W. A. WARMAN.

POWER GENERATOR.

APPLICATION FILED JAN. 10, 1916.

1,236,793.

Patented Aug. 14, 1917.

2 SHEETS—SHEET 1.

Fig. 1.

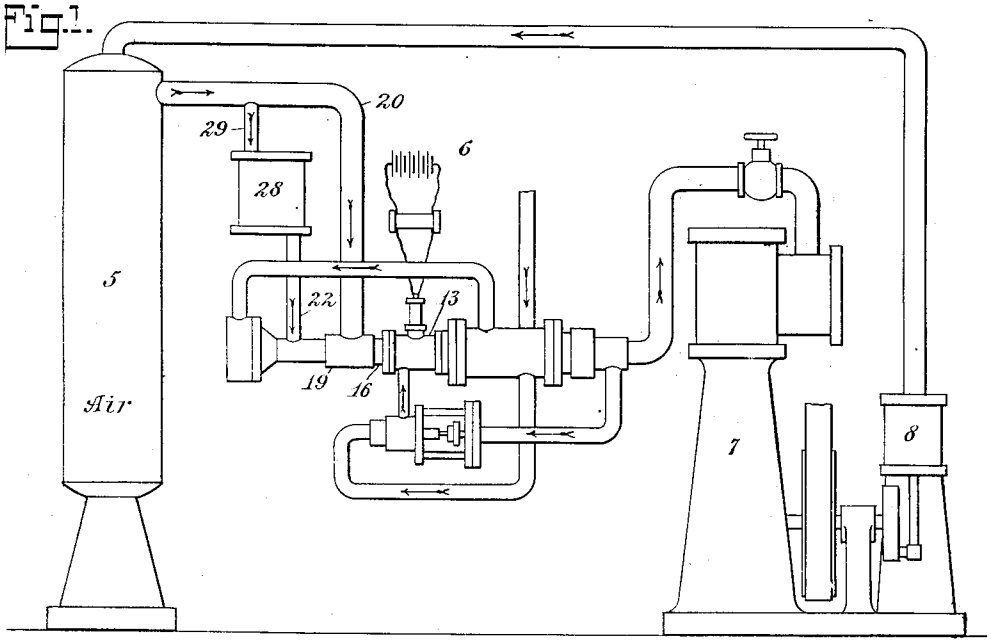
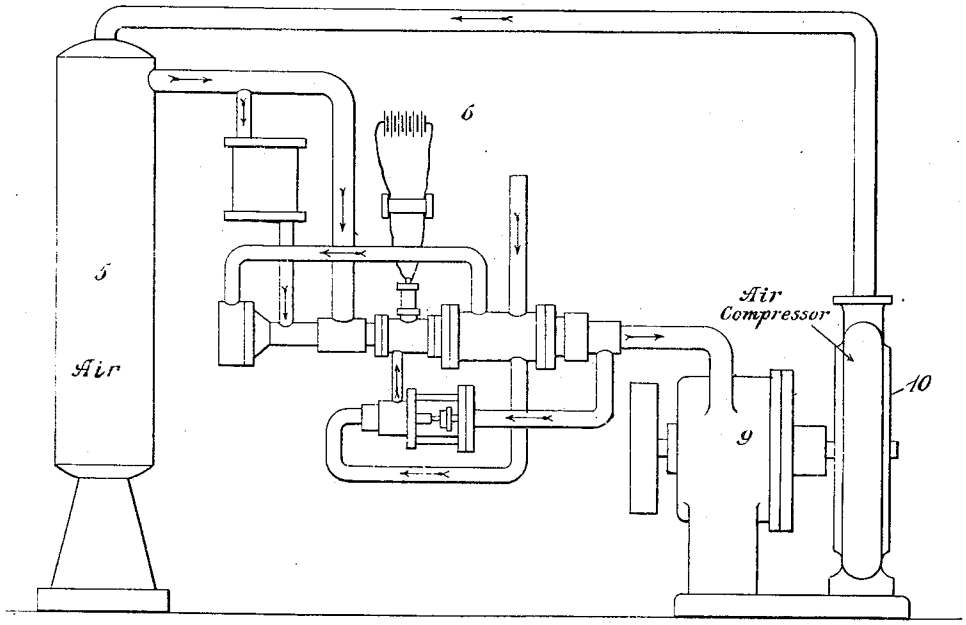


Fig. 2.



WITNESS

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INVENTOR

William A. Warman

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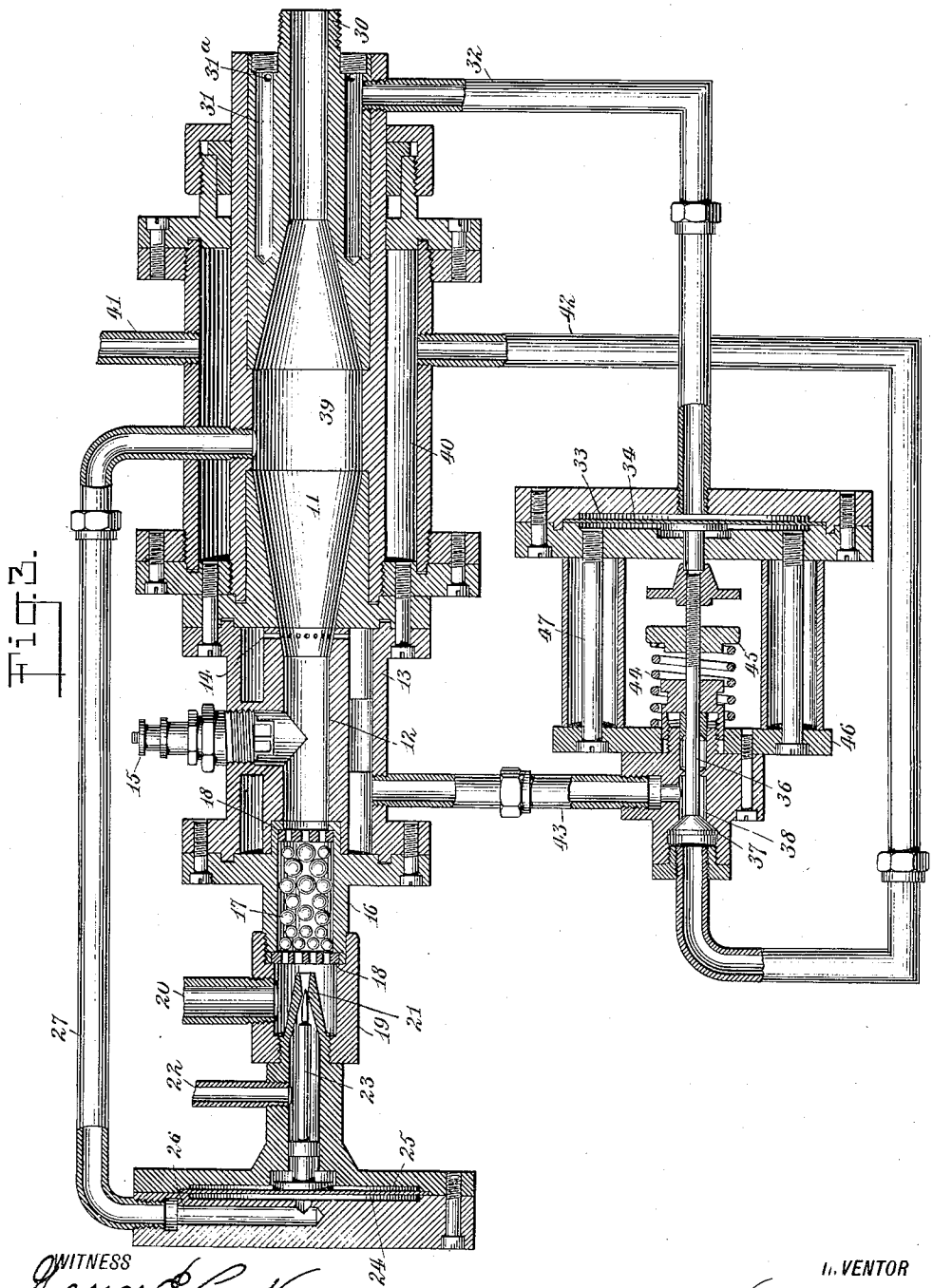
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UNITED STATES PATENT OFFICE.

WILLIAM A. WARMAN, OF BROOKLYN, NEW YORK, ASSIGNOR TO KELLER MECHANICAL ENGRAVING COMPANY, OF BROOKLYN, NEW YORK, A CORPORATION OF NEW YORK.

POWER-GENERATOR.

1,236,793. Specification of Letters Patent. Patented Aug. 14, 1917.

Application filed January 10, 1916. Serial No. 71,236.

To all whom it may concern:

Be it known that I, WILLIAM A. WARMAN, a citizen of the United States, and a resident of New York, borough of Brooklyn, in the county of Kings and State of New York, have made and invented certain new and useful Improvements in Power-Generators, of which the following is a specification.

My invention relates to an improvement in power generators adapted for use in connection with a reciprocating, rotary or turbine engine, or with some other mechanism for utilizing the pressure obtained thereby, the generator being of that kind or type wherein the power is obtained from a gas, vapor, oil or other combustible fuel, continuously burned in the combustion chamber.

From numerous experiments which I have made in the construction and operation of power generators of the above type, I have learned that it is desirable, if not absolutely essential that the construction of the generator must be such that, first, air and fuel may be continuously supplied to the combustion chamber, mixed in such proportions as to form a combustible mixture, and without excess of either of said ingredients; secondly, that the mixture may be supplied to the combustion chamber at a continuously increasing velocity and at a rate greater than the propagation of the flame; thirdly, that the mixture may be burned as it enters the combustion chamber; fourthly, means must be provided for injecting water in small particles directly into the flame at or near the point of its propagation; and, fifthly, that the fluid must be permitted to flow in its natural path without impediment.

The object of my invention, therefore, is to so construct the generator that the above conditions may be fulfilled, and further to provide a structure which will be capable of carrying out the method shown and described in my application, filed May 4, 1911, and bearing Serial No. 624,970, and with these ends in view the invention consists in certain novel features of construction and combinations of parts, as will be hereinafter fully described and pointed out in the claims.

In the accompanying drawings, Figure 1 is a view in elevation of my improved generator showing the same applied to a reciprocating engine;

Fig. 2 is a similar view showing the same as applied to a turbine engine; and—

Fig. 3 is a sectional view of the generator apart from any mechanism for translating its energy.

Referring to the drawings, Fig. 1, 5 represents an air reservoir, 6 my improved generator, 7 a reciprocating engine, and 8 an air compressor of one type connected with the reservoir 5, or, as shown in Fig. 2, the reservoir 5 and generator 6 may be connected up with a turbine engine 9 and an air compressor 10 of the rotary type, it being understood of course that my improved generator may be employed in connection with any means adapted for translating power.

Referring more particularly to the sectional view of the generator, illustrated in Fig. 3, 11 represents the combustion chamber preferably of the shape shown, that is, increasing in diameter from its forward end to about the central portion thereof, and then decreasing in diameter to the rear end thereof, the purpose and effect of so shaping the chamber being hereinafter described. Forward of this chamber 11, and connected therewith, is the ignition chamber 12 surrounded by the water-jacket 13, small openings 14 leading from the water-jacket into the combustion chamber to permit of the escape of small particles of water from the former into the latter, the ignition chamber being provided with an electric sparking plug or device 15, whereby to ignite the fuel which is supplied and burned.

Forward of the ignition chamber 12 and connected therewith is the mixing chamber comprising in part the chamber 16 filled with balls or comminuted material 17, said mixing chamber being also provided at its forward and rear end with the perforated plates 18 to permit of the flow of the fuel into and out of the same, the comminuted material 17 also assisting in thoroughly mixing the air and fuel before the entrance of the mixture into the ignition chamber. I have found from experience that it is desirable to increase the velocity of the flow of the fuel on its way to the ignition and combustion chambers, this being accomplished in any one of several well-known ways, as, for instance, as shown in the draw-

ings; this may be effected by restricting the number or size of the openings in the plate 18 adjacent to the ignition chamber. The mixing chamber also comprises in part the chamber 19, into which leads an air inlet pipe 20 from the reservoir 5, in which the air is compressed by means of an air compressor of some type, as, for instance, such as illustrated in Figs. 1 and 2.

Into the chamber 19 also leads the fuel supply pipe 21, with which is connected the pipe 22 leading from a suitable source of fuel supply, the quantity of fuel sent to the chamber being regulated by the needle valve 23 resting against and operated by the diaphragm 24. This diaphragm is located in a chamber 25 communicating with the inlet 26 and pipe 27, the latter leading from the central portion of the combustion chamber 11, this construction and arrangement of parts resulting in the automatic regulation of the supply of fuel to the chamber in accordance with the pressure generated in the chamber 11, the needle valve 23 opening and closing the port in the pipe 21 as the diaphragm is caused to move by the pressure exerted thereon and transmitted thereto from said chamber 11 through the pipe 27 and inlet 26. The quantity of air supplied to the mixing chamber depends upon the difference in pressure between the pressure within the combustion chamber 11 and the pressure within the air reservoir. It will accordingly be seen that the pressure within the combustion chamber 11 not only controls, and automatically regulates, the fuel supply, but also regulates the air supply, so that the exact and proper mixture of air and fuel is always maintained without excess of either ingredient.

In the construction illustrated, the gasolene oil or other fuel is contained within the tank or reservoir 28, Fig. 1, this tank 28 being connected to the air inlet pipe 20 leading from the reservoir 5 to the chamber 19, by means of the pipe 29, in order to retain the fuel, and supply the same to the mixing chamber under the same pressure as the air is also fed to said mixing chamber.

From the combustion chamber 11 leads the outlet pipe 30 surrounded by a series of holes or chambers 31 communicating with each other by means of the holes 31ª, filled with water, and from which chambers leads the pipe 32 to a device for regulating the supply of water into the chamber between the ignition chamber 12 and the water-jacket 13, this regulating device comprising the diaphragm 33 contained within the chamber 34, and against which diaphragm rests the valve stem 36 provided with the valve 37 seating on the wall of the chamber 38. Surrounding the combustion chamber is the jacket 39 forming the water chamber 40 and into which leads an inlet pipe 41 from some suitable source of supply, and from which water chamber 40 leads the pipe 42 to the chamber 38. Connecting the chamber 38 with the water-jacket, surrounding the ignition chamber, is a pipe 43 for supplying water into the chamber surrounding said ignition chamber. By this construction and arrangement of parts I am enabled to regulate the supply of water into the chamber surrounding the ignition chamber, and from the former the supply through the perforations 14 into the ignition chamber 11, as when the heat or temperature of the burning gases flowing out of the combustion chamber 11 and through the outlet pipe 30 rises, the water in the chambers 31 and pipe 32 will expand, causing the diaphragm 33 to exert its pressure on the valve stem 36 and unseat the valve 37, thereby permitting the water to pass from the chamber 40 surrounding the combustion chamber 11 through the pipe 42 into the chamber 38, through the pipe 43 and into the chamber surrounding the ignition chamber, and then through the openings 14 into the combustion chamber 11. When the temperature of the water in the chambers 31 is lowered, by reason of the lowering of the temperature of the outflowing burning gases through the pipe 30, the decrease in pressure in the pipe 32 and chamber 34 will allow the diaphragm 33 to be returned to its normal position, and the valve 37 seated by reason of the spring 44 around the valve stem 36, and one end of which spring bears against the regulating nut 45 and the opposite end against the wall or plate 46 indirectly connected by the bolts 47 with the walls of the chamber 34.

From the foregoing it will be understood that after the mixture has been ignited in the chamber 12, it will be continuously burned in the chamber 12, the expanded burned gases being led through the outlet pipe 30 to some device for utilizing the power; that the fuel is fed through the pipe 22 and into the mixing chamber where it is thoroughly combined with the air also led into the mixing chamber through the pipe 20, the supply of fuel being automatically regulated by the pressure in the combustion chamber 11, the air and fuel being supplied to the mixing chamber under pressure; that after the air and fuel have been thoroughly mixed and ignited and at the time of the entrance thereof into the combustion chamber, small particles of water are directed into the ignited mixture, the burning gases being allowed to flow through the combustion chamber and into and through the pipe 30 without impediment, the pressure of the water directed into the ignited mixture being regulated automatically by the temperature of the outflowing gases through the said pipe 30.

It will be further understood that the rate

at which the air and fuel are supplied to the mixing chamber, and the rate at which the mixture issues therefrom into the ignition chamber is greater than that of the propagation of the flame, the consequence being that the zone in which the ignition of the mixture occurs is located at an appreciable distance from the plate 18, thereby avoiding the burning and destruction thereof. Furthermore, this construction and arrangement of parts prevents any back-firing into the mixing chamber, which would be otherwise liable to occur, in view of the fact that a combustible mixture is effected at the point of egress thereof from the mixing chamber into the ignition chamber.

By permitting the gas to flow in its natural path, as above described, I eliminate entirely the necessity of using baffle plates, heretofore employed in breaking up and intimately mixing the air and subsequent to their passage into the combustion chamber, and which of necessity decreases the efficiency of the generator by impeding the flow of the fluid.

By means of the generator constructed as above described, the water is injected in the form of a spray into the flame at or about the time that the latter is propagated, the temperature of the burning gases being thereby lowered to a desirable degree. Furthermore, the water injected directly into the flame, as it is, is rapidly converted into steam, the expansion thereof taking place in a medium of gases of much less density than in those instances wherein the water is converted into steam in a boiler or pipes located within the combustion chamber.

By means of the above construction and arrangement of parts I am also enabled to supply to the combustion chamber just such an amount of air as will render the fuel combustible, and just so much water, in liquid form, as is necessary to cool the fluid to its proper temperature, and an amount such as will absorb the necessary amount of heat to convert the water into steam, either in a superheated condition, dry or saturated, as may be desired, thereby rendering the generator far more efficient than in those constructions wherein an excess of air is supplied to the combustion chamber either alone or with the water injected into the flame.

What I claim is:—

1. A power generator comprising a combustion chamber surrounded by a water-jacket, an ignition chamber connected to and communicating with said combustion chamber, a mixing chamber connected to and communicating with said ignition chamber, means for supplying air and fuel to said mixing chamber, means connected with said combustion chamber for automatically regulating the supply of air and fuel to the mixing chamber, and means connected with said water-jacket for supplying and automatically regulating the discharge of water into the burning gas at its entrance into said combustion chamber.

2. A power generator of the character described comprising a combustion chamber surrounded by a water-jacket and having a discharge pipe also surrounded by a water-jacket, an ignition chamber connected to and communicating with said combustion chamber and surrounded by a water-jacket, a mixing chamber connected to and communicating with said ignition chamber, means for supplying air and fuel to said mixing chamber and automatically regulating the flow thereof, and means connected to the water chambers surrounding said outlet, combustion chamber and ignition chamber for automatically regulating the discharge of water into the burning gas at its entrance into said combustion chamber.

3. The combination with a combustion chamber surrounded by a water-jacket of an ignition chamber connected to and communicating with said combustion chamber and surrounded by a water-jacket, a mixing chamber connected to and communicating with said ignition chamber, means for supplying air and fuel to said mixing chamber, means communicating with said combustion chamber to automatically regulate the supply of air and fuel to said mixing chamber by the pressure in said combustion chamber, a discharge outlet from said combustion chamber surrounded by a water-jacket, and means connected with the water-jackets surrounding said discharge outlet, combustion chamber and ignition chamber for regulating the supply of water from the water-jacket surrounding said combustion chamber to the burning gas as it enters said combustion chamber by reason of the temperature of the gases flowing through said discharge outlet.

Signed at borough of Brooklyn in the county of Kings and State of New York this 4th day of Jan'y A. D. 1916.

WILLIAM A. WARMAN.

Witnesses:

JOHN COOK.

MABEL E. CRITCHLEY.