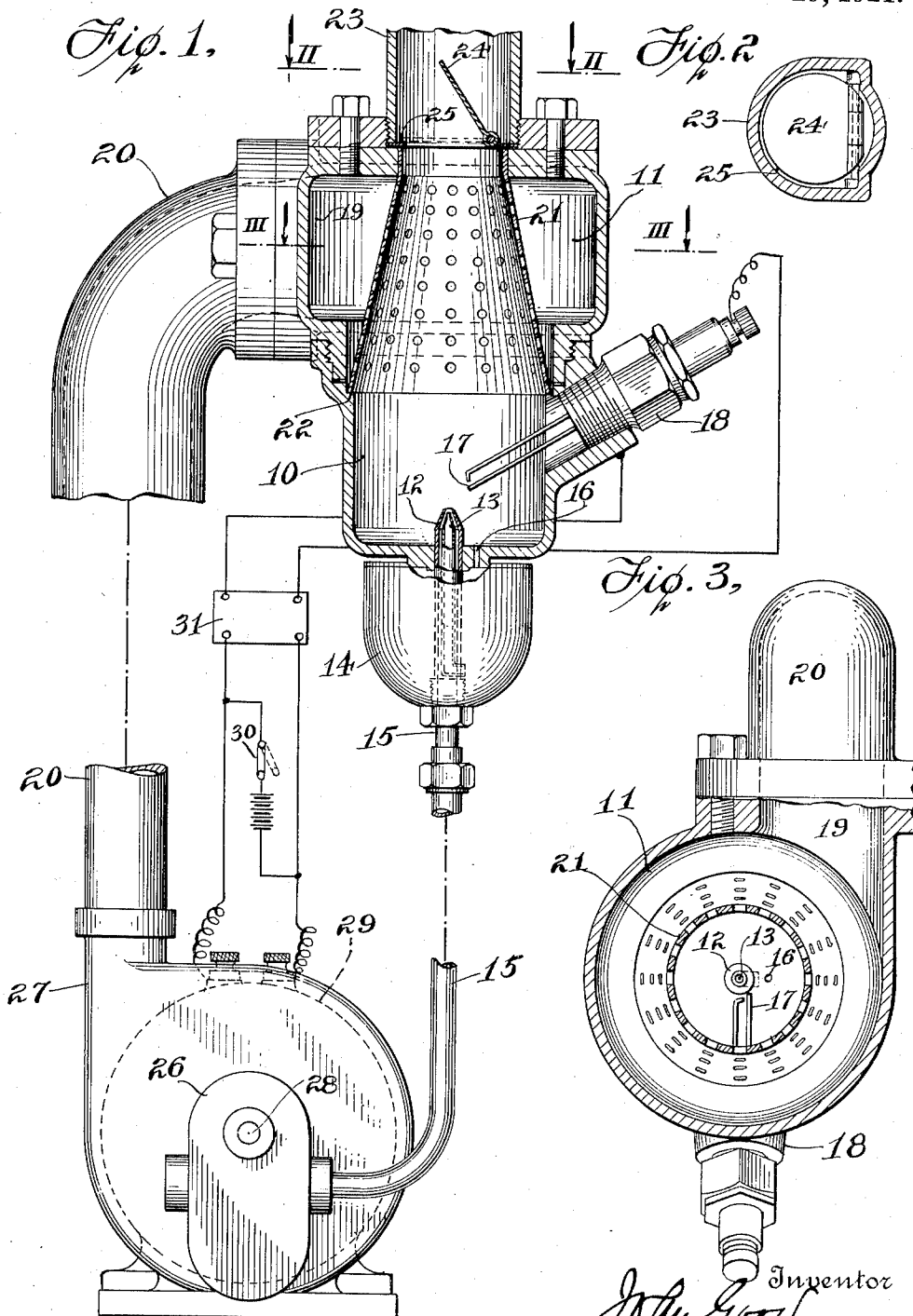


J. GOOD.
COMBUSTION APPARATUS.

APPLICATION FILED JUNE 13, 1917. RENEWED AUG. 24, 1920.

1,373,190.

Patented Mar. 29, 1921.



By

Inventor
John Good
Attorney
McKee & Co.

UNITED STATES PATENT OFFICE.

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

COMBUSTION APPARATUS.

1,373,190.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JOHN GOOD, a United States citizen, residing in Garden city, Long Island, New York, have invented the following-described new and useful Improvements in Combustion Apparatus.

This invention is a heating apparatus of the general type disclosed in my prior Patent No. 1,207,897, issued December 12, 1916, and is adapted to burn kerosene and heavier oils, or other liquid fuels, the fuel being atomized in a confined space at high velocity, ignited cold and non-explosively, and supplied with the proper proportion of combustion-supporting air to produce a forced but continuous flame which may be conducted or directed by a tube to the part or parts to be heated. The main objects of my present invention are to insure the instantaneous and reliable ignition even though the temperature be extremely low, to permit of less accurate, and hence of more economic manufacture, assembly and adjustment of the parts and to render the apparatus generally more efficient in action. One important feature of my invention contributing to these results, is a flap valve, baffle or other movable member, in the outlet from the flame-generating or igniting chamber which normally substantially closes said outlet but automatically moves to or toward open position upon the starting of the fuel atomizing operation.

Although the invention is adaptable to a wide variety of uses, I have in mind particularly the use of it as a preliminary heater for the vaporizer of an internal combustion engine also burning kerosene or heavier oils. The desired results may be secured by various different forms of apparatus according to the specific character of the part or parts to be heated, and it is to be understood that the particular mechanism illustrated in the accompanying drawings is merely one of many different embodiments of my invention and that the details of construction of the particular means illustrated are comparatively unimportant.

In these drawings,
Figure 1 represents, in side elevation, one form of this invention, the burner head being shown mainly in central vertical section, and

Figs. 2 and 3 are transverse sections on the lines II—II and III—III respectively of Fig. 1.

The particular form of apparatus selected for illustration in the accompanying drawings is similar in some respects, to that disclosed in my prior patent above referred to, in that an air nozzle, from which air passes at high velocity, enters the end of a burner chamber substantially axially thereof and in aspirating relation to an oil nozzle. The atomized fuel spray produced by the operation of the two nozzles is intercepted by an electric igniter which ignites the fuel spray without explosion and without initial or preliminary heating and accomplishes this effect even though the fuel be a liquid heavier than kerosene. Supplemental air is supplied to the resulting flame to support combustion but at a point slightly beyond the igniting point. The present burner is however, arranged to operate with the axis of the spray vertical instead of horizontal, which conduces to various advantages in connection with combustion engines.

More specifically, the burner head or flame-generating part of the heating device includes two united parts 10 and 11, the former constituting a nozzle cap and the latter an air admission chamber. As designed for use in a vertical position, the cap is at the bottom below the air admission chamber, and an air nozzle 12 and liquid nozzle 13 project upwardly through its lower end toward the air chamber. These two nozzles are conveniently made concentric and are in aspirating relation so that when air or other pressure is supplied to the nozzle 12 a fine spray of liquid will be produced and discharged upwardly. The liquid nozzle communicates with a liquid supply receptacle 14 through which extends the tube leading to the air nozzle. It will be understood that this receptacle may be supplied from any suitable source, and preferably has a float-controlled inlet valve, not shown, whereby the level is kept substantially constant during operation. The pressure on the liquid is equalized to that existing in the nozzle cap 10, through a hole 16 which also serves to return any excess liquid from the cap to the liquid receptacle and thereby keeps the interior of the burner head clean and the least likely to emit unpleasant odors.

The atomized fuel spray is intercepted by the two opposing electrodes 17 of an electric igniter which electrodes are carried on an insulating plug 18 like an ordinary spark

plug, and are elongated to bring the spark gap in a position within the spray and near, but not exactly at, its axis and one of them is hook-shaped at its end as shown.

5 The air admission chamber, being of somewhat larger diameter than the burner, has an air entrance 19 arranged tangentially and communicating with the supply pipe 20 for the combustion-supporting air. Extending
10 through the air admission chamber and in axial alinement with the spray is a perforated annular wall 21 forming a thin-walled casing through which the flame passes and through the perforations of which the
15 combustion-supporting air enters from the chamber 11. This annular perforated wall serves the important purpose of distributing the air uniformly around the flame. The annular wall as shown is frusto-conical with
20 its larger end of substantially the same size as the nozzle cap and seated upon a shoulder 22 therein and above the igniter, while the smaller or upper end fits within an opening in the outer wall of the air admission cham-
25 ber and communicates with a closed flame tube 23, of any desired length.

Reliability of instant ignition under all circumstances is enhanced by a valve, baffle, or other equivalent movable member, nor-
30 mally substantially closing communication between the burner head and flame tube when the device is not in operation and which automatically moves to open position upon the establishment of ignition of the
35 spray. One form of such a member consists of a hinged flap 24 between the inlet end of the flame tube and the delivery end of the flame generating part or burner head. This flap is hinged along one straight side
40 to a washer-like ring 25 clamped between the flame tube and burner head and serving as a seat for the flap. The flap closes on its seat in the present case by gravity alone and is made of such weight and has such free-
45 dom of movement that while it will normally remain on its seat even though the air supplying apparatus be in operation, it will rise to open position immediately on the establishment of flame in the head. Al-
50 though the igniter is energized simultaneously with the delivery of air the effect is to produce a slight lag in ignition but with very certain igniting results. The flap op-
55 erates to prevent the free escape of the air and spray from the flame-generating part of the head at the instant of the beginning of the operation and thereby aids in preventing a condition of spray or mixture which is otherwise likely to forestall prompt ignition.
60 Self-opening closures of various weights may be used with the same ultimate effect on the reliability of ignition. When the device is opened to upright position it obstructs only slightly the free passage of the flame to
65 the burner tube.

The fuel-atomizing medium delivered to nozzle 12 and the combustion-supporting air delivered to the inlet 19 through pipe 20 may be taken from any suitable source, for ex-
70 ample, an air compressor 26 in the form of a geared or positive pump supplies the pipe 15 with atomizing air and a fan blower 27 supplies the pipe 20. These may be operated from a common shaft 28 so that upon the ro-
75 tation of this shaft, air will be delivered both for spraying and combustion supporting. The particular means illustrated for supplying the air is not essential to this invention and may be replaced by other mechanism
80 such for example as that illustrated in my prior patent and as in that patent the rotation of the drive shaft 28 may also drive a magneto or other electrical device which delivers a sparking current to the igniter
85 simultaneously with the production of the fuel spray. Or as shown in Fig. 1, the drive shaft may be driven by an electric motor 29 shown in rear of the blower 27 under the control of a switch or push button, such as
90 30 which also energizes the spark coil 31 to render the igniter active. Thus the operation of the single switch device automati-
95 cally establishes ignition and combustion and continues the same for as long as desired, the opening of the switch producing an im-
mediate cessation of combustion by discontinuing the supply of fuel.

I claim:

1. The combination of a passage to be heated, a burner head in communication
100 therewith having connections with air and fuel supplies, means for igniting the fuel in said head and means for initially obstructing the free flow of gases from said burner head to said passage.

2. In apparatus of the kind described, the combination of a passage to be heated, a burner head and igniting chamber in com-
105 munication therewith having a fuel atomizing means, means for igniting the atomized fuel, means for supplying combustion-sup-
110 porting air, and means for automatically opening communication between said igniting chamber and said passage after the starting of the fuel spraying operation.

3. In apparatus of the kind described, the combination of a flame tube, a perforated annular casing having one end communicat-
115 ing therewith, means for spraying liquid fuel into the opposite end of said casing, means for igniting said spray, means for delivering combustion-supporting air through
120 said casing, and means for initially obstructing the free flow of gases from said casing to said flame tube.

4. In apparatus of the kind described, the combination of an inclosed flame passage, a burner head communicating therewith,
125 means for supplying liquid fuel and combustion supporting air to said burner head,

means for igniting said fuel in the head and means normally preventing communication between said burner head and said passage and automatically opening after the starting of the fuel delivery.

5. An apparatus of the class described, including an annular, vertically disposed, perforated casing, and containing means for spraying and igniting fuel, means for delivering combustion supporting air through the perforations of said casing, a flame tube connected to the upper end of said casing, and a gravity operated automatically opening valve member at the lower end of said flame tube.

6. Apparatus of the kind described comprising a vertically disposed closed burner head connected to a flame passage at its upper extremity and containing means for producing an upwardly directed atomized liquid fuel spray substantially central of said head, and an electric igniter intercepting said spray within the head, and containing also an air admission and distributing means above said igniter, in combination with a source of pressure to operate said spray-producing means and to supply combustion-supporting air to said air admission and distributing means, and means for energizing said igniter.

7. Apparatus of the kind described comprising a vertically disposed closed burner head formed of an upper air-admission chamber connected to a flame passage at its upper end and a lower chamber containing means for atomizing and projecting upwardly a liquid fuel spray, and containing also an electric igniter directly intercepting said spray, a liquid receptacle to supply said atomizing means, having a pressure equalizing communication with said lower chamber, in combination with air supplying apparatus supplying air to both chambers and electrical apparatus for coincidentally energizing said igniter.

8. Apparatus of the kind described comprising a vertically disposed closed burner head formed of an upper air-admission chamber connected at its upper end to a flame passage of relatively narrow diameter, and a lower chamber containing means for atomizing and projecting upwardly a liquid fuel spray, and an electric igniter directly intercepting said spray, and a liquid fuel supply receptacle below said lower chamber, said spraying means comprising nozzle members extending upwardly through said lower chamber, in combination with air-compressing apparatus supplying air to said admission chamber and nozzle members and means for coincidentally energizing the igniter.

9. Combustion apparatus comprising air forcing mechanism delivering air to a closed

burner head, a fuel nozzle conducting liquid fuel thereto from an external receptacle and a communication between said head and receptacle adapted to communicate the pressure of the former to the latter.

10. Combustion apparatus comprising air forcing mechanism delivering air to a closed burner head, a fuel nozzle conducting liquid fuel thereto from an external receptacle and a passage between the lower part of said head and the receptacle adapted to drain liquid fuel from the former to the latter.

11. Combustion apparatus comprising a vertical chamber having an upwardly directed fuel spraying means mounted in the lower part thereof, and connected at its upper end to a flame passage of relatively smaller diameter, an electric igniter mounted in said chamber with electrodes intercepting the upwardly directed spray, an entrance for combustion-supporting air disposed in position to mix such air with the spray beyond its point of interception by the igniter and means for supplying air through said entrance in proportion to establish substantially complete combustion in said chamber and passage.

12. In apparatus of the kind described, a vertically disposed closed burner head comprising an upper air-admission chamber connected at its upper end to a flame tube of relatively narrow diameter and containing an air-distributing, perforated sleeve or shell and a lower chamber containing means for atomizing and projecting upwardly a liquid fuel spray centrally of said shell and also containing an electric spark igniter directly intercepting said spray and a liquid fuel supply receptacle connected to said lower chamber in combination with means for coincidentally supplying air to said upper chamber and said spraying means and for energizing said igniter.

13. In apparatus of the kind described a vertically disposed, closed burner head comprising an upper air-admission chamber connected at its upper end to a flame tube and containing a thin-walled air-distributing member, a lower chamber containing means for atomizing and projecting upwardly a liquid fuel spray into the upper chamber and containing an electric spark igniter directly intercepting said spray, a liquid receptacle to supply said atomizing means and a drain hole in the bottom of said lower chamber leading to said receptacle, in combination with air compressing apparatus supplying air to both chambers and means for coincidentally energizing said igniter.

In testimony whereof I have signed this specification.

JOHN GOOD.