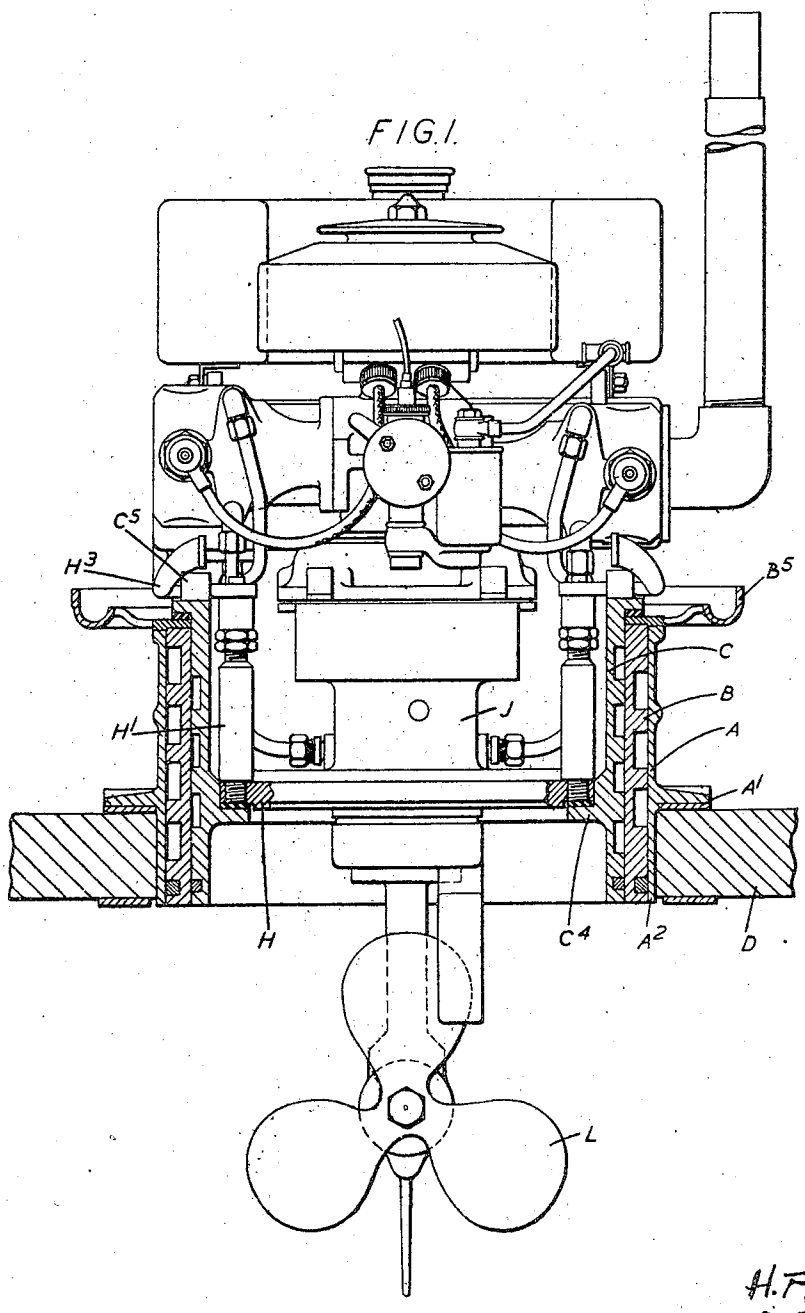
April 5, 1949. H. P. BROWN ET AL 2,466,635

SCREW PROPELLER STEERING AND DEPTH REGULATION APPARATUS

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FIG. 1.



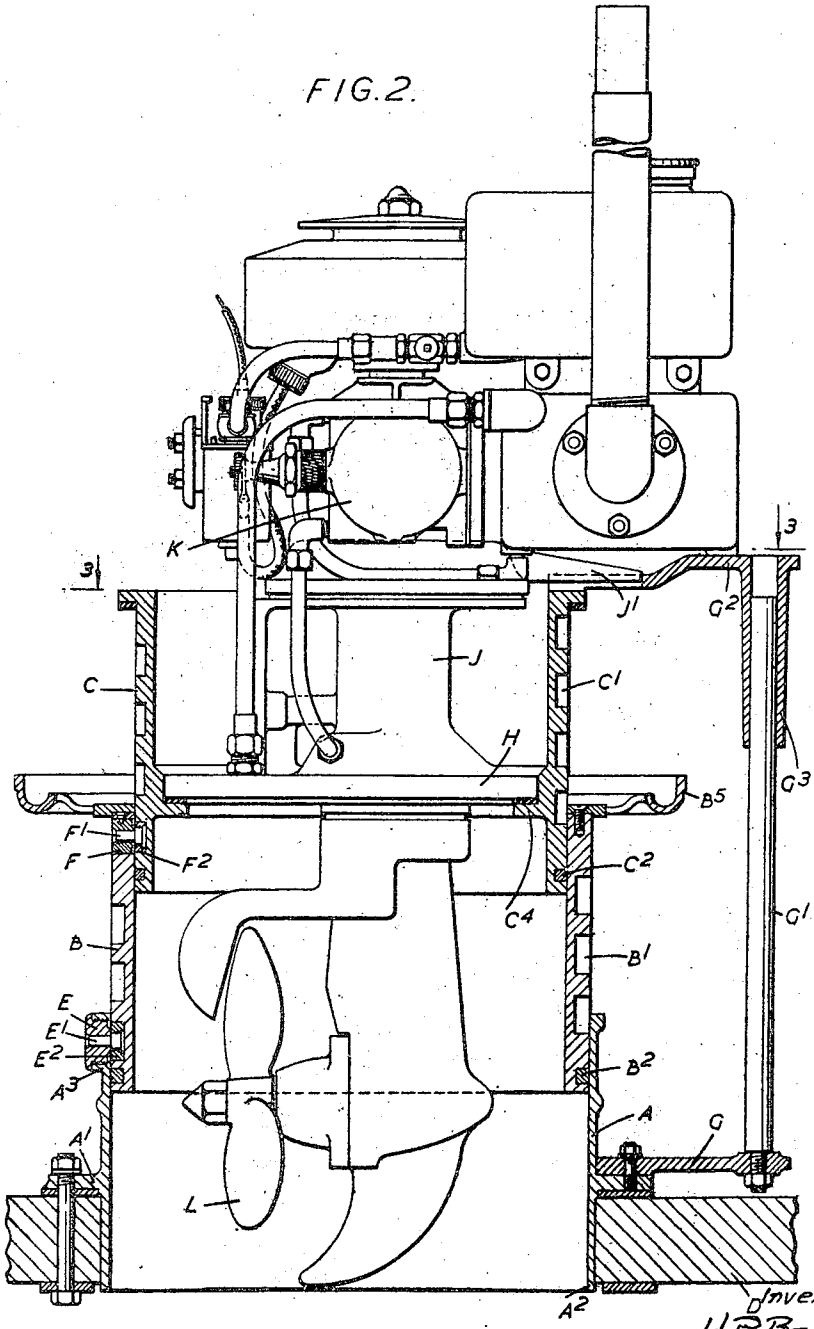
Inventors
H. P. Brown
By A. G. Armstrong
Emery Holcombe & Blair
Attorneys

April 5, 1949. H. P. BROWN ET AL 2,466,635

SCREW PROPELLER STEERING AND DEPTH REGULATION APPARATUS

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FIG. 2.



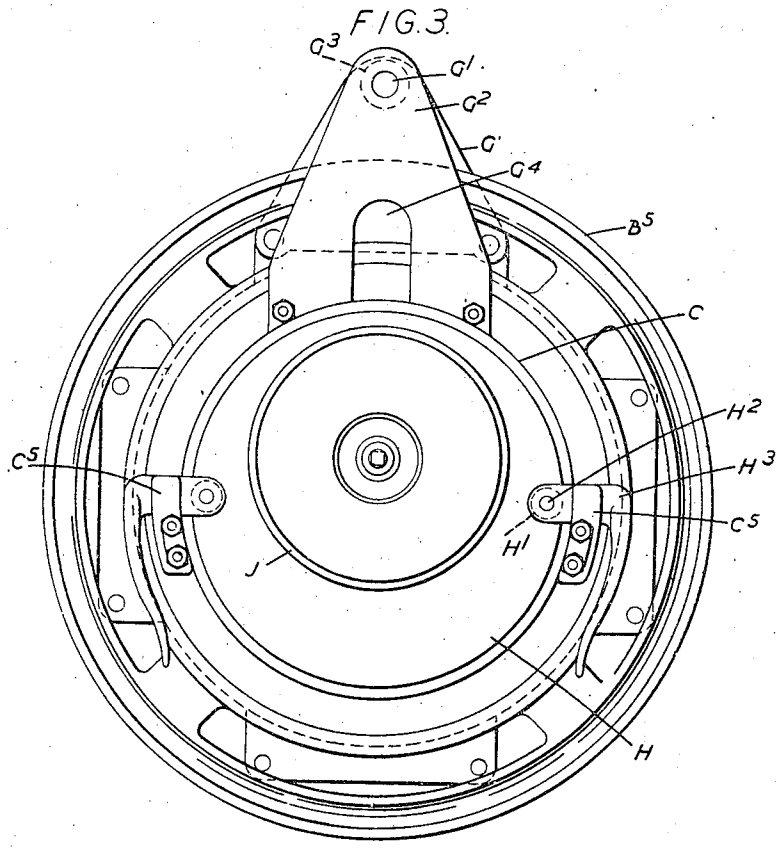
Inventors
H P Brown
By A G Armstrong
Emery, Holcomb & Blair
Attorneys

April 5, 1949. H. P. BROWN ET AL 2,466,635

SCREW PROPELLER STEERING AND DEPTH REGULATION APPARATUS

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FIG. 3.



Inventors
H. P. BROWN
By A. G. ARMSTRONG
Emery Holcombe & Blair
Attorneys

April 5, 1949. H. P. BROWN ET AL 2,466,635

SCREW PROPELLER STEERING AND DEPTH REGULATION APPARATUS

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FIG. 4.

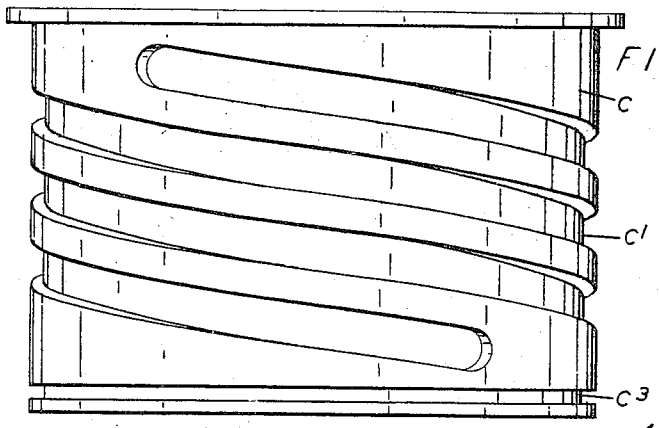


FIG. 5.

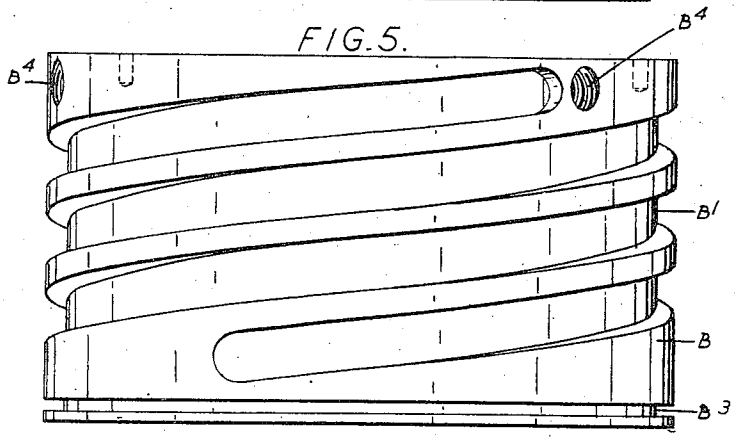
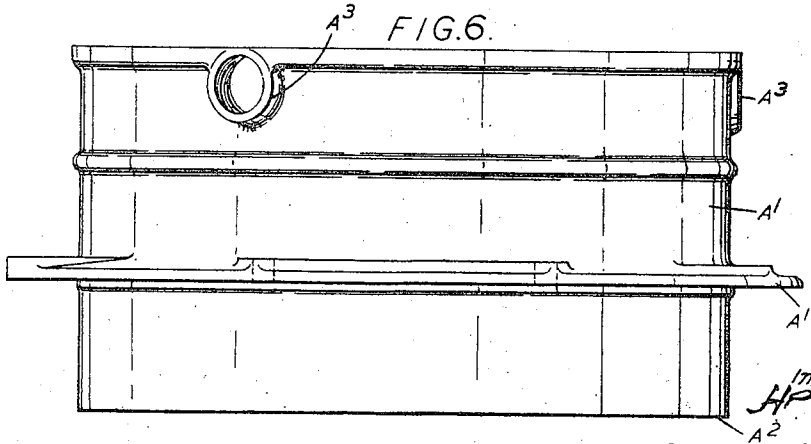


FIG. 6.



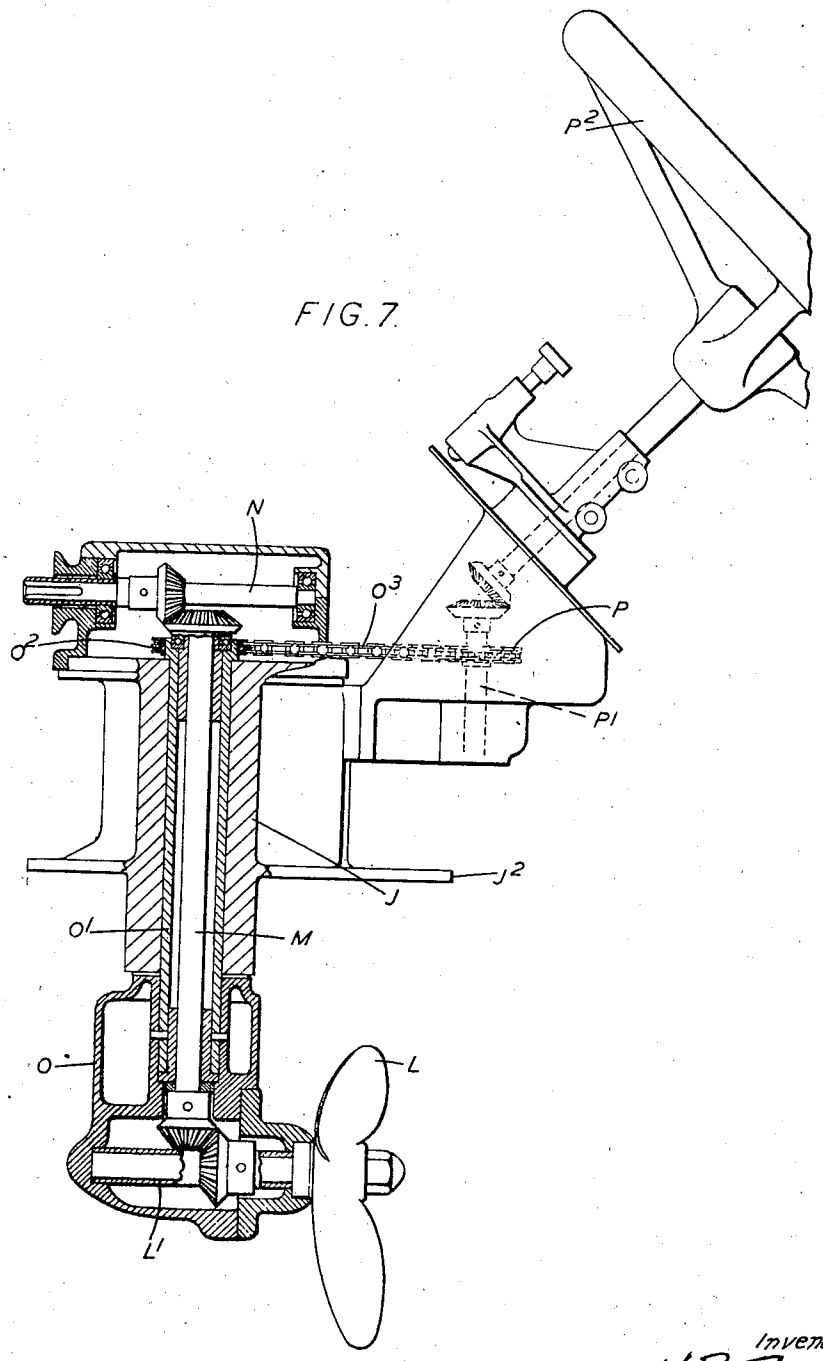
Inventors
H P Brown
By A G Armstrong
Emery Holcombe & Blair
Attorneys

April 5, 1949. H. P. BROWN ET AL 2,466,635

SCREW PROPELLER STEERING AND DEPTH REGULATION APPARATUS

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FIG. 7.



Inventors
H. P. BROWN
By A. G. ARMSTRONG
Emery Holcombe & Blair
Attorneys

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UNITED STATES PATENT OFFICE

2,466,635

SCREW PROPELLER STEERING AND DEPTH REGULATION APPARATUS

Harold Percy Brown and Albert George Armstrong, London, England, assignors to British Motor Boat Manufacturing Company Limited, London, England, a company of Great Britain

Application February 5, 1946, Serial No. 645,640
In Great Britain February 27, 1945

8 Claims. (Cl. 115—35)

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This invention relates to apparatus for use in the propulsion of ships and has for its object to provide a construction which will enable the propeller to be retracted or withdrawn within the contour of the hull when the vessel is in shallow water or is to be propelled by other means.

According to this invention the improved apparatus comprises in combination a transmission shaft rotatably mounted in a substantially vertical position within the hull of the vessel and adapted at its lower end to drive a propeller about a substantially horizontal axis, means for raising this shaft with the propeller until the latter is withdrawn within the contour of the bottom of the hull, and a source of power from which the shaft and the propeller are driven and whose connection to the shaft can be maintained while the shaft is raised and lowered. In the preferred arrangement a well extending through the bottom of the vessel has its lower end open, and rotatably mounted in a substantially vertical position in this well is a power transmission shaft to whose lower end a propeller is so connected that it will be rotatable about a substantially horizontal axis. A source of power connected to the upper end of the vertical shaft serves to drive the propeller through this shaft and by suitable means the shaft together with the propeller can be raised and lowered in the well without disconnecting the shaft from the source of power so that the propeller may be withdrawn into the well and thus within the contour of the bottom of the vessel. The well which is arranged with its axis substantially vertical is preferably constituted by a tubular member which may be formed in two or more concentric parts which are movable relatively and telescopically. The transmission shaft is carried in the well member by one of the parts thereof which is movable relatively and telescopically with respect to one or more other parts. By suitable means the parts constituting the well member can be caused to slide relatively in the direction of their common axis thereby raising or lowering the shaft and the propeller.

In a preferred arrangement the well member is constituted by three parts movable relatively telescopically and connected as by rollers on radial axes which engage screwthreads or helical grooves in the parts so that by rotation of at least one of these parts about the axis of the well member all the parts will be telescopically extended and the shaft which is carried by one of the parts together with the propeller connected thereto will be raised into the well. In this construction two of the three parts of which the well member is formed are respectively provided with right and left hand screwthreads which are engaged by rollers on radial axes mounted on two of the parts so that if the intermediate tubular part is rotated relatively to the other two parts, the latter being held against rotation, the well member as a whole will be extended or telescoped and the shaft and propeller raised or lowered.

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The source of power may be an internal combustion engine which may be mounted on the upper part of the well member and connected to the vertical transmission shaft so that when this shaft is raised and lowered the engine will be similarly moved with it. In such a construction the engine may be connected to the well member and to the shaft in such a manner that it can be readily disconnected and removed either for replacement or when propulsion by the propeller is not desired. Further the mounting for the vertical shaft in the well member may be such that this mounting may be disconnected and the shaft with the propeller completely removed from the well whose lower end can then be closed by a suitably formed plug or the like.

In a modified construction the casing of the transmission shaft with the propeller and the gearing through which it is driven may be turned as a whole in a known manner about a vertical axis thus changing the direction in which the thrust is exerted by the propeller and enabling the vessel to be driven forwards, astern, or laterally. Means may be provided for fixing the axis of the propeller in one or more angular positions about the vertical transmission shaft, as for instance when going ahead or astern.

It will be understood that though apparatus as above-described is more particularly intended to be constructed as a complete unit including the engine mounted on and movable with the vertical shaft, if desired the source of power may be disposed apart from the well member and vertical shaft with a suitable connection to the latter which will permit of the raising and lowering of this shaft with the propeller without disconnecting the shaft from the source of power. For example, in one arrangement the source of power may be an electric motor from which the drive is transmitted through flexible shafting to the vertical shaft in the well. Alternatively there may be a fixed engine in the vessel from whose crankshaft a drive is transmitted through bevel or like gearing and a sleeve member keyed to but slidable in the axial direction upon the vertical shaft so as to permit the latter to be raised and lowered

without disturbing the connection through which the drive is transmitted thereto from the engine.

The accompanying drawings illustrate by way of example a construction which may be employed when carrying the invention into practice. In these drawings,

Figure 1 is a sectional elevation of a retractable mounting according to this invention for a propulsive unit comprising an engine, transmission shafting and propeller, the apparatus being shown with the well-like structure which carries the propulsive unit telescoped so that the propeller is lowered into a position in which it can be operative to drive the vessel in which the apparatus is installed. The well-like structure is shown in section, but the propulsive unit in elevation and appears as viewed from astern.

Figure 2 is a sectional elevation similar to Figure 1, but showing the retractable mounting extended upwards with the propulsive unit withdrawn into the well-like structure so that the propeller now lies within the contour of the bottom of the vessel. This figure shows the whole apparatus as seen from the right hand side in Figure 1 the parts in section being viewed in a plane at right angles to the plane in which they are seen in Figure 1.

Figure 3 is a sectional plan on the horizontal line 3—3 in Figure 2.

Figure 4 is a side elevation of the uppermost section of the three-part telscopic well structure, this part being held against rotation while being moved in the axial direction.

Figure 5 is a side elevation of the central and intermediate section of the well structure by the rotation of which the extension or telescoping of the several parts is effected.

Figure 6 is a similar view of the lowest section of the well structure which is fixed in the bottom of the vessel and within this part lie the intermediate and uppermost portions when they have been telescoped to lower the propulsive unit so that the propeller may be operative.

Figure 7 is a part-sectional vertical elevation showing a construction of the transmission to the propeller as arranged to allow the propeller to be swung about the axis of the vertical transmission shaft for the purpose of altering the direction in which the propeller is to exert its thrust. The figure also shows an arrangement which permits power to be transmitted from a separate source outside the well structure, as for example through flexible shafting so that the connection to the source of power, for instance an electric motor, can be maintained while the propeller and its shafting is raised or lowered.

The whole well structure is built up of three tubular sections A, B and C of suitable length which fit one within the other being all relatively movable in the direction of their common axis. In addition to this relative axial movement the intermediate section B is rotatable, but the sections A and C are held against rotation. The lowermost section A has an external flange A^1 through which it can be bolted to some convenient part D of the bottom of the vessel so that the open lower end A^2 of the section lies in a circular opening in the skin of the vessel where the propeller is to be located. The end A^2 may be shaped to conform with the contour of the hull of the vessel at this place. In the wall of the upper end part of the section A there are a series of sockets A^3 at least three in number and equally spaced apart circumferentially. Each socket contains a plug E which carries a bearing pin E^1 with a roller B^2 which projects inwards beyond the cylindrical inner surface of the section A the rollers thus being free to rotate about axes which are radial with respect to the axis of the section.

The intermediate tubular section B is a sliding fit within the lowermost section A and in it outer surface and in the thickness of its wall is formed at least one and preferably more than one helical groove B^1 these grooves together constituting multiple quick pitch screwthreads each of square section, see Figure 5. In these grooves B^1 lie the rollers E^2 mounted within the section A. The arrangement is such that if the section B is rotated relatively to the section A the section B will either be raised within the section A so as to project beyond the upper end of the lower section, or if rotation is in the opposite direction the section B will be lowered and telescoped into the section A. Preferably a sealing ring B^2 is placed in an annular groove B^3 in the exterior of the section B towards its lower end so as to prevent the passage of water between this section and the wall of the lowermost section A. In the upper end portion of the section B are circumferentially spaced sockets B^4 in each of which is a plug F carrying a bearing pin F^1 with a roller F^2 rotatable on this pin whose axis is radial with respect to the axis of the section B. These rollers F^2 project on the inside of the section B and beyond its inner cylindrical surface in the same way as the rollers E^2 are described above as projecting within the lower section A.

The third and upper most tubular section C is a sliding fit within the intermediate section B and like that section has on its exterior and in the thickness of its wall helical grooves C^1 which form quick pitch screwthreads each of square section as seen in Figure 4. These grooves C^1 are adapted to contain the rollers F^2 which project within the section B. The screwthreads formed by the grooves B^1 in the section B and those formed by the grooves C^1 in the section C are oppositely directed as may be seen in Figures 4 and 5 the threads formed by the grooves B^1 being right-handed while those formed by the grooves C^1 are left-handed. The section C is conveniently provided with a sealing ring C^2 which lies in a groove C^3 formed in the exterior of the section near its lower end.

Attached to and projecting laterally from the lowermost section A is an arm G which carries a vertical guide rod G^1 lying parallel with the common axis of the telescopically sliding sections A, B and C. A somewhat similar arm G^2 is connected to and projects radially from the upper end of the uppermost section C and this arm carries a guide sleeve G^3 within which lies and can slide the guide rod G^1. This guide prevents the section C from rotating relatively to the lowest section A while the three sections are being moved in the axial direction. This movement is effected by rotation of the intermediate section B and to enable this to be done a shaped annular member B^5 is suitably mounted on the upper end of the section B this member B^5 forming a hand wheel which can be grasped when the section B is to be turned. When this section is turned in one direction the three sections will be telescoped sliding one within the other into the positions in which the parts are shown in Figure 1 when the propeller lies below the bottom D of the vessel where it can be operative to propel the vessel. If the section B is then turned in the opposite direction the sections will move one within the other and the well structure will be

extended until the parts are in the positions in which they are shown in Figure 2 where the whole propulsive unit carried by the well structure is raised so as to bring the propeller into the well and within the contour of the bottom of the vessel. If desired this rotation of the section B may be effected by power.

At a suitable place in the length of the uppermost section C and preferably towards its lower end there is within it an inwardly directed flange C^4 of convenient width and on this flange rests a flange H which extends outwards from and around a part J of the casing enclosing the transmission shafting of the propulsion unit. The unit is held down on the flange C^4 and in a manner which permits of its being readily disconnected for removal, by the following arrangement. Projecting upwards from the flange H from points diametrically opposite on this flange are two substantial pins or pillars H^1 each of which is adjustable in length and carries pivoted at H^2 at its upper end a lever H^3 shaped as can be seen in Figure 3. Each of these levers H^3 can be swung so as to bring part of it under a lug C^5 mounted on the upper end of the section C, the under surface of the lug or the upper surface of the lever being slightly inclined so as to have a cam action when the lever is engaged with the lug thus locking the propulsive unit firmly down on the flange C^4. The levers H^3 can be easily swung out from under the lugs and the whole propulsive unit is then freed so that it may be lifted out of the section C. If it is not to be replaced a closure disc of suitable structure can then be placed on the flange C^4 and there fixed in some convenient manner thus completely closing the well opening through the bottom of the vessel. When the unit is placed in the well structure and about to be secured there its correct circumferential position is located by means of an arm J^1 which projects radially from the casing J and is adapted to lie in a corresponding slot G^4 in the arm G^3 projecting from the upper end of the section C.

The propulsion unit considered as a whole is conveniently of a known type and in this case is shown in the drawings as comprising an egine K which drives a vertical transmission shaft enclosed in the casing J. At its lower end the drive is transmitted through bevel gearing to a short horizontal shaft on the end of which is the propeller L. Figure 7 illustrates a known arrangement which may be used with the present invention to enable the propeller to be swung about the vertical transmission shaft so as to enable the vessel to be propelled forwards, astern or laterally. In this construction the engine is not mounted above and directly connected to the vertical transmission shaft M as in the construction of propulsive unit shown in Figures 1 and 2. At its upper end the shaft M is driven through bevel gearing from a short horizontal shaft N the end of which can be coupled as by means of a splined sleeve to a flexible shaft or other connection to a separate motor which may be an electric motor or internal combustion engine suitably mounted near by. The shaft L^1 on one end of which is the propeller L is driven through bevel gearing from the shaft M and the propeller shaft L^1 is carried in bearings in a casing O which is fixed on the lower end of a sleeve O^1 which surrounds the vertical shaft M and runs up within the casing J wherein the sleeve is rotatable. On the upper end of the sleeve O^1 is a chain wheel O^2 and the chain O^3 passing round this wheel runs

also round a chain wheel P on a short vertical shaft P^1 which through bevel gearing can be turned by means of a hand wheel P^2. Rotation of the hand wheel P^2 will cause the propeller shafts L^1 to be swung into any angular position about the vertical shaft M and thus the direction in which the thrust of the propeller L is to be exerted can be altered. The flange J^2 around the casing J may rest on the flange C^4 within the uppermost section C of the well structure and be there fixed in some convenient manner. If, as mentioned, the shaft N is connected to the source of power through flexible shafting this will permit the raising and lowering of the propeller and the transmission mechainsm shown in Figure 7 so as to retract or lower the propeller for use.

It is to be understood that where in the above description mention is made of a propulsion unit, this expression is to be taken as meaning either a complete propulsion combination of engine, driving shaft and propeller in a well-known form, or a construction in which the vertical driving shaft and propeller are mounted in the well member and the source of power is disposed outside and the drive therefrom transmitted to the shaft and propeller by suitable means such as indicated above. The whole propulsion apparatus together with the whole well member may in some cases be regarded as a unit and supplied as such being in a form ready assembled and only needing to be placed in the vessel and bolted down.

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

1. A ship propulsion unit comprising in combination a cylindrical tubular casing composed of at least two telescoping parts relatively movable axially and provided with sealing means at all sliding joints therebetween, this casing being mounted with its axis approximately vertical in the hull of the vessel and with the ends of the casing open, said casing forming a well-like structure, means for moving the parts of the casing relatively in the axial direction whereby the overall length of the casing can be reduced or extended, a transmission shaft rotatably carried in the said casing with its axis substantially parallel to that of the casing, a propeller rotatable about an axis at right angles to that of the said shaft with means for driving the propeller as the shaft rotates, the said casing when the parts thereof are extended raising the said shaft with the propeller until the propeller is withdrawn within the contour of the hull but when the length of the said casing is reduced by telescopic relative movement of the parts thereof the propeller will be lowered into a position in which it can be operative to propel the vessel, a source of power, and a connection between said source of power and the upper end of the said transmission shaft whereby power transmission to the propeller will be maintained while the said shaft is raised and lowered.

2. A ship propulsion unit comprising in combination a cylindrical tubular casing composed of at least two telescoping parts which are relatively movable axially and one of which is rotatable, this casing being mounted with its axis approximately vertical in the hull of the vessel with the ends of the casing open and forming a well-like structure, means for rotating said rotatable part relatively to other parts of the said casing, means whereby such relative rotation will cause relative movement of the casing parts in the axial direc-

tion and thereby reduce or extend the overall length of the casing, a transmission shaft rotatably carried in the upper part of said casing with its axis substantially parallel to that of the casing, a propeller rotatable about an axis at right angles to that of the said shaft with means for driving the propeller as the shaft rotates, the axial length of said casing parts when extended raising the said shaft with the propeller until the propeller is withdrawn within the contour of the hull, the length of said shaft when lowered by telescoping the casing exposing the propeller beneath the hull in operative position to propel the latter, a source of power, and a connection between said source of power and the upper end of said transmission shaft, whereby power transmission to the propeller will be maintained while the said shaft is raised and lowered.

3. A ship propulsion unit comprising in combination a cylindrical tubular casing constructed in three sections all of which are relatively movable telescopically and of which at least one is rotatable relatively to the other sections, said casing being mounted with its axis approximately vertical in the hull of the vessel with the ends of the casing open, said casing forming a well-like structure, a spiral groove formation resembling a screwthread on the exterior of two of the said casing sections the grooves on one part running in a direction opposite to the grooves on the other part, at least two radially projecting members carried by each of two of the said casing sections and engaging the spiral grooves on the grooved casing sections, means for rotating one of the said casing sections relatively to the other two sections of the casing thereby moving the three sections of the casing axially relatively to each other and the overall length of the casing will be reduced or extended according to the direction in which the said casing section is rotated, a transmission shaft rotatably mounted in the said casing and carried by the uppermost of the three said casing sections, the axis of this transmission shaft being substantially parallel to that of the casing, a propeller rotatable about an axis at right angles to that of the said shaft with means for driving the propeller as the shaft rotates, the said casing when the sections thereof are extended raising the said shaft with the propeller until the propeller is withdrawn within the contour of the hull but when the length of the said casing is reduced by telescopic relative movement of the sections the propeller will be lowered into a position in which it is operative to propel the vessel, a source of power and a connection between said source of power and the upper end of the said transmission shaft whereby power transmission to the propeller will be maintained while the said shaft is raised and lowered.

4. A ship propulsion unit comprising in combination a cylindrical tubular casing constructed in three sections all of which are relatively movable telescopically, said casing being mounted with its axis approximately vertical in the hull of the vessel with the ends of the casing open, said casing forming a well-like structure, spiral groove formations resembling screw threads on the exterior of the intermediate and of the uppermost sections of the casing, the grooves on one section running in a direction opposite to the grooves on the other section, at least two radially projecting members carried by the lowermost of the three said sections and similar members carried by the said intermediate section, these projecting members respectively engaging the spiral grooves on

the exterior of the intermediate and uppermost sections of the said casing, means for holding the lowermost and the uppermost sections of the casing against rotation, means for rotating the said intermediate section relatively to the upper and lower sections whereby the engagement of the said radially projecting members with the said spiral grooves moves the three sections of the casing relatively in the axial direction and reduces or extends the overall length of the said tubular casing according to the direction in which the said intermediate section is rotated, a transmission shaft rotatably disposed in the said casing and carried by the uppermost of the said three sections with the axis of this shaft substantially parallel to that of the casing, a propeller rotatable about an axis at right angles to that of the axis of the said shaft with means for driving the propeller as the shaft rotates, the said casing when the sections thereof are extended raising the said shaft with the propeller until the propeller is withdrawn within the contour of the hull but when the length of the casing is reduced by relative telescopic movement of the said three sections the propeller will be lowered into a position in which it is operative to propel the vessel, a source of power, and a connection between said source of power and the upper end of the said transmission shaft, whereby power transmission to the propeller will be maintained while the said shaft is raised and lowered.

5. A ship propulsion unit as set out in claim 2 wherein the transmission shaft is detachably mounted in the said tubular casing and the shaft with the propeller at one end and the connection to the source of power at the other end thereof constitute a unitary assemblage removable from the casing as a unit.

6. A ship propulsion unit as set out in claim 3 wherein the source of power comprises an internal combustion engine mounted at the upper end of the said transmission shaft and which with the propeller and the shaft form a complete unitary assemblage detachably mounted in the uppermost section of the said tubular casing.

7. A ship propulsion unit as set out in claim 3 provided with means for turning that portion of the propulsion mechanism comprising the transmission shaft and the propeller with its shaft about a vertical axis in the said casing, thereby changing the direction in which propulsion is effected.

8. A hull propulsion unit comprising in combination a tubular casing composed of at least two telescoping parts, water tight packing means between said parts permitting relative sliding movement between them, the outer one of said parts being mounted over an aperture in the bottom of the hull with its axis approximately vertical, means for closing the joint between said outer part and hull surrounding said aperture, the lower ends of said telescoping parts being open to the water to form a vertically extensible well-like structure supported within the hull, a transmission shaft disposed axially within said well-like structure and rotatably supported in the upper one of said telescoping parts, said shaft projecting below the hull bottom in the lower position of said upper telescoping part, a propeller rotatable about an axis at right angles to that of said shaft and mounted for rotation in bearing means supported at the lower end thereof, means for turning said bearing means about the axis of said shaft, said bearing means and pro-

peller being withdrawable within the lower one of said telescoping parts when the upper part is raised, means associated with said telescoping parts for raising said upper part, angle gearing connecting said shaft and propeller and means carried by said upper part for rotating said shaft and propeller in unison to propel said hull in a direction parallel to the axis of said propeller when the latter is in its lowered position.

HAROLD PERCY BROWN.
ALBERT GEORGE ARMSTRONG.

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