pipe, formed with the screw-thread, the flaring end piece, formed with the central threaded bearing, the air-induction tube on which said end piece is adjustably mounted, the centralizing and supporting screws, the jacket adjustably mounted on the induction-tube and formed with the chamber, having the annular opening, and means for introducing steam or air under pressure into diametrically opposite sides of said chamber substantially as and for the purpose set forth.

5. In a hydrocarbon-burner, the combination of the oil-supply pipe, the union attached thereto and provided with the plug, in line with said oil-pipe, the air-induction tube, and flaring end piece surrounding said oil-pipe, the jacket adjustably mounted on the induction-tube and formed with the chamber, and the annular openings, and means for introducing steam or air under pressure into diametrically opposite sides of said chamber, for the purpose and substantially in the manner described.

6. In a hydrocarbon-burner, the combination of the oil-supply pipe, the air-induction tube, surrounding said oil-pipe, said air-induction tube, having its inner end formed with a beveled edge, and being reduced in external diameter as far as the screw-thread, the jacket adjustably mounted on the induction-tube and formed with the beveled edge, and having its internal diameter increased as far back as the screw-thread, to form the chamber, and means for introducing steam or air under pressure into said chamber, for the purpose and substantially in the manner described.

7. In a hydrocarbon-burner, the combination of the graduated valve, and oil-supply pipe, the union, the oil-pipe, the air-induction tube, the jacket adjustably mounted on the induction-tube and formed with the chamber, and annular opening, and the valve, and connections with opposite sides of said chamber for supplying steam or air under pressure to said chamber, for the purpose and substantially in the manner described.

8. In a hydrocarbon-burner, the combination with the induction-tube provided with the tubular portion and having a flaring end having central bearings, of an oil-supply tube supported concentrically within said tubular portion at one end in said bearing, and radially-disposed screws adjustable in said induction-tube near its other end for centralizing said supply-tube, a jacket adjustably mounted on and surrounding the discharge end of said tubular portion forming a surrounding chamber with inclined outlet, a pipe provided with a valve and connected with a source of air or steam supply and coupling and branch pipes leading from opposite sides of said pipe to opposite sides of the said jacket and supported therein, all substantially as and for the purpose specified.

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