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BOILER INSTALLATION ON STEAM TURBINE PLANTS FOR AIRCRAFT

Original Filed Aug. 30, 1921

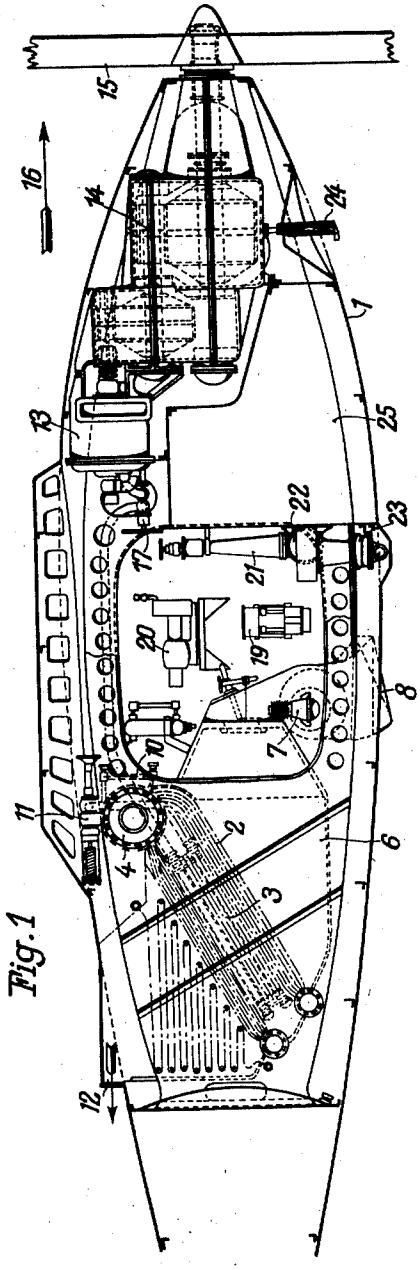

Fig. 1

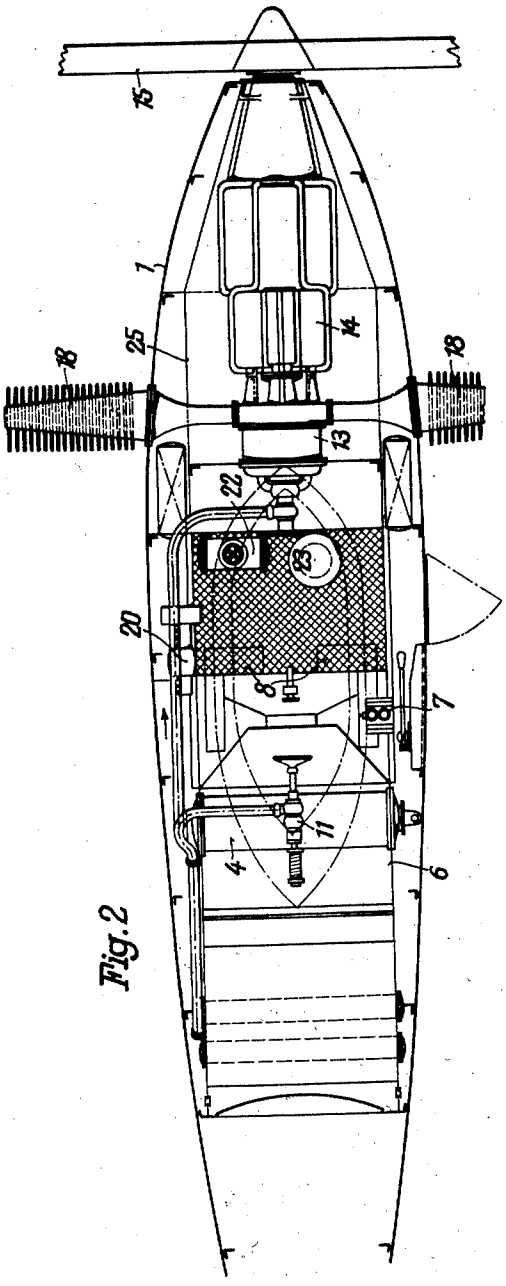

Fig. 2

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UNITED STATES PATENT OFFICE

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BOILER INSTALLATION ON STEAM-TURBINE PLANTS FOR AIRCRAFT

Original application filed August 30, 1921, Serial No. 496,922, and in Germany August 25, 1915. Divided and this application filed January 10, 1930. Serial No. 419,876.

(GRANTED UNDER THE PROVISIONS OF THE ACT OF MARCH 3, 1921, 41 STAT. L., 1313)

This case is a division of my application Serial No. 496,922, filed August 30, 1921.

This invention refers to steam turbine plants for aircraft in which oil-fired high-pressure water tube boilers with an upper drum are used as steam generators. Compared to the so-called flash boilers without upper drum the present system has the advantage that the reserve of water in the upper drum allows a better regulation of the steam generation and feed-water supply, further temporarily a higher steam consumption without emptying the tubes of water. The water reserve in the upper drum forms moreover a power reserve which is of great importance for aircraft if, for instance, an aeroplane descends with stopped furnace in order to be able to start the engine immediately if suddenly obstacles arise.

To keep the weight down the diameter and contents of the upper drum naturally must be reduced as much as possible. Particularly in order not to expose the tube rows nearest to the fire to being burned-through it is imperative to strictly adhere to the water level in the upper drum. This is necessary also because, as known, the expansion of the water increases considerably in cases of high steam pressures, so that the water level changes for this reason as well with somewhat rising temperature of the feed-water considerably.

Especially the change of the position of the air-craft while in flight naturally influences the water level in the upper drum importantly.

The present invention relates to a particular arrangement of a water tube boiler of the said type in an engine plant of an air-craft where the last-mentioned factor of the change of position is eliminated to the utmost, so that the regulation of the water level becomes easier to control. For this purpose the boiler is so arranged that the axis of its upper drum lies transversal to the direction of the flight. An upward-inclined position of the air-craft when ascending or a downward-inclined position when descending has by applying this arrangement no influence or but little influence on the height of the water level in the upper drum as shown by the water level indicator; in curve-flights the water level remains likewise parallel with the axis of the upper drum since the centrifugal force acts upon the water.

In addition to these advantages in operation, the present special arrangement has, particularly for aeroplanes, the advantage that the weight of the boiler—as that of the generally larger weight-portion of the entire engine plant—admits of being built symmetrically into the centre of the aeroplane.

An example for the present invention is represented in Figs. 1 and 2, Fig. 1 showing the front elevation, and Fig. 2 the plane of a steam turbine plant for, say, the middle hull of an aeroplane or the engine-car of an air-ship. 1 is the hull of the craft, 2 the water tube boiler, 3 its superheater, 4 the upper drum set transversal to the middle of the hull, 5 its feed-water preheater possibly after-connected to the nest of boiler-tubes, 6 the combustion chamber of the boiler, 7 a fan for the boiler driven, perhaps, by means of a small gasoline motor, 8 its air entrance, 9 the burner, 10 the water gauge, 11 the stop-valve combined with a safety-valve, 12 the gas exit.

The turbine 13 is, in the present example, arranged in the front of the hull, and drives the propeller 15, say, over a two-step gearing 14. The arrow 16 designates the drive-direction, 17 is the stop valve at the turbine, 18 two air-cooled condensers which are arranged on both sides of the hull. 19 is a boiler feed-pump, 20 a little turbodynamo for electric light, wireless, and so forth, 21 a steam-jet air-pump with cooler 22 for their water of condensation, 23 a pump for water of condensation—driven by means of a small steam turbine—which sucks the water of condensation out of the condensers and presses it to the feed pump. 24 designates an air-cooled oil-cooler for the lubricating oil for the gearing and turbine bearings, 25 a fuel tank.

This example, shows that only the transversal position of the upper drum characterized by the present invention admits a favourable building-in the water tube boiler of an air-craft, as hereby the small available

space of the hull will be used as well as at all possible. Further the weights of the plant can be distributed with perfect symmetry. The latter point is, of course, very important. The attendance to the entire engine plant is greatly facilitated, for instance, by the fact that as in the sketched example the attendance side of the boiler and the turbine may lie immediately opposite one another. The invention contributes, therefore, essentially to the rational solution of the problem of a steam-drive for air-craft since very much depends naturally, in the case of a drive as here described, on the position of the water tube boiler in the air-craft, and, especially, on the particular position of its upper drum.

What I claim is:—

A light steam turbine plant with oil-fired water tube boiler for air-craft, its upper drum being positioned transverse to the course of the flight.

In testimony whereof I affix my signature.

RUDOLF WAGNER.