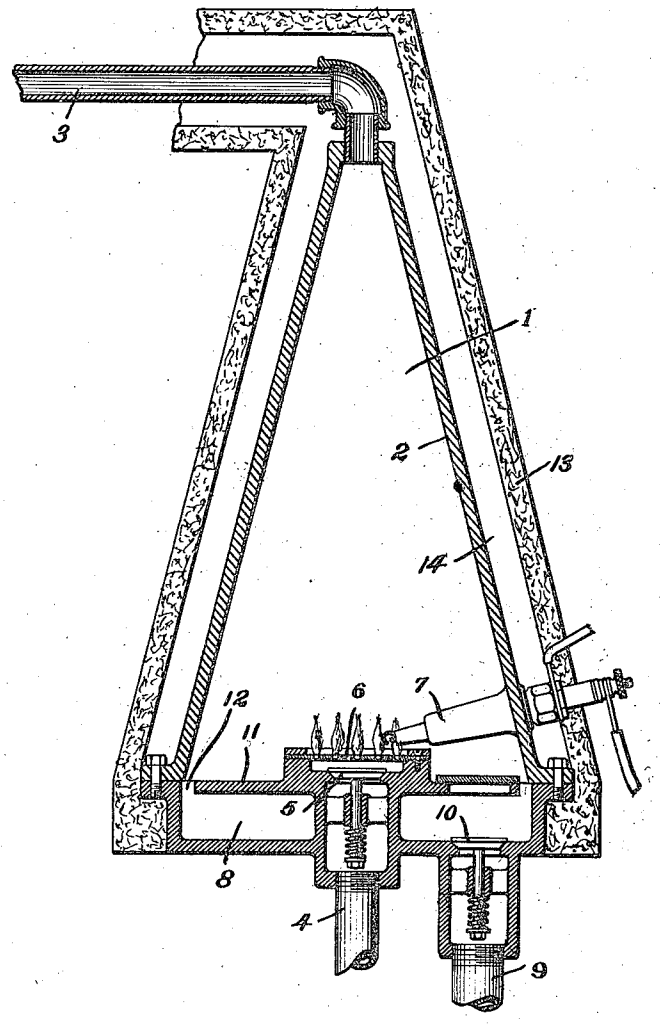
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FLUID PRESSURE GENERATOR.

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1,191,235. Patented July 18, 1916.



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UNITED STATES PATENT OFFICE.

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FLUID-PRESSURE GENERATOR.

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To all whom it may concern:

Be it known that I, ERNST RICHTER, a citizen of the United States, residing at Cincinnati, Hamilton county, Ohio, have invented certain new and useful Improvements in Fluid-Pressure Generators, of which the following is a specification.

This invention relates to a device for generating a pressure in fluid, by the action of heat on a combustible fluid, the fluid under pressure being led away from the generator for such use as is desired, preferably in a motive-power engine.

The invention will be readily understood from the following description taken in connection with the accompanying drawing which is a vertical section of a generator exemplifying my invention.

In the drawing: 1, indicates a combustion-chamber, illustrated as being of conical form with its small end upward: 2, the conical inwall of this chamber, this inwall being smooth or uninterrupted from its base to its top: 3, an outlet pipe connected with the top of the combustion-chamber and adapted to convey the pressure-fluid to the engine or other device for utilizing it: 4, a fluid injection-pipe communicating with the base of the combustion-chamber and adapted to convey to the combustion-chamber a combustible fluid, as a suitable mixture of gas and air, the pipe 4 being intended for connection with a suitable pump for injecting the fluid under pressure into the base of the combustion-chamber: 5, a normally closed valve closing communication between the fluid injection pipe and the combustion-chamber, this valve seating against the pressure in pipe 4: 6, a burner disposed in the base of the combustion-chamber over valve 5 so that the combustible fluid entering the combustion-chamber must pass through the burner, the burner being illustrated as a diaphragm with a number of gas ajutages at which flames will burn as the combustible fluid passes through them: 7, an igniting device, illustrated as a spark-plug, of well known form, this igniter being supported by the combustion-chamber in position to produce effective sparking at the burner: 8, an air chamber below the floor of the combustion-chamber: 9, an air injection-pipe leading to this air-chamber and adapted to convey to the air chamber air under pressure: 10, a valve, similar to valve 5, between air-chamber 8 and air injection-pipe 9 and closing against the pressure in pipe 9: 11, the floor of the combustion-chamber: 12, a marginal slot placing air chamber 8 in communication with the base of the combustion-chamber at the base of the inwall of the combustion-chamber: 13, a jacket of non-conducting material, mineral wool for instance, disposed exterior to the combustion-chamber and exterior to so much of outlet pipe 3 as is deemed expedient: and 14, a dead air space formed between the non-conducting jacket and the combustion-chamber and the outlet pipe.

It is immaterial to the present invention as to how the pressure is to be produced through fluid pipe 4 for the injection of the combustible fluid, or through pipe 9 for the injection of air, but in case the pressure-fluid is to be utilized in the actuation of a motive-power engine it is preferred that the pressure in these pipes be produced by pumps suitably driven from the engine. Pipe 4 must convey to the combustion-chamber, through the burner, a combustible mixture in such volume and in such periods as to satisfy the withdrawals of pressure-fluid from the combustion-chamber through pipe 3.

The burner 6 is to be of such character that flames burning above it will not light back, such character of burner being attained by a perforated diaphragm or wire gauze having such small fluid passages as will prevent the lighting back, after the teachings of Sir Humphrey Davy.

The burner and igniter may be of any usual character appropriate to the igniting and burning of combustible gas under pressure.

Valves 5 and 10 close against the pressure in their pipes when exposed to a superior pressure upon their upper surfaces and it is preferred to provide them with springs, as illustrated, for holding them normally closed. With a given pressure in the combustion-chamber, the pressure in pipes 4 and 9 must exceed that pressure at the time when injection is to take place, and these valves will be normally closed when the pressure in pipes 4 and 9 does not exceed that in the combustion-chamber. Assume, now, for the moment, that outlet-pipe 3 is to convey the pressure-fluid from the generator to some device, a fluid-pressure turbine, for instance, producing a substantially constant draft upon the generator. Combustible fluid, as a

suitable mixture of gas and air, for instance, is injected into the base of the combustion-chamber through the burner. The igniting device lights the flames of the burner and the mixture burns and expands, the expanded hot products in the combustion-chamber going through outlet-pipe 3 to the utilizing device. If the withdrawal from the combustion-chamber is constant then the injection of the combustible mixture should be substantially constant, and, as the igniting device is acting all the time, the burner will be kept constantly burning and the injected combustible fluid always burning and expanding. While the pressure under which the combustible-fluid is injected into the combustion-chamber must exceed that in the combustion-chamber, the volume injected will, of course, be very much less than the volume of the burned mixture. On the above assumption that there is a substantially continuous injection of combustible-fluid under pressure and a substantially constant withdrawal of the high pressure products from the generator, the valve 5, which is a check-valve, may not be essential though it serves to prevent the possibility of any excessive pressure going back from the combustion-chamber to injection-pipe 4.

As it is desirable to discharge from the generator the products of combustion at high heat in order to utilize the expansion of the products as the temperature falls, it becomes of importance to conserve the heat of the products and prevent radiation through the wall of the generator and pipe 3. Non-conducting jacket 13 and dead-air space 14 serve largely in conserving this heat, but I go still further and surround the hot products with a jacket of air between them and the wall of the generator. Air injected into the generator through pipe 9 enters the combustion-chamber at the base of its inwall and goes up along the smooth or uninterrupted surface of this inwall surrounding the core of hot products, this jacket of air within the combustion-chamber serving in preventing the hot products coming in direct contact with the wall of the combustion-chamber, thus preventing the hot products from acting on and destroying the wall of the combustion-chamber and preventing the products from imparting their heat to the wall and thus lessening the degree of radiation of heat. Owing to the conical character of the combustion-chamber the jacketing air is held inward as it proceeds to the top of the combustion-chamber, the general aspect thus being that of a tapering core of hot products going to the outlet pipe and surrounded, while in the combustion-chamber, with a jacket of air, the core of hot products becoming smaller as they proceed upward and therefore calling for less air for the purpose of jacketing them. The air injected for this jacketing purpose must, of course, be in excess of the pressure in the combustion-chamber and no dynamic advantage is to be expected to accrue directly from this air. Some of this jacketing air may undesirably commingle with the products, but, to whatever extent this occurs, the jacketing air joins the expanded products and goes out through the outlet pipe and becomes available as part of the utilized pressure-fluid. This jacket air, thus going out of the generator gives back, of course, no more energy than was put into it in injecting it into the combustion-chamber but it has served, as above explained, in insulating the core of burned products from the wall of the combustion-chamber thus protecting the wall and conserving the heat of the products.

In the above assumption there has been a constant draft upon the generator and a constant supply of combustible fluid to the combustion-chamber, and a constant supply of air injected through pipe 9 to form the air jacket for the core of burning and burned fluid. Assume, now, that pipe 3 goes to a reciprocating motor, of a type substantially similar to an ordinary steam engine arranged to work steam largely by expansion. In such case pipe 3 will have no outlet until the valve of the engine opens and admits the pressure-fluid from the generator. When this occurs then the pressure in the combustion-chamber will fall according to the known laws of expansion, and decrease in temperature, and when the cut-off valve of the engine closes then the pressure-fluid in the engine works by expansion. Prior to the beginning of the next stroke of the engine the injection of combustible fluid into the combustion-chamber should be repeated so that, at the beginning of each stroke, the engine may be supplied by the generator with fluid at working pressure and capable of being utilized under such degree of expansion in the engine as is thought expedient.

It is to be observed that the burner is disposed centrally of the combustion-chamber. While there may be no explosion of the combustible mixture, the burning of that mixture will be the fiercest over the burner and the temperature will consequently be higher over the burner than at points further removed from the burner sidewise. This disposition of the burner, of itself, tends to protect the wall of the combustion chamber from the hottest zone of the burning gases, and the conical form of the combustion chamber yields room for a comparatively large volume of content for the burning gases in their zone of fiercest burning.

It should be explained that the jacketing air injected by pipe 9 not only interposes an insulating medium between the hot prod-

ucts in the combustion chamber and the wall of the combustion chamber, but also interposes an insulating medium between the hot products and such ultimate outer surface as may be capable of radiating the picked-up heat to the atmosphere, and that the heat picked-up by the insulating air results in the expansion of that air and goes to the point of utilization and becomes available.

I claim:—

1. A fluid pressure generator comprising, a combustion-chamber having an inwall converging from its base to its top, an outlet pipe communicating with its top and adapted to convey expanded products therefrom to a device adapted to utilize them, an inlet-pipe leading to the base of the combustion chamber and adapted to convey a combustible mixture to the combustion chamber under pressure, a burner disposed between said inlet-pipe and the interior of the combustion-chamber, an igniting device disposed within the combustion chamber and adapted to ignite the combustible mixture coming into the combustion chamber through the burner, and an air entrance at the base of the inwall of the combustion-chamber independent of the inlet-pipe conveying the combustible mixture to the chamber, combined substantially as set forth.

2. A fluid pressure generator comprising, a combustion chamber having a smooth or uninterrupted interior surface, an outlet pipe communicating with its top and adapted to convey expanded products therefrom to a device adapted to utilize them, an inlet-pipe leading to the base of the combustion chamber and adapted to convey a combustible mixture to the combustion chamber under pressure, a burner disposed between said inlet-pipe and the interior of the combustion-chamber, an igniting device disposed within the combustion chamber and adapted to ignite the combustible mixture coming into the combustion chamber through the burner, and an air inlet-pipe entirely independent of the first-mentioned inlet-pipe and adapted to deliver air under pressure all around the base of the combustion chamber at the inwall thereof to jacket the core of burning gases within the combustion chamber, combined substantially as set forth.

3. A fluid pressure generator comprising, a combustion chamber having a smooth or uninterrupted interior surface, an outlet pipe communicating with its top and adapted to convey expanded products therefrom to a device adapted to utilize them, an inlet-pipe leading to the base of the combustion chamber and adapted to convey a combustible mixture to the combustion chamber under pressure, a burner disposed between said inlet-pipe and the interior of the combustion chamber, an igniting device disposed within the combustion chamber and adapted to ignite the combustible mixture coming into the combustion chamber through the burner, an air inlet-pipe independent of the first-mentioned inlet-pipe adapted to deliver air under pressure to all around the base of the combustion chamber at the inwall thereof to jacket the core of burning gases within the combustion chamber, and a valve between said air-inlet pipe and combustion chamber and closing toward the air-inlet pipe but adapted to open when the pressure in the air-inlet pipe exceeds that in the combustion chamber, combined substantially as set forth.

4. A fluid pressure generator comprising, a combustion-chamber having an inwall converging from its base to its top, an outlet pipe communicating with its top and adapted to convey expanded products therefrom to a device adapted to utilize them, an inlet-pipe leading to the base of the combustion chamber and adapted to convey a combustible mixture to the combustion chamber under pressure, a burner disposed between said inlet-pipe and the interior of the combustion chamber, an igniting device disposed within the combustion chamber and adapted to ignite the combustible mixture coming into the combustion chamber through the burner, and an air inlet-pipe independent of the first-mentioned inlet-pipe adapted to deliver air under pressure to the base of the combustion chamber at the inwall thereof to jacket the core of burning gases within the combustion chamber, combined substantially as set forth.

5. A fluid pressure generator comprising, a combustion chamber having a smooth or uninterrupted interior surface, an outlet pipe communicating with its top and adapted to convey expanded products therefrom to a device adapted to utilize them, an inlet-pipe leading to the base of the combustion chamber and adapted to convey a combustible mixture to the combustion chamber under pressure, a burner disposed between said inlet-pipe and the interior of the combustion-chamber, an igniting device disposed within the combustion chamber and adapted to ignite the combustible mixture coming into the combustion chamber through the burner, an air-chamber disposed below the base of the combustion chamber, a passage leading therefrom to the combustion chamber all around the base of the inwall of the combustion chamber, and an air-inlet pipe connected with said air chamber independent of the first-mentioned inlet-pipe and adapted to convey thereto air under pressure to form an insulating jacket at the inwall of the combustion-chamber, combined substantially as set forth.

6. A fluid pressure generator comprising, a combustion chamber of conical form with

its smaller end at its top, an outlet pipe communicating with its top and adapted to convey expanded products therefrom to a device adapted to utilize them, an inlet-pipe leading to the base of the combustion chamber and adapted to convey a combustible mixture to the combustion chamber under pressure, a burner disposed between said inlet-pipe and the interior of the combustion chamber, an igniting device disposed within the combustion chamber and adapted to ignite the combustible mixture coming into the combustion chamber through the burner, an air chamber disposed below the base of the combustion chamber, a passage leading therefrom into the combustion chamber at the base of the inwall of the combustion chamber, and an air inlet-pipe communicating with said air chamber and adapted to inject air thereto under pressure to form an insulating jacket at the inwall of the combustion chamber, combined substantially as set forth.

7. A fluid pressure generator comprising, a combustion chamber of conical form having its smaller end at its top, an outlet pipe communicating with its top and adapted to convey expanded products therefrom to a device adapted to utilize them, an inlet-pipe leading to the base of the combustion chamber and adapted to convey a combustible mixture to the combustion chamber under pressure, a burner disposed between said inlet-pipe and the interior of the combustion chamber, an igniting device disposed within the combustion chamber and adapted to ignite the combustible mixture coming into the combustion chamber through the burner, a valve disposed between said inlet-pipe and burner and closing against the pressure in the inlet-pipe but adapted to open when said pressure exceeds that in the combustion chamber, an air chamber disposed below the base of the combustion chamber, a passage placing said air chamber in communication with the combustion-chamber at the inwall of the combustion chamber and adapted to permit the passage of air from the air chamber to the inner surface of the wall of the combustion chamber to form an insulating jacket around the core of burning gases within the combustion chamber, an air inlet-pipe leading to said air chamber, and a valve disposed between said air chamber and air inlet-pipe and closing against the pressure in the air inlet-pipe but adapted to open when the pressure in the air inlet-pipe exceeds that in the combustion chamber, combined substantially as set forth.

8. A fluid pressure generator comprising, a combustion chamber having a smooth or uninterrupted interior surface, an outlet pipe communicating with its top and adapted to convey expanded products therefrom to a device adapted to utilize them, an inlet-pipe leading to the base of the combustion chamber and adapted to convey a combustible mixture to the combustion chamber under pressure, a burner disposed between said inlet-pipe and the interior of the combustion chamber, an igniting device disposed within the combustion chamber and adapted to ignite the combustible mixture coming into the combustion chamber through the burner, an air-chamber disposed below the base of the combustion chamber, an air inlet pipe independent of the first-mentioned inlet-pipe leading to said air chamber and adapted to convey thereto air under pressure to form an insulating medium to surround the hot products in the generator, and means for conveying said insulating air along with the hot products from the combustion chamber to a device of utilization, combined substantially as set forth.

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Witnesses:
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