(No Model.) 3 Sheets—Sheet 1.

J. W. DILKS.

ADJUSTABLE SCREW PROPELLER.

No. 264,446. Patented Sept. 19, 1882.

Fig. 1.

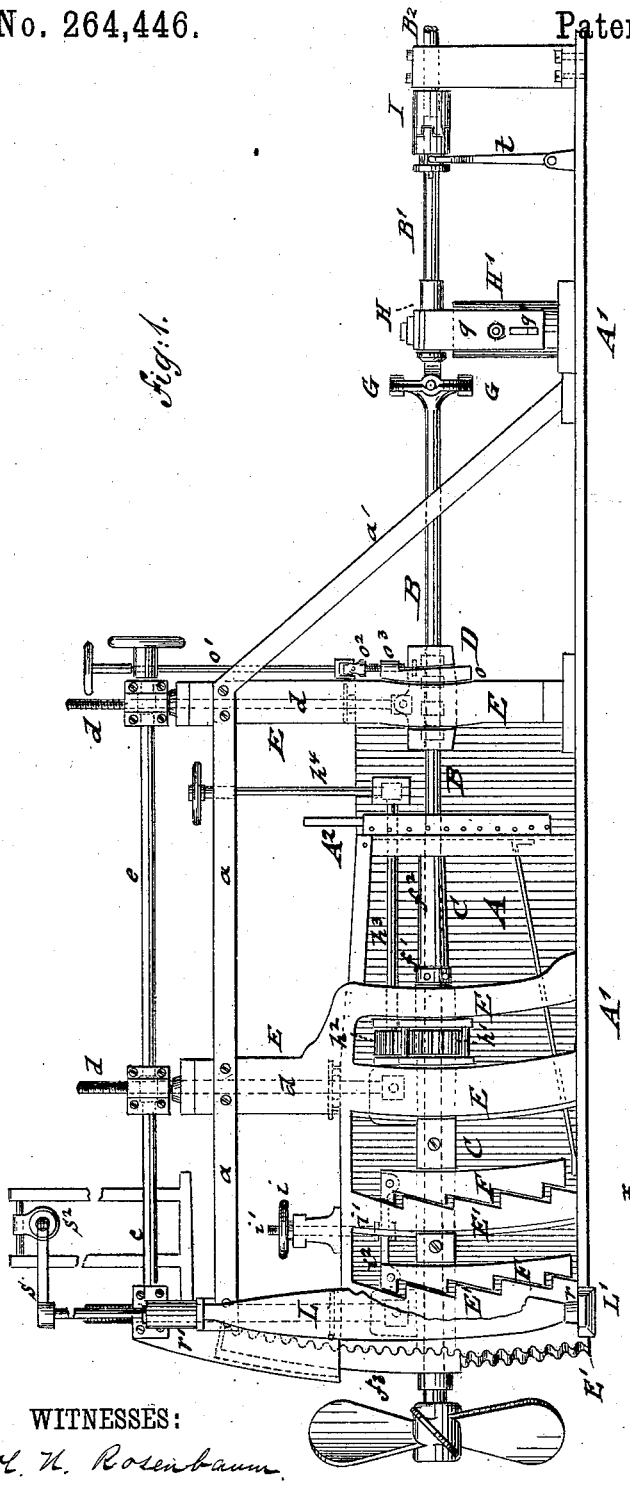
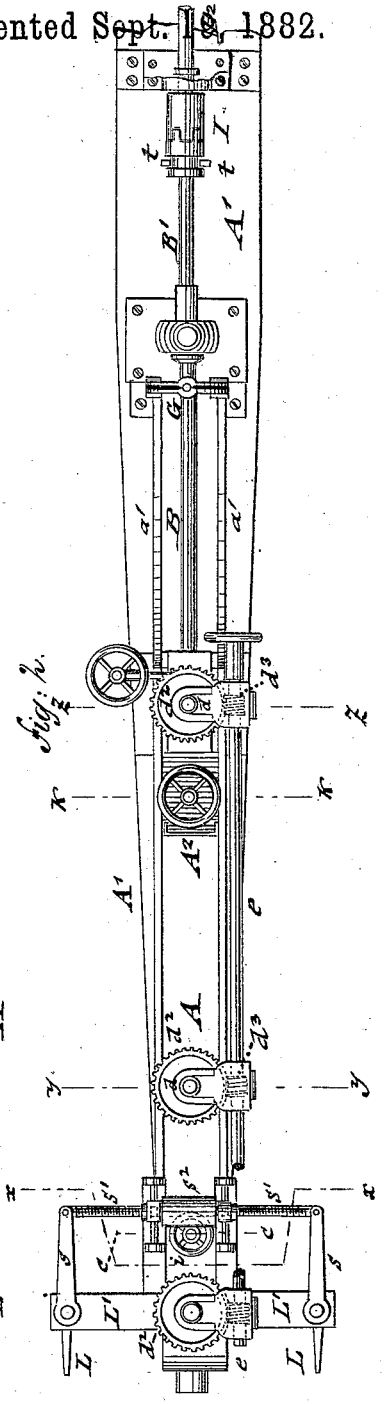


Fig. 2.



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(No Model.) 3 Sheets—Sheet 2.

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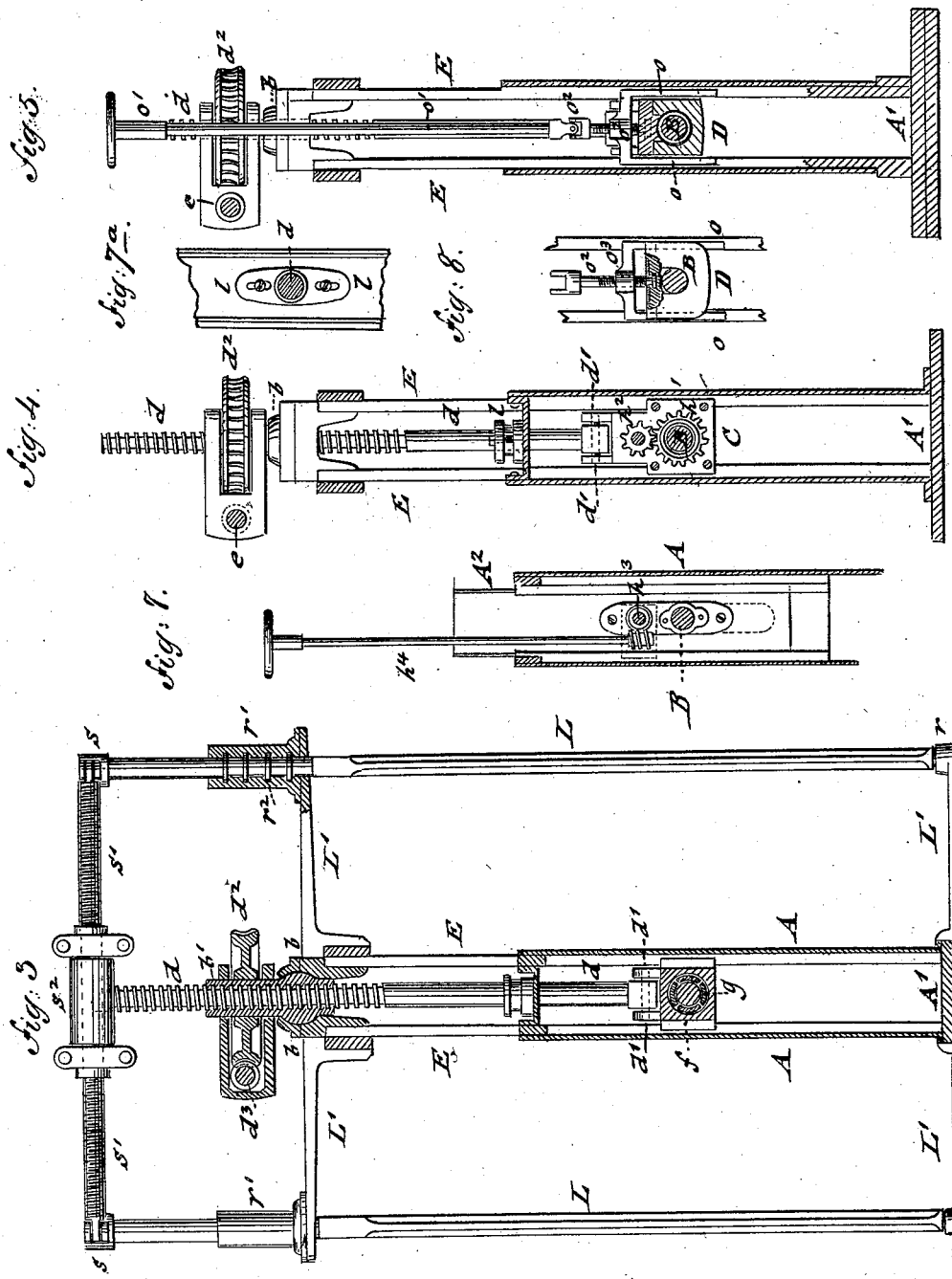

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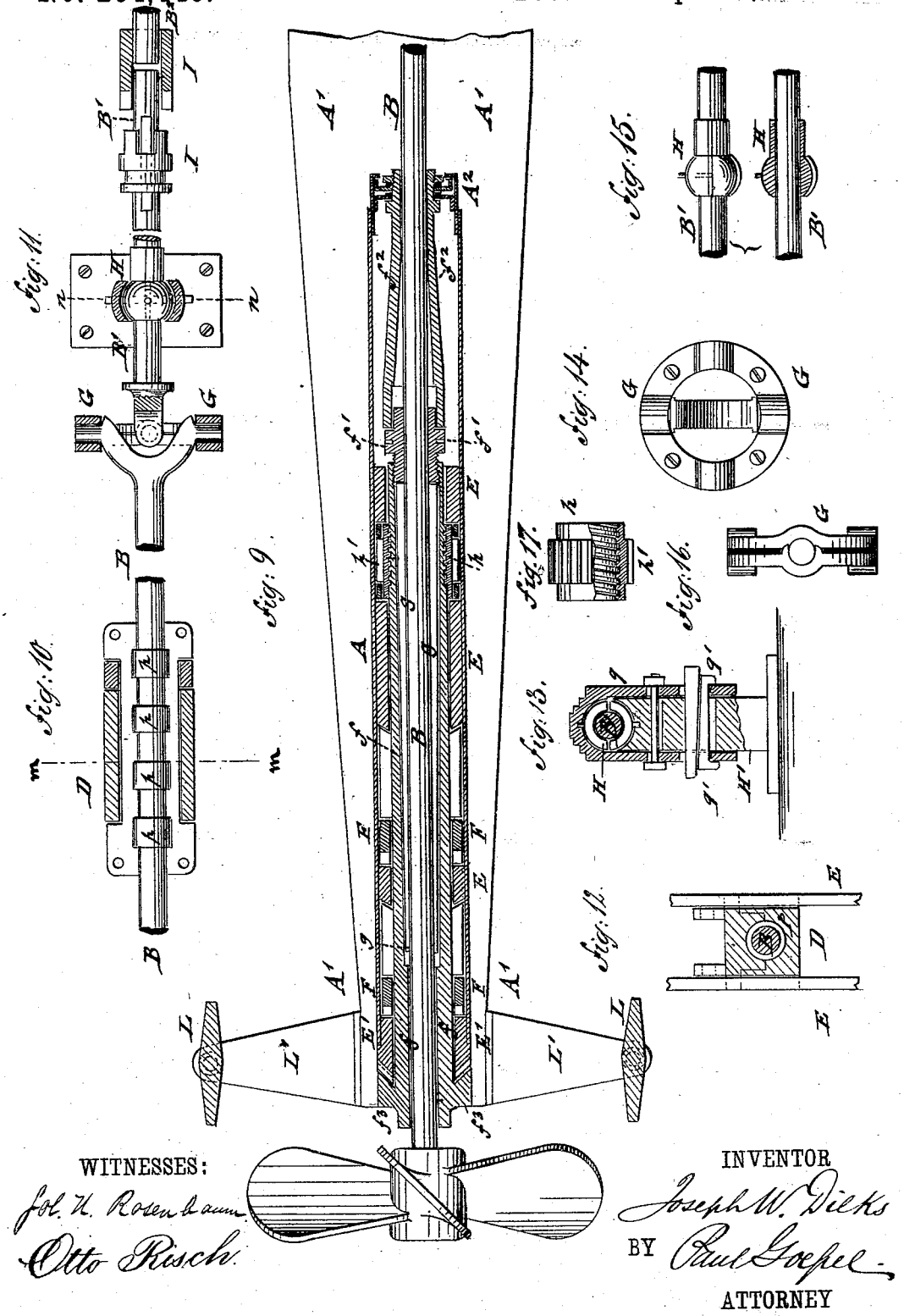

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JOSEPH W. DILKS, OF BROOKLYN, NEW YORK.

ADJUSTABLE SCREW-PROPELLER.

SPECIFICATION forming part of Letters Patent No. 264,446, dated September 19, 1882.

Application filed January 21, 1882. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH W. DILKS, of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Propelling and Steering Gears for Steamships, of which the following is a specification.

This invention relates to an improved propelling and steering gear for steamships, by which the propeller-shaft is capable of being raised or lowered for giving the propeller greater depth of water and increased resistance, so that the lifting of the propeller in rough weather above the water is prevented, and that injurious strains and shocks upon the engine are almost entirely obviated. The propelling-gear is so constructed that it can be raised or lowered while running without stopping the engine, which places the mechanism wholly within control, it being so arranged and inclosed as to resist the thrust exerted upon the shaft, and to prevent the entrance of water into the hull of the vessel. By means of the raising and lowering mechanism of the propeller, not only considerable saving of fuel and less wear upon the machinery is produced, but also greater speed obtained, as no loss of power takes place at any time.

The invention consists essentially of a propeller-shaft that is made of three sections—an inner section, a short intermediate section, and an outer adjustable end section, carrying the screw. The inner section is connected to the intermediate section by a clutch-coupling, and the intermediate section to the end section by a universal joint. The end section is made vertically adjustable in a tightly-packed casing and locked to toothed arc-shaped ends of the same by means of toothed segments of the longitudinally-adjustable main bearing of the end section. A thrust-bearing at the inner end of the casing takes up the thrust of the propeller. The bearings of the adjustable end section are guided by arc-shaped guide-plates and raised or lowered by suitable mechanism. The different operating parts of the end section of the shaft are tightly packed at the points where they pass the interior of the casing, so as to prevent the exit of water therefrom. The tight locking of the bearings of the end section of the shaft, after the same has been adjusted, is accomplished by locking mechanism applied to the bearings and guide-plates. The wear of the main bearing is provided for by the longitudinal adjustment of the inner journal-bearing. The adjusting and locking appliances of the bearings are all operated by mechanism from the outside of the guide-casing. The steering mechanism consists of separate rudder-blades, arranged equidistantly from the screw-shaft, the rudder-blades being operated at each side of the propeller-shaft by a suitable steering-gear, as will appear more fully hereinafter, and finally be pointed out in the claims.

In the accompanying drawings, Figure 1 represents a side elevation of my improved propelling and steering gear for steamships. Fig. 2 is a plan view of the same. Figs. 3, 4, 5, 6, and 7 are detail vertical transverse sections, respectively, on lines *x x*, *y y*, *z z*, *c c*, and *k k*, Fig. 2. Fig. 7ª is a top view of one of the stuffing-boxes used for the tight packing of the different rods or shafts passing through the guide-casing. Fig. 8 is a detail of the wedge-pieces of the thrust-bearing shown in Fig. 5. Fig. 9 is a detail horizontal section of the main bearing of the adjustable end section of the shaft. Figs. 10 and 12 are a horizontal section and a vertical transverse section on line *m m*, Fig. 10, of the thrust-bearing of the end section of the shaft. Fig. 11 is a plan view of the intermediate shaft-section, showing its connection by a universal joint and clutch-coupling with the end and inner sections of the shaft. Fig. 13 is a vertical transverse section of the bearing of the intermediate shaft-section on line *n n*, Fig. 11. Figs. 14 and 16 are a detail side and end view of the universal joint connecting the shaft-sections. Fig. 15 is a detail side view and a section of the bearing of the intermediate shaft-section; and Fig. 17 is a side view, partly in section, of the screw-nut for adjusting the main bearing of the screw-shaft in longitudinal direction.

Similar letters of reference indicate corresponding parts.

By reference to the drawings, A represents an upright casing of oblong shape, which is secured by a bed-plate, A′, to the keel at the stern of the vessel. The casing A is made of metal plates of suitable strength, open at the rear end, but tightly closed at the sides, top, and bottom, also at a point at some distance

back of its front end by a tightly-packed end plate, A^2, so as to prevent the passage of the water through the casing to the hull.

The rear end, B, of the propeller-shaft passes longitudinally through the casing A, and is adapted to be adjusted higher or lower within the same. The propeller-shaft B is supported inside of the closed portion of the casing by a main bearing, C, and outside of the end plate, A^2, at the inner or front end of the casing by a thrust-bearing, D. The main and thrust bearings C and D are guided by projecting side shoulders along the arc-shaped lower parts of strong end and intermediate posts, E E′, which extend above the casing, the upper straight parts of the posts being stiffened by longitudinal connecting-pieces *a*, and by braces *a′*, that run down from the front posts to the bed-plates A′ of the casing, as shown in Figs. 1 and 2.

The upright posts E of the casing A carry ball-shaped bearings *b b* for interiorly-threaded sleeves *b′ b′*, which are arranged with exterior spherical enlargements that are capable of motion in the correspondingly-shaped bearings *b b* of the upright posts E, as shown in Fig. 3.

The shaft-bearings C D are hung to the lower ends of suspension-rods *d d*, which pass through the top plate of the casing and through the sleeves *b′ b′*, the suspension-rods being threaded at the upper ends. The screw-threads of the several suspension-rods *d d* are differentiated in such a manner that the pitch of the thread increases in proportion to the size of arc through which the different shaft-bearings D and C have to pass in their vertical adjustment. The thread of the suspension-rod *d* of the thrust-bearing D has therefore a less pitch than the thread of the intermediate suspension-rod, and the thread of the rearmost suspension-rod a greater pitch than that of the intermediate rod. The sleeves *b′ b′* are provided with interior screw-threads of a pitch corresponding to that of their suspension-rods *d d*. The lower ends of the rods *d d* are pivoted to fixed top lugs, *d′ d′*, of the bearings, as shown in Figs. 3 and 4.

To the sleeves *b′ b′* of the vertical suspension-rods *d d* are keyed gear-wheels d^2 d^2, which are engaged respectively by worm-wheels d^3 d^3 of a longitudinal side shaft, *e*, said shaft having a hand-wheel at its end.

By turning the hand-wheel in one or the other direction all the suspension-rods *d d* are simultaneously raised or lowered by means of the sleeves, and consequently the propeller-shaft raised or lowered within the casing. The sleeves and their bearings provide for the varying positions of the suspension-rods *d d* in adapting themselves to the changing position of the propeller-shaft without exerting thereby any strain on the adjusting mechanism, while the differentiated threads of the suspension-rods and sleeves provide for moving the shaft-bearings and the end section of the shaft through the varying lengths of arcs due to their vertical adjustment in the main casing.

The main bearing C consists of a square box or shell, *f*, which extends from the rear end of the casing A to a point at some distance beyond the middle of the same, where the box *f* is connected by a screw-coupling with a conically-tapering box, f^2, which is packed tightly to the shaft at the point where the same passes through the end plate, A^2, as shown clearly in Figs. 1, 7, and 9. The coupling *f′* engages the box *f*, but slides loosely in the end of the box f^2.

The brasses or journal-bearings *g g* of the shaft B are arranged inside of the box *f*, they being adjusted when they are worn to some extent by means of the screw-coupling *f′*, which pushes them backward, so as to keep up the contact between the inclosing-box and the shaft, as shown in Fig. 9. The box *f* of the propeller-shaft extends at its rear end to the outside of the casing, and is provided with arc-shaped toothed segments f^3, the teeth of which are beveled and adapted to mesh with the similarly beveled and toothed rear posts, E′, of the casing A.

To secure the intimate intermeshing of the toothed segments f^3 with the arc-shaped rear posts, E′, the segments are tightly drawn into the same by a setting mechanism consisting of a screw-nut, *h*, placed upon the box *f*, and engaging a short threaded portion upon the exterior of the same, as shown in Figs. 9 and 17. The screw-nut *h* is prevented from changing its position longitudinally by a retaining-frame, (shown in Figs. 1 and 9,) but is capable of being axially turned by means of an exterior cog-wheel, *h′*, which is geared with a pinion, h^2, at the end of a horizontal shaft, h^3, that passes through the end plate, A, to the outside of the same, where it is connected by a bevel or a worm wheel connection with a vertical shaft, h^4, having a hand-wheel at the upper end, as shown in Figs. 1 and 7.

By turning the upright shaft h^4 the intermediate transmitting-shaft, h^3, turns the screw-nut of the box and draws the latter either inwardly or moves it in outward direction. The result is either a rigid interlocking of the toothed segments f^3 with the toothed rear posts, E′, of the casing, or the clearing of the teeth of the segments from those of the rear posts. The interlocking of the segments and rear posts secures the rigid position of the propeller-shaft after the same has been set to the proper angle of inclination, so that it can resist the powerful force exerted thereon.

The box of the main bearing C is also locked by rack-pieces F, which are made of arc shape, their teeth entering into toothed edges of the rear guide-posts, E′, of the casing. The rack-pieces bear against projecting side shoulders of the main bearing C, so as to produce the rigid locking of the same by raising the rack-pieces F and drawing them tightly against the teeth of the guide-posts E′, whereby a wedge action is exerted on the same.

The rack-pieces F are raised or lowered by means of a hand-wheel, *i*, and screw-rod *i′*, they being pivoted to a horizontal connecting-

plate, i^2, as shown clearly in Figs. 1 and 6. The rack-pieces F have to be lowered, so that the required play for clearing the segments f^3 from the toothed rear ends of the casing is obtained. After the shaft and propeller have been adjusted to the required position the box and segments f^3 are drawn in again, so as to re-establish the connection of shaft and casing.

The shaft can be adjusted while the vessel is in motion, it being firmly held during the time required for the adjusting operation by the screw-nut h^2, and by the locking rack-pieces F. These rack-pieces F serve to remove all jar and spring from the main bearing of the propeller-shaft, and to secure it in fixed position during and after the setting of the screw-shaft.

The end plate, A^2, of the casing A is properly guided throughout its length, and adapted thereby to follow the vertical motion of the shaft whenever it is adjusted, as shown in Figs. 1 and 7.

All the screw-rods of the different adjusting mechanisms are tightly packed at the points where they pass through the top plate by stuffing-boxes l, which are secured by screw-bolts to the top plate, said bolts working in longitudinal slots of the stuffing-boxes, as shown in Fig. 7^a, so that the stuffing-boxes adjust themselves automatically to any change of position of the screw-rods, without, however, allowing the water to pass from the interior of the casing to the hull. The stuffing-boxes, as well as packing of the end plate, A^2, have to be kept tight, so as to prevent leakage through the casing.

The thrust-bearing D serves to take up the push and pull strain exerted upon the shaft by the propeller and the engine. It is locked to the front posts, E, by means of arc-shaped wedge-pieces o o, which are vertically adjustable by means of a hand-wheel and rod, o', which latter is swiveled to a short screw-rod, o^2, engaging a nut, o^3, in the transverse portion of the wedge-pieces, as appears clearly in Figs. 1, 5, and 8. The wedge-pieces o o serve for the purpose of taking up any lost motion in the main bearing.

The propeller-shaft is provided inside of the thrust-bearing with a number of thrust-rings, p p, as appears clearly in Figs. 10 and 12, said thrust-rings turning in corresponding recesses of the bearing D, Fig. 10.

A universal joint, G, of special construction connects the adjustable end section, B, of the shaft with the short intermediate shaft-section, B′. The center of the universal joint G forms the center of the arc which the end section describes between its extreme positions of vertical adjustment, and also the common center for the arc-shaped portions of the guide-posts E E′. The universal joint G is clearly shown in Figs. 11, 14, and 16, and consists of two rings with intermediate packing, which are coupled together by screw-bolts and provided with bearings for the forked ends of the shaft-sections B and B′, the ends of one shaft-section being applied in the coupling-rings at right angles to the ends of the other shaft-section. The forked ends of the shaft-sections B B are made with slightly-conical shoulders at the points where they enter the bearings of the coupling-rings, so as to exert the least possible friction upon the coupling-rings and do away with lost motion.

The short intermediate section, B, of the shaft turns in a ball-and-socket bearing, H, which is shown in Figs. 11 and 15, said ball-and-socket bearing being secured to a stationary pillar, H′, by a U-shaped binding-strap, q, and wedge-shaped keys q'. The ball-and-socket bearing H provides for any vibratory motion of the intermediate shaft-section, B′, supports the same close to the universal joint G, and gives a firm support thereto.

The short intermediate shaft-section is thrown by the clutch-coupling I into gear with the main section B^2 of the shaft, the movable part of the clutch being applied to a forked and pivoted lever, t, whereby it is thrown in or out of gear with the fixed section of the coupling at the end of the main shaft. By the clutch-coupling I the adjustable end section of the shaft may be disconnected from the main section whenever the vessel has to proceed under sail, in which case the engine is stopped and the fires banked. The pressure of the water upon the screw causes the latter to rotate with perfect freedom, together with its end and intermediate shaft-sections, with but little drag upon the screw and strain upon the engine.

The steering mechanism consists of the vertical and axially-turning rudder-blades L, which are arranged equidistantly from the propeller-shaft—one at each side of the same—as, owing to the vertical adjustment of the shaft, the rudder cannot be arranged, in the customary manner, in line with the center plane of the vessel. The vertical rudder-blades L are supported in fixed transverse bracket-arms L′, extending from the bed-plate A′, and the top of the rear posts, E′ E′, the lower ends of the rudder-blades turning in step-bearings r of the lower bracket-arms, while the upper ends turn on neck-bearings r' of the upper arms, the upper ends being provided with sustaining-rings r^2 within the neck-bearings r'.

To the uppermost ends of the rudder-blades L are applied fixed parallel crank-arms s, which are transversely connected by screw-rods s', that are acted upon by a central screw-nut, s^2, which is operated by a suitable steering-wheel or other mechanism. (Not shown in the drawings.)

By means of the steering-gear the rudder-blades are always moved parallel to each other and set at any desired angle to the longitudinal axis of the vessel, so as to produce by their resistance to the water the easy and effective steering of the vessel. The blades are rigidly supported by the neck and step bearings of the bracket-arms, the sustaining rings of the

neck-bearings removing any strain upon the step-bearings, so that the rudders follow easily the motion of the steering-wheel.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a propelling-gear for steamships, the combination, with the driving or main section of the shaft, of a short intermediate shaft-section connected thereto by a clutch-coupling, and of a vertically-adjustable propeller-shaft connected to the intermediate shaft-section by a universal joint, the intermediate shaft and its connections with the driving and screw-shafts being located in the hold of the vessel at some distance from the stern, substantially as set forth.

2. In a propelling-gear for steamships, the combination, with the vertically-adjustable end section of the shaft, of a stern-casing having arc-shaped guide-posts, of shaft-bearings guided along the posts, and of mechanism whereby the bearings are raised or lowered in the stern-casing, substantially as set forth.

3. In a propelling-gear for steamships, the combination of a stern-casing having arc-shaped guide-posts, a vertically-adjustable shaft-section, bearings for supporting and guiding the shaft-section, mechanism for raising or lowering the shaft-bearings in the casing, and mechanism for rigidly locking the shaft-bearings to the casing, substantially as specified.

4. In a propelling-gear for steamships, the combination of stern-casing A, having a vertically-guided end plate, A^2, and guide-posts E E^2, with a vertically-adjustable shaft-section, B, a thrust-bearing, D, in front of the end plate, a main bearing, C, back of the end plate, and mechanism for raising or lowering the thrust and main bearings, substantially as described.

5. In a propelling-gear for steamships, the combination of a stern-casing, A, having arc-shaped and toothed rear guide-posts, E′, shaft-section B, main bearing C, locking rack-pieces F, and mechanism for raising or lowering the rack-pieces, substantially as set forth.

6. In a propelling-gear for steamships, the combination of a stern-casing, A, having toothed rear posts, E′, shaft-section B, longitudinally-adjustable box *f*, having toothed rear segments, f^3, screw-nut *h h′*, and mechanism whereby the screw-nut is turned and the box moved outwardly or inwardly, substantially as set forth.

7. In a propelling device for steamships, the combination of a stern-casing, A, having vertically-guided end plates, A^2, shaft-section B, and a main bearing, C, composed of a main box, *f*, interior tapering brasses *g*, screw-coupling *f*, and conically-tapering box f^2, the latter being connected to the end plate of the casing, substantially as set forth.

8. In a propelling-gear for steamships, the combination of a stern-casing, A, having vertical guide-posts E E′, shaft-section B, having thrust-rings *p*, thrust-bearing D, having projecting side shoulders, wedge-pieces *o*, and mechanism for vertically adjusting the wedge-pieces, substantially as described.

9. In a propelling-gear for steamships, the combination of an adjustable end section, B, of the shaft and intermediate shaft-section, B′, both having forked adjoining ends at right angles to each other, with a universal joint, G, substantially as described.

10. In a propelling-gear for steamships, the combination of the adjustable end section, B, of the shaft, universal joint G, intermediate shaft-section, B′, supported by a ball-and-socket bearing, H, and a main section, B^2, connected by a clutch-coupling, I, with the intermediate shaft, B′, substantially as specified.

11. In a propelling-gear for steamships, the combination of a vertically-adjustable shaft-section, bearings for supporting the shaft-section, vertical suspension-rods applied to the bearings and provided with screw-threads of differentiated pitch, screw-sleeves supported in ball-and-socket bearings, and mechanism for actuating the sleeves, substantially as described.

12. In a propelling-gear for steamships, the combination of an adjustable shaft-section, B, and of an intermediate shaft-section, B′, both having forked adjoining ends at right angles to each other, with a universal joint, G, formed of coupling-rings, having bearings for the shaft ends, and of intermediate packing-rings, substantially as specified.

13. In a propelling and steering gear for steam-vessels, the combination of a vertically-adjustable propeller and shaft, a stern-casing having fixed laterally-extending bracket-arms, vertical and parallel rudder-blades arranged equidistantly from the propeller-shaft and supported in step and neck bearings of the bracket-arms, and mechanism for simultaneously turning the rudder-blades in their bearings, substantially as set forth.

14. In a propelling and steering gear for steam-vessels, the combination of a vertically-adjustable propeller and shaft, a stern-casing for guiding the shaft, fixed upper and lower bracket-arms extending laterally and at right angles from the stern-casing, parallel upright rudder-blades arranged equidistantly from the propelling-shaft and supported in step and neck bearings of the bracket-arms, sustaining rings on the upper shaft ends of the blades inside of the correspondingly-grooved neck-bearings, fixed crank-arms at the upper ends of the rudder-shafts, transversely connecting screw-rods, and an actuating screw-nut, all substantially as specified.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

his
JOSEPH W. × DILKS.
mark

Witnesses:
PAUL GOEPEL,
CARL KARP.