Feb. 19, 1929. 1,702,642

H. C. CALDWELL

HEAT GENERATOR

Filed Sept. 9, 1924

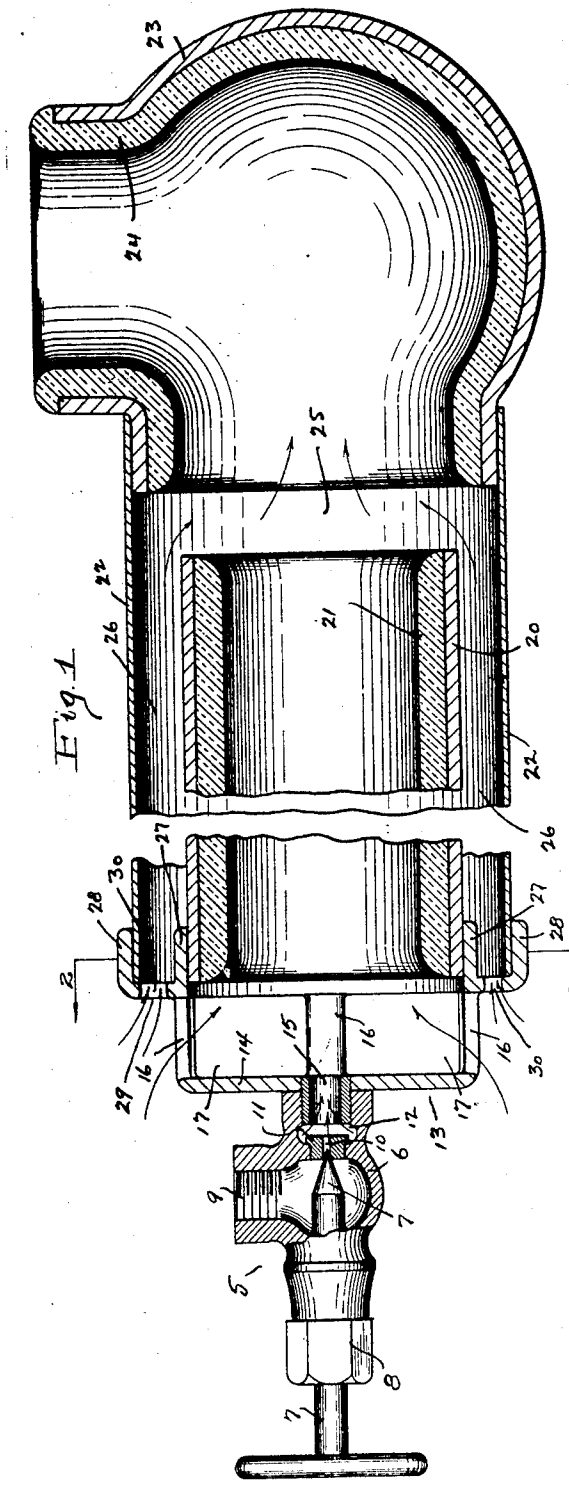

Fig. 1.

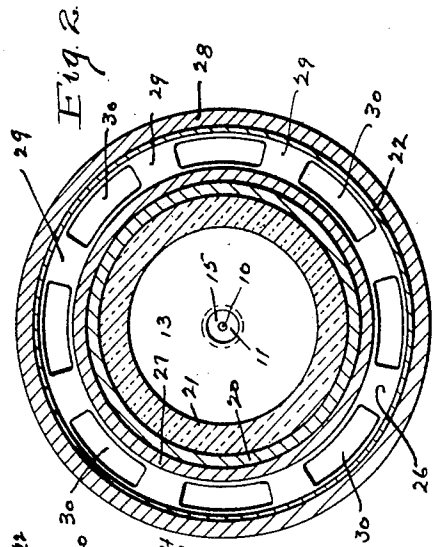

Fig. 2.

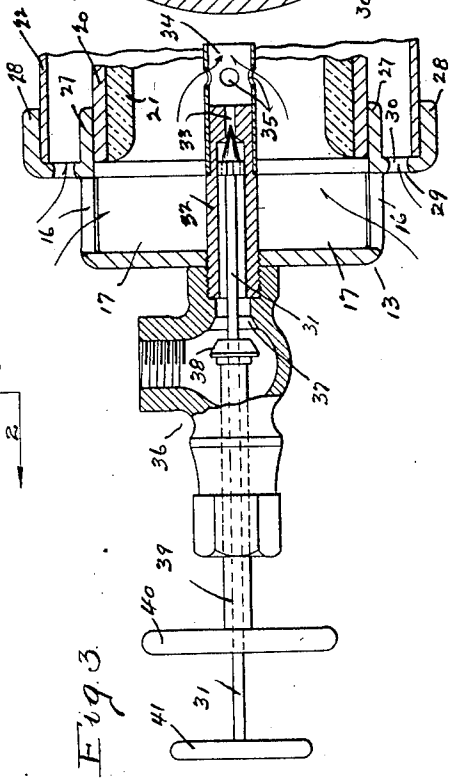

Fig. 3.

Inventor
Henry C. Caldwell
by J. Wm. Ellis
Attorney.

Patented Feb. 19, 1929. 1,702,642

UNITED STATES PATENT OFFICE.

HENRY C. CALDWELL, OF BUFFALO, NEW YORK.

HEAT GENERATOR.

Application filed September 9, 1924. Serial No. 736,718.

My invention relates in general to gas heat generators in which the mixture and combustion of the gas products occur entirely within the device, which differ from the ordinary gas burner in which the mixture of gas and air passes into a chamber or spreader from which it flows and after which it is ignited.

An object of my invention has been to provide a heat generator in which ignition of the products of combustion will take place within the device under all gas pressures and loads without manual regulation and without backfiring.

Another object has been to provide a device in which the point at which ignition takes place is not constant, but which varies with varying pressures and loads.

Another object has been to provide a device in which all the heat shall be generated within the device and then conducted in one volume to the work, such generated heat being in a state of compression before leaving the outlet of the device, whereby its velocity is increased before it reaches the point of contact with the work.

Another object has been to provide a device in which all air inlets are made permanent in size.

Furthermore, my device is so designed that all the radiant heat from the generator is utilized to preheat the secondary air used in the generator.

Moreover, my device is of such a nature that ignition may be made to occur within the generator each time auxiliary air is added.

The above objects and advantages have been accomplished by the device shown in the accompanying drawings, of which:

Fig. 1 is a sectional elevation of my heat generator.

Fig. 2 is a transverse, sectional elevation taken on line 2—2 of Fig. 1.

Fig. 3 is a fragmentary, sectional view showing a modification of my invention.

Referring to the form of invention shown in Figs. 1 and 2, 5 represents a gas control valve having a body 6 and a needle valve 7. The valve body is, of course, provided with the usual stuffing box 8 for packing the needle valve 7. 9 represents the gas inlet for the valve and 10 the gas outlet orifice of my device. This outlet orifice is formed centrally in an orifice plug 11. The orifice plug is fitted by any suitable means into the valve body 6 and may be replaced by another plug having the correct size gas orifice for existing gas conditions. The needle valve 7 is, of course, engageable with the orifice 10. The gas body 6 is provided with a lateral slot 12 immediately in front of the orifice plug 11, whereby air from the atmosphere will be supplied to the stream of gas coming from the orifice 10, thus providing a low pressure combustion chamber. The size of the slot is such that only sufficient air may be admitted to the generator to properly support combustion when the gas is at its minimum pressure.

The device is provided with a generator head 13, having a disc 14. The valve 5 is connected centrally to the disc 14 by means of a pipe nipple 15 which screws into the disc 14 and into the valve 5. The pipe 15 thus forms the low pressure combustion chamber above referred to, and it is in line and, preferably, centrally arranged with respect to the gas orifice 10, whereby the gas coming from the orifice and the admixed air coming from the slot 12 will be passed through the nipple 15. The generator head is provided with a plurality of spacing arms 16, whereby a plurality of intermediate air openings 17 are provided.

The generator head with the valve arrangement may be connected to any suitable device in which heat is to be generated, such as a boiler, a heater, and the like. For convenience, in the drawings, I have shown a generator comprising an inner tube 20 provided with a refractory lining 21 forming an intermediate pressure chamber. An outer tube 22 is also provided, which preferably carries at its outer end an elbow fitting 23 thereby forming a high pressure combustion chamber whereby the heat generated is directed upwardly, the fitting being provided with a refractory lining 24. The tube 20 with its lining 21 is of such a length that there is a space 25 between its outer end and the inner end of the elbow fitting 23. This space is in open communication with the air space 26 between the tubes 20 and 22. In order to properly support the tubes 20 and 22, I provide the generator head with flanges 27 and 28 with which the tubes 20 and 22 are respectively engageable. The flanges 27 and 28 are connected by a plurality of arms 29, whereby a plurality of auxiliary air spaces 30 are provided through which air is supplied to the air space 26. For convenience of terminology, I have called the chambers formed by the tube 20

and lining 21, and the fitting 23 and lining 24, multiple combustion, or high pressure, chambers. Obviously more than two such multiple chambers may be employed if desired.

The form of invention shown in Fig. 3 is designed primarily for the purpose of lessening the noise of combustion which may occur in the form of invention shown in Fig. 1. In order to do this, the needle valve 31 is carried past the air opening 17 in the generator head 13, and a tube 32 serves to form a guide and support for the valve 31, and it is provided at its outer end with a restricted orifice 33. Mounted over the end of this tube is a tube 34, which is provided with a plurality of apertures 35 through which the first stage of auxiliary air passes. The valve 36 in this form of the invention is provided with an ordinary angular seat 37 with which a shut-off valve 38 is engageable. The shut-off valve is carried by a hollow valve stem 39 through which the needle valve 31 passes. The stem 39 is provided with an actuating wheel 40 and the stem 31 with a similar wheel 41. In this form of the invention the supply of gas to the needle valve may be shut off by means of the valve 38 without disturbing the adjustment of the needle valve. For illustrative purposes this form of the invention is also connected to the tubes 20 and 22.

From the foregoing, it will be clear that when the form of invention shown in Figs. 1 and 2 is operated, gas will pass from the valve body 6 through the orifice 10 and be projected at a velocity corresponding to the gas pressure and the size of the orifice used, past the air opening 12, and into the nipple connected to the generator head 13. In passing the air opening 12, the gas will be admixed with air coming through said opening and initial combustion will occur a distance in front of the orifice depending upon the pressure of the gas and the size of the orifice. As this mixture passes into the generator head, additional air is admixed with it coming through the openings 17 in the head and further combustion occurs within the tube 20 and its refractory lining 21. The refractory lining due to the heat present becomes incandescent and serves to aid combustion and increases the pressure of the products of combustion within the tube, as well as to increase its velocity toward the outlet of the generator. When the flame within the generator reaches the space 25, additional air will then be added to it coming from the air space 26 which is supplied with air from the atmosphere through the series of openings 30. All radiant heat from the tube 20 and lining 21 serves to heat the air within the air space 26 so that this air when supplied to the flame as it passes the space 25 is preheated, whereby combustion is aided, and the loss of radiant heat from the generator reduced. It will thus be seen that the heat generated within the tube 20 and within the elbow fitting 23 will be the result of complete combustion, and that this heat will be conducted through the upper opening of the elbow fitting directly to the work.

In my device the interspaced air openings are each so proportioned that proper amounts of air will be added to the gas at the several points to properly support combustion. The slot 12 is so proportioned that only sufficient air is allowed to pass through the slot and mix with the gas to make a combustible mixture when the gas is at its minimum pressure and volume, thereby preventing backfiring.

In operation, the device shown in Fig. 3 is very similar to that just above described except that the first air admixed with the gas coming from the orifice 33 is supplied through the opening 35 and the tube 34. Additional air is supplied to the first combustion through the openings 17 and openings 30 as above described.

While I have shown and described my device in connection with gas, it is obvious that oil or any other hydrocarbon may be used while maintaining all the advantages of my heat generator.

Obviously some other modifications of the forms herein shown and described may be made without departing from the spirit of my invention, or the scope of the appended claims, and I do not, therefore, wish to be limited to the exact embodiments herein shown and described, the forms herein shown and described being merely preferred forms thereof.

Having thus described my invention, what I claim is:

1. A heat generator comprising a gas control valve provided with a body which is formed with an uninterrupted gas orifice and a valve air opening located immediately in front of the gas orifice, a solid needle valve for controlling the size of the gas orifice, a generator head carrying the valve and formed with intermediate air openings and with a plurality of auxiliary air spaces, a low pressure combustion chamber carried by the head and located immediately in front of the valve air opening, an intermediate pressure combustion chamber carried by the head and in communication with the intermediate air openings of the head, a jacket carried by the head and arranged in interspaced relation with the intermediate pressure combustion chamber and in front of the auxiliary air spaces of the head, and a high pressure combustion chamber carried by the forward end of the jacket and having its rear end arranged in interspaced relation with the forward end of the intermediate pressure combustion chamber.

2. A heat generator comprising a gas control valve provided with a body which is formed with an uninterrupted gas orifice and

a valve air opening located immediately in front of the gas orifice, a solid needle valve for controlling the size of the gas orifice, a generator head carrying the valve and formed with intermediate air openings and with a plurality of auxiliary air spaces, a low pressure combustion chamber carried by the head and located immediately in front of the valve air opening, an intermediate pressure combustion chamber carried by the head and in communication with the intermediate air openings of the head, a jacket carried by the head and arranged in interspaced relation with the intermediate pressure combustion chamber and in front of the auxiliary air spaces of the head, and an angularly shaped high pressure combustion chamber carried by the forward end of the jacket and having its rear end arranged in interspaced relation with the forward end of the intermediate pressure combustion chamber.

In testimony whereof, I have hereunto signed my name.

HENRY C. CALDWELL.