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R. J. MELLICK ET AL
AIRPLANE

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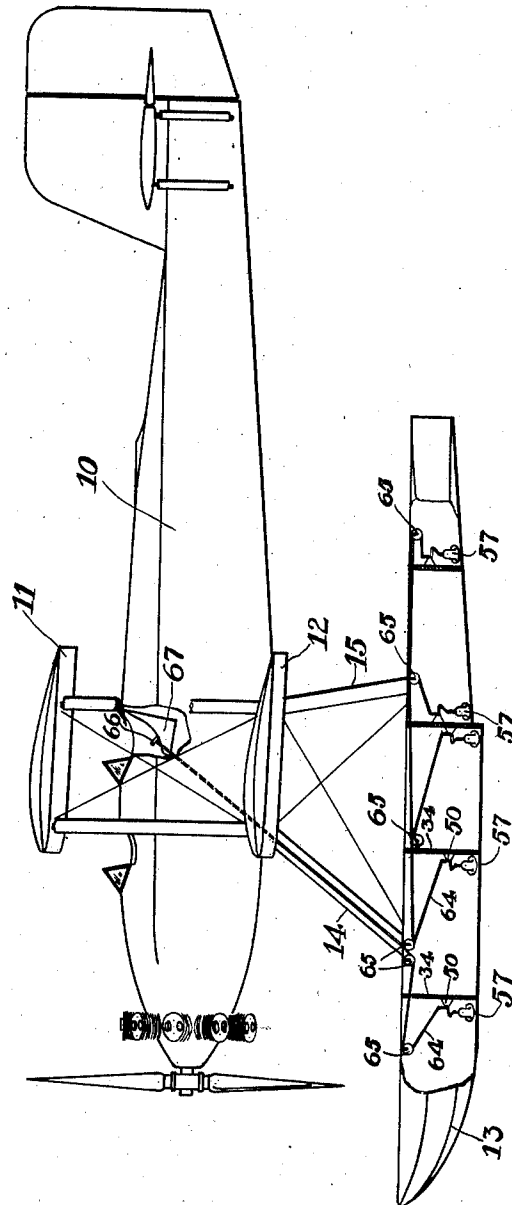


Fig 1

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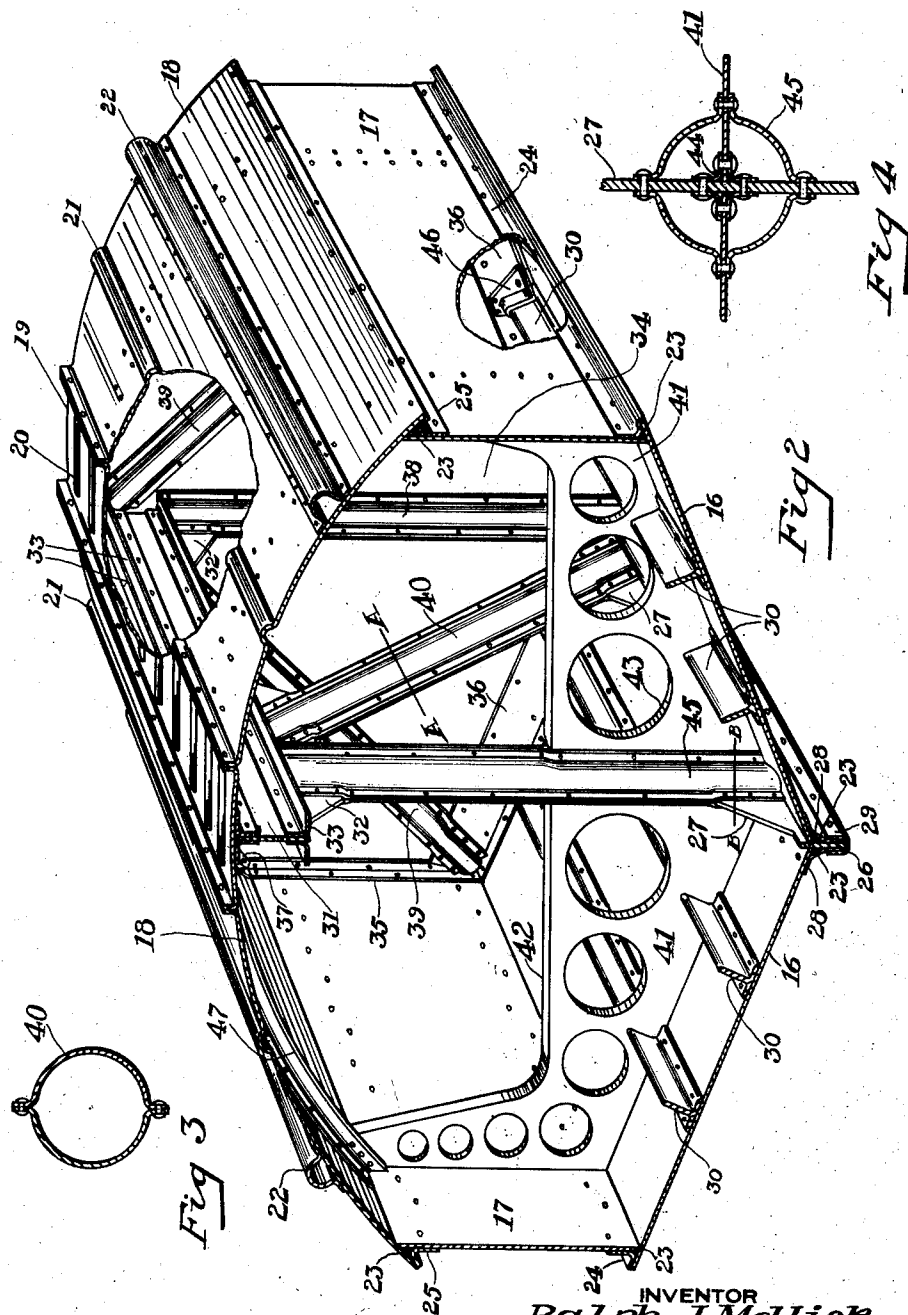


Fig 3

Fig 2

Fig 4

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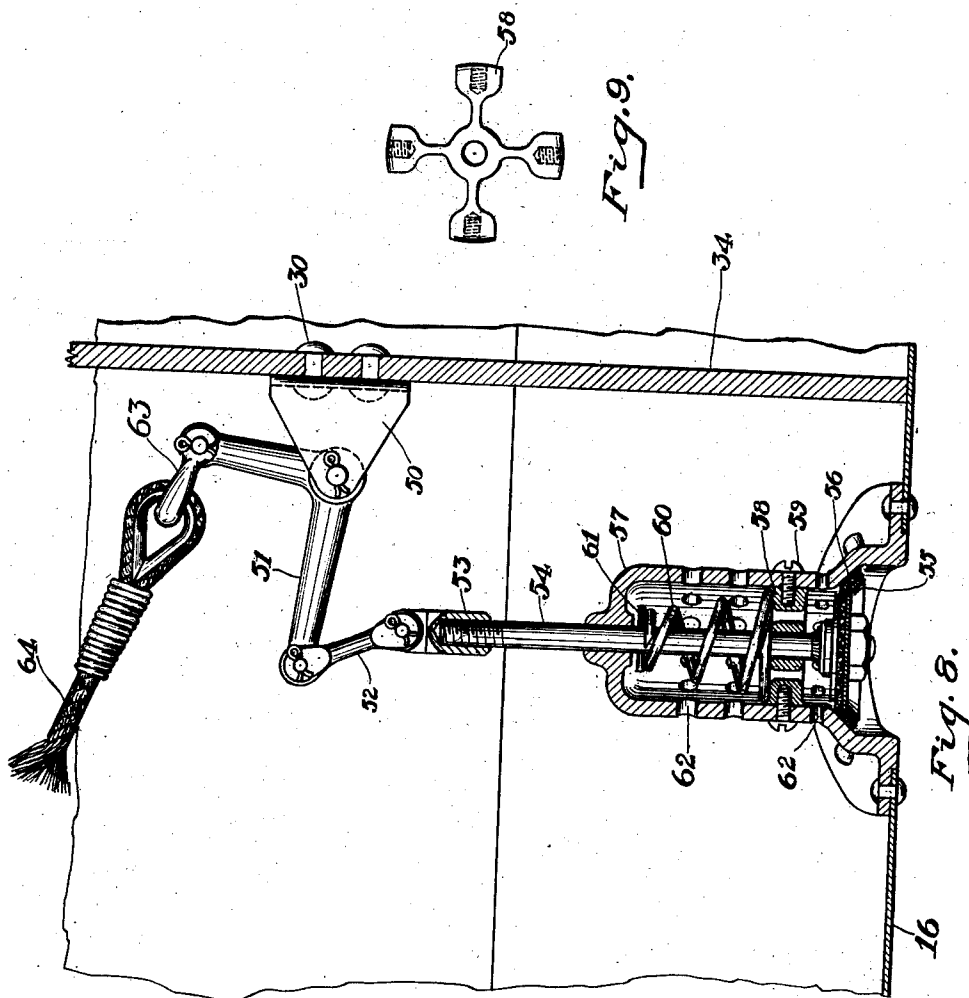
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UNITED STATES PATENT OFFICE

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AIRPLANE

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This invention relates to improvements in airplanes, and has reference particularly to aircraft floats.

One object of the invention is the formation of an all-metal float in which both strength and light weight are attained by the use of thin gauge metal on account of various novel features of design hereinafter mentioned.

A further object is the provision of means for removing the water that may leak into the various compartments of the float, or any of them, while the airplane is resting upon the water.

Another object is the provision of means for evacuating the water entrained in the compartments of the float after the plane has risen and is in flight.

Other objects and features of novelty will appear as we proceed with the description of that embodiment of the invention which, for the purposes of the present application, we have illustrated in the accompanying drawings in which:

Fig. 1 is a side elevation of a hydroplane embodying our invention, certain parts being broken away in order to more fully illustrate the means we have devised for evacuating water from the various compartments of the float during the flight of the plane;

Fig. 2 is a perspective view on a larger scale of a portion of one of the floats, certain parts being broken away and shown in section in order to adequately illustrate the structural details of the float;

Fig. 3 is a cross section of a strut, the section being taken on the line A—A Fig. 2;

Fig. 4 is a cross section of a strut and joint, the section being taken substantially on the line B—B Fig. 2;

Fig. 5 is a side elevation of the float with parts broken away to illustrate more or less diagrammatically our system for pumping water out of the various float compartments;

Fig. 6 is a longitudinal sectional detail view of a pump which may be employed for the purpose;

Fig. 7 is a view partly in section illustrating the float controlled valve which we em-

ploy at the lower end of each of the pipes of this system;

Fig. 8 is a detail view partly in section and on a larger scale showing one of the valve controlled drain openings in the float; and

Fig. 9 is a detail plan view of the spring retainer and valve stem guide used in the construction of Fig. 10.

Similar reference characters refer to like parts throughout the views.

In the drawings, the fuselage of a hydroplane is indicated at 10, the plane wings at 11 and 12, one of the floats at 13 and certain of the struts connecting the float with wing 12 at 14 and 15.

The material of which the float parts are constructed is preferably an alloy of aluminum which is employed because of its high strength-weight ratio, but other materials having a high strength-weight ratio may, of course, be substituted. In the large scale view of Fig. 2 the various structural features are illustrated to advantage. In this figure the bottom panels of the float are shown at 16 and the side panels at 17. The arched deck is formed of three pieces, that is two side portions or panels 18 and a central panel or strip 19, flanged on its edges for attachment to the flanged inner edges of the panels 18, and provided with transverse beads 20 constituting treads which facilitate the use of the panel 19 as a walkway. The deck panels 18 are reinforced by integral beads 21 and by channel stiffening members 22 which are riveted to the panels.

The joints of the float, particularly along the sides and bottom thereof where water is most apt to enter, are formed in a novel way which we will now describe. Where two plates come together, as for instance the bottom and side panels 16 and 17, one of them, 16 in this instance, extends beyond the line of intersection of the plates. In the angle thus formed between this extension and the other plate 17, we mount packing 23. Then by means of a properly formed angle bar 24 we cover and protect this packing and at the same time join the two plates together, this being accomplished preferably by riveting each flange of the angle bar to one of the

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panels 16, 17. Similarly the joints between the side panels 17 and the deck panels 18 are formed with the deck panel overhanging the side panel, and in the angle therebetween packing 23 is placed and retained by the angle bar 25 which is riveted along its flanges to the panels 17 and 18 respectively. The packing which we prefer to employ for this purpose is cotton wicking impregnated with marine glue.

The keel of the float comprises a central web member 26 having upward extensions 27 which will be referred to later herein. On each side of the web member 26 we mount angle bars 28 which are riveted to the bottom panels 16 and enclose packing 23 of the same nature as that above referred to. A rubbing strip 29 of channel form encloses the lower edge of the web member 26 and the lower flanges of the angle bars 28 and is riveted in place, thereby securing also the lower flanges of the angle bars 28.

The bottom panels 16 of the float are reinforced by structural bars of suitable cross section, preferably T-bars, 30, which are continuous from front to rear of the float. The deck of the float is supported at the middle by an I-beam which preferably is built up from plates and comprises a web 31 which at intervals has integral extensions 32, the purpose of which will later appear. The flanges of the beam are formed by angle bars 33 riveted to the web along both the upper and lower edges of the same.

The float is divided into a series of compartments by bulkheads 34 of relatively thin material. The latter is attached to the side panels 17 of the float by being mounted between angle bars 35 which are riveted to the panels 17, and is attached to the bottom and deck panels in a similar manner by means of angles 36 and 37, respectively. Suitable packing (not shown) may be employed in these joints.

Each bulkhead 34 is further stiffened and reinforced by a central vertical strut 38 and by inclined struts 39 extending from the ridge beam of the float to the chines thereof. These struts are separated by the bulkhead itself into two equal parts which are riveted together through the bulkhead, the ends of the struts being separated sufficiently to straddle the vertical portions of the angle bars 36 and 37.

In the central vertical longitudinal plane of the float there are inclined struts 40 of the same cross sectional form as the struts 39, this form being shown in section in Fig. 3. The two halves of this strut are separated somewhat at its ends to straddle the continuations 32 and 27 of the web member 31 and the keel 26 respectively, to which the parts of the strut are riveted.

In positions intermediate the bulkheads 34 there are partial bulkheads 41 constructed of

sheets or plates of metal fitting the sides and bottom of the float, but cut out on their upper sides and flanged, as shown at 42. A plurality of openings are formed in the plate and each one is flanged as at 43, thereby improving the bulkhead from the standpoints of both lightness and stiffness.

The lower portion of the partial bulkhead 41 is slotted to straddle the projection 27 of the keel 26, and these parts are held firmly in position by four angle plates 44 which are riveted to both parts, as shown in Fig. 4.

In order to still further strengthen the joint between the parts 27 and 41, in order to reinforce the bulkhead 41, and in order to form a vertical strut for the ridge beam of the float, we employ a strut or column 45 formed of four column pieces of flanged quarter-round section. At its upper end this column is split in the longitudinal plane of the float to receive the extension 32 of the ridge beam, to which the adjacent flanges of the strut are riveted. At the bottom end of the strut these same flanges are again separated to straddle the extension 27 of the keel 26. This column also straddles the transversely arranged bulkhead 41 from the top of the bottom of the latter, and the adjacent flanges of the column pieces are riveted together through said bulkheads.

The strut 38 is similar to the strut or column 45, except that the former is completely separated by the bulkhead 34 while the parts of the column 45 come together above the partial bulkhead 41.

On account of the desirability of preserving a water tight joint between each of the bulkheads 34 and the reinforcing T-bars 30, we provide flanged fittings or saddles 46 in conjunction with which suitable packing (not shown) may be employed.

Arched angle bars 47 secured at their outer ends to the partial bulkheads 41 form additional supports for the deck to which they are riveted.

Referring now to the means which we employ for evacuating water from the float compartments during the flight of the plane, as illustrated in Figs. 1, 10 and 11, on the forward side of each bulkhead 34 we mount a bracket 50, in which is pivotally supported a bell crank 51. To one arm of the latter is attached a link 52 connecting the same with a cap 53 which is threaded upon the upper end of a valve stem 54. This stem 54 carries at its lower extremity a valve piece 55 having a leather washer 56 adapted to engage a conical surface on a casting 57 which has a flanged lower end that is secured to the bottom panel 16 of the float around a drain opening therein by rivets or the like, as shown in Fig. 10. The lower portion of the stem is guided in the hub of a spider 58 secured to the casting by means of screws 59, or the like. The coil spring 60 bears upon the top of

spider 58, and at its upper end engages a pin 61 mounted in the stem 54, thereby tending to hold the stem elevated and the valve piece 55 in closed position. The casting 57 is provided with numerous holes 62 through which water may enter on its way to the drain opening.

On the upper arm of each bell crank 51 is a clevis 63 for attachment to a cable 64. These cables run over guide pulleys 65 and thence through hollow strut 14 up to lever 66 located in proximity to the pilot's seat 67. As will be apparent, operation of the lever 66 will pull upon all of the cables 64 simultaneously thereby swinging the bell cranks 61 to depress the valve stems 54 and valves 55 against the action of springs 60. Any water entrained in some or all of the float compartments will thereupon flow through the holes 62 and through the spaces between the arms of spider 58 downwardly upon the valve piece 55 and out of the drain opening. Conversely, when the pull on lever 66 is relieved the springs 60 will act to draw the various valves 55 tightly onto their seats. Pressure encountered when the plane rests upon the water serves to close the valves all the more tightly. It will be observed that the drain openings are located at the rear of each compartment in advance of the float step because any water entrained in a compartment tends to wash towards the rear when the plane is in flight, particularly during ascent. For the compartments in the rear of the float step, however, we may position the drain openings at the forward end, as indicated in Fig. 1, on account of the forward and downward inclination of the bottom panels of these compartments.

Now referring to Figs. 7, 8 and 9 wherein we have illustrated our pump system for bailing out water from any or all of the compartments between bulkheads, here we have a manifold pipe 70 to which are connected a series of suction pipes 71, one for each compartment. The details of the pump are unimportant but for purposes of illustration we have shown herein a double acting hand pump 72 having a plunger rod 73 extending through the deck of the float and provided with a handle 74. The pump piston may consist of a pair of metal disks 75 with oppositely flanged leathers 76 interposed between the disks 75, all these parts being then clamped together by means of a nut 77 threaded onto the lower end of the plunger rod 73. Double connectors 78 are joined to the pump cylinder near its upper and lower ends. Each of these connectors has an outwardly opening check valve 79 and an inwardly opening check valve 80. The outwardly opening valves are connected by pipes 81 and 82 with an outlet 83 in the side of the float. The inwardly opening valves are connected through

pipes 84 and 85 and through one of the pipes 71 to the manifold pipe 70.

The lower end of each pipe 71 is mounted in a two-piece bracket 86, 87 the parts of which are clamped together and to the adjacent bulkhead 34 by machine screws 88. The extremities of the pipes 71 are flared, as shown at 89, thereby providing seats for ball valves 90, each of which is mounted on the short arm of a lever 91 that is looped about a pin 92 within a bifurcation of the bracket piece 87, whereby the lever is supported for pivotal movement. On the extremity of the long arm of lever 91 there is a float 93. On account of the fact that the float 93 is of greater weight than the ball 90 or is mounted upon a longer lever arm, or both, the ball 90 remains seated in the flared end 89 of pipe 71 at all times except when water collects in the compartment to a depth sufficient to raise the float 93. The parts are designed so that this does not occur until the lower end of pipe 71 is immersed in water.

When the pump handle 74 is reciprocated, suction is exerted upon all of the pipes 71 through the manifold 70. This merely exhausts the air from the pipes that are in dry compartments because the balls 90 hold these pipes closed, but if the lower end of any pipe 71 is immersed in water and the float 93 raised on that account, then the vacuum existing in that pipe by reason of the operation of the pump will cause water to rise in the pipe 71 and be moved into the pump through check valves 80 and upon the next stroke of the pump expelled through check valves 79 and pipes 81 and 82 to the outlet 83.

Having thus described our invention, we claim:

1. In an airplane, a built up beam comprising a web member, a projecting plate integral with said web member extending outwardly from the said beam, and a structural member open at one end along a central transverse plane straddling said projecting plate and secured thereto.

2. In an airplane, a built up beam comprising a web member, a projecting plate integral with said web member and extending outwardly from said beam, and a structural member arranged with its principal longitudinal plane coincident with the principal longitudinal plane of said beam, one end of said structural member straddling said projecting plate and being secured thereto.

3. In an airplane, a corner construction, comprising a plurality of plates meeting to form angles, fastening means between said plates at their meeting lines for preventing relative movement thereof, flanged column pieces mounted in said angles beyond said means, and rivets extending through said plates and the flanges of adjacent column pieces.

4. In an airplane, a corner construction,

comprising a plurality of plates meeting to form angles, angle braces mounted in said angles and riveted to said plates, flanged column pieces mounted in each of said angles outside of said angle braces, and rivets extending through said plates and the flanges of adjacent column pieces.

5. In an airplane, a corner construction, comprising a plurality of plates meeting to form angles, fastening means between said plates at their meeting lines for preventing relative movement thereof, and a flanged column piece mounted in each of said angles, said column pieces being connected together to form a column with its axis close to the meeting lines of said plates.

6. In an airplane, a float comprising two plates meeting on a line inwardly from the edge of one of them, packing in the angle between said plates on the outside of the joint, and an angle bar secured through its two flanges independently of each other to both plates on the outside of the joint, retaining and protecting said packing.

In testimony whereof, we hereunto affix our signatures.

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