B. H. BLAISDELL.

COMBUSTION CHAMBER.

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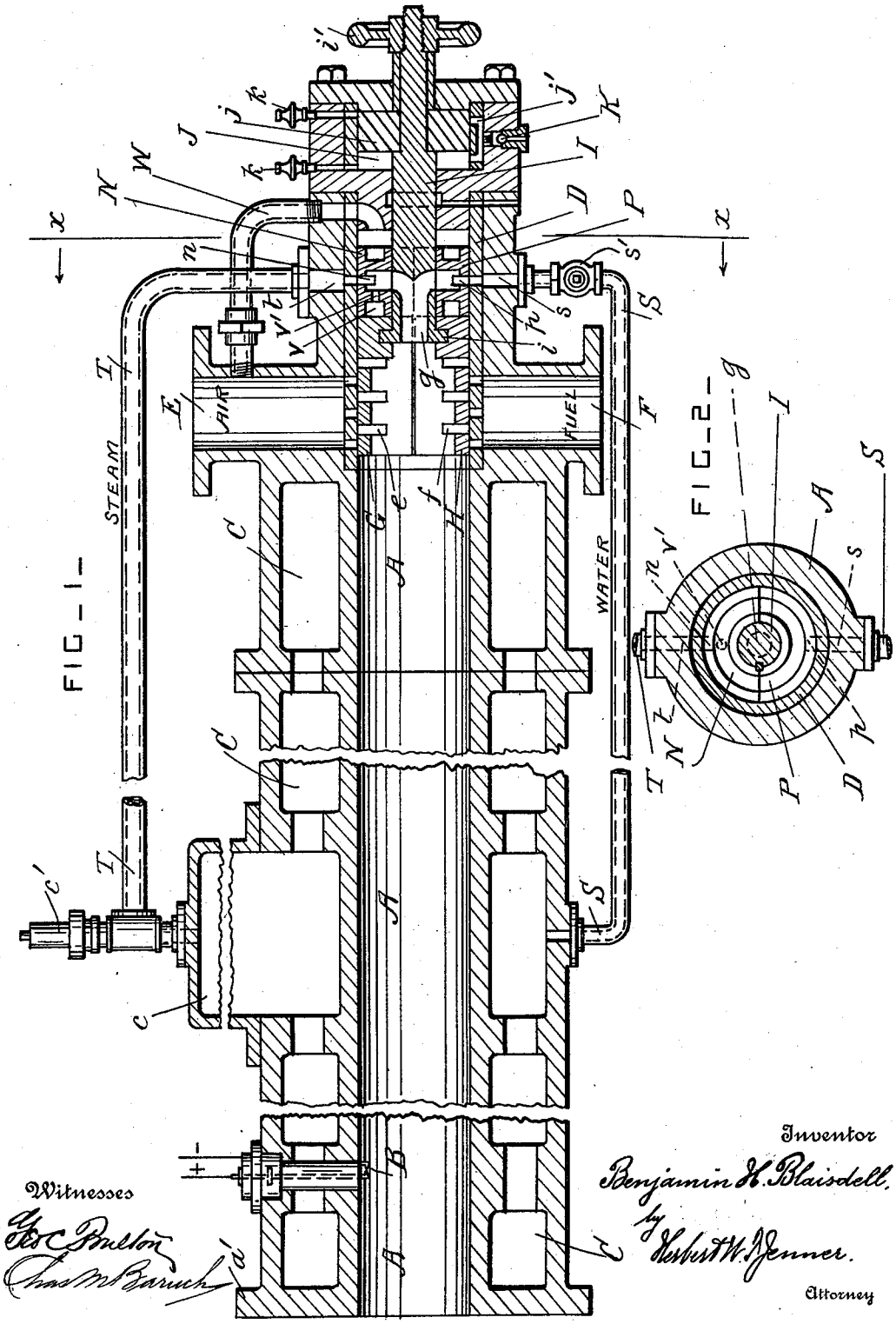
1,008,689. Patented Nov. 14, 1911.



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COMBUSTION-CHAMBER.

1,008,689. Specification of Letters Patent. Patented Nov. 14, 1911.

Application filed November 25, 1910. Serial No. 594,146.

To all whom it may concern:

Be it known that I, BENJAMIN H. BLAISDELL, a citizen of the United States, residing at Manila, in the Philippine Islands, have invented certain new and useful Improvements in Combustion-Chambers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to combustion chambers for use in connection with gas engines of the turbine type; and it consists in the novel construction and combination of the parts hereinafter fully described and claimed whereby the gas engine is supplied with pressure fluid to drive it.

In the drawings, Figure 1 is a longitudinal section through a combustion chamber constructed according to this invention. Fig. 2 is a cross-section, taken on the line *x*—*x* in Fig. 1.

A is the explosion chamber in which a charge of air and hydrocarbon is ignited. This chamber is relatively very long in proportion to its diameter or width, and one end of it is provided with a flange *a'* or other approved means for connecting it to the turbine or other engine to be driven.

B is the igniter which is of any approved construction, such as an electric igniter. This igniter is arranged in the chamber A adjacent to its outlet end.

C is a water jacket encircling the combustion chamber and forming a boiler for generating steam. This jacket is provided with a steam dome *c*, and a safety-valve *c'*.

D is a cylinder or casing for the regulating valves arranged in the inlet end portion of the combustion chamber.

E is the air inlet passage at one side of the combustion chamber, and F is the fuel inlet passage at its opposite side. Any approved fuel can be used, such as a liquid hydrocarbon, combustible vapor or gas, and the apparatus can be variously modified and changed to suit the particular kind of fuel used.

G is the air valve; and H is the gas valve. These valves are semi-cylindrical in form, and they are slidable side by side in the cylinder D. These valves and the cylinder are provided with any suitable ports *e* and *f* for the passage of air and gas respectively.

I is the valve spindle provided at one end with a T-shaped head *i* which engages with two recesses in the valves G and H respectively.

J is a cushioning cylinder which forms a cover for closing the outer end of the valve cylinder D. The valve spindle I projects through this cylinder D, and it is provided with a handle *i'* on its projecting end for sliding it by hand when required. The cushioning cylinder is provided with a cushioning piston *j*, and *j'* is a port of small area which permits air to pass from one side of the piston to the other, and which prevents the piston from moving too rapidly at the ends of its strokes.

K is a valve for admitting air to the ends of the cushioning cylinder; and *k* are adjustable plugs for regulating the outlet of air from the cylinder and adjusting the compression or cushioning.

N is the steam valve; and P is the water valve. These valves are semi-cylindrical in form and they are slidable in the valve cylinder D and on the valve spindle I. The valves, or as many of them as necessary, are provided with suitable means, such as grooves and keys for preventing them from revolving.

S is the water pipe which is connected to the water jacket and to a water port *s* in the combustion chamber and valve cylinder. A valve *s'* is provided for regulating the supply of water.

T is a steam pipe connected to the steam dome and to a steam port *t* in the combustion chamber and valve cylinder.

The valves N and P are provided with ports *n* and *p* which are placed in communication with the ports *t* and *s* respectively, and which communicate with a longitudinal passage *g* in the valve spindle leading through the air and gas valves into the combustion chamber.

The space *v* between the air valve and the steam valve is connected with the steam port by a passage *v'*, and the space *v* is constantly in communication with the space between the gas valve and the water valve.

W is an air inlet pipe connected at one end with the space in the valve cylinder between the cushioning cylinder J and the steam and water valves. The other end of the pipe W is connected to the air inlet passage E, or to any other convenient source whence a supply of compressed air can be obtained.

In starting the apparatus the air and gas valve are opened by hand, or by pressure from the pipe W, and the steam and water valves are closed by the pressure of the air from the pipe W. Air and gas are admitted under pressure to the combustion chamber through their respective passages E and F, their proportions being regulated by suitable valves, not shown. The air and gas are compressed to any desirable extent by any approved devices, not shown, so that they may flow freely into the combustion chamber and become mixed therein. The explosive mixture of air and gas passes longitudinally through the combustion chamber and is ignited when it reaches the igniter B near the outlet end of the chamber. The pressure rises suddenly in the combustion chamber, and the gas and air valves are propelled rearwardly to close their respective ports, shock and undue impact being prevented by the cushioning piston. The pressure thus obtained in the combustion chamber affords a means for driving a turbine gas engine or other similar motor. When the pressure in the combustion chamber falls below the pressure of the compressed air in the pipe W, the steam and water valves are moved forwardly to open the steam and water ports. The steam and water valves slide upon the valve spindle I which remains stationary. Steam and water from the water jacket are now injected through the combustion chamber into the motor and force the products of combustion out of the combustion chamber, and assist in driving the motor. The valve s' can be closed, if desired, and steam alone can be used as the scavenging fluid. When the steam pressure falls in the combustion chamber below the pressure of the air in the air pipe W, the air from the pipe W forces all the valves forward to their original positions, re-opening the air and gas valves G and H, and closing the steam and water valves.

The explosions in the combustion chamber take place intermittently and at intervals regulated by the requirements of the motor. The steam and water spray assist in propelling the motor and also prevent it and the valves from being overheated by the explosions. The valves are automatic in their action being operated by the fluid pressure of the products of combustion and the compressed air and not by valve operating mechanism, but the form and arrangement of the valves may be changed and modified in many ways in carrying out this invention.

What I claim is:

1. The combination, with a tubular combustion chamber of great length in proportion to its width, said chamber having an inlet at one end and an outlet at its other end, and the said outlet and the passage through the chamber being constantly open and unobstructed; of an igniter arranged at the outlet end of the chamber, and automatic valve mechanism controlling the admission of combustible fluid through the said inlet, said valve mechanism being operated intermittently by direct exposure to the varying pressure of the fluid contents of the chamber.

2. The combination, with a tubular combustion chamber of great length in proportion to its width, said chamber having an inlet at one end and an outlet at its other end, and the said outlet and the passage through the chamber being constantly open and unobstructed; of an igniter arranged at the outlet end of the chamber, automatic valve mechanism controlling the admission of combustible fluid through the said inlet, said valve mechanism being operated intermittently by direct exposure to the varying pressure of the fluid contents of the chamber, and means for admitting scavenging fluid to the said chamber to scavenge its contents in the interval between the combustion of one charge and the admission of another charge.

3. The combination, with a combustion chamber having an inlet for the combustible charge at one end and an outlet for the high-pressure gases at the other end, of an igniter arranged in the said chamber adjacent to its outlet, valve mechanism controlling the supply of combustible fluid to the said inlet, said valve mechanism being operated automatically to cut off the supply of fluid by the increased pressure of the charge when ignited, and a cushioning device for preventing the said valve mechanism from being so operated too suddenly.

4. The combination, with a combustion chamber, of automatic valves for air and fuel which close when the contents of the chamber are ignited, separate valves for admitting steam and water to the combustion chamber, and a cylinder for compressed air which opens the steam and water valves when the pressure in the combustion chamber falls after ignition.

5. The combination, with a combustion chamber, and a boiler heated by said chamber, of automatic valves for air and fuel which close when the contents of the chamber are ignited, a valve for admitting scavenging fluid from the said boiler to the combustion chamber, and a cylinder for compressed air which opens the said valve when the pressure in the combustion chamber falls after ignition.

6. The combination, with a combustion chamber, of a valve cylinder secured in one end portion of the combustion chamber, automatic valves for air and fuel which slide in the said cylinder and close when the contents of the chamber are ignited, and means for admitting compressed air to the

said cylinder behind the said valves to open them when the pressure falls in the combustion chamber.

7. The combination, with a combustion chamber, of a valve cylinder secured in one end portion of the combination chamber, automatic valves for air and fuel which slide in the said cylinder and close when the contents of the chamber are ignited, a valve spindle connected to the said valves and projecting from the valve cylinder, and a cushioning device connected to the said spindle and preventing the valves from moving too suddenly.

8. The combination, with a combustion chamber, of a valve cylinder secured in one end portion of the chamber, automatic valves for air and fuel which slide in the said cylinder and close when the contents of the chamber are ignited, a valve spindle connected to the said valves and provided with a passage which communicates constantly with the combustion chamber, and a valve for scavenging fluid slidable in the said cylinder and controlling the said passage through the valve spindle.

9. The combination, with a combustion chamber, of a valve cylinder secured in one end portion of the chamber, automatic valves for air and fuel which slide in the said cylinder and close when the contents of the chamber are ignited, a valve spindle connected to the said valves and provided with a passage which communicates constantly with the combustion chamber, a steam valve and a water valve arranged side by side and controlling the said passage and also slidable in the said cylinder, and means for admitting compressed air to the said cylinder to force all the said valves forwardly therein.

10. The combination, with a combustion chamber for a gas turbine having an igniter at its outlet end, and having also automatic valves for air, fuel and scavenging fluid at its opposite end, said valves being operated by the varying pressure of the fluid contents of the said chamber; of means for generating steam from the surplus heat of combustion, said automatic valves being arranged to admit the steam to the combustion chamber in the interval between the combustion of one charge and the admission of another charge, to scavenge its contents and to assist in driving the turbine; and means for mixing cooling fluid with the said steam to prevent the turbine from being overheated.

In testimony whereof I have affixed my signature in the presence of two witnesses.

BENJAMIN H. BLAISDELL.

Witnesses:
MICH. W. JENKINS,
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