No. 719,958. PATENTED FEB. 3, 1903.

J. SINCLAIR.

SCREW PROPELLER FOR THE PROPULSION AND STEERING OF SHIPS.

APPLICATION FILED JUNE 6, 1901.

NO MODEL. 5 SHEETS—SHEET 1.

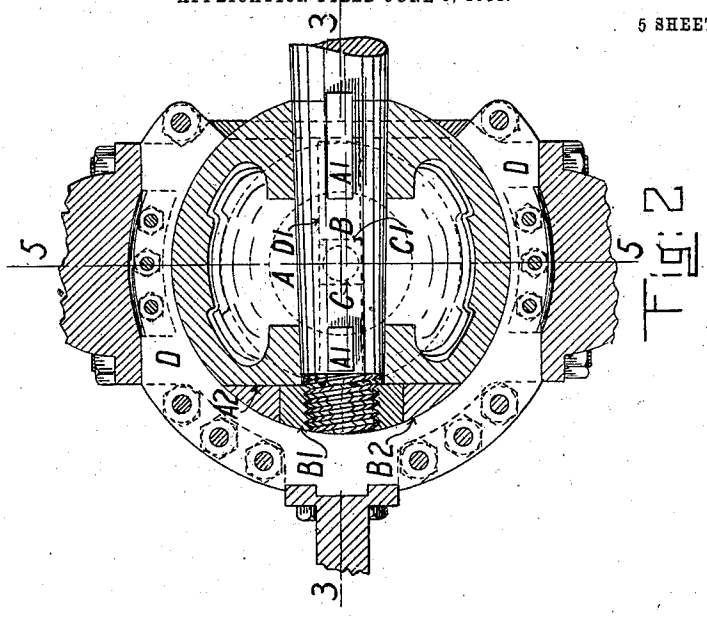

Fig. 2.

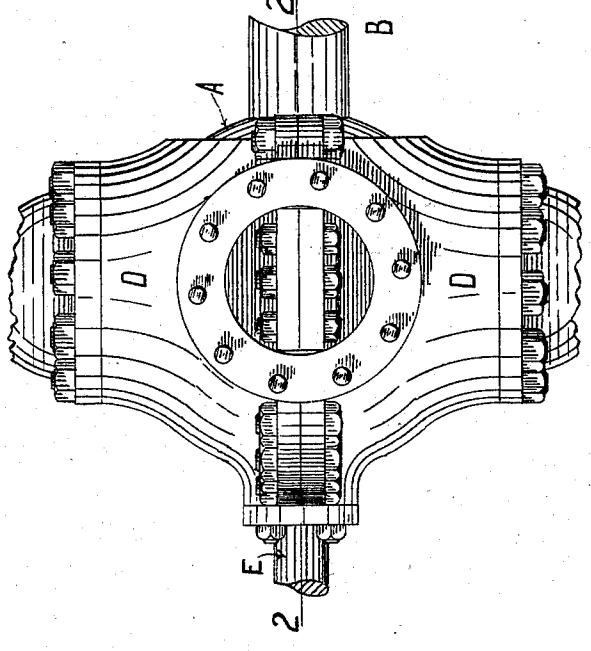

Fig. 1.

Witnesses.
James L. Norris Jr.
Robt Ewalt.

Inventor.
John Sinclair.
By James L. Norris
Atty.

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NO MODEL. 5 SHEETS--SHEET 2.

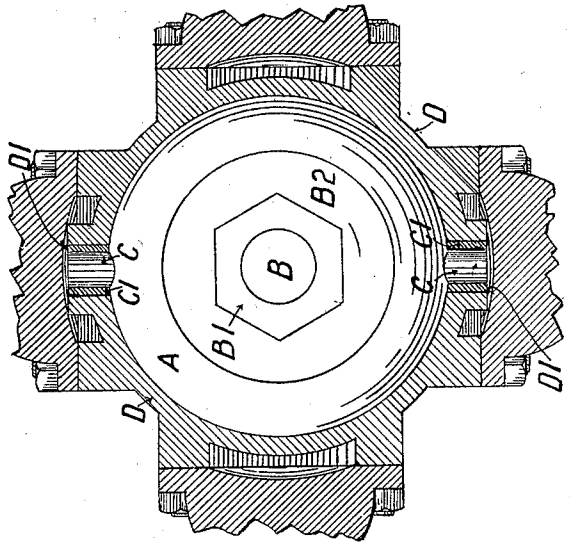

Fig. 4

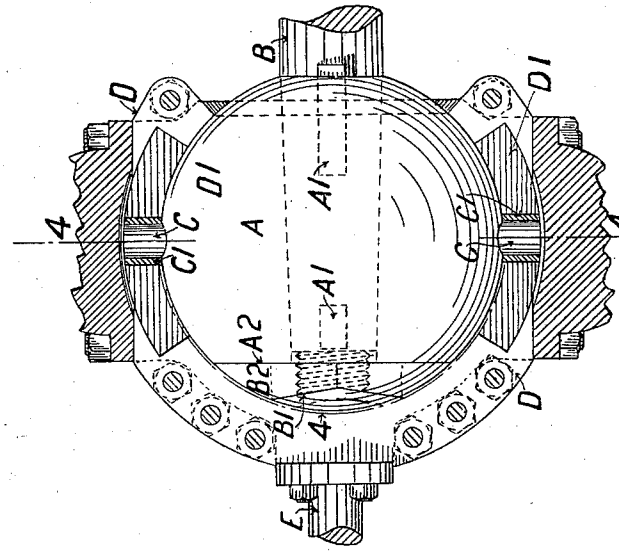

Fig. 3

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NO MODEL. 5 SHEETS—SHEET 3.

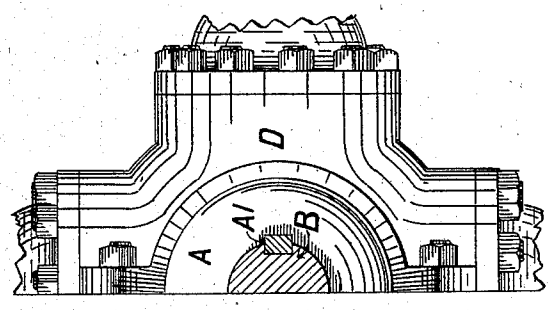

Fig. 7

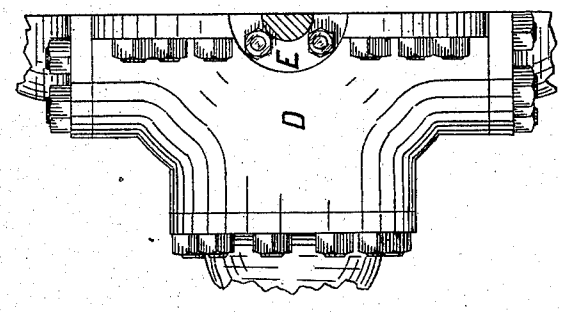

Fig. 6

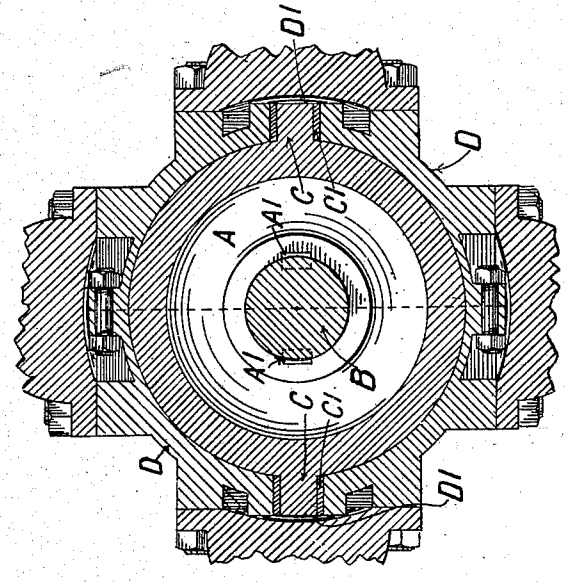

Fig. 5

Witnesses,
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NO MODEL. 5 SHEETS—SHEET 4.

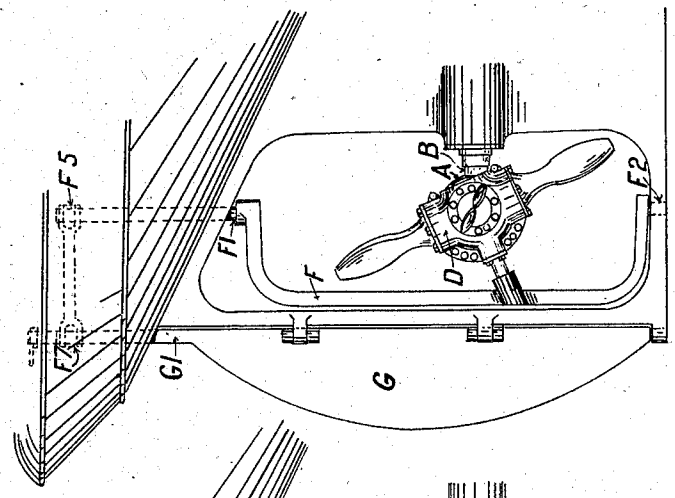

Fig. 10

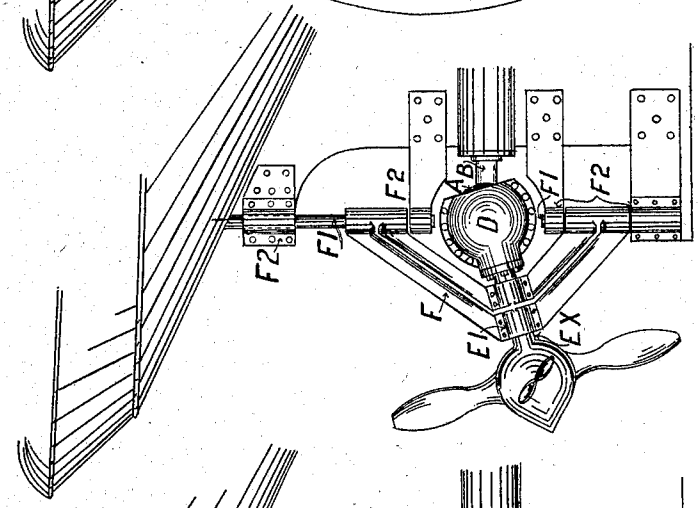

Fig. 9

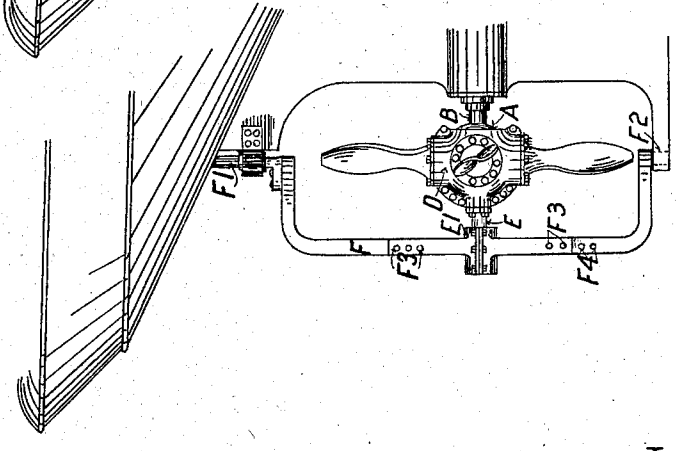

Fig. 8

Witnesses,
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Robert Everett

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John Sinclair.
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NO MODEL. 5 SHEETS—SHEET 5.

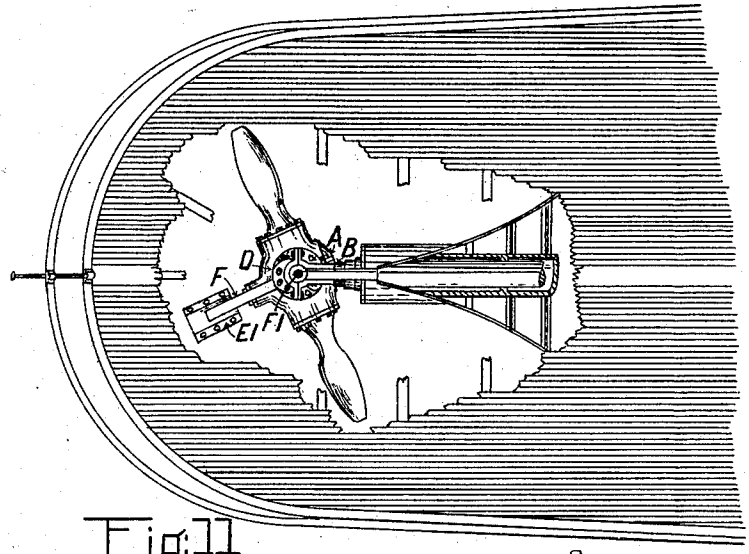

Fig. 11

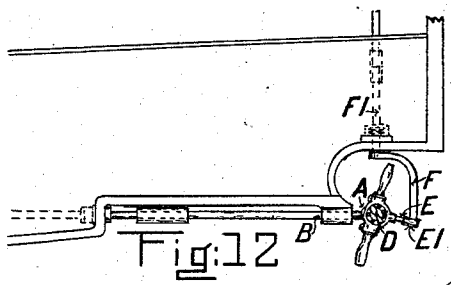

Fig. 12

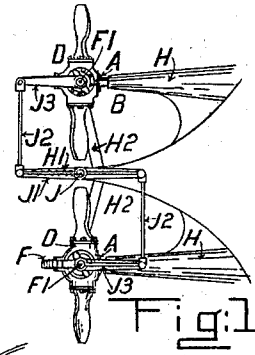

Fig. 14

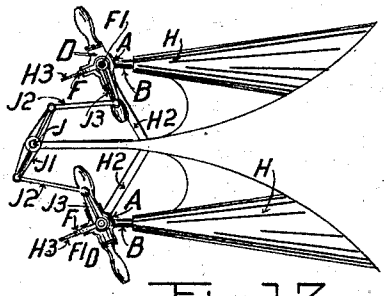

Fig. 13

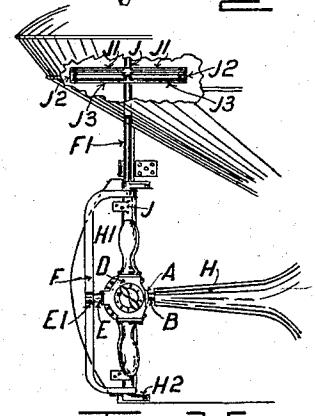

Fig. 15

Witnesses,
James L. Norris Jr.
Robert Everett

Inventor.
John Sinclair.
By James L. Norris.
Atty.

UNITED STATES PATENT OFFICE.

JOHN SINCLAIR, OF BALMAIN, NEW SOUTH WALES, AUSTRALIA.

SCREW-PROPELLER FOR THE PROPULSION AND STEERING OF SHIPS.

SPECIFICATION forming part of Letters Patent No. 719,958, dated February 3, 1903.

Application filed June 6, 1901. Serial No. 63,441. (No model.)

To all whom it may concern:

Be it known that I, JOHN SINCLAIR, marine engineer, a subject of the King of Great Britain, and a resident of No. 15 Ballast Point road, Balmain, near Sydney, in the State of New South Wales and Commonwealth of Australia, have invented new and useful improvements in screw-propellers and appurtenances for the propulsion and steering of ships, parts of which are applicable to universal joints or shaft-couplings, of which the following is a specification.

Marine screw-propellers as at present constructed propel the vessels to which they are attached only in a direction axial to the vessel's length, either going ahead or going astern. To alter the direction of advance of the vessel, a large retarding-surface, called the "rudder," is moved radially across the vessel's stern, achieving the desired object, but very slowly and with considerable loss of power. When the propeller is revolving "astern," the rudder is almost useless, causing steamers to be unwieldy and where navigation is congested to have limited power of self-preservation and to be a menace to neighboring bodies. Attempts have been made to overcome these disadvantages, but these hitherto have been more or less impracticable, owing to the unsuitability of the devices for the purposes intended. However, these present improvements have been specially devised so that these disadvantages will be more than obviated, while increased propelling power and increased steering capability are attained by the ship. These improvements in screw-propellers and appurtenances for the propulsion and steering of ships, parts of which are applicable to universal joints or shaft-couplings, consist, first and mainly, in the particular construction of a universal nave for or of the propeller, enabling said propeller to take up within limits axial inclinations at any angle to the axial line of the ship, such universal nave being applicable also as a universal joint. These improvements consist, secondly and consequentially, in the attachment of such a screw-propeller to a ship with its axial line fixed or adjustable at an angle other than a right angle with the axial line of the screw-shaft, so that said propeller will have a "dip" or a downward as well as a horizontal thrust, and these improvements consist, thirdly, in the particular combinations of mechanical parts hereinafter described and specifically claimed; but in order that this invention may be clearly understood reference will now be made to the drawings herewith, in which similar characters of reference wherever they occur indicate similar parts or parts having similar functions.

Figure 1 is a side elevation of the universally-naved propeller having a blade removed. Fig. 2 is a sectional plane on line 2 2 of Fig. 1. Fig. 3 is a sectional elevation on line 3 3 of Fig. 2. Fig. 4 is a sectional elevation on line 4 4 of Fig. 3. Fig. 5 is a sectional elevation on line 5 5 of Fig. 2. Fig. 6 shows a half outer end view, and Fig. 7 a half inner end view, of such propeller. Fig. 8 is a side elevation of a universally-naved steering-propeller and its appurtenances on a steamer, said propeller having a fixed but adjustable tail-bearing. Fig. 9 is a side elevation of a universal nave joining a screw-shaft and a tail-shaft, on which latter is a steering-propeller with its dip permanently fixed. Fig. 10 is a side elevation of a universally-naved steering-propeller on a steamer carrying also an ordinary rudder, said propeller having its dip permanently fixed. Fig. 11 is a plan of the parts shown on Fig. 8 with the propeller moved by the steering-gear to cause the steamer to move to starboard or to the right hand. Fig. 12 is a partial side elevation of a double-ended steamer or ferry-boat having a universally-naved steering-propeller with its dip permanently fixed. Fig. 13 is a plan showing a steamer having twin universally-naved steering-propellers with appurtenances to move them simultaneously. It also shows two rudders outwardly of the propellers, though these are not essential. Fig. 14 is a plan showing a vessel having twin universally-naved steering-propellers with appurtenances, so as to move them simultaneously and showing a central rudder, which also is not an essential. Fig. 15 is a side elevation of Fig. 14.

In constructing a marine screw-propeller or a universal joint according to this invention a hollow sphere A, hereinafter called the "hub," is fitted to the tail end of the shaft B. This hub A is of such diameter as will include the

length of taper on said shaft B and the nut B′, which secures the hub in position, and it is turned to fit the shaft accurately and has key-seats A′. The after end of the hub has a flat A^2, on which takes the nut B′, while a ring or collar B^2, with a hexagonally-shaped center, fits closely over the sides of the nut B′ and is doweled or otherwise attached to the flat A^2, thereby effecting the double purpose of securing the nut B′ from any possible movement and completing the spherical formation of the hub. This method of attachment will be adopted in most cases of alteration from an old to this improved construction. In other cases, however, the hub may be formed solid on the shaft or attached to it by means of keys driven through the hub A and shaft B at right angles to the axis of said shaft. Radial cylindrical gudgeons, bosses, snugs, or pins C, hereinafter termed "driving-pins," are cast or fitted on the hub A at right angles to the axis of the shaft B and central with regard to the fore-and-aft length of hub. The propeller-blades or other driven devices are secured to a hollow shell or nave D by studs and nuts or in any usual and preferably detachable manner. The nave D is made in two parts and accurately fitted to the hub A, and it has peripheral slots or recesses D′, in which take and are guided the driving-pins C, inclosed, preferably, in liners or box-bearings or shoes C′, accurately fitting said slots in a fore-and-aft direction. The forward end of the nave D is open in some degree, so that the driving-pins C are free to move and to permit of motion in any direction within the limits designed. It will be seen whether as a universal nave for a screw-propeller or as a universal joint these devices permit within limits of movement angularly up and down, so that a dip, hereinbefore referred to, may be attained and altered at any time desired, and also permit of movement angularly, horizontally, or sidewardly, so that the thrust is laterally angular to the axial line of the main or the first power shaft. At the same time no parts of the interior of the nave or of the hub are exposed. The interior of the hub also may be used as a reservoir for liquid lubricant, which thence will very gradually, but insistently, find its way to the working faces of the various parts.

Referring now to Figs. 8 and 11 of the drawings, a universally-naved and steering propeller is shown with a tail-shaft E, which has a bearing E′ in a steering-frame F in a footstep-bearing F^2 at bottom and a shank or post F′ at top. To this post F′ ordinary steering mechanism is connected, so as to control the movement of the frame F as the rudder of a vessel is ordinarily controlled. It will be seen that the tail-bearing E′ may be adjusted by means of bolts and nuts or rivets or studs F^3 in holes F^4 to give a dip to the set of the propeller. Also it is clear that any radial movement of the frame F will alter the angular set sidewardly of the propeller and so utilize it and its thrust (or pull when going astern) as a steering force which the steamer will readily and effectively answer to.

Fig. 3 shows the universal nave used to joint the screw-shaft B with an auxiliary tail-shaft $E^\times$, on the end of which, outwardly of bearing E′, is an ordinary propeller having a permanent dip. The bearing E′ is in a frame F, keyed or otherwise fixed to a parted or divided rudder-post F′ in bearings F^2. The movement of the rudder-post F′ by means of ordinary steering mechanism moves the propeller sidewardly and gives it and its motion the desired steering power.

Fig. 10 shows how these present improvements may be substituted for the ordinary construction of screw-propeller at a minimum of expense. In this case the frame F, carrying the tail-bearing E′, has its footstep-bearing F^2 and its plank or post F′. This post F′ has a T-head F^5, connected by side rods F^6 to a similar T-head or levers F^7 of like function on the ordinary rudder-post G′ of the rudder G.

Fig. 12 shows one end of a double-ended steamer, torpedo-boat, a steam-yacht, or other vessel in which the shaft B is exposed for some length. The improved universally-naved propeller has a dip, is attached to the end of this shaft, and has its tail-shaft E in bearing E′ of the steering-frame F on the end of post F′, which is actuated with like or better results similarly to an ordinary rudder-post.

Fig. 13 shows twin universally-naved screws on shafts B, protruding from casings H. Tail-shafts E have bearings in frames F with footstep-bearings in the bottom stays or braces H^2. As shown, these frames F carry or support rudders H^3. The posts F′ pass upwardly through the counter of the vessel and are connected by a system of levers with the king steering-post J, to which the ordinary steering-gear is attached. This system of levers, which is ensconced inside the skin of the counter or stern, consists of cross-head J′, side rods J^2, and half cross-heads or radius-levers J^3, insuring that the sidewise movement of the frames F with the propellers and the rudders H^3 will correspond, as shown in the drawings, and so an effective steering power be obtained.

Figs. 14 and 15 show similar constructions to those in Fig. 13; but in this case the frames F do not carry rudders H^3, although rudder H′ is carried by the ordinary rudder-post. The system of levers connecting the rudder-posts with the posts F′ is practically the same, and these devices are within the skin of the vessel, as shown.

It is essential in all cases that the center of hub and nave which correspond shall be in the axial line of the post or shank of the frame which holds their tail-shaft, or rather the bearing of said tail-shaft. It is desirable, too, that these posts or shanks should pass through a thrust-bearing to take up any vertical play.

No precise amount of dip for the propellers is postulated, for this so far must be arbitrary and be derived from calculation and experiment. Suffice it to say that a propeller with any degree of dip possible will give better results with than it will without dip. In some cases the dip might be self-adjustable in that the tail-bearing would be held in a vertical slot in the steering-frame. As the steamer went ahead the tail-bearing would seek the lowermost position, while on reversal it would seek the uppermost place, and so allow of the most effective thrust from the propeller in either direction. In other cases the dip might be altered mechanically by steam, hydraulic, or other mechanism from in-board either continuously connected or adapted to be connected when required.

It is not to be supposed that though I have shown and described a series of some of the more useful applications of these present improvements in marine propulsion and steering these are the only constructions possible or of which I am aware. There are many other constructions and combinations equally useful, but which it is not necessary herein to more fully describe, for these which are set forth will indicate to any one skilled in the art to which this invention appertains how he may apply these present improvements in practically every contingency without having to resort to any device or construction now not known.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. A main or propeller shaft, a spherical hub on said main or propeller shaft, a divided sphere having a segmental opening embracing said hub, the said hub having two diametrically opposite driving-pins and said divided sphere being slotted to receive said pins, both ends of slots being closed, and propeller-blades mounted and balanced directly on said divided sphere.

2. A main or propeller shaft, a hollow spherical hub on said main or propeller shaft, two diametrically opposite driving-pins on said hub, a divided sphere embracing said hub and having slots to receive said pins both ends of the slots being closed, propeller-blades mounted and balanced directly on said divided sphere, a tail or steering shaft or lever connected with said divided sphere, and a bearing for said tail-shaft in steering frame or post.

3. A main or propeller shaft, a spherical hub on said main or propeller shaft two diametrically opposite driving-pins on said hub, a divided sphere embracing said hub and having slots to receive said pins, propeller-blades mounted and balanced directly on said divided sphere, a tail or steering shaft or lever connected with said divided sphere, and means for holding said tail shaft or lever at an angle to the said main shaft and with the outer end of said tail-shaft at any vertical dip relatively to the said main shaft.

4. A main or propeller shaft, a spherical hub on said main or propeller shaft, two diametrically opposite driving-pins on said hub, a divided sphere embracing said hub and having slots to receive said pins, propeller-blades mounted and balanced directly on said divided sphere, a tail or steering shaft or lever connected with said divided sphere, and a bearing for said tail-shaft, said bearing being adjustable to thereby vary the dip of the tail-shaft in a vertical plane.

5. A driving-shaft, a propeller, a steering shaft or lever carried on said propeller, a universal joint connecting said driving-shaft and propeller and means for holding the steering-shaft at an angle to the driving-shaft and with the outer end of said steering-shaft below or "dipped" relatively to the driving-shaft.

6. A driving-shaft, a propeller, a steering shaft or lever carried on said propeller, a universal-joint connection uniting said driving-shaft and propeller and a bearing supporting the steering-shaft said bearing being vertically adjustable to thereby vary the dip of the steering-shaft and propeller.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN SINCLAIR.

Witnesses:
FRED WALSH,
PERCY NEWELL.