G. E. CLAPP.

PROCESS OF BURNING LIQUID FUEL.

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1,020,266. Patented Mar. 12, 1912.

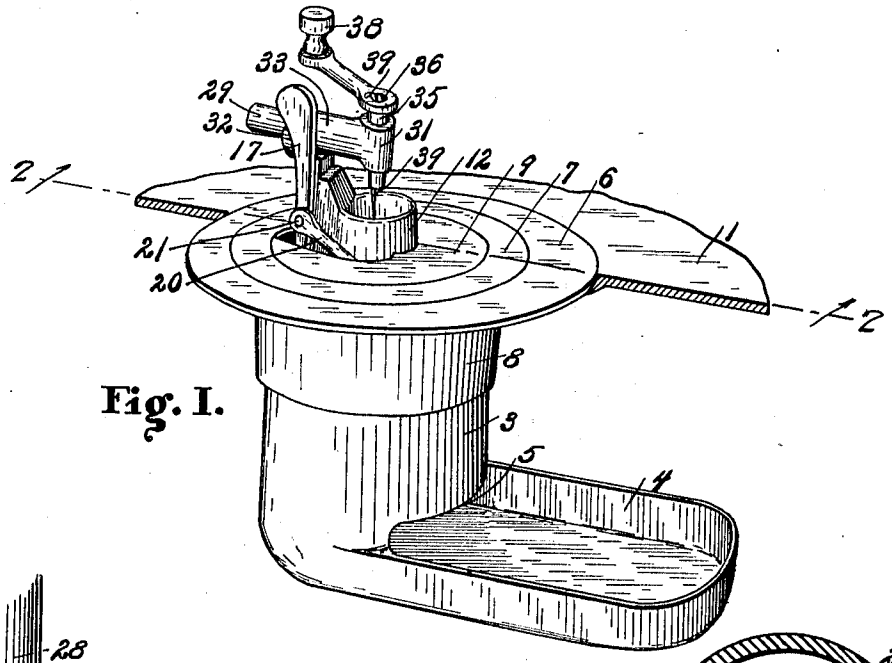

Fig. I.

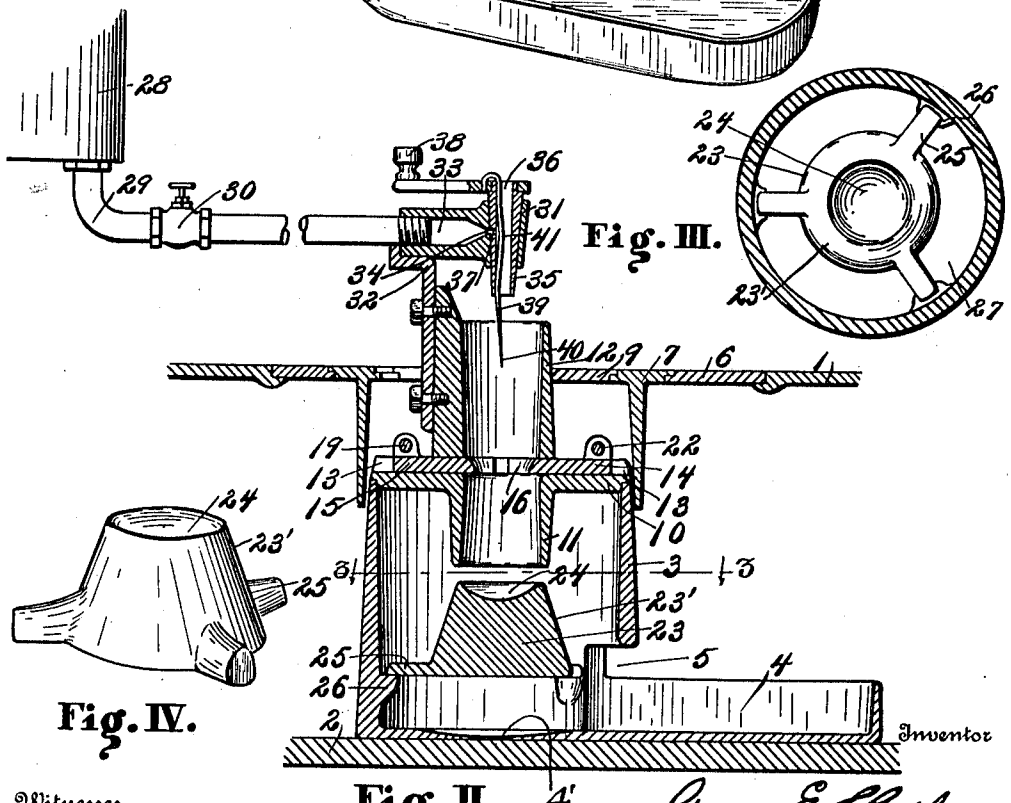

Fig. II.

Fig. III.

Fig. IV.

Witnesses

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PROCESS OF BURNING LIQUID FUEL.

1,020,266. Specification of Letters Patent. Patented Mar. 12, 1912.

Application filed November 14, 1910. Serial No. 592,294.

To all whom it may concern:

Be it known that I, GEORGE E. CLAPP, a citizen of the United States, residing at the city of Kalamazoo, county of Kalamazoo, State of Michigan, have invented certain new and useful Improvements in Processes of Burning Liquid Fuel, of which the following is a specification.

This invention relates to a method or process of burning crude oil or other liquid hydrocarbon fuel.

The objects of the invention are to provide an improved process of converting crude oil or other liquid hydrocarbon into gas, and further, to thus convert and burn simultaneously.

I accomplish the objects of my invention by the devices and means described in the following specification.

I carry out my improved method or process by means of the apparatus illustrated in the accompanying drawing, in which,

Figure 1 is a perspective view of a crude oil burner in place in a cook stove or range, partially shown. Fig. 2 is a vertical longitudinal sectional elevation through the same structure, taken on a line corresponding to line 2—2 of Fig. 1. Fig. 3 is a sectional plan view taken on a line corresponding to line 3—3 of Fig. 2, showing the generator cup and surrounding air passage. Fig. 4 is a detail view of the generator cup.

In the drawing, the sectional views are taken looking in the direction of the little arrows at the ends of the section lines, and similar numerals of reference refer to similar parts throughout the several views.

This apparatus is that appearing in my concurrent application for patent Ser. No. 571,880.

So that my improved process and method will be completely understood, I will describe the apparatus and the method of its operation. Of course my improved process or method can be carried out by any suitable apparatus by which the same results, so far as the method or process is concerned, can be obtained.

Considering the numbered parts of the drawing, I have shown the stove only partially, the same being a portion of an ordinary cooking stove, the top 1 and the bottom 2 being illustrated diagrammatically. Beneath one of the lids I arrange my generator chamber 3, which is provided with a pan-like base extension 4 communicating with the said generator chamber by the opening 5. A ring 6 takes the place of the lid of the stove, and within this ring is supported a second ring 7 having a downwardly projecting flange 8 which telescopes over the top of the generator shell 3. A curved top plate 9 is provided therefor to completely close this top opening except for the tubular air intake 12. A plate 10 with a central opening is provided for the generator 3, having a downwardly-projecting, centrally-arranged, tubular flange 11, and an upwardly-projecting tubular air intake 12 for the air supply, corresponding to and amounting to an extension upwardly of the flange 11. On the top 10 are formed ways 13 in which are damper slides 14 and 15 notched at the centers to form an aperture 16. These are controlled by a lever 17, which is pivotally connected at 19 to the slide 15. A link 20 is pivoted to the lever 17 at 21 and connects by pivot 22 to the opposite slide 14 of the damper, so that on manipulation of the lever 17 the dampers open and close to and from the center, as is very clear from an inspection of Figs. 1 and 2. The details of this mechanism are fully described and illustrated in my concurrent application Ser. No. 571,880, for patent for oil burners, filed July 14, 1910.

In the generator chamber 3 is a cup 23 of a comparatively large mass of cast iron, preferably having a shallow depression 24 formed in the top thereof and having sloping sides 23′ so that the body of this cup is conical in form and of solid metal. This cup 23 is supported in place by radial or spider arms 25, which rest upon ledges or lugs 26 projecting inwardly in the generator chamber 3. A slight depression 4′ for receiving the oil for starting the fire is beneath the cup 23. Because the cup is supported by the spider arms 25 on the lugs 26, an annular air space 27 surrounds the same, down through which the air for supporting combustion is delivered. A fuel tank 28 supplies fuel to the burner through a pipe 29, which terminates in a feed device 31, which is supported on the bracket 32, secured to the air conduit or intake 12. A globe valve 30 is in the pipe 29 as extra precaution to comply with the requirements of fire underwriters. This feed device consists of a chamber 33 which is perforated at its

end at 34, in which is arranged the vertical conical spigot 35, which is tubular in form, having a vertical aperture 36 therethrough open at top and bottom. A lateral aperture 37 leads through the side of this spigot to the central aperture 36, and is adapted to register with the aperture 34 of the chamber for controlling and regulating the delivery of fuel to the burner. A lead wire 39 is secured to the spigot and extends down through the hollow of the same, terminating in a sharp point, as 40. This wire is slightly offset or bent to one side at 41, opposite the aperture 37. A handle 38 is provided for controlling the feed device by adjusting the spigot 35 and thereby regulating the size of the feed aperture.

I have thus described in detail the various parts of my improved structure. I will now indicate the operation of my device and describe the process by which I am able to effectively burn crude petroleum, or any liquid hydrocarbon which is at all volatile or capable of gasification.

In the operation of my improved device, fuel is placed in the tank 28 and is delivered through the pipe 29 into the chamber 33, which is comparatively large and is delivered to the small aperture 34, which is controlled by the spigot 35, which is tubular, having a vertical opening 36 therethrough. A small transverse opening 37 in the spigot coöperates with the hole 34. Oil is delivered freely down through the tubular spigot along the leading wire 39 and drizzles off in a fine stream or in a series of very small drops at the point 40. It drops down into the depression 24 in the generator cup 23 and drizzles over into the depression 4′ in the pan 4, and, when the fire is lighted, it immediately heats up the mass of metal constituting the cup 23. As soon as this metal is heated, air is drawn down through the intake passage 12 and delivers onto the oil contained in the cup and mixes with the vapor and gas and proceeds to burn. The heavy body of the cup 23 thus becomes quite highly heated so that the oil that drops onto the depression 24 in the top thereof assumes a spheroidal form and has the appearance of molten lead or metal in a ladle. It is evaporated and gasified by the heated body of the cup 23 and passes as vapor and gas from the cup without any overflow, when it is mixed with the air that is delivered downwardly into this mixing chamber.

The amount of air and the amount of fuel has to be very carefully regulated, and, when the supply of fuel is cut down, it is necessary also to cut down the supply of air by regulating the damper by means of the lever 17. When the volume of fuel is increased, it is necessary to open the damper. So nice is this adjustment necessary that, if the volume of oil is too large for the amount of air, the fuel will burn with a smoky flame and an unsatisfactory result will be obtained, and eventually the fire will go out. On the other hand, if the damper is opened too wide for the amount of fuel, the flame soon burns the fuel and becomes so low that the gas is not generated and the flame flashes out. Further, it is necessary that the fuel be delivered in a constant small stream. If, in the apparatus here illustrated, which is substantially drawn to scale, the wire 39 is removed and the oil allowed to drip from the larger aperture of the spigot, the size of the drops will be so large and the interval between the same will be so great that the fire will practically go out between times. It is necessary to insure success that a constant quantity of the oil be delivered, and, when this is done and the right amount of air for supporting combustion for this volume is delivered, the heavy body 23 of the cup will become heated and enough heat will be stored to immediately vaporize and gasify the oil that may be needed to properly maintain combustion. I have described a small stream which is exactly what occurs with crude oil. The stream consists of very fine drops when lighter, less viscid oil, as kerosene, is used. A depression in this cup should be rounded at the bottom and be of such depth as to retain the fuel in the spheroidal form, but should not be deeper than is required to hold the proper amount of fuel.

By my method, a quantity of the liquid hydrocarbon or crude oil is delivered continuously and in a fine stream to a heated cup or receptacle, which is of such mass and temperature as to immediately throw the fuel into the spheroidal form. This enables the temperature of the cup to be kept at such a high degree that as soon as the temperature of the fuel drops sufficiently so that the fuel will contact with the cup, a quantity of gas is at once generated. This gas is burned immediately and reacts upon this receptacle to maintain a sufficient temperature by storing the heat to insure this spheroidal condition. If the cup is filled too full, a very violent boiling occurs, which immediately reduces the quantity to the required point to properly maintain the equilibrium of the device. It will be remembered that the volatile fuel has a very pronounced cooling effect, if it contacts with the metal. It is this complete control and the holding the bulk in the spheroidal condition that enables the rapid and complete conversion of small quantities into gas immediately, which secures the valuable results which I obtain. If the whole volume of the fuel were heated, the temperature would drop too low for the conversion.

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

1. The method of vaporizing crude oil or similar fuels, which consists in supplying fuel in the form of a thin, substantially continuous stream upon a suitable receiving surface and maintaining at this surface a temperature sufficient to cause the liquid fuel to assume and maintain a spheroidal state.

2. The method of vaporizing crude oil or similar fuels, which consists in supplying fuel in the form of a thin, substantially continuous stream into a suitable shallow receiving receptacle and maintaining at the surface thereof a temperature sufficient to cause the liquid fuel to assume and maintain a spheroidal state.

3. The method of vaporizing and burning crude oil or similar fuels, which consists in supplying fuel in the form of a thin, substantially continuous stream into a suitable shallow receiving receptacle and maintaining at the surface thereof a temperature sufficient to cause the liquid fuel to assume and maintain a spheroidal state and delivering a current of air of sufficient volume to insure complete combustion of the fuel and maintain the temperature.

In witness whereof, I have hereunto set my hand and seal in the presence of two witnesses.

GEORGE E. CLAPP. [L. S.]

Witnesses:
L. G. GREENFIELD,
M. L. GLASGOW.