June 8, 1926. 1,588,247

S. P. LYON

HIGH LIFT RADIATOR

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Fig. 1.

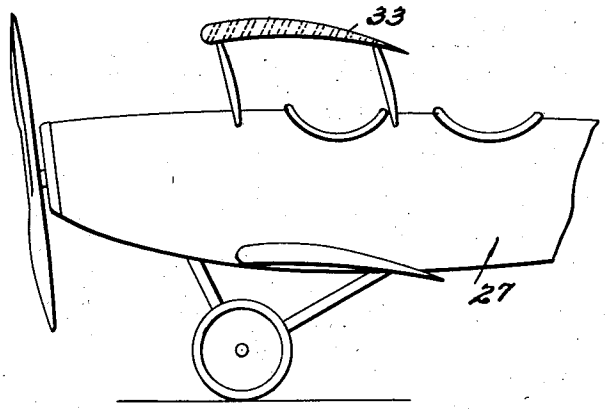


Fig. 2.

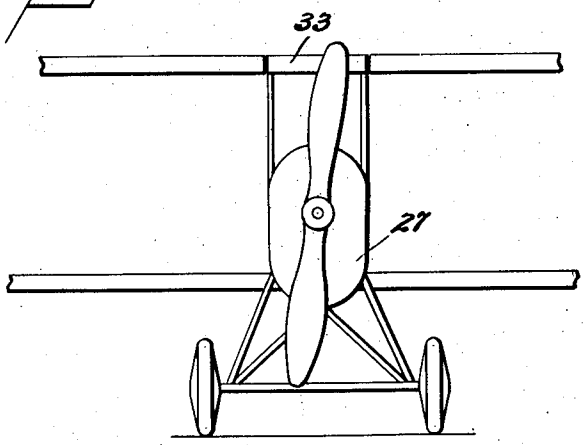


Fig. 3.

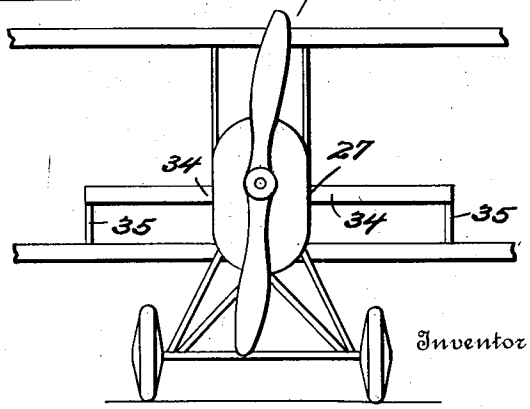
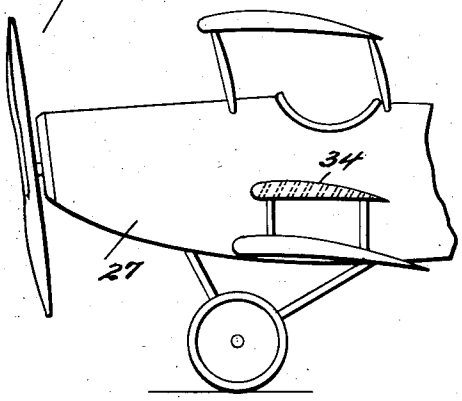


Fig. 4.



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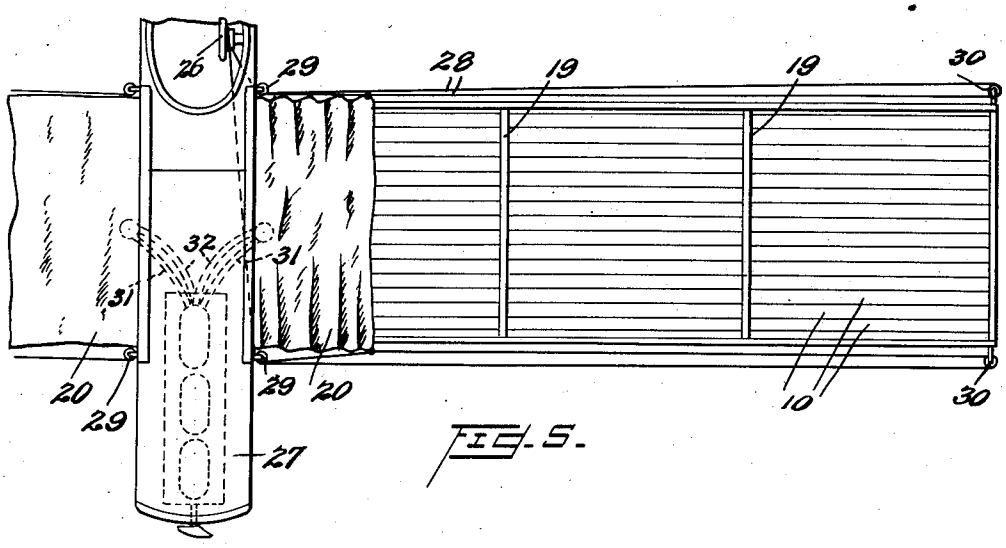


FIG. 5.

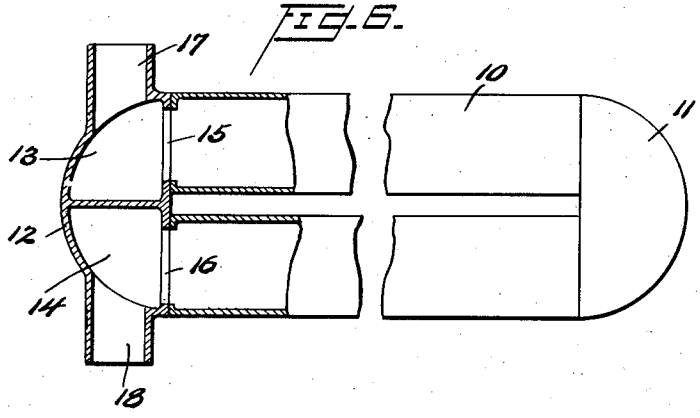


FIG. 6.

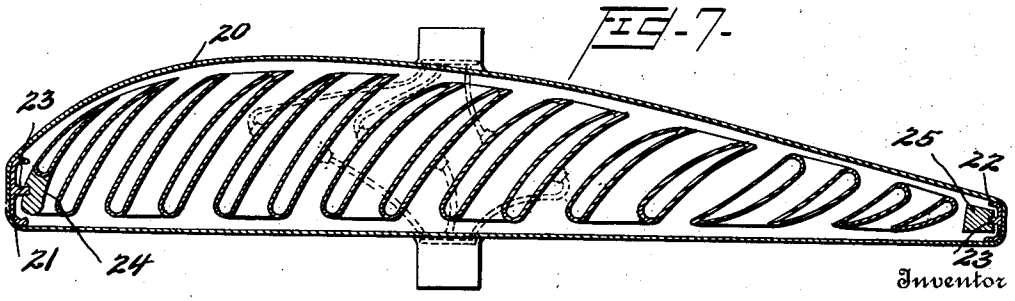


FIG. 7.

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UNITED STATES PATENT OFFICE.

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HIGH-LIFT RADIATOR.

Application filed March 29, 1923. Serial No. 628,521.

This invention relates to radiators for cooling the water of an internal combustion engine.

The object of the invention is to produce what may be termed a high lift radiator, or in other words a radiator of aero-foil formation as a whole, having a high lift drift ratio and having the capacity of lifting its own weight and more while the aircraft in which it is installed is in actual flight, the improved radiator thereby increasing rather than decreasing the efficiency of the aircraft.

With the above and other objects in view the invention consists of the novel construction, combination and arrangement herein fully described, shown and claimed.

In the accompanying drawings:—

Figure 1 is a fragmentary side elevation of an airplane of the bi-plane type, showing the radiator in its applied relation thereto;

Figure 2 is a front elevation of the same, showing the radiator in sections;

Figure 3 is a view similar to Figure 2 showing another manner of mounting and locating the radiator;

Figure 4 is a side elevation of the same showing the radiator in section;

Figure 5 is a fragmentary plan view of the same;

Figure 6 is a detailed sectional view of one pair of water tubes showing the connected heaters and the intake and outlet connections;

Figure 7 is an enlarged fore and aft vertical section through the radiator taken parallel to the plane symmetry of the aircraft.

Referring primarily to Figure 7, it will be observed that the radiator, which is therein shown in sectional detail, is of aero-foil formation and is composed in the main of water tubes 10 which extend substantially at right angles to the plane of symmetry of the machine or the longitudinal axis of the fuselage, as shown in the other views.

Each of the water tubes 10 is also of streamline or aero-foil formation and the tubes are arranged in spaced relation to each other, leaving intervening air space, as shown, through which the air stream passes for cooling the surfaces of the tubes and the water which circulates through said tubes. It will be noted that the tubes 10 incline upwardly and rearwardly so as to produce a lifting effect as the radiator passes through the air stream while the machine is in flight and all of the tubes 10 together make up a relatively large aero-foil shaped radiator having a convex or cambered upper surface and a lower surface which may be either flat or concave or otherwise cambered, as may be found most expedient to produce the required lift in order that the radiator as a whole may lift its own weight while in flight. In actual use the radiator has demonstrated its ability to lift its own weight and a considerable amount in addition thereto.

The tubes 10 are preferably connected in pairs at their outer ends by a water header 11 and they are likewise connected at their inner ends by another water header 12 having two compartments 13 and 14, one of which communicates through an opening 15 with one of the tubes 10, the other compartment 14 communicating with the other tube through an opening 16. The circulating water is thus caused to pass lengthwise of the tubes back and forth and is cooled by the air impinging against the surfaces of the tubes. An intake 17 leads into the compartment 13, while an outlet 18 permits the water to pass from the radiator back to the engine, which the radiator is designed to cool, the engine not being shown as it forms no part of the present invention.

At intervals, the tubes 10 are connected by web-like members or braces 19, which are disposed edgewise in the air stream and which serve to support the tubes 10 in spaced relation to each other and greatly strengthen the radiator structure.

In order to adapt the radiator for high and low altitude work, I provide the radiator with a flexible cover 20 which extends over the top of the radiator and under the same, as shown in Fig. 7, the cover 20 being connected under the leading edge of the radiator to a runner 21. The rear portion of the cover 20 is connected at the trailing edge of the radiator to enter the runner 22. The runners 21 and 22 have guiding rods 23 which engage guide grooves in front and rear guides 24 and 25, arranged, respectively, at the loading and trailing edges of the structure. The cover 20 is of sufficient size to entirely cover and inclose the radiator, but is capable of being telescopically moved along the radiator to expose more or

less thereof to the cooling influences of the air stream.

In order to manipulate the cover 20 any suitable means may be employed, such as a hand wheel 26 mounted within the pilot's compartment of the fuselage 27 of the aircraft, as shown in Fig. 5, cables 28 passing around a drum on said hand wheel and also around guide pulleys 29 and 30 at the inner and outer corners of the radiator. By this means the pilot may move the flexible cover outwardly and inwardly to cover and uncover the radiator, thus adapting the radiator to high and low altitude work in order to maintain the engine at its best thermal efficiency. Suitable hose connections 31 extend from the intakes 17 to the engine, while other hose connections 32 extend from the outlets 18 back to the engine. Thus a complete circulation of water is provided for between the engine and the radiator.

In Figures 1 and 2, the radiator shown at 33 is shown as comprising the center section of the upper plane of the machine. It is also proposed to make the radiator in two sections, as shown in Figs. 3, 4, and 5 mounting the same at opposite sides of the fuselage 27 and between the top and bottom planes, the inner ends of the radiator sections shown at 34 being attached in any suitable way to the fuselage 27 and the outer ends thereof being supported by struts 35. It will thus be seen that the radiator may in one or more parts or sections be mounted in the best way to minimize head resistance and in fact increase the total lifting capacity of the aircraft in conjunction with which the radiator structure is used.

What I claim is:—

1. For use in aircraft a water cooling radiator of high lift-drift ratio formation having the shape of an aerofoil in fore and after section parallel to the plane of symmetry of the aircraft, said radiator comprising water tubes extending as to their length substantially at a right angle to the plane of symmetry and of aerofoil formation in cross section, means for bracing said tubes longitudinally of said craft, said tubes varying in size in cross section proportional to the dimensions of the radiator in fore and aft section.

2. A water cooling radiator of high lift-drift ratio formation having the shape of an aerofoil in fore and after section parallel to the plane of symmetry of the aircraft, said radiator comprising water tubes extending as to their length substantially at a right angle to the plane of symmetry and of aerofoil formation in cross section, and a flexible cover having a telescopic relation to said radiator.

3. A water cooling radiator of high lift-drift ratio formation having the shape of an aerofoil in fore and after section parallel to the plane of symmetry of the aircraft, said radiator comprising water tubes extending as to their length substantially at a right angle to the plane of symmetry and of aerofoil formation in cross section, a flexible cover surrounding said radiator, and means for projecting and retracting said cover to expose more or less of the radiator to the air stream.

In testimony whereof I affix my signature.

SIDNEY P. LYON.