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B. HOFFMANN

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PRESSURE COMBUSTION BOILER

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Fig. 1.

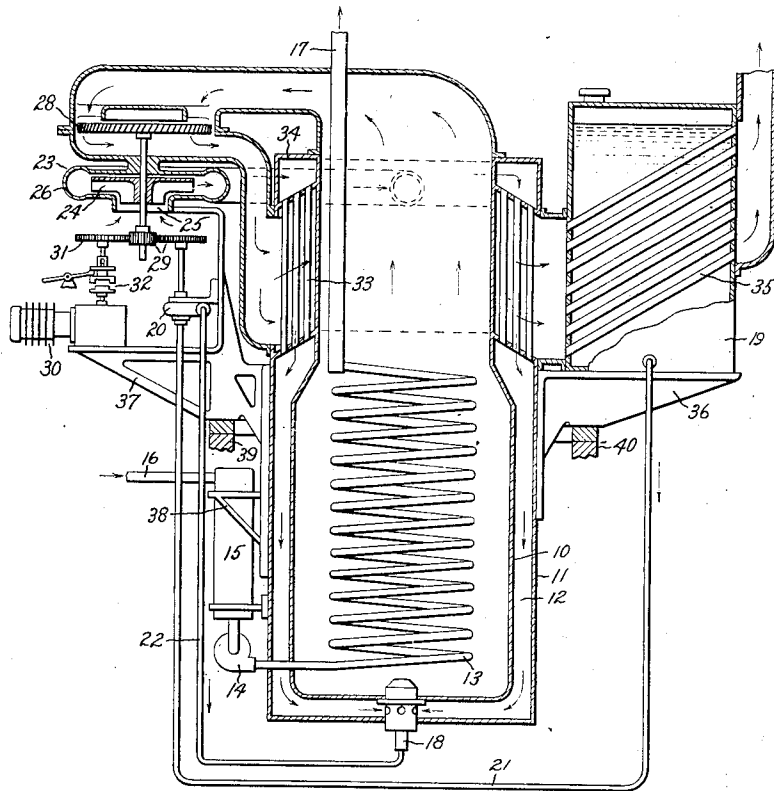
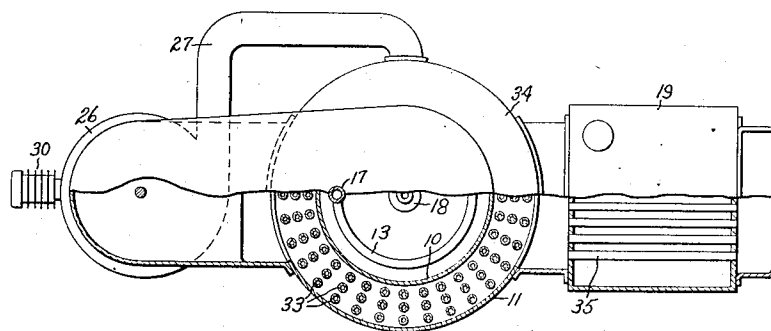


Fig. 2.



Inventor:
Bruno Hoffmann,
by *Harry E. Dunham*
His Attorney.

UNITED STATES PATENT OFFICE

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PRESSURE COMBUSTION BOILER

Bruno Hoffmann, Berlin-Spandau, Germany, assignor to General Electric Company, a corporation of New York

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3 Claims. (Cl. 122-24)

The present invention relates to pressure combustion boilers to which air for maintaining combustion is supplied under pressure by means of a blower or centrifugal pump driven by a gas turbine receiving combustion gases discharged from the boiler. In certain cases, for instance where this type of boiler is used for operating aircraft, it has been found difficult to form foundations with the rigidity and of the size required for quiet operation of the boiler and the auxiliaries connected thereto and forming parts thereof.

The object of the present invention is to provide an improved construction and arrangement of pressure combustion boilers whereby the aforementioned difficulties are overcome. This is accomplished in accordance with my invention by supporting the auxiliaries including the gas turbine, the blower, fuel pump, starting motor, as well as the preheater and the fuel tank on the casing of the boiler; in other words, by uniting the boiler with the auxiliaries to form a single, unitary, compact block. This block is preferably provided with two supporting elements near its center line of gravity. In this manner an entirely rigid system is produced which makes it possible to support the entire system on comparatively small supporting surfaces. Such arrangement in addition has other advantages. The necessary pipe connections, for instance the overflow pipe from the boiler to the gas turbine, become very short and wide so that heat stresses and pressure losses are reduced to a minimum. This is especially possible when the air preheater is arranged to form a ring surrounding the boiler casing.

For a better understanding of what I believe to be novel and my invention, attention is directed to the following description and the claims appended hereto in connection with the accompanying drawing.

In the drawing, Fig. 1 represents a diagrammatic view of a section through a boiler arrangement embodying my invention, and Fig. 2 illustrates a top view partly in section of Fig. 1.

More specifically, the arrangement shown in the drawing comprises a boiler proper having an inner casing 10 surrounded by an outer casing 11. These casings form a chamber 12 between them for preheating the combustion air. A heating element 13 is disposed in the combustion chamber formed within the inner casing 10. This heating element has an inlet connected to the discharge of a circulating pump 14, which latter is connected to an economizer or preheater 15

receiving operating medium through a conduit 16. During operation, liquid forced through the heating element 13 is heated and discharged through an outlet conduit 17. A burner 18 is provided in the lower portion of the boiler for discharging a mixture of fuel and air into the combustion chamber. Fuel is supplied to the burner from a fuel or oil tank 19 by means of a fuel pump 20 having an inlet conduit 21 connected to the tank 19 and a discharge conduit 22 connected to the burner 18. Air is supplied to the burner 18 by means including a blower or centrifugal pump or compressor 23 having an impeller chamber with an impeller 24. During operation, air is forced through an inlet 25 and discharged from a scroll 26 of the centrifugal pump 23 through a conduit 27 to an air preheater. The centrifugal pump 23 is driven in known manner by an exhaust gas turbine 28 which receives combustion gases exhausted from the combustion chamber of the boiler. The aforementioned fuel pump 20 is connected to the shaft of the centrifugal pump 23 by a gearing 29 so that during normal operation the fuel pump 20 is also driven by the exhaust gas turbine 28. During starting operation the fuel pump and the centrifugal blower are operated by means of an auxiliary motor, in the present instance indicated as a small combustion engine 30, connected to the gearing 29 by means of a gear 31 and a clutch 32. The air preheater for preheating the air discharged from the centrifugal blower through the conduit 27 comprises in accordance with my invention a plurality of rows of heating tubes 33 concentrically arranged about the upper portion of the inner casing 10 and connected at their upper ends to a header 34 and at their lower ends to the aforementioned air preheating chamber 12. During operation, the air discharged from the centrifugal blower through the conduit 27 is conducted to the upper header 34, whence it flows downwardly through the heating tubes 33 into the chamber 12 and the burner 18. The preheating of the air conducted through the heating tubes 33 is effected by the gases discharged from the exhaust gas turbine 28. These gases also serve to preheat the fuel. This is accomplished by the provision of a plurality of heating tubes 35 in the fuel tank 19. These heating tubes receive the gases discharged from the air preheater. In this manner both the available kinetic energy and the heat energy of the combustion gases exhausted from the boiler are utilized and regained.

In accordance with my invention all of the

auxiliaries including the fuel tank are secured to the boiler to form a compact design which requires little supporting surface when used on airplanes. As shown in the drawing, the fuel tank 5 19 is supported on the right-hand side of the boiler casing by means including a bracket 36 secured to the outer casing 11 of the boiler and the auxiliaries including the gas turbine 28, the centrifugal blower 23, the oil pump 20 and the 10 auxiliary motor 30 are secured to the left-hand side of the outer casing 11 by means including a bracket 37. The liquid preheater 15 is also secured to the left-hand side of the outer casing 11 by means including another bracket 38. In this 15 manner, the weight of the auxiliaries and the fuel tank is balanced with regard to the boiler proper. The whole structure thus forms a single block which is supported on struts 39 and 40 of an aircraft. The support is provided near the 20 center line of gravity of the block.

Having described the method of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, I desire to have it understood that the 25 apparatus shown is only illustrative and that the invention may be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A portable pressure combustion boiler arrangement including the combination of a boiler 30 proper having a casing and a heating element therein, auxiliaries comprising a blower, a fuel pump and a starting motor together with a tank for fuel, said auxiliaries forming two groups 35 completely supported on and secured to opposite portions of the boiler casing, and means including passages formed in the tank for receiving combustion gases to preheat the fuel.

2. A pressure combustion boiler including the combination of a boiler proper having an inner and an outer casing forming a chamber for preheating combustion air, a burner, means including a gas turbine receiving combustion gases 5 discharged from the boiler and a blower driven by the turbine for forcing air through said chamber, a tank and a fuel pump for forcing fuel into the burner, the gas turbine together with 10 the centrifugal blower and the fuel pump being supported on one side of the casing and the fuel tank being supported on the opposite side of the casing.

3. A pressure combustion boiler arrangement including the combination of a boiler proper having a heating element and a burner, an air preheater surrounding the casing, means including a 15 gas turbine arranged to receive the combustion gases discharged from the boiler and a centrifugal pump driven from the gas turbine for forcing 20 air through the preheating chamber into the burner, a tank for fuel including a plurality of heating tubes receiving gases discharged from the preheating chamber to preheat fuel in the 25 tank and a fuel pump for forcing fuel from the tank into the burner, means including a bracket secured to one side of the casing to support the gas turbine, the centrifugal blower and the fuel pump, and means including another bracket se- 30 cured to the opposite side of the casing for supporting the tank and to balance the weight of said gas turbine, centrifugal blower and fuel pump on the opposite side of the casing, the brackets forming supporting surfaces for the entire arrangement 35 near the center line of gravity thereof.

BRUNO HOFFMANN.