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Igniter

Robert Goddard
WPI Class of 1908

Aug. 17, 1937. R. H. GODDARD 2,090,039

IGNITER

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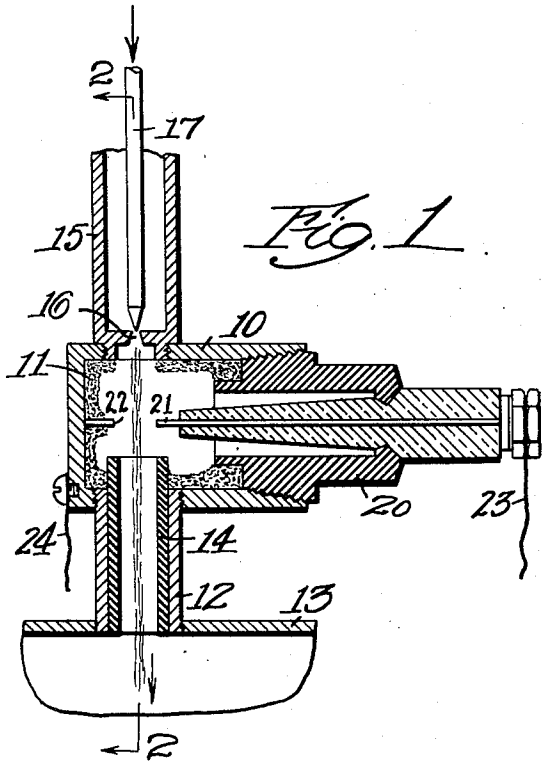

Fig. 1

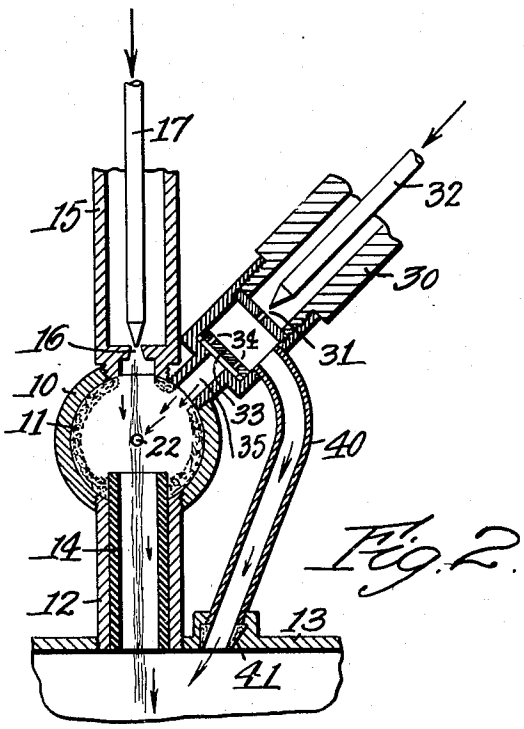

Fig. 2

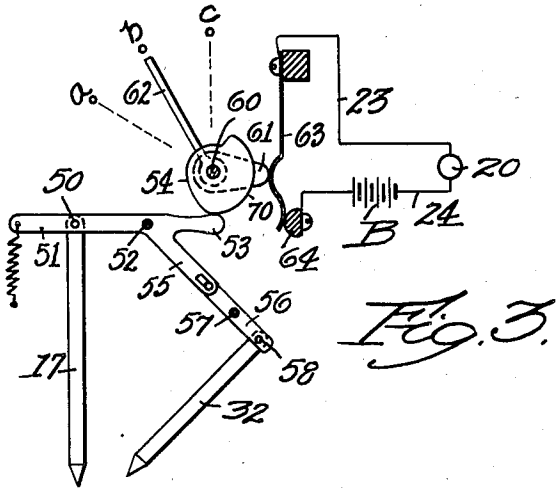

Fig. 3

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2,090,039

IGNITER

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7 Claims. (Cl. 158—28)

This invention relates to continuous combustion apparatus and more particularly to means for starting and maintaining continuous combustion of gases therein.

In the development of my invention, I have provided an igniter having an ignition chamber communicating with the combustion chamber of said apparatus.

It is the general object of my invention to provide improved means for producing and maintaining an ignition flame in said igniter and for projecting said flame into the combustion chamber of said apparatus.

To the attainment of the latter object, a further feature of my invention relates to the provision of means for supplying additional oxidizing fluid to said ignition flame as it enters the combustion chamber.

I also provide an improved control device by which the combustible and oxidizing fluids and the electric spark may be simultaneously turned on, and by further movement of which the spark may be turned off without interrupting the flow of either fluid.

My invention further relates to arrangements and combinations of parts which will be hereinafter described and more particularly pointed out in the appended claims.

A preferred form of the invention is shown in the drawing, in which

Fig. 1 is a sectional side elevation of my improved igniter;

Fig. 2 is a sectional elevation, taken along the line 2—2 in Fig. 1, and

Fig. 3 is a side elevation of one form of control device.

Referring to Figs. 1 and 2, my improved igniter comprises a combustion chamber 10 preferably in the form of a short closed steel cylinder having a refractory lining 11. The chamber 10 is connected and secured by a tube 12 to the wall 13 of the chamber in which continuous combustion is to be maintained. The chamber 10 is of such small capacity that no explosion occurring therein will be appreciable or will be harmful to the combustion apparatus. The tube 12 is preferably provided with a heat-resisting or refractory lining tube 14 which constitutes a communicating passage between the ignition chamber 10 and the combustion chamber 13.

A combustible fluid at low pressure, such as gasoline, is provided for the ignition chamber 10 through a supply pipe 15 and a fine stream of this fluid or gasoline is admitted to the chamber 10 through a small opening 16 controlled by a needle valve 17.

A spark-plug 20 closes the open end of the ignition chamber 10 and is provided with a point or terminal 21 from which the electric spark jumps to a second point or terminal 22, positioned at the opposite side of the path of flow of the stream of combustible fluid entering the chamber through the orifice 16, so that the spark passes along the surface of the stream of fuel where vapor is forming.

Wires 23 and 24 connect the points 21 and 22 to a battery B or other source of electricity, the circuit being conveniently controlled by the control device shown in Fig. 3.

With this construction it will be seen that the path of travel of the spark is transverse to the travel of the stream of combustible fluid, so that the spark passes more or less over the surface of the stream of fluid and will readily ignite the same, provided any oxidizing fluid is also present.

In order to provide such oxidizing fluid, I connect a supply of such fluid under moderate pressure through a second supply pipe 30 (Fig. 2) to one side of the ignition chamber 10, preferably in the inclined position shown in Fig. 2. The pipe 30 is provided with a small orifice 31 controlled by a second needle valve 32.

In order that the stream of oxidizing fluid may not too directly engage the stream of combustible fluid at the ignition point, I provide a baffle plate or disc 33 having a series of perforations 34 and positioned above a restricted passage 35 leading into the ignition chamber 10. The stream of fluid entering through the orifice 31 impinges against and is diffused by the disc 33 and the streams of fluid entering through the perforations 33 impinge against and are diffused by the lower end wall of the member which provides the restricted passage 35.

With this construction the oxygen gas or other oxidizing fluid enters the ignition chamber in a dispersed condition and more or less in the form of a mist or spray rather than in the form of a compact stream which might extinguish the flame in the ignition chamber or break up and scatter the gasoline stream.

Definite and reliable ignition of the mixed gases on the surface of the gasoline stream in the ignition chamber is thus attained, but it is found that such an ignition flame, even when produced, will sometimes burn only feebly, if at all, as it enters the combustion chamber 13, due to lack of available oxygen. Accordingly I provide a by-pass 40 (Fig. 2) from the supply pipe

30 above the baffle plate 33, said by-pass entering the combustion chamber 13 at a point adjacent the point at which the gases from the ignition chamber also enter the chamber 13.

The by-pass 40 is commonly of less cross sectional area than the passage in the tube 14, and the outlet of the by-pass 40 will preferably have a refractory nozzle or tip 41 in the wall of the combustion chamber and this nozzle will be set at an oblique angle as indicated in Fig. 2, so that the oxidizing fluid will be directed obliquely into the path of the ignition flame from the ignition chamber.

With this additional supply of oxidizing fluid, a large and intense ignition flame will be reliably maintained in the combustion chamber for any desired period.

It is desirable that the gas and oxygen as well as the spark shall be turned on simultaneously when the apparatus is started, and it is also frequently desirable to maintain the flow of gas and oxygen through the ignition chamber for a period after the spark is no longer necessary. An illustrative device capable of operating as above described is shown in Fig. 3, in which I have shown the needle valve 17 connected at 50 to a lever 51 which is pivoted at 52 and has a portion 53 engaging a cam 54. The lever 51 also has an arm 55 having a pin and slot connection with a lever 56 pivoted at 57 and connected at 58 to the needle valve 32.

The cam 54 is mounted on a cam shaft 60 which is further provided with a second cam 61 and with a handle 62. The cam 61 engages a spring-plate terminal 63 and forces the same against a second or fixed terminal 64 to complete a circuit through the wires 23 and 24 and the battery B or other source of electricity, thereby closing the circuit through the spark-plug terminals 21 and 22.

The handle 62 has an off position *a*, a position *b* in which the needle valves 17 and 32 are both opened and the circuit through the contact 63 and 64 is closed, and a further position *c* in which the needle valves 17 and 32 remain open but the circuit is broken between the contacts 63 and 64.

In order to accomplish this result, the cam 54 is made concentric in the portion 70, so that no further movement of the lever 51 takes place as the handle moves from *b* to *c* but the cam 61 moves downward out of engagement with the plate 63.

Having thus described my invention and the advantages thereof, I do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claims, but what I claim is:—

1. In combustion apparatus having a chamber for continuous combustion, an igniter for said chamber comprising a relatively small ignition chamber connected to said combustion chamber by a tube of substantially greater length than diameter, means to deliver a stream of liquid fuel through said ignition chamber and through said connecting tube to said combustion chamber, means to supply a diffused gaseous oxidizing agent to said ignition chamber to support surface-combustion about said fuel stream, an ignition device in said chamber, and means to supply additional gaseous oxidizing agent to said surface-ignited fuel stream within said combustion chamber and closely adjacent the inner end of said connecting tube.

2. In combustion apparatus having a chamber for continuous combustion, an igniter for said chamber comprising a relatively small ignition chamber connected to said combustion chamber by a tube of substantially greater length than diameter, means to deliver a stream of liquid fuel through said ignition chamber and through said connecting tube to said combustion chamber, means to supply a diffused gaseous oxidizing agent to said ignition chamber to support surface-combustion about said fuel stream, an ignition device in said chamber, and means to supply additional gaseous oxidizing agent to said surface-ignited fuel stream within said combustion chamber, closely adjacent the inner end of said connecting tube and in a direction inwardly oblique to the path of said fuel stream.

3. In combustion apparatus having a chamber for continuous combustion, an igniter for said chamber comprising a relatively small ignition chamber connected to said combustion chamber by a tube of substantially greater length than diameter, means to deliver a stream of liquid fuel through said ignition chamber and through said connecting tube to said combustion chamber, means to supply a diffused gaseous oxidizing agent to said ignition chamber to support surface-combustion about said fuel stream, and a by-pass from said latter means to said combustion chamber, which by-pass is of less cross section than said connecting tube and which supplies additional gaseous oxidizing agent to said surface-ignited fuel stream within said combustion chamber, closely adjacent the inner end of said connecting tube and in a direction inwardly oblique to the path of said fuel stream.

4. In combustion apparatus having a chamber for continuous combustion, an igniter for said chamber comprising an ignition chamber having an elongated passage communicating with said combustion chamber, means to cause a stream of liquid fuel to flow through said ignition chamber and through said passage to said combustion chamber, means to supply oxygen in diffused condition to said fuel stream in said ignition chamber, means to ignite a surface mixture of oxygen and fuel vapor about said stream, and means to supply additional oxygen to said fuel stream and ignited mixture within said combustion chamber and closely adjacent the point where said fuel stream leaves said passage and enters said chamber.

5. In combustion apparatus having a chamber for continuous combustion, an igniter for said chamber comprising a relatively small ignition chamber having an elongated passage communicating with said combustion chamber, means to supply a stream of liquid fuel to said ignition chamber, means to supply an oxidizing gas to said fuel stream in said ignition chamber, a baffle effective to break up and diffuse the stream of oxidizing gas before it strikes said stream of liquid fuel, and means to pass an electric spark transversely across the surface of said stream in said ignition chamber to effect surface-combustion about said stream.

6. An igniter comprising an ignition chamber, means to cause a fine stream of liquid gasoline to flow through said chamber, means to cause a spark to pass transversely of the surface of said stream from one side to the opposite side of said stream, and means to supply oxygen gas to said chamber, said latter means comprising a passage entering said chamber in the plane of gasoline flow but substantially inclined relative thereto in said plane and means in said passage effective to break up and diffuse the stream of oxygen gas as it approaches

the inner end of said passage and before it engages the gasoline stream.

7. An igniter comprising an ignition chamber, means to cause a fine stream of gasoline to flow through said chamber, means to cause a spark to pass transversely of the surface of said stream in said chamber, means to supply oxygen gas to said chamber and comprising a passage through which said gas flows, and a baffle plate transversely disposed in said passage in the path of said oxygen gas as it enters said chamber, said baffle plate having perforations through which said oxygen gas flows along said passage in dispersed portions, and said passage having portions directly engaged by and dispersing the oxygen gas after passing through said perforations.

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