F. CLENNELL & F. W. THORP.

SHIP'S PROPELLER.

APPLICATION FILED JUNE 29, 1905.

1,008,953. Patented Nov. 14, 1911.

2 SHEETS—SHEET 1.

FIG. 3

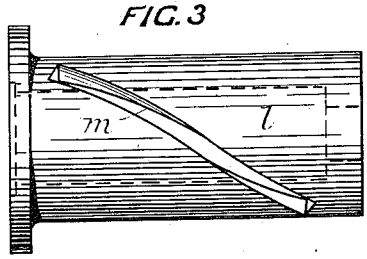


FIG. 1

FIG. 2

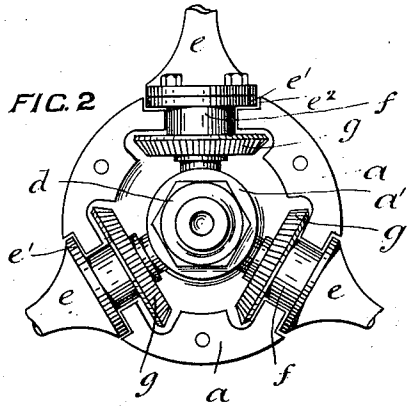
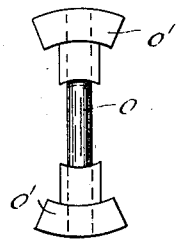


FIG. 4



WITNESSES;

F. H. Logan

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2 SHEETS—SHEET 2.

FIG. 5

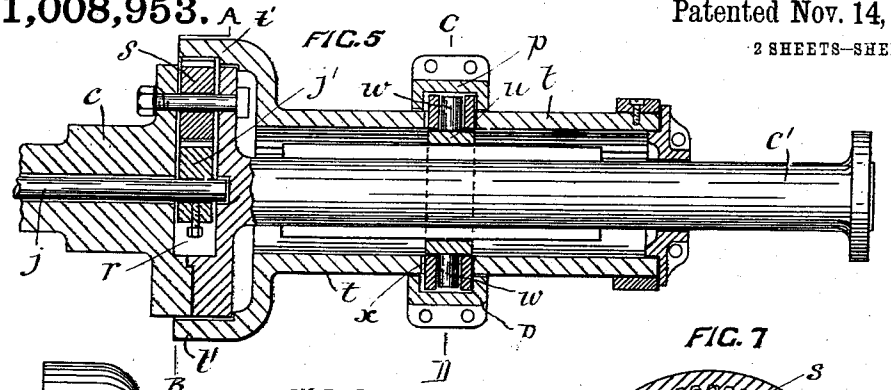


FIG. 6

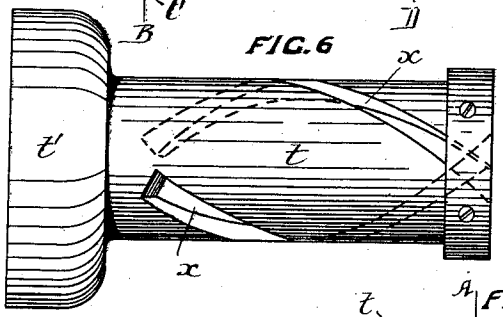


FIG. 7

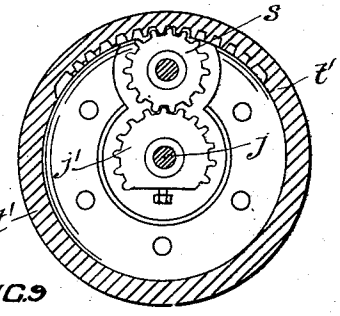
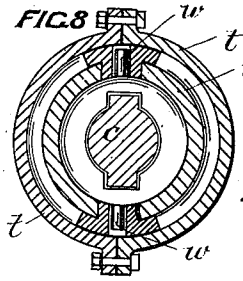


FIG. 8



A FIG. 9

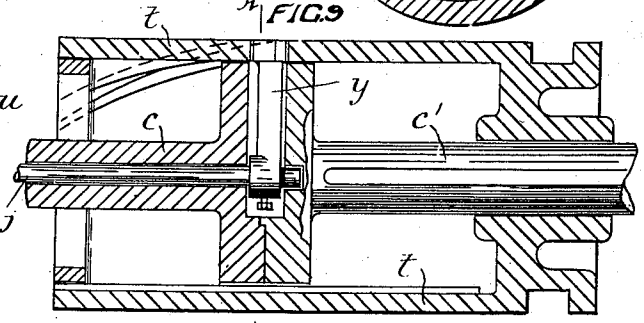
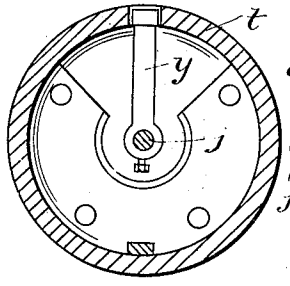
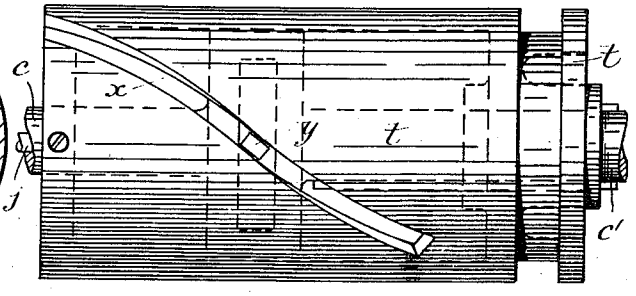


FIG. 11



B FIG. 10



WITNESSES;

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UNITED STATES PATENT OFFICE.

FRANK CLENNELL, OF WELLINGTON, AND FREDERICK WILLIAM THORP, OF MOTUEKA, NEW ZEALAND.

SHIP'S PROPELLER.

1,008,953. Specification of Letters Patent. Patented Nov. 14, 1911.

Application filed June 29, 1905. Serial No. 267,585.

To all whom it may concern:

Be it known that we, FRANK CLENNELL and FREDERICK WILLIAM THORP, subjects of the King of Great Britain, residing, respectively, at Wellington and Motueka, in the Colony of New Zealand, have invented new and useful Improvements in Ships' Propellers; and we do hereby declare the following to be a full, clear, and exact description of the same.

This invention has been designed in order to provide a propeller for ships that will be capable of driving a vessel either ahead or astern without stopping or altering the direction of motion of the engine.

The invention is particularly applicable in connection with ships driven by turbine engines in which generally separate engines are used for driving ahead and astern, but it is also suitable for use in connection with the ordinary type of engines.

In carrying out the invention the propeller boss is formed in two portions inclosing a hollow space. It is secured to the tail shaft in the ordinary manner. Each blade of the propeller is provided with a neck portion that fits within bearings formed in the wall of the propeller boss and projects into the space inclosed thereby. The inner ends of these neck portions or projections have secured to, or made in one with, them bevel gear wheels, the teeth of which face inward.

The tail shaft is formed with a hollow bore running centrally through it and fitting within this bore is a spindle the rear end of which projects outward into the hollow of the propeller boss and has secured upon it a bevel wheel that gears with all of the bevel wheels secured to the propeller blades. This spindle is free to rotate independently within the shaft bore. Thus by the rotation of the spindle and the gear wheel upon it, the propeller blades will be caused simultaneously to rotate on their own axes so as thereby to alter the pitch to any desired degree and cause the blades to assume any desired angle in relation to the center line of the tail shaft, thus providing for the vessel being driven ahead or astern while the tail shaft is rotating in the one direction.

Means are provided whereby the spindle may be rotated as desired and be held from rotation at any position so that the blades may not work loose or alter their position while the propeller is revolving.

In the accompanying drawings:—Figure 1 is a sectional plan of the propeller and of means for actuating the blade operating mechanism. Fig. 2 is an end elevation of the inner half of the propeller boss. Figs. 3 and 4 are details of the blade actuating appliances that will be hereinafter more fully referred to. Figs. 5 to 8 are illustrations of alternative means for actuating the propeller blades, while, Figs. 9 to 11 are illustrations of further alternative appliances for performing the same function.

Referring to Figs. 1 and 2:—The boss of the propeller is divided into two halves (*a*) and (*b*) jointed together so as to inclose a hollow space. The half (*a*) is securely fixed upon the end of the tail shaft (*c*) in the ordinary manner by means of the nut (*d*) and its end face is formed as a seat upon which the outer half (*b*) fits and is fastened by means of set screws, bolts or the like.

The blades (*e*) of the propeller are each formed with necks or shanks (*f*) and these shanks fit within bearings formed in the propeller boss and project into the hollow space inclosed therein. The bearings in which the shanks (*f*) fit are preferably formed in the joint between the two portions (*a*) and (*b*) of the boss so as thus to allow of the blades being quickly fitted to the boss. Upon the inner end of each shank is a bevel toothed wheel (*g*), the teeth of which face inward toward the center of the boss. This bevel wheel may be formed in one with the blade and shank or it may be made separately and secured thereto in any approved manner. The inner ends of the shanks rest in footstep bearings (*h*) formed in the internal body portion (*a'*) of the boss. The blades (*e*) are thus capable of swinging around on longitudinal axes in their bearings so as to assume any angle in relation to the plane of the tail shaft. Each blade is formed with a flange (*e'*) and the outside face of the propeller boss is formed wih recesses (e^2) into which these flanges fit, thus providing turning faces on which the blades may turn.

In Fig. 2 one of the blades is shown as being made separately from its shank and secured thereto by means of studs and nuts. This manner of construction will allow of the blade being removed and replaced without having to remove the portion (*b*) of the propeller boss.

The tail shaft (*c*) is bored longitudinally through its center and within the bore thus formed a spindle (*j*) fits so as to be capable of revolving independently of the tail shaft. This spindle passes out through a gland in the end of the tail shaft and projects outward into the hollow of the propeller boss, its extreme end being carried in a bearing formed in the cap portion (*b*) of the boss. A gear wheel (*k*) is securely mounted upon the spindle and this gear wheel gears with all of the bevel wheels (*g*) of the propeller blades. Thus when the spindle is revolved, simultaneous and equal turning movement will be imparted to the propeller blades.

The blades will revolve with the tail shaft in the ordinary manner but the angle assumed in relation to the plane of the shaft may be reversed or adjusted to any desired degree by giving an independent partial rotation to the spindle (*j*). Various ways of giving this movement to the spindle and blades and for locking them in any desired position may be devised. In the drawings three ways of effecting this object are shown.

In Fig. 1 a sleeve portion (*l*) is interposed between the inner end of the tail shaft (*c*) and the main shaft (*c'*). This sleeve is formed with a pair of spiral slots (*m*) in its side diametrically opposite to each other. The formation of these slots is shown in Fig. 3 which is a plan view of the sleeve. The inner end of the spindle (*j*) is provided with an enlargement (*n*) that fits within the sleeve (*l*). This enlarged portion is provided with a slot (*n'*) extending longitudinally along it. A cotter pin (*o*), shown in detail in Fig. 4, passes through the slot (*n'*) and projects from each side through the spiral slots (*m*) in the sleeve. A recessed collar (*p*) loosely encircles the sleeve and fits over the ends of the cotter pin (*o*) carried in sliding blocks (*o'*). This collar is capable of a sliding movement along the sleeve and when thus moved will carry the cotter pin with it, which cotter pin, by reason of the spiral slots (*m*) will be caused to move also through a partial revolution and carry the spindle (*j*) around with it. Thus the desired amount of movement may be given the spindle to cause the propeller blades to assume any angle required.

Any means suitable for sliding the collar (*p*) upon the sleeve and for locking it at any point thereon may be employed. For instance a bifurcated lever may encircle the collar and be connected thereto, by the movement of which the collar will be caused to move. This lever may be locked in any position.

Alternative means for rotating the spindle are shown in Figs. 5 to 8 of the drawings. In these figures, Fig. 5 is a sectional plan, Fig. 6 a plan, Fig. 7 a cross section on the line A—B of Fig. 5, and Fig 8 a cross section on the line C—D of Fig. 5. In the means here shown, the coupling of the tail shaft with the main shaft is recessed as at (*r*) in order to allow of the insertion within such recess of a pinion (*j'*) secured upon the end of the spindle (*j*) and of a pinion (*s*) gearing with such pinion and the periphery of which projects beyond the periphery of the coupling. A sleeve (*t*) surrounds the main shaft and is formed with a hood portion (*t'*) that envelops the coupling. This hood portion (*t'*) is formed with teeth on its inner periphery that engage with the teeth of the pinion (*s*). A collar (*u*) surrounds the shaft within the sleeve and is prevented from independent rotation by means of feather keys. This collar is provided with pins (*w*) projecting outward from it. These pins pass out through spiral slots (*x*) formed in the sleeve and project beyond them. The recessed collar (*p*) then surrounds the sleeve and fits over the ends of the pins. Suitable means are provided for sliding the collar (*p*) along the sleeve. When it is thus moved the pins (*w*) and collar (*u*) will be carried with it, the pins sliding along the spiral slots in the sleeve, while being held from rotatory movement upon the shaft, will cause such sleeve to rotate independently thereof. This rotatory movement of the sleeve will then be communicated to the pinion (*j'*) and spindle (*j*) through the pinion (*s*).

Further alternative means are shown in Figs. 9 to 11, Fig. 9 being a sectional plan, Fig. 10 a plan and Fig. 11 a cross section on the line A—B of Fig. 9 In these means, the sleeve (*t*) surrounds the shaft coupling and is capable of longitudinal sliding movement upon the shaft but is held from independent rotatory movement by means of feather keys The coupling is recessed for a portion of its diameter, as shown in Fig. 11. The inner end of the spindle projects into this recess and has secured to it an arm (*y*) which extends radially outward and passes into a spiral slot (*x*) formed in the sleeve. Thus by sliding the sleeve along, the arm (*y*) will be caused to follow the spiral slot and it will thus be given a rotary movement which movement will be imparted to the spindle (*j*).

Although the means shown and described are suitable for effecting the required movement of the spindle (*j*) to actuate the blades of the propeller in order to adjust their angles, it is to be understood that such means

do not constitute the important features of this invention as other means equally effective may be devised and adopted.

What we do claim as our invention and desire to secure by Letters Patent, is:—

In a ship's propeller, the combination of a tail-shaft having a tapering end portion, a threaded outer end, and an axial bore therethrough; an inner boss-piece having a tapering opening therethrough fitting on said tapering end portion, and provided with outer recesses forming apertured flange portions; an outer boss piece provided with outer recesses forming apertured flange portions and an end bearing-recess; bolts in the apertures of the flange portions and holding the inner and outer boss-pieces together, whereby a substantially spherical boss is formed, said pieces being provided with hollow spaces and supplementary coöperative recesses forming radial bearings having annular recesses, the inner boss-piece also being provided with step bearings having closed inner ends and coaxial with the radial bearings respectively; shanks fitted in said radial bearings and the corresponding step bearings respectively; propeller blades on said shanks; bevel gears on said shanks and movable in said spaces; a spindle in said axial-bore and having its end seated in said bearing recess of the outer boss-piece; a bevel gear on said spindle and meshing with the bevel gears of the shanks; means for adjusting said spindle relative to the tail shaft; a packing gland on the outer end of the tail-shaft and embracing said spindle; flanges on said shanks and seated in said annular recesses, and a nut on said threaded portion of the tail shaft and holding the inner boss-piece in position.

In testimony whereof, we have signed this specification in the presence of two subscribing witnesses.

FRANK CLENNELL.
FREDERICK WILLIAM THORP.

Witnesses to the signature of Frank Clennell:

W. ALEXANDER,
G. T. WIX.

Witnesses to the signature of Frederick William Thorp:

CHARLES Y. FELL,
PHILIP TOPLISS.