G. H. CURTISS.

CRUISING HYDROAEROPLANE.

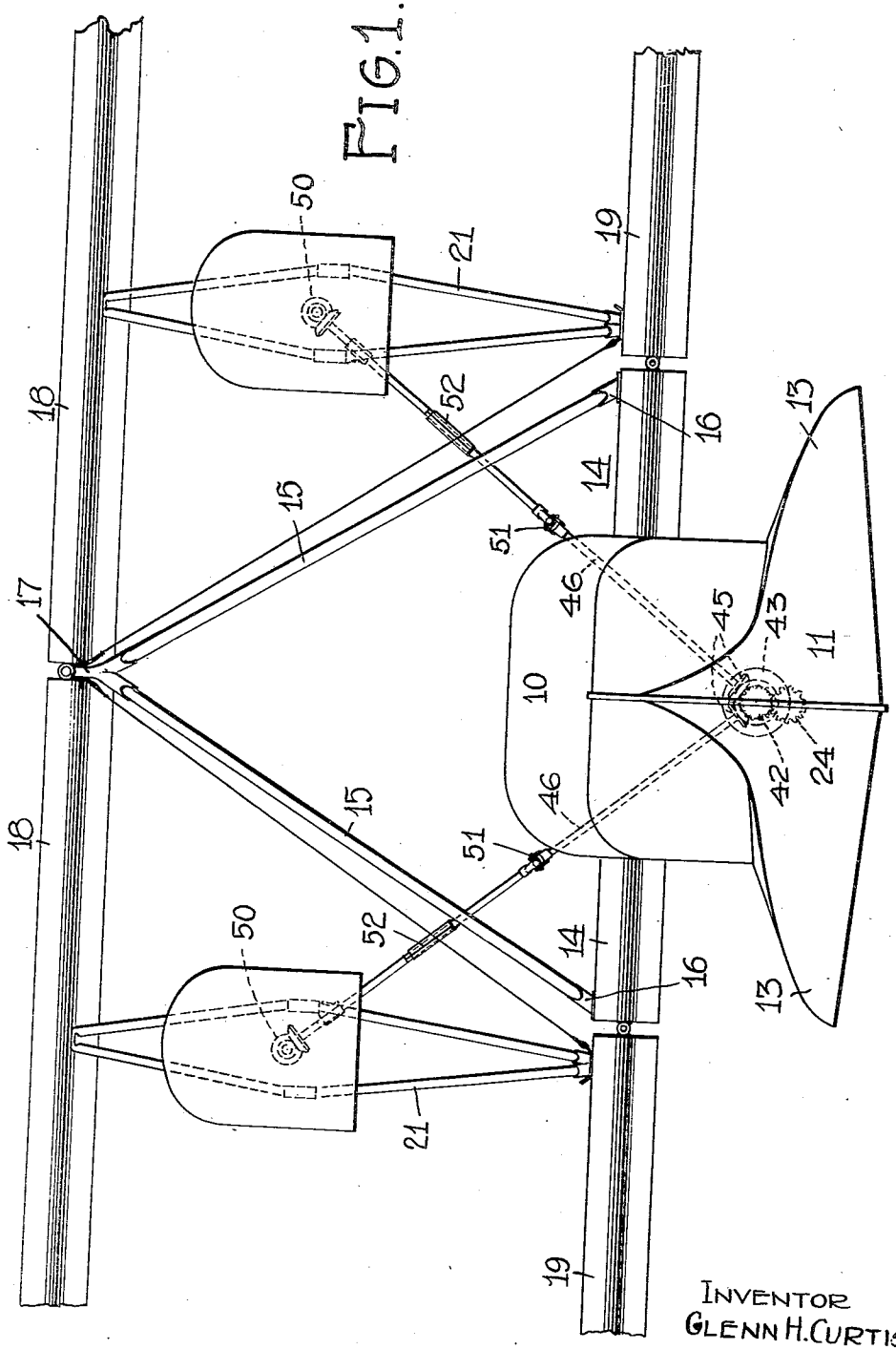
APPLICATION FILED JULY 1, 1916.

1,316,277.

Patented Sept. 16, 1919.

2 SHEETS—SHEET 1.

FIG. 1.



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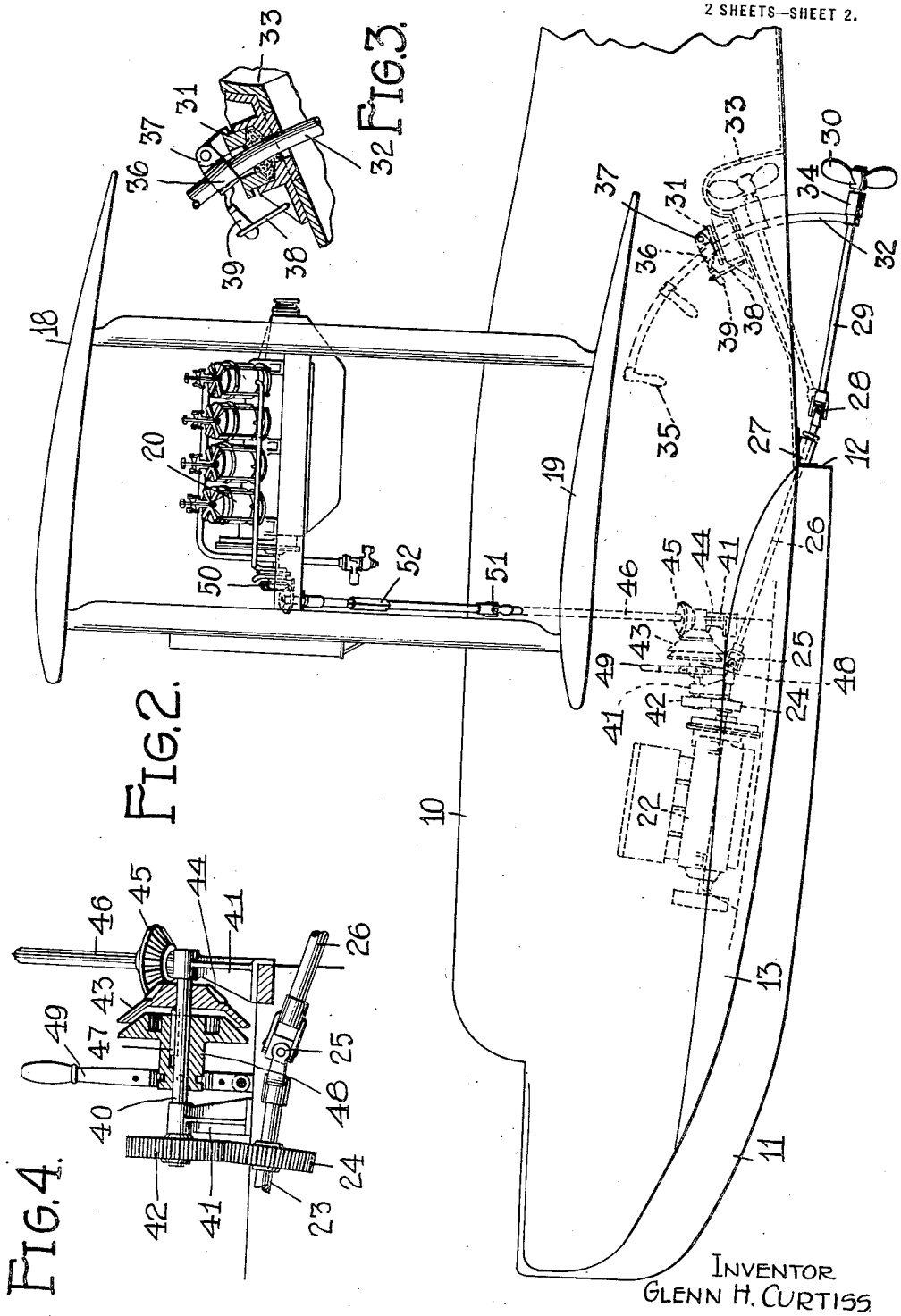


FIG. 2.

FIG. 3.

FIG. 4.

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UNITED STATES PATENT OFFICE.

GLENN H. CURTISS, OF BUFFALO, NEW YORK, ASSIGNOR TO CURTISS AEROPLANE AND MOTOR CORPORATION, OF BUFFALO, NEW YORK, A CORPORATION OF NEW YORK.

CRUISING HYDROAEROPLANE.

1,316,277. Specification of Letters Patent. Patented Sept. 16, 1919.

Application filed July 1, 1916. Serial No. 107,161.

To all whom it may concern:

Be it known that I, GLENN H. CURTISS, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Cruising Hydroaeroplanes, of which the following is a specification.

My present invention relates to flying boats and is particularly concerned in the provision of means enabling the craft to proceed as a motor boat when stripped of its flying equipment after the manner disclosed in the pending application of J. P. Tarbox, filed Dec. 15th, 1915, Serial No. 66,913.

As a principal object I contemplate the provision of a flying boat with a motor located within the hull and coupled to a water propeller projecting from the hull immediately behind the hydroplaning step with which aerial craft of this type are customarily equipped.

An object of equal importance with the foregoing is to provide a driving shaft for the water propeller previously mentioned, which shall be jointed and mounted in such manner as to permit the propeller to be hidden away within an appropriate recess or pocket provided in the hull for its accommodation when not in use. Minor objects in this connection are to provide suitable means for readily handling the propeller when being shifted into either its operative or inoperative positions, while at the same time to furnish locking means of a suitable nature adapted to maintain the propeller in the position to which it has been shifted.

Another object of prime importance is to connect the hull motor with the aerial engines, which in flying boats heretofore developed are arranged between the wings, exteriorly of the hull proper, in order that the hull motor may serve as an engine starter for such aerial power plants.

An object dependent upon the one preceding is to provide the driving connections between the hull motor and the aerial engines with means permitting a ready disengagement of the connections in case it should be found necessary to shed the wings of the craft together with the engines supported thereby, in the manner clearly set forth in the pending application above mentioned.

The above and additional objects, to be hereinafter more specifically treated, are accomplished by such means as are illustrated in the drawings, described in the following specification and then more clearly pointed out in the claims, which are appended hereto and form a part of this application.

With reference to the drawings, in which there is illustrated one embodiment of the invention, and throughout the several views of which like characters of reference designate similar parts,

Figure 1 is a front elevation of a flying boat equipped with the present invention;

Fig. 2 is a side elevational view of the boat;

Fig. 3 is a detail of one of the locks employed to support the shiftable water propeller, and

Fig. 4 is a detail in longitudinal section of the clutch mechanism and its connections, as interposed between the hull motor and the areial engines to be started thereby.

The hull of the boat may be designated in its entirety by the numeral 10, and is provided with the usual hydroplaning bottom 11 which slopes downwardly and rearwardly on an easy curve to a step 12 which terminates at the bottom in substantially the transverse vertical plane of the center of gravity of the craft. Laterally the bottom 11 is extended by means of integral fin surfaces 13, while the hull as a whole tapers rearwardly from the step to the usual tail, which it has not been thought necessary to illustrate. The bottom, aft of the step is inclined upwardly and rearwardly, thus making a salient angle with that portion of the bottom forwardly of the step. The step may therefore be said to indicate the point of maximum convexity in the hull bottom since the bottom longitudinally of the hull is characterized by downward convexity.

This particular type of flying boat is constructed with the view of permitting the wings to be shed instantly at the desire of the aviator, in order that the craft may be stripped to its motor boat essentials, as might be necessary in storms, in attempting to reach an anchorage having a restricted approach, or for purposes of concealment. For this reason, the biplane cell comprising the aerial supporting surfaces of the craft is supported upon a wing panel designated 14 and built into intimate relation with the hull 10, extending transversely therefrom to

overlie the fins 13 at their greatest width. Erected upon this wing panel are A-braces 15 which are supported in footing sockets 16 by the panel and which carry at their apexes the inverted Y sockets 17 to which the upper wing panels 18 are directly hinged in a manner providing for an immediate disruption of the connection. Lower wing surfaces 19 are similarly mounted directly to the wing panel 14 of which they form lateral prolongations. The means whereby these connections may be given an immediate release in order to shed the wings from the hull need not be entered into in detail at the present time.

Power plants designated as a whole by numerals 20 are mounted between the upper and lower surfaces 18 and 19 upon supports 21 placed in juxtaposition to the hull panel 14. These engines are provided with the usual propellers which serve to drive the craft normally both through the water and air. As arranged, however, they will be dispensed with at the time that the wings are shed, which will deprive the boat of its means of propulsion, unless some auxiliary power plant is to be furnished.

The present invention has solved this problem by mounting an auxiliary motor 22 within the hull 10 and providing means for operatively connecting this motor to a water propeller and to the aerial engines 20 for the double purpose of propelling the craft as a motor boat, when the wings have been shed, and to otherwise act as an engine starter for the power plants 20, since it is frequently inconvenient to attend to the power plants, owing to their remote position with respect to the pilots' seats.

The crank shaft 23 (Fig. 4) of the motor 22 is equipped with a driving gear 24 and has a universal joint connection 25 with a shaft 26 which is journaled within bearings 27 to protrude from the hull 10 immediately behind the hydroplaning step 12 thereof, and at an angle to the crank shaft 23. At the protruding extremity of the shaft 26 a second universal joint connection 28 couples the propeller shaft 29 thereto, upon the outer terminal of which shaft is mounted the water propeller 30.

It is desired, of course, that the external propelling mechanism shall not protrude beyond the hull limits in such manner as to interfere, by the resistance offered thereby, to the normal movement of the boat under the propulsion of the aerial engines 20. To attain this end a pocket is formed within the tail of the hull 10 immediately abaft the hydroplaning step 12 and hence abaft the transverse vertical plane of the center of gravity and is radially arranged with respect to the universal joint 28 and is of such dimensions as will accommodate the propeller 30 and the major portion of the shaft 29 entirely within lines of the hull bottom. Communicating with this pocket by means of a stuffing box 31 is an arcuate bracket arm 32, the curve of which is described from the joint 28 as a center. Upon that extremity of the arm 32 protruding into the propeller pocket 33 is carried a bearing 34 for the support of the outer extremity of the crank shaft 29. At the other end of the arm 32 is arranged a handle 35 whereby the propeller may be readily shifted into or out of its pocket 33.

A lock substantially automatic in its nature is illustrated in Fig. 3 and serves to support the arm 32 in any position. This lock consists of a sleeve 36 which is pivotally mounted by an ear 37 upon the stuffing gland 31, or at some other suitable point along the course of the arcuate arm 32 which this sleeve embraces. It will be obvious that an upward pull upon the handle 35 will be permitted by this catch unless some means are provided to hold it down, but that all downward movement of the arm will be effectually prevented by the automatic binding action thereon of the sleeve 36.

Since, however, action of the propeller 30 upon the water when driven by its motor 22 would exert a lifting effect upon the outer extremity of the shaft 29, it will be apparent that some such means as the removable loop or bail 38 must necessarily be provided to engage the handle 39 with which the sleeve 36 is preferably equipped. If desired, locking means of any suitable nature may be associated with the arm handle 35.

It now remains to describe the driving connections which are interposed between the hull motor and the aerial motors in order that the former may be employed to start the latter. Reference will now be had to Fig. 4 in particular, in which is shown a shaft 40 journaled between a pair of supporting brackets 41 and carrying a gear 42 for engagement with the crank shaft gear 24 previously described. Loosely mounted upon the shaft 40 is the female clutch member 43 which is exteriorly formed with beveled gear teeth 44 adapted to engage gears 45 carried by the drive shafts 46. Splined upon the shaft 40 by means of the key or feather 47 is the male clutch member 48. A lever 49 is associated with the clutch member 48 in such manner that it may be operated to drive the member into engagement with the mating member 43, so that drive of the shaft 40 which is initiated by the gear 42 may be transferred to the shafts 46.

The shafts 46 extend from the hull 10 at the proper angle to engage with gears 50 arranged upon the respective crank shafts of the aerial engines 20. Each shaft 46 is provided with an intermediate universal joint connection 51, together with slip joint connections 52. These latter are squared in

order to transfer the driving power imparted to each shaft from the common clutch 43—48.

When the wings of the aircraft are released and shed, the universal joint 51 of each of the shafts 46 will first be put into play, then as all connections between the wings and the hull 10 are severed, and the latter forges ahead as a motor boat, the slip joints 52 will permit of an immediate disengagement between the aerial engines 20 and the hull motor.

From the foregoing it should be clear that the improvements contemplated by this invention may be readily applied to any type of flying boat having exteriorly mounted engines, as regards the driving connections between a hull motor serving as a starter for such external engines, whether the water propeller is also employed or not. It is a corollary, therefore, that the water propeller may be provided for any hydroaircraft in which it is advantageous to unship the propeller as regards its action within the water, without actually disconnecting it from an operative position.

While in the foregoing, however, there has thus been illustrated in the drawings and described in the specification such combination and arrangement of elements as constitute one preferred embodiment of this invention, it is desired to emphasize the fact that such departures from the particular embodiment disclosed may be made in later adaptions of this invention as shall be recognized as within the scope of the appended claims.

What is claimed is:

1. In a hydroaircraft, the combination with aerial supporting surfaces, of a flotation body having its bottom surface longitudinally downwardly convexed, the point of maximum convexity lying substantially beneath the center of gravity, that portion of the bottom surface in advance of its point of maximum convexity constituting the principal hydroplaning surface, a rearwardly facing step formed in the bottom at or near said point of maximum convexity, said bottom at a point aft of the step and likewise aft of the transverse vertical plane of the center of gravity being recessed, the recess being closed upon all sides excepting the bottom, a power plant, a water propeller, a driving connection between the power plant and the propeller, the connection being extended through the bottom of the body in the vicinity of the step, a joint formed in the driving connection admitting of the movement of the propeller from an operative position beneath the bottom to an inoperative position inclosed for the major part within the confines of the recess, said propeller when inclosed in the recess being effectually removed from the line of air rush incident to flight, means extending through the bottom of the body for moving the propeller from one to the other of the positions indicated, and means inside the body for locking the propeller in either of said positions.

2. In a hydroaircraft, the combination with aerial supporting surfaces, an aerial propeller and a power plant connecting with the aerial propeller for driving it, of a flotation body having its bottom surface longitudinally downwardly convexed, the point of maximum convexity lying substantially beneath the center of gravity, that portion of the bottom surface in advance of its point of maximum convexity constituting the principal hydroplaning surface, a rearwardly facing step formed in the bottom at or near said point of maximum convexity, said bottom at a point aft of the step and likewise aft of the transverse vertical plane of the center of gravity being recessed, the recess being closed upon all sides excepting the bottom and forwardly removed from the tail end of the float, a power plant inclosed within the body and seated directly above its principal hydroplaning surface, a water propeller, a driving connection between the last mentioned power plant and the water propeller, the connection being extended through the bottom of the body at a point in the vicinity of the step, a joint formed in the driving connection admitting of the movement of the water propeller from an operative position beneath the body to an inoperative position inclosed for the major part within the confines of the recess where it is removed from the line of air rush incident to flight, means extended through the bottom of the body for moving the water propeller from one to the other of the positions indicated, means inside the body for locking the water propeller in either of its adjusted positions, a connection between the power plant inclosed within the body and the power plant first mentioned, the character of connection being such that the operation of one will operate the other, and means forming a part of said connection to render it effectual or ineffectual, said last mentioned means being confined to the interior of the body.

3. In a flying boat, the combination with aerial supporting surfaces, of a hull having its bottom surface longitudinally downwardly convexed, the point of maximum convexity lying substantially beneath the center of gravity, that portion of the bottom surface in advance of its point of maximum convexity constituting the principal hydroplaning surface of the craft, a rearwardly facing step formed in the bottom at or near said point of maximum convexity, said bottom at a point aft of the step and likewise aft of the transverse vertical plane

of the center of gravity being upwardly and rearwardly inclined, that portion of the hull having the upwardly and rearwardly inclined bottom being decidedly lighter per unit of area than that portion of the hull forwardly thereof, a pocket formed in the upwardly and rearwardly inclined bottom portion intermediately of its ends but nearer the step than the stern end of the hull, said pocket being closed upon all sides excepting the bottom, a power plant, a water propeller, a driving connection between the power plant and the propeller, the connection being extended through the bottom of the body at a point forwardly of the pocket and in the vicinity of the step, a joint formed in the driving connection admitting of the movement of the propeller from an operative position beneath the bottom to an inoperative position inclosed for the major part within the confines of the pocket where it is effectually removed from the line of air rush incident to flight, means extending through the bottom of the body for moving the propeller from one to the other of the positions indicated, means inside the body for locking the propeller in either of its adjusted positions, and clutch mechanism embodied in the driving connection between the power plant and the propeller to render it effectual or ineffectual as desired.

4. In a hydroaircraft, the combination with sheddable aerial supporting surfaces, a power plant sheddable with the supporting surfaces, an aerial propeller, and a driving connection between the power plant and the propeller, of a flotation body, the supporting surfaces being connected thereto, said flotation body having its bottom surface longitudinally downwardly convexed, the point of maximum convexity lying substantially beneath the center of gravity, that portion of the bottom surface in advance of its point of maximum convexity constituting the principal hydroplaning surface, a rearwardly facing step formed in the bottom at or near its point of maximum convexity, said bottom at a point aft of the step and likewise aft of the transverse vertical plane of the center of gravity being recessed, the recess being closed upon all sides excepting the bottom, a power plant inclosed in the hull directly above said principal hydroplaning surface, a water propeller, a driving connection between the power plant and water propeller, the connection being extended through the bottom of the body at a point in the vicinity of the step, a joint formed in said driving connection admitting of the movement of the water propeller from an operative position beneath the bottom to an inoperative position inclosed for the major part within the confines of the pocket where it is removed from the line of air rush incident to flight, a driving connection between the power plant inclosed in the body and the power plant driving the aerial propeller, the character of connection being such that the operation of one power plant serves as a starter for the other, a breakable joint in said connection admitting of the shedding of the first mentioned power plant with the aerial supporting surfaces, clutch mechanism embodied in said driving connection to render it effectual or ineffectual as desired, means extending through the bottom of the body for moving the water propeller from a position without to a position within the recess and means inside the body for locking the propeller in either of said positions.

In testimony whereof I affix my signature.

GLENN H. CURTISS.