Nov. 22, 1927. 1,650,343

J. GOOD.

ELECTRICALLY IGNITED LIQUID FUEL BURNER

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Fig. 1,

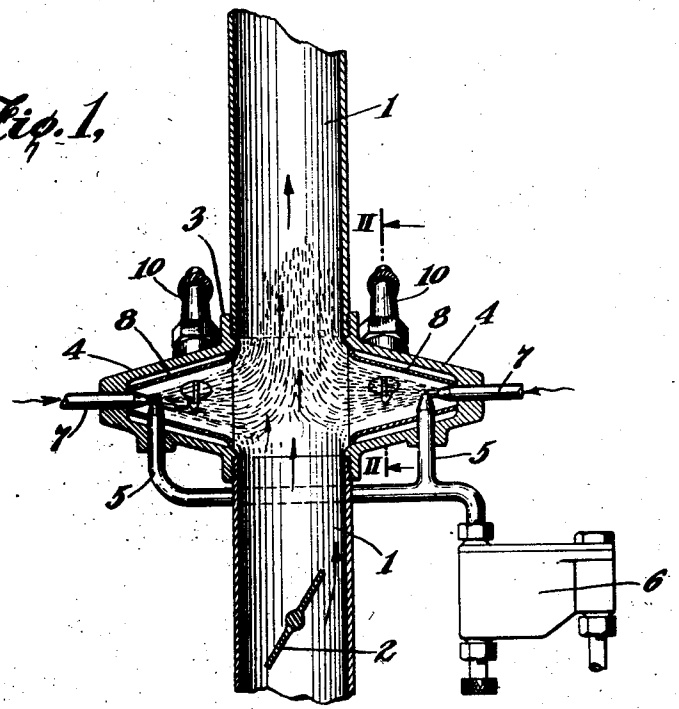
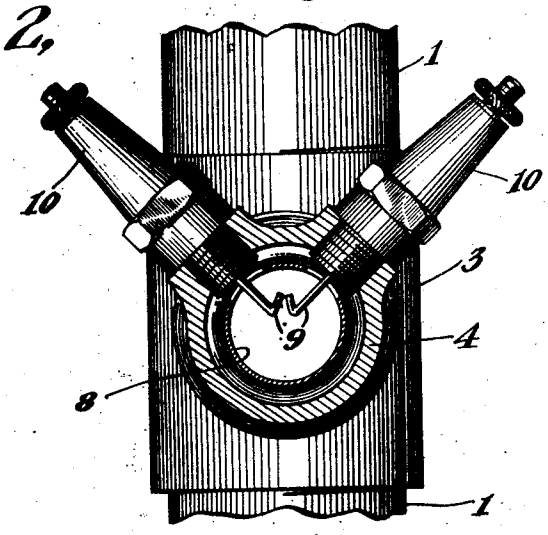


Fig. 2,



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Fig. 3,

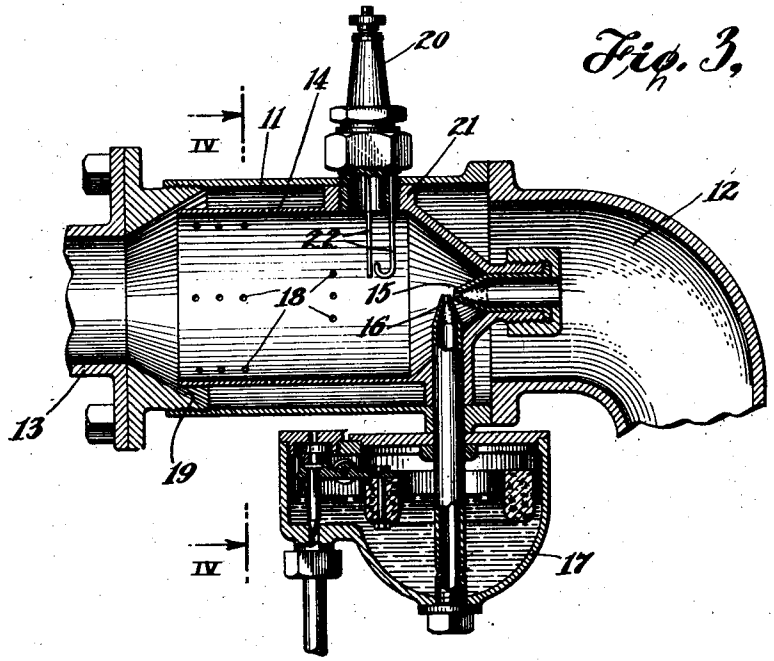
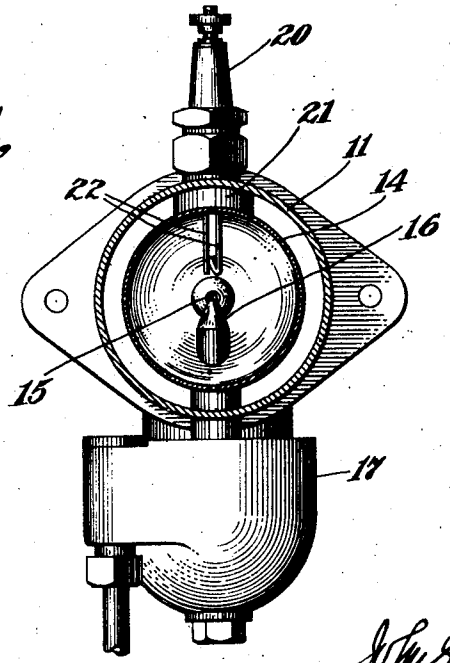


Fig. 4,



Inventor

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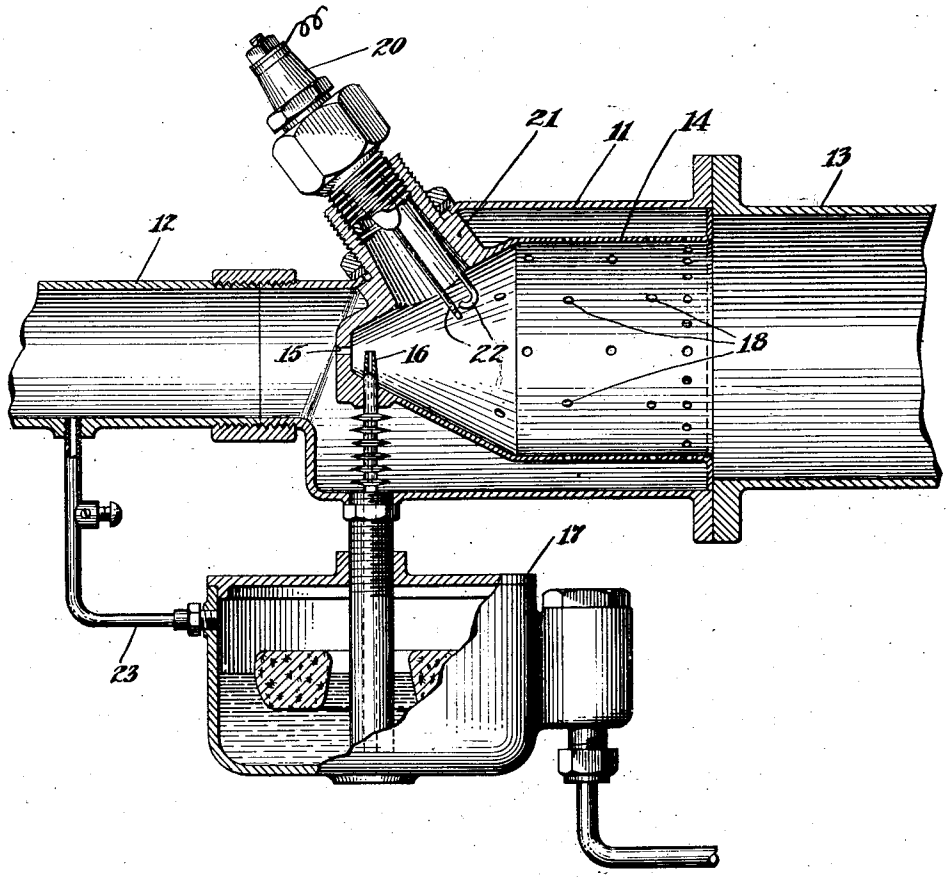
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Fig. 5.



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UNITED STATES PATENT OFFICE.

JOHN GOOD, OF GARDEN CITY, NEW YORK, ASSIGNOR TO GOOD INVENTIONS CO., OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

ELECTRICALLY-IGNITED LIQUID-FUEL BURNER.

Application filed June 2, 1920. Serial No. 386,108.

The invention is a continuation of certain parts of my prior applications, Ser. No. 101,887, filed June 6, 1916, and Serial No. 195,506, filed October 9, 1917, renewed July 24, 1924, and is directed toward certainty of prompt ignition and steady burning, being concerned with keeping the igniting spark plug cool, and clean and free of deposits of fuel and soot, and the employment of a quickly heated interior metallic shell which promotes promptness of ignition, vaporization of the fuel, absence of smoke and smell, and, in the arrangement illustrated, also aids in the isolation and protection of the spark plug.

In the drawing:—

Fig. 1, represents a longitudinal section of one form of the invention.

Fig. 2, being a cross section thereof on line 2—2.

Fig. 3, is a longitudinal section of another form.

Fig. 4, is a cross section thereof on the line 4—4, and

Fig. 5, is still another form.

In the form of the Figs. 1 and 2 an air flow is established by any suitable means through the passage 1 under the control of an adjustment valve 2. The two pipe sections of this passage are joined by an intermediate fitting 3 providing two identical opposed spray chambers 4 which are of conical shape and together with the air passage form ignition and mixing spaces. The liquid fuel is supplied to each chamber by a fuel nozzle 5 connected to a common constant level liquid fuel receptacle 6 and is discharged from said nozzles, in whole or in part, by the aspirating effect of the air jet nozzles 7 which latter are arranged axially of the chambers and supplied with air for fuel delivery purposes in any suitable way. The spray in each chamber is surrounded by a thin, conical, metallic wall 8, separated from the main wall of the cavity by an air space and providing an ignition chamber, and the electrodes 9 of the single electrode spark plugs 10, which are screwed into the main chamber wall, extend through this air space and through openings in the interior shell 8 to a spark-gap position in the spray, as indicated in Fig. 2. When the apparatus is in operation the spark within the metallic shell 8 ignites the spray mixture therein which joins the air in the passage 1 resulting in complete combustion in the latter.

In the burner structure of Figs. 3 and 4 the air enters the main burner casing 11 by passage 12 and the combustion products pass out, or are drawn off, by way of the outlet or flame pipe 13. The ignition space is formed by an interior thin walled metallic shell or spout 14, as in Fig. 1, centrally located in the main casing with one end open toward the flame passage 13 and the other of conical shape and thicker dimension so as to be adapted to receive the fuel nozzles. Part of the air flow forms an air jet at the nozzle 15 mounted in the end of the thick conical part of the shell and this air jet is placed in atomizing relation to a fuel nozzle 16 which draws liquid fuel from the constant level or float chamber 17. The rest of the air flow joins the spray produced by the nozzle through the series of holes 18 in the metallic shell and also through the annular passage 19 at the end of the shell, so as to produce rapid mixing and combustion. The double electrode spark plug 20 of this form is screwed through the main casing into the boss 21 of the thin interior shell so that its very long electrodes reach a proper spark-gap position in the interior of the latter. When this apparatus is in operation the air jet in the ignition and mixing space produces a proportional fuel spray which is ignited by the heat developed by the electrical igniter and which is immediately joined by and thoroughly mixed with the rest of the air resulting in complete combustion as the mixture passes off to the outlet.

In Fig. 5 the general structure and operation is essentially that of Fig. 3 and will be recognized without description. The electrode opening in the thin interior shell is formed as a cavity extending well out of the combustion zone and the spark plug mounted in the outer end of such cavity carries a pair of long electrodes 22 reaching through the air space within the cavity to a proper spark-gap position in the ignition and mixing space. The tube shown at 23 is the means of transmitting the air pressure of the entering air pipe to the float chamber to facilitate the lifting of the fuel to the nozzle orifice when the burner is operated by

air pressure. This tube is not necessary, ordinarily, when the device is operated by suction applied to the flame outlet. None of the burners herein illustrated is limited as to the means by which the air flow is produced. The specific detail of the spark plug arrangement of this figure and the other features appearing therein is claimed in a co-pending application Serial No. 231,910, filed May 1st, 1918.

The interior shell in each of the structures above described serves to isolate the body of the spark plug, that is to say, the insulating portion of the plug which is made of porcelain or an analogously insulating material, from the heat and spray, thus tending to keep it cool and clean, and the air current in the space between the casing wall and shell, in Figs. 3 and 5, also serves to keep it cool. Moreover, if the said shell be made sufficiently thin where it surrounds the ignition zone, there results also a noticeable improvement in the promptness and reliability of ignition, as well as in the general behaviour of the burner. The degree of thinness requisite to produce this result, I have ascertained, is dependent to some extent on the character of the material of which the shell is made. Thus for steel, the practical limit is about $\frac{1}{16}$ inch, for aluminum about $\frac{5}{32}$ inch and for metals of intermediate weights the limit is proportional. In every case the best result is secured by making the wall as thin as consistent with the ability of the material to stand up under the heat and I prefer to use nichrome steel which can be made very thin and adequately withstands the temperature. The particular manner of utilizing walls of this degree of thinness, so that they form or surround the ignition space of spark-ignited burners, is not of special consequence to the result so long as such a wall is immediately adjacent to the point of ignition and adapted to become instantly heated by the initial flame. In Fig. 1 it is merely a stamping inserted into the spray space as a lining and in Figs. 3 and 5 the shell serves to divide and distribute the air flow as above described besides supporting the air nozzle; such shells may obviously have various collateral functions without impairing the effect of the thin part which surrounds the ignition zone and coacts therewith in producing the results stated.

I claim—

1. In a combustion system, in combination with an ignition chamber for receiving sprayed fuel, a spark plug having its body isolated from the zone of combustion of said chamber and its spark terminals projecting into the interior of said chamber.

2. In a combustion system, in combination with an ignition chamber, and means for supplying fuel thereto to be ignited, a spark plug having its body mounted at a distance from said chamber and its spark terminals extended therefrom and projecting through the wall of said ignition chamber.

3. An enclosed liquid fuel burner including a casing, means for continuously admitting air into and spraying liquid fuel within the same in ignitable relations, means for igniting the fuel, and a thin metal shell spaced from the casing and surrounding the flame and adapted to be heated by contact therewith.

4. In an enclosed electrically ignited burner, a flame passage, a thin-walled shell forming an ignition and mixing space opening into said passage and provided with means for producing a continuous flow of fuel and air into it and with an igniter having its igniting terminal in said space, the thickness of the wall of said shell being proportional to the specific weight of the metal used as represented by the maximum limits of $\frac{1}{16}$th inch for steel and $\frac{5}{32}$nd inch for aluminum.

5. An enclosed liquid fuel burner having a casing and flame passage, a thin-walled enclosure therein forming an ignition and mixing space and separated from the casing by an air space, means providing a constant flow of fuel and air to the ignition space, a spark plug mounted in the casing wall and having an electrode extending to the interior of said thin-walled enclosure.

6. An enclosed liquid fuel burner comprising an ignition chamber for receiving sprayed fuel formed by a metal wall less than $\frac{1}{16}$ inch in thickness, a spark plug having its body isolated from the zone of combustion in said chamber and its spark terminals projecting into the interior thereof, and air and fuel inlet means opening into said chamber and providing a continuous flow of air and fuel into the igniter chamber.

7. An enclosed liquid fuel burner comprising an outer casing, a second casing enclosed therein providing an ignition chamber, the walls of said second casing being spaced from the walls of the outer casing to provide an air space about the ignition chamber, means for admitting liquid fuel and air into said ignition chamber in ignitable relation, and a spark plug means having its body portion mounted in the outer casing and its electrodes extending through said air space, exposed to the air therein, and through an opening in the wall of the second casing into the ignition chamber to ignite the fuel therein.

8. An enclosed liquid fuel burner comprising a casing, a wall dividing the interior of the casing into an ignition chamber and an air space or spaces, means for admitting liquid fuel and air into the ignition chamber in ignitable relations, and an electric igniter means for igniting the fuel in the ignition chamber, said electric igniter means having

its body portion mounted in the casing and its active igniting portions extending through said air space or spaces, exposed to the air therein, and through an opening or openings in said dividing wall into the ignition space.

9. In a combustion system, the combination with an ignition chamber, and means for supplying fuel thereto to be ignited, a spark plug having its body mounted at a distance from said chamber and out of communication therewith, and its spark terminals extended therefrom and projecting through the wall of said ignition chamber.

10. In a liquid fuel burner, an ignition and mixing chamber having an air jet within it for atomizing liquid fuel and a liquid fuel nozzle connected to a fuel source, and having a spark-plug opening with its entrance out of line with the axis of said liquid nozzle, and a spark-plug having an electrode extending from said opening to a spark-gap position in the spray from said nozzle.

11. In a spark ignited liquid fuel burner, an ignition and mixing chamber, means for causing a flow of a fuel and air mixture through the same, an opening in said chamber, and a spark-plug, the body of which does not extend to said chamber but the electrodes of which extend through said opening to a spark-gap position in the path of said mixture.

In testimony whereof, I have signed this specification.

JOHN GOOD.