3 Sheets—Sheet 1.

J. J. KUNSTÄDTER.

Steering-Propeller.

No. 219,405. Patented Sept. 9, 1879.

Fig. 1.

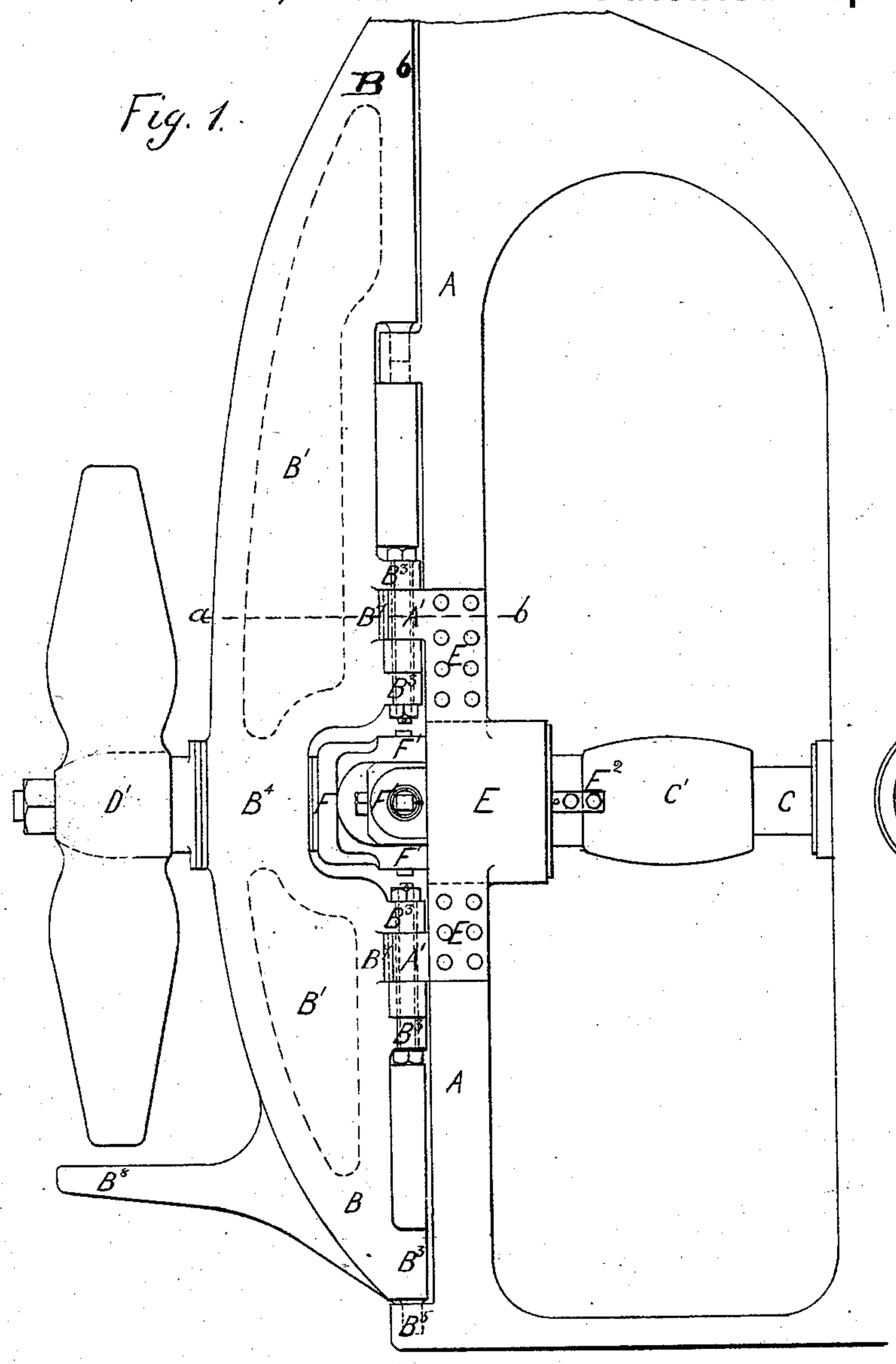


Fig. 4.

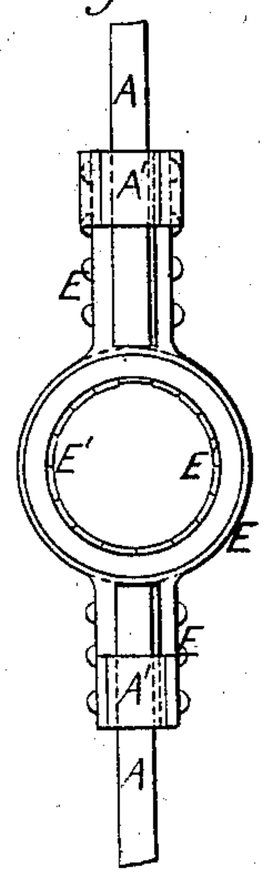


Fig. 5.

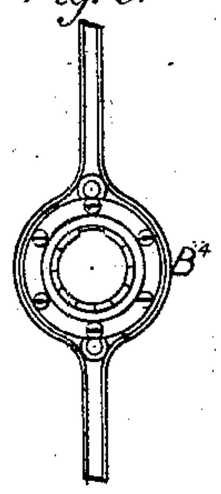
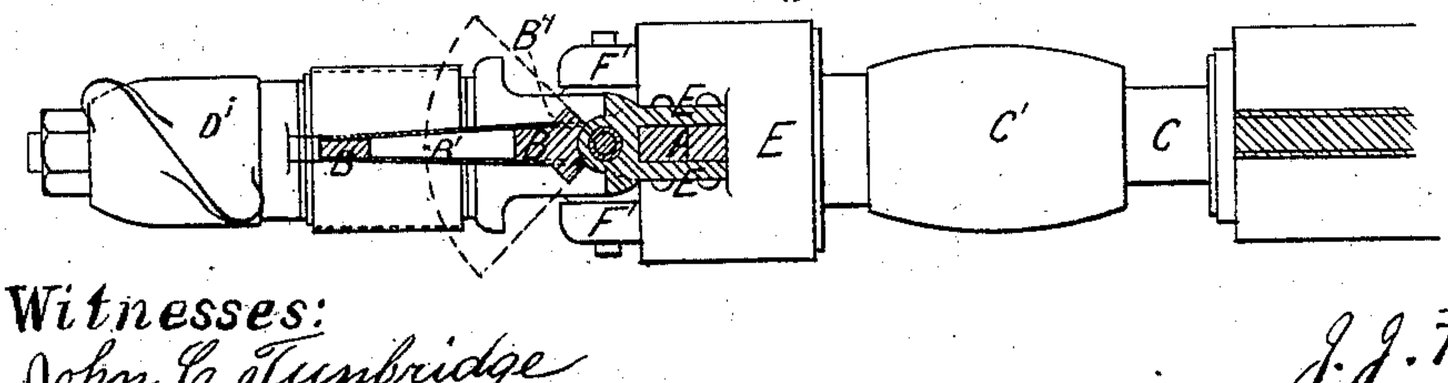


Fig. 3.



Witnesses:
John C. Tunbridge
James Tuck

Inventor:
J. J. Kunstädter
by his attorney
A. V. Briesen

3 Sheets—Sheet 2.

J. J. KUNSTÄDTER.

Steering-Propeller.

No. 219,405. Patented Sept. 9, 1879.

Fig. 2.

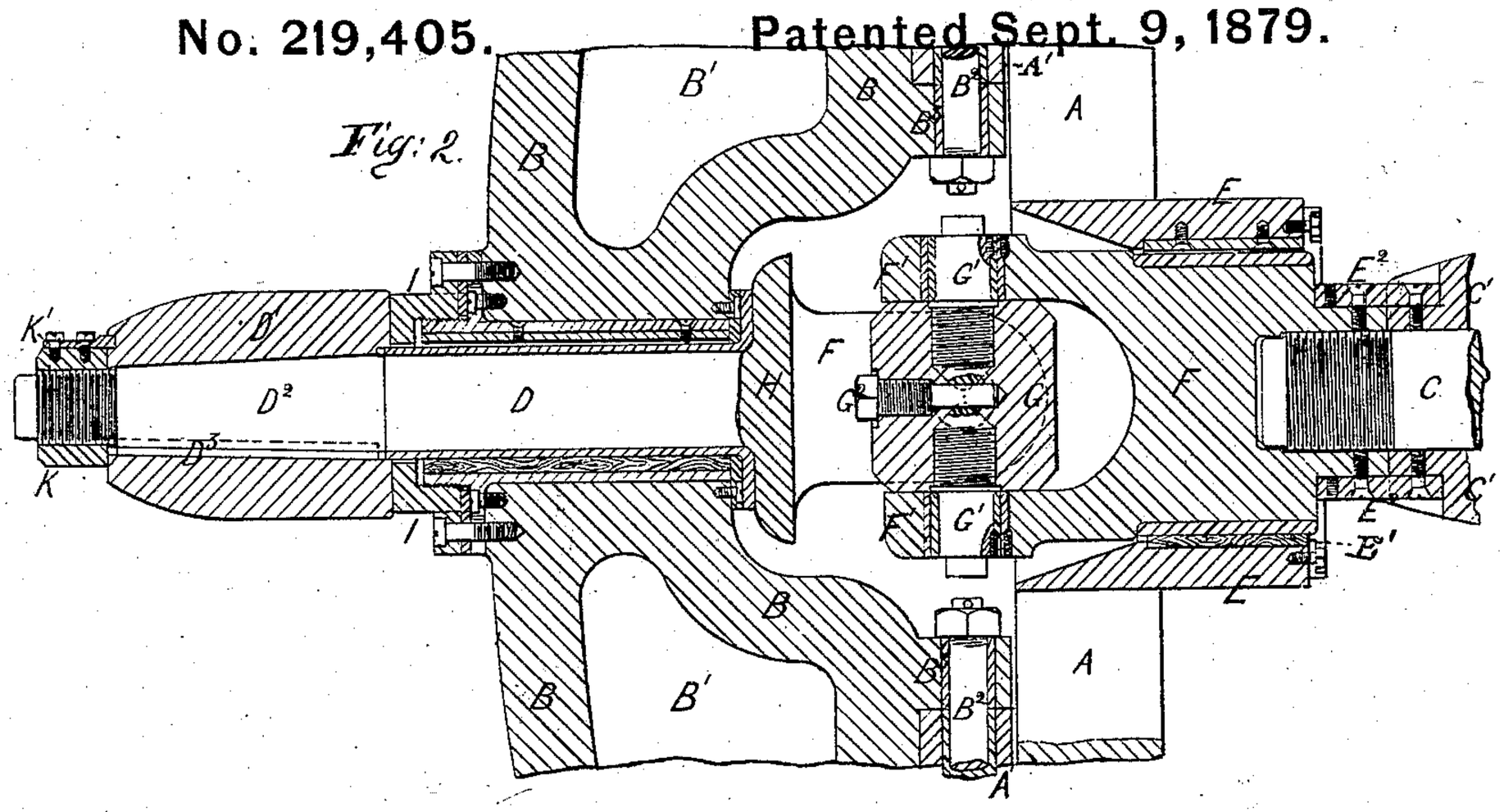


Fig. 6.

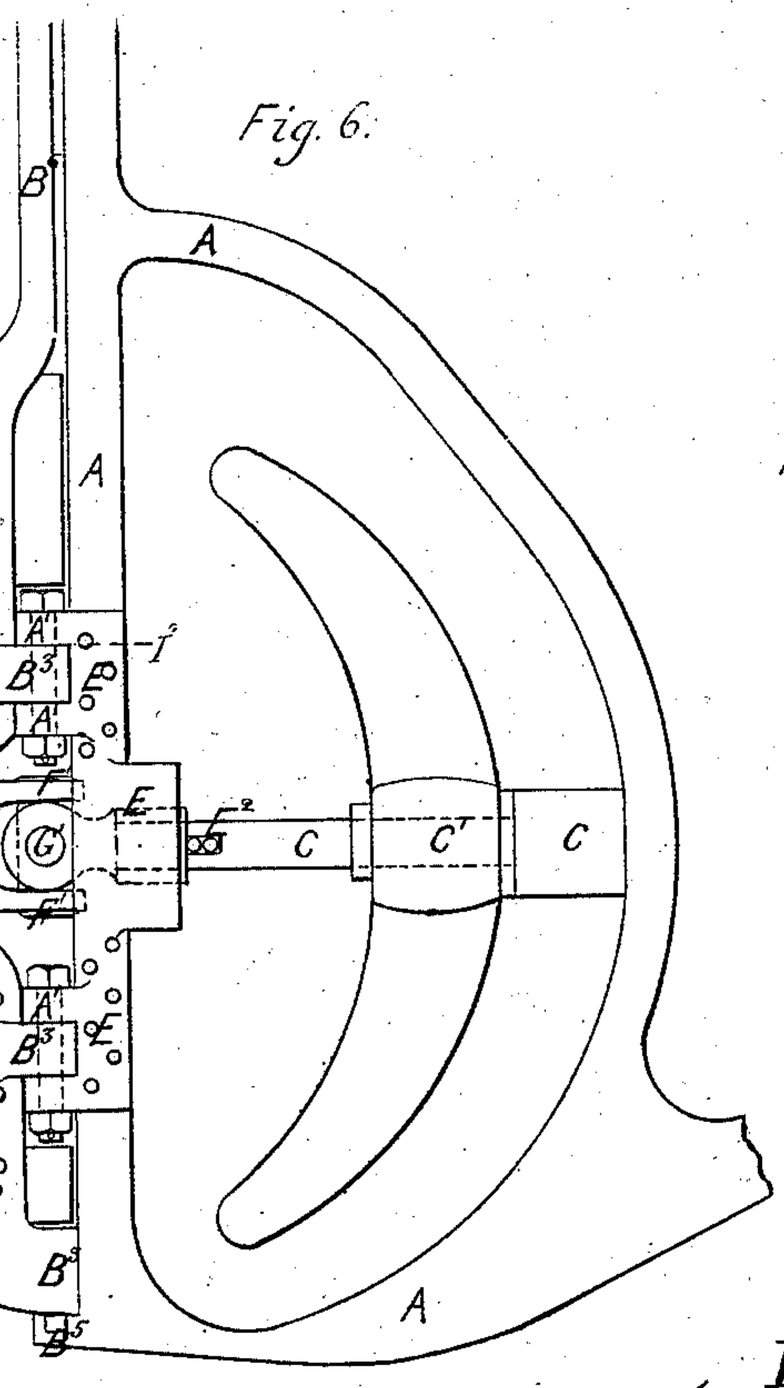


Fig. 6ª.

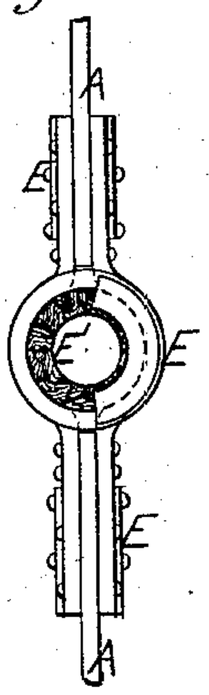


Fig. 6ᵇ.

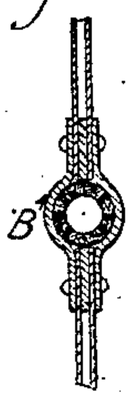
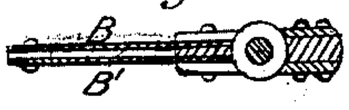


Fig. 6ᶜ.



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3 Sheets—Sheet 3.

J. J. KUNSTÄDTER.
Steering-Propeller.

No. 219,405. Patented Sept. 9, 1879.

Fig. 7

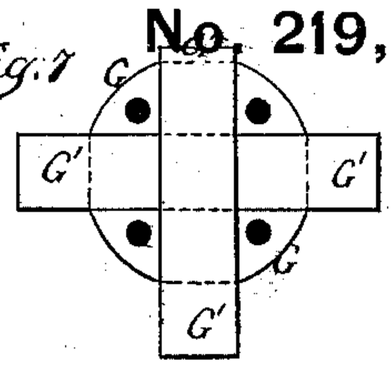


Fig. 7a

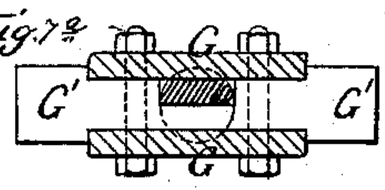


Fig. 8.

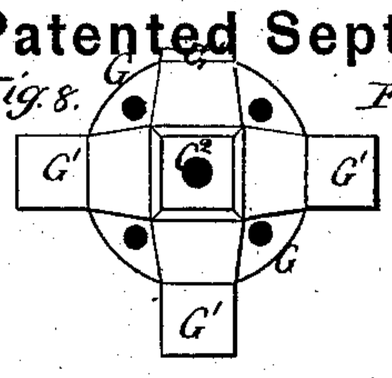


Fig. 8a

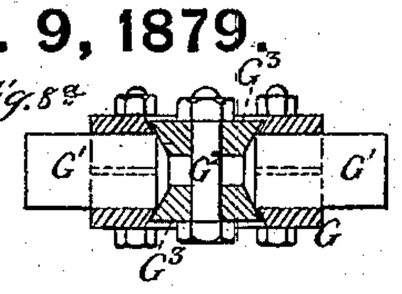


Fig. 9

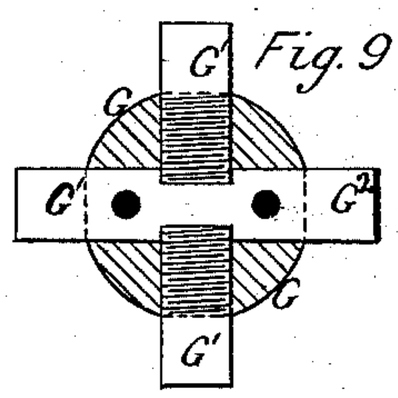


Fig. 9a

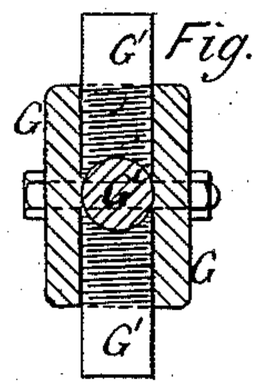


Fig. 10

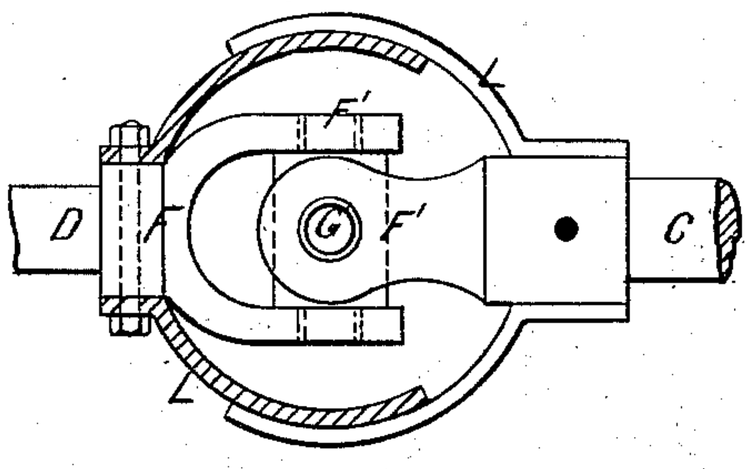


Fig. 12

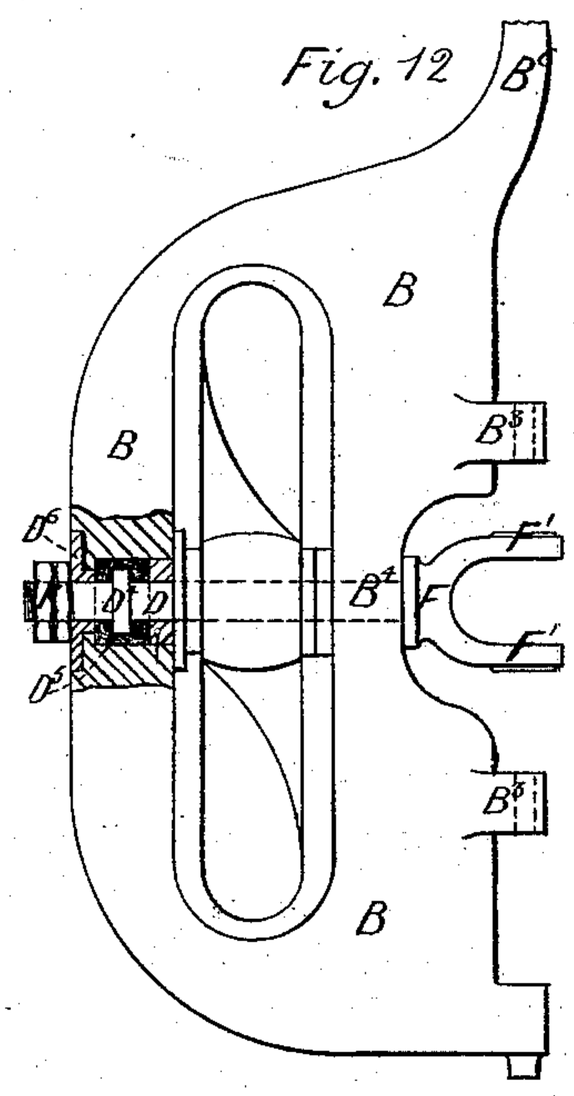
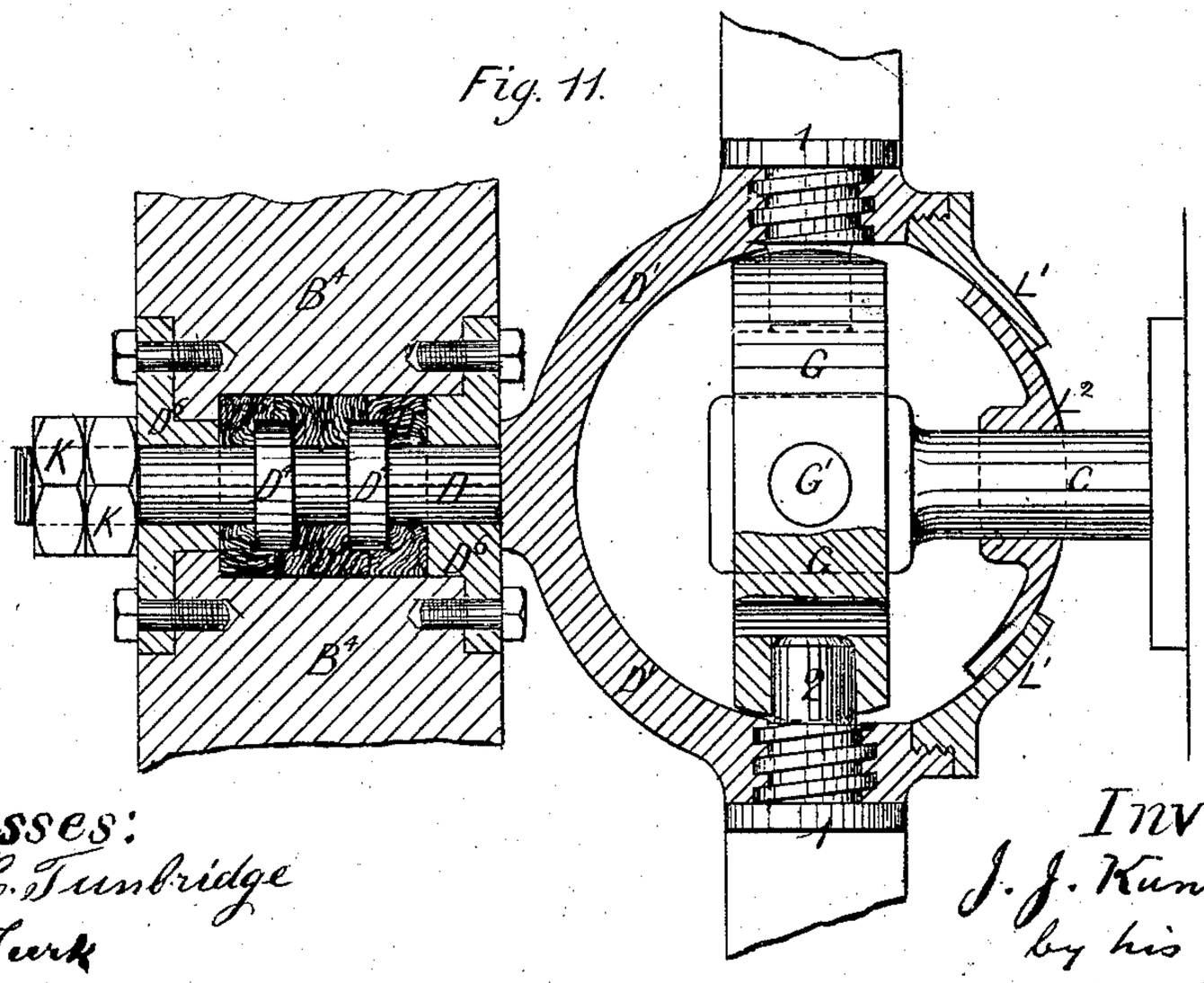


Fig. 11.



Witnesses:
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James Turk

Inventor:
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by his attorney
A. V. Briesen

UNITED STATES PATENT OFFICE.

JACOB J. KUNSTÄDTER, OF WALBROOK, LONDON, ENGLAND.

IMPROVEMENT IN STEERING-PROPELLERS.

Specification forming part of Letters Patent No. **219,405**, dated September 9, 1879; application filed February 25, 1879; patented in England, June 13, 1877.

To all whom it may concern:

Be it known that I, JACOB JOACHIM KUNSTÄDTER, of Walbrook House, Walbrook, in the city of London, England, engineer, have invented a new and useful Improvement in Steering-Propellers, applicable to apparatus and fittings for effecting and facilitating the steering and propulsion of vessels, parts whereof are applicable to other purposes, which invention is fully set forth in the following specification, reference being had to the accompanying three sheets of illustrative drawings—that is to say:

This invention relates to certain improvement upon that class of apparatus which has been proposed from time to time for effecting the steering of vessels and facilitating the propulsion thereof by means of a screw-propeller mounted in or on the rudder of the vessel, or in or on a swinging frame-work having a rudder-like motion, the outer portion of the shaft carrying the steering-screw propeller being connected to the main propelling-shaft by means of universal gearing.

Now, the objects of this present invention are particularly novel and improved construction, fitting, and application of joints designed and constructed for the purpose of strength and ready fitting, and for the ready jointing of the fork-coupling pieces on or to the adjacent forked end or ends of the shafts to be coupled, and means for relieving the coupling-joint from the end-thrust of the steering-propeller and backward thrust or drag when the screw is reversed, and, generally, means or apparatus for facilitating or effecting the practical application of the said screw-steering device to screw-propelled vessels of different classes, and also as auxiliary propeller to paddle boats and sailing-vessels.

As before remarked, there have from time to time been proposed certain arrangements of apparatus for employment of a screw-propeller for the purpose of steering; but the insufficiency or inherent intricacy, unwieldiness, and inaccessibility of the fittings, or a combination of these defects, have precluded the adoption of such devices. Now, in order to the successful application of a steering screw-propeller, the following essential conditions have to be observed, particularly in the case of large vessels—that is to say, first, that the apparatus for actuating the swiveling screw steering-propeller must be simple and readily applicable to the existing machinery—that is, directly applicable to the main propeller-shaft—in the case of that class of vessels, and that without increasing the strain upon and the liability of derangement of the main propelling device; second, toothed or beveled gearing must be avoided, or rather absolutely discarded, as being too cumbersome and complicated, and, further, that such is liable, from wave or other sudden shock, to dislocation or injury by ripping out of the teeth of such gearing; third, a ball-and-socket jointing of the main propelling-shaft with the steering screw-shaft must be avoided and discarded as too cumbersome and presenting too great friction within the joint, and the consequent certainty of such jointing working loose and becoming rapidly worn and inoperative; fourth, that a link-joint is also, and for the same reason as a ball-and-socket jointing, to be discarded; fifth, that a universal jointing for the shaft is essential, and that the same shall be simple, readily accessible for repairs, and capable of being constructed of any desired strength by simply increasing the dimensions of the parts to withstand the torsional strain consequent upon the rotary propelling action, and, in addition, to overcome the application of any sudden strain consequent upon any impediment, such as wreckage, flotsam, or jetsam, which would tend to effect the clogging of the parts, and the sudden change of direction consequent upon and necessary for the steering—that is to say, the swiveling action; sixth, that the pivotings or points of resistance of the joint shall be so constructed that, while allowing of or providing for the ready application and fitting of the joint and coupling, they shall have a common center or intersecting lines of center of action, so that the strain shall be equally divided between and be simultaneously borne by the four joint-studs; seventh, that provision be made for relieving the universal joint constructed upon such principles from the end-thrust of the steering screw-propeller shaft; eighth, that the bearings of the framing within which the steering screw-propeller and its shaft works

shall be of requisite strength and adequate fitting for carrying the said screw-propeller and receiving the end-thrust thereof; and, ninth, that the arms of the fork-coupling pieces or forked ends on or of the shafts to be coupled shall not require to be tampered with by reheating, opening, and readjustment for the purpose of fitting to studs of the joint-nut by opening and again closing them, nor that it shall be necessary or requisite that the forks be divided for the purpose of adjustment—in short, that the fork-pieces as forged shall not require to be tampered with after having been wrought—that is, it is necessary that the holes in the extremities of the fork-pieces shall exactly fit the pins or studs of the joint-nut or center part, so as not to allow of any play but that of turning of said holes of the fork-pieces upon the pins or the studs of the nut of the joint, and that the said pins or studs shall be so fitted into the joint as to secure these conditions.

In order that the invention may be clearly understood, there are annexed hereto sheets of drawings, to which reference is made by figures and letters in the following particular description.

Figure 1 represents, in elevation, screw steering apparatus fitted according to this invention, the steering-screw being mounted on the outside of the rudder-frame; Fig. 2, vertical section, showing construction and fitting of gearing. Fig. 3 is a sectional plan at line *a b* of Fig. 1; Fig. 4, view of stern-frame from right-hand side of Fig. 1; Fig. 5, a similar view of the bearing in the rudder-frame in which the rudder screw-shaft works and is carried. Fig. 6, represents, in elevation, the screw steering-propeller fitted to smaller craft, such as yachts and boats. Fig. 6^a is view on rear side of rudder-post, showing lignum-vitæ bearing and outside ring; Fig. 6^b, section at line *c d* of Fig. 6, and Fig. 6^c section at line *e f* of Fig. 6. Figs. 7 and 7^a are plan and section, respectively, of a construction of joint-nut and pivots for effecting a universal jointing of the forked ends of the main and steering propeller-shafts. Figs. 8 and 8^a are like views of a modification of construction of the joint-nut and pivots. Figs. 9 and 9^a are like views of a further modification of the joint-nut. Fig. 10 represents the jointed double-eyed forked ends of the adjacent shafts coupled by the joint and pivots, and the whole inclosed in a glandular or globular casing. Fig. 11 represents the fitting for a certain construction of propeller for steering purposes with thrust-bearings for the outer steering propeller-shaft and globular casing. Fig. 12 represents the steering-screw fitted within the rudder.

In Figs. 1 to 5, A is the stern-frame of the vessel, said stern-frame being of wrought-iron. B is the rudder or swiveling frame, also of wrought-iron, and fitted in with wood at B^1, said rudder or frame being properly mounted upon bearings A′ and pins B^2, as shown in Fig. 2. C is the main propeller-shaft. C′ represents the boss of the main propeller. D is the steering-screw shaft, and D^1 is the steering-screw boss. The rudder-screw shown in the drawings is a two-bladed one; but any form of screw may be employed.

Stern-frame and stern-frame bearing.—The stern-frame post has a piece cut out of it opposite the end of the propeller-shaft, and a wrought-iron clasp-bracket bearing, E, as shown upon the drawings, is fitted tight on the stern-frame and riveted and keyed in position. This bracket E is to have two bosses, A′, as shown, projecting beyond the outer post and bored out vertically, and lined with gun-metal bushes to suit the rudder-pins B^2, the said two bosses A′ to be perfectly semicircular throughout their length, and having the same center as the holes and pins B^2 thereon, so that the rudder-frame may fit properly to the outside of the bosses, the portions of the clasp-bracket E forward—that is, to the right hand of the drawings—of the stern-post to be bored out and fitted with lignum-vitæ at E^1 to suit the shaft, the projections A′ to be forged on this bracket E to suit rudder-bosses B^3.

Rudder-frame.—The rudder-frame B and head B^6 *f* to be forged in one piece, as shown, and having a center boss, B^4, bored out; the rudder to have bosses B^3 forged, on which must be bored (in a straight line with the step-pin B^5 and head B^6) and bushed with gun-metal bushes bored to receive the pins B^2; the recessed portion between each pair of bosses B^3 to be made circular in horizontal section to fit the outside of the stern-post bosses A′; the rudder to be plated and secured in position by gun-metal bolts B^2, fitted with lock-plates, as shown; the rudder-stops B^7 to be forged on rudder-frame, to determine the angle of inclination to which the rudder-frame may be turned.

Steering-propeller, shafting, and jointing.—The shafts C and D to be wrought-iron, each shaft fitted with its double eye or fork F, to be forged in one piece; the eyes F′ to be bored and bushed with gun-metal bushes bored out to receive the studs or pivots G^1 of the joint-nut G; the center block, G, of the universal joint to be gun-metal or phospor-bronze, bored and screwed as shown in Fig. 2, and having steel pins G^1 screwed tight into it, and locked by the center locking-screw, G^2, to prevent their turning; the projecting portions of each pin to be bushed with gun-metal to fit the holes in two double-eyed shafts; the center of all these four pins to be perfectly in line at right angles with each other, and in the same line vertically with the rudder-pins B^2 when the rudder is amidships—that is, in a directly longitudinal direction.

The forward or main shaft-fork F, beyond the double eye, is to be cased with gun-metal where it works in the lignum-vitæ lining E^1 of the clasp-bracket bearing E, the forward end to be bored, screwed, and secured to fit

tightly and suit the screwed end of the main driving-propeller shaft C, and to have two oblong keys, E^2, let into the main shaft-fork F and end of propeller-boss C′, as shown in the drawings, to secure them against getting loose.

The outermost shaft, D, beyond the double eye, is to be cased with gun-metal where it works in the rudder-boss B^4, which is lined with lignum-vitæ, the back part, H, of the double eye or fork F to form a thrust-collar, to take the thrust when going astern—that is, when the screw is reversed—the forward thrust to be taken by a collar, I, secured upon a metal lining-piece within the center boss, B^4, of the rudder-frame B, between the said rudder-frame B and steering-propeller boss D^1, the shaft end D^2 to be tapered to fit the boring of the propeller-boss and screwed at its outer end to receive a nut, K, with stop pin or key K^1, all as clearly shown in Fig. 2.

The steering-propeller is secured to shaft D^2 by a fore-and-aft key, D^3, and the screwed nut K, and is set in same line as the driving-propeller.

The projecting toe-piece B^3 on the rudder-foot acts as a guard to protect the rudder-screw from striking the ground or other likelihood of damage.

It will be seen that the shafts C D are swiveled directly to one another by a universal joint, which is situated between the rudder-pins B^2, and is disconnected from all the other parts of the ship. By this construction the motive power applied to the shaft C will be directly transferred to the shaft D, and will not exert any strain upon the rudder-pins or stern portion of the ship.

In Figs. 6 to 6^c the parts similar to those shown in Figs. 1 to 5 are marked with similar letters of reference, and further description of them will not be necessary, as the difference in form of the stern-post in various vessels will require certain merely mechanical alterations, which will be obvious to and be applied by any practical man acquainted with the art when aided by this specification, and for applying the invention.

In Figs. 7 7^a is represented an improved joint wherein is employed two studs or pivot-pieces, G^1, which are centrally thereof cut away through half their thickness, so as when laid together crosswise, as is clearly shown in Fig. 7^a, they shall form an interlocking arrangement of four pivots, studs, or arms, G^1. These interlocking pivot-pieces are passed through the holes at the extremities of the adjacent forks of the shafts to be coupled, and plates G, grooved at right angles correspondingly to the interlocking joint-pins, are provided, which plates G are to be bolted together upon and to secure the interlocking pivot-pieces between said plates, and thus a joint is formed fulfilling the conditions above set forth as requisite.

According to a modification shown in Figs. 8 and 8^a, I construct the joint as follows: The four stud-pieces G^1 of the joint are made dovetail in shape at their inner ends, as shown, and plates G are provided recessed on the faces thereof for the reception of the dovetailed portions of the said stud-pieces; and then the plates are to be bolted together. The center of the joint-nut plates thus formed will be drilled out, and then a bolt or screw will be inserted, and by the use of two square bevel-edged nut-plates, G^3, or washers, acting by reason of the center locking-stud, G^2, upon the beveled edges of the inner dovetail ends of the joint-pins G^1, the said joint-pins will be tightly jammed into the recesses of the joint-plates G, so as to prevent any working loose of the parts. In fitting this joint-nut to the fork ends of the shafts to be coupled, the said fork ends will have holes or eyes formed therein to fit exactly the studs of the joint-nut, and these studs will be introduced into the said holes in the fork ends and be seated therein. The joint-plates G, which will have been previously fitted and made true, will now be placed in position to receive the dovetail ends of the joint-pins G^1, and the said joint-plates will be bolted together and locked, thus making a secure and perfect jointing of the fork ends of the propelling and steering screw-shafts, as is requisite, without any opening of or tampering with the said forks after their having been forged and prepared.

Again, according to another arrangement, Figs. 9 and 9^3, the joint is constructed with pins G^1, screwed and grooved at and on their inner ends, to take into tapped holes at opposite sides of the joint-nut G, which is solid in this case, and with a straight pin, marked G^1 G^2, passing through the nut G, which pin is keyed into the nut and pinned therein, so as to prevent the turning of the pins, as is clearly shown by the said figures of the drawings. These joints may be inclosed in globular casings, as shown at L, Fig. 10, bolted together, and one working within the other, so as to form a continuous covering of the joint, within which a supply of lubricant, suet, or other solid grease—such as tallow alone or in mixture with oil—is to be supplied, and which can be replenished from time to time, as may be necessary, by injection through a groove and perforation or tube in the shaft, so as to provide an efficient lubrication of the parts or joint working within the casing.

Again, the propeller may be constructed with the joint working within the boss thereof, as shown in Fig. 11, and this especially for small craft; and consists of a hollow boss, D^1, with a shaft, D, projecting from the end or face thereof, within which boss is a ring-piece, G, which forms the connections or nut of the joint. The blades of the propeller are formed with a shank part, 1, which is screwed for a portion of the length of said shank, and then made plain at 2, to take into the hollow boss D^1 at right angles to the projecting shaft D, and so that the plain part 2 of said shanks of

the propeller-blades shall take into holes in the ring G. The ring-piece G is first to be secured or pinned at G^1 to the end of the propelling-shaft C, or end cap secured thereto, so as to be free to be turned thereupon and within the hollow boss of the screw. Thus there will be, first, the action of turning of the ring on the pin G^1 of the propelling-shaft C, and, second, the action of turning of the ring on the studs 2 of the propeller-blades. Then on the boss D^1 of the screw is to be screwed a curved piece or cap, L^1, with a hole or opening sufficient for the play of the propeller and framing in turning from right to left in steering, and on the shaft is bolted a corresponding curved cap, L^2, to cover the hole, and, as is shown, to work within the hollow boss. Thus within the boss of the propeller is the universal joint, which is covered by the cap-pieces L^1 L^2, and within this is to be contained the lubricant injected through the groove and hole of shaft from time to time, as is desired, and so the whole working parts are continually working within the lubricant, and inclosed to prevent the action of the water thereon.

The novelty in this joint is the part L^1 L^2 and fitting of the shaft D for the purpose of relieving the joint from end-thrust, which end-thrust arrangement is applicable to the bearings for the steering-screw shaft in the swiveling framings generally, and which thrust-bearings I will now describe: For the purpose of taking the end-thrust off the universal joint, as shown in Figs. 6, 11, or off the propeller-boss and joint, as shown in Fig. 11, the steering-screw shaft D is fitted with or has formed thereon a collar piece or pieces, D^4, contained within the bearing-glands fitted in the part B^4 of the rudder-swiveling framing containing or carrying the shaft D of the steering-screw.

D^5 are collar-pieces of lignum-vitæ, the same being thrust-blocks for the collar or collars D^4 of the shaft D, and are secured in the said bearings B^4 by end box-plates D^6, to inclose the thrust-block or collar-pieces D^5 within the glands or bearing part B^4 of the steering-framing. On the outside of the steering-screw-propeller shaft is turned a screw-thread for the reception of two outside lock-nuts, K, the outer of which nuts will be pinned on the shaft, and the inner of the two nuts will bear against the glands or bearing-plate D^6.

In the case of the application to screw-propelled vessels to be fitted with this improved steering-screw device, and where the main screw-shaft does not project through the stern-post, the stern-post has to be cut away, as described for Figs. 1 and 2, and the bearing-bracket E will be fitted as described.

For sailing-vessels and paddle-boats to be fitted with this steering-screw apparatus, the bearings and glands, as described, will be fitted to, and a supplementary shaft will be passed through, the stern-post for propelling the steering-screw. The supplementary shaft will be driven by gearing off the main engines for paddle-boats or otherwise by "donkey," as convenient.

In Fig. 12 the screw is shown fitted in the rudder-blade B, and the thrust-bearing collar D^4 and blocks D^5 and end plate D^6 are similar to those shown in Fig. 11.

When necessary or desirable to provide against possible clogging or injury to the joint a grid or screen may be fitted upon the vessel, and projecting outward and backward, so as to act as a guard or catcher to divert or repel any object that might otherwise find its way into or to the joint.

When two screws are employed, in order that the second screw—*i. e.*, the steering-screw—may not drag or race, the said screw is, broadly speaking, to be of coarser pitch than the main screw, and this difference of pitch is to be decided by the difference between the dimensions of the two screws, the pitch of the rudder-screw being coarser ratioally and comparatively with the difference of the dimensions of the two screws, which result will be ascertained by calculations based upon experimental data. If but one screw is used the dimensions will be as usual.

The joints or couplings, consisting of the double-eyed forks and nut or joint-piece and pivots, as described, may be employed for various useful purposes as a joint or coupling, wherein it is desired to couple or connect shafts or parts having a rotatory motion, or to which a rotatory motion is to be communicated, or shafts or parts working at an angle to each other, or having a changing degree of angle in reference to each other, and to which a rotatory motion or otherwise is to be communicated, such as, for instance, the coupling of shafting in shops or mills, or for driving or actuating drills, as in rock-boring apparatus, agricultural implements, or machinery, &c.

I am aware that heretofore a screw-propeller has been placed into the rudder of a vessel and connected to the shaft of the main propeller, as is shown in Patent No. 35,693, granted to H. Kuhne, June 24, 1862; but in that construction the joint between the two shafts was effected by means of a gear-wheel fitted upon the rudder-post. This construction is defective, as the motive power applied to the main shaft will be transmitted partly to the rudder-post, and will tend to weaken the ship, and I do not claim the same; but

I do claim—

1. The combination, in a vessel, of the propeller-shaft C, carrying the main screw, with the shaft D, carrying the steering-screw, and swiveled directly to the shaft C without connecting the swivel to the rudder-post, substantstantially as specified.

2. The combination, in a vessel, of the rudder B, which is hung by the pins B^2 B^2, with the shafts C D, which carry, respectively, the main and the steering screw, and which are

connected by a universal joint situated between the pins B^2 B^2, substantially as specified.

3. The combination of the forked shaft C with the forked shaft D, and with the center block, G, pins G^1, and locking-screw G^2, substantially as specified.

In testimony whereof I, the said JACOB JOACHIM KUNSTÄDTER, have hereunto set my hand to the foregoing specification for patent of the United States.

J. J. KUNSTÄDTER.

Witnesses:
WALTER A. BARLOW,
6 *St. Paul's Churchyard, London, E. C.*
BERNHARD CULSES,
His clerk.