June 22, 1937. E. CORRADINO ET AL 2,084,321

PROPELLING MECHANISM

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Fig. 1

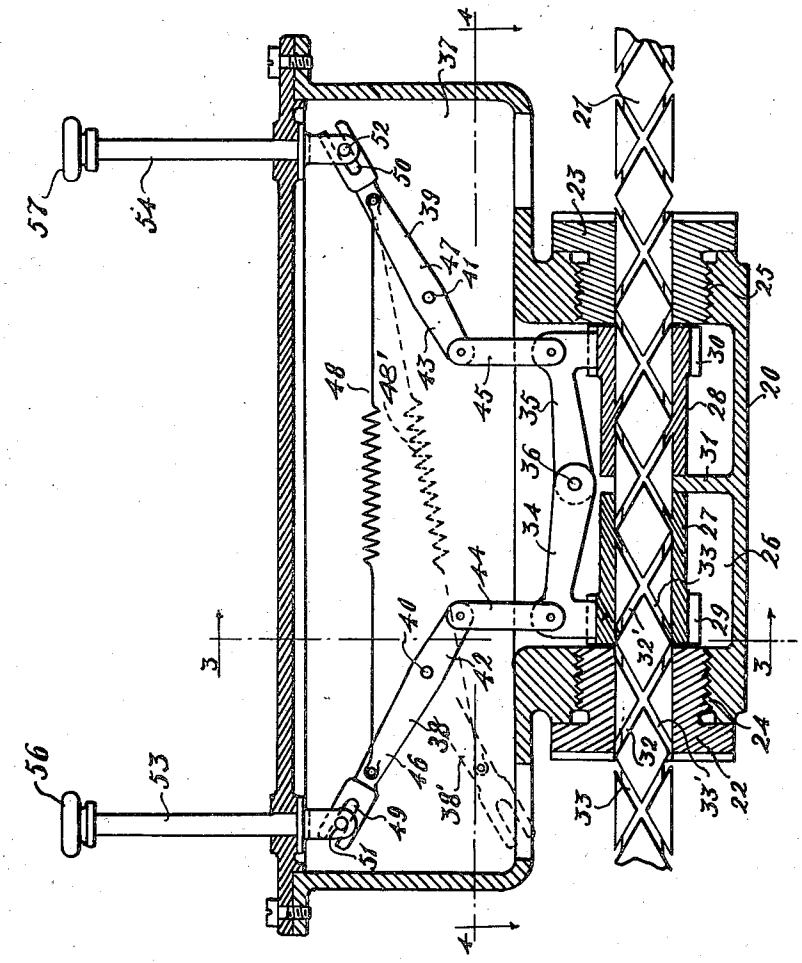
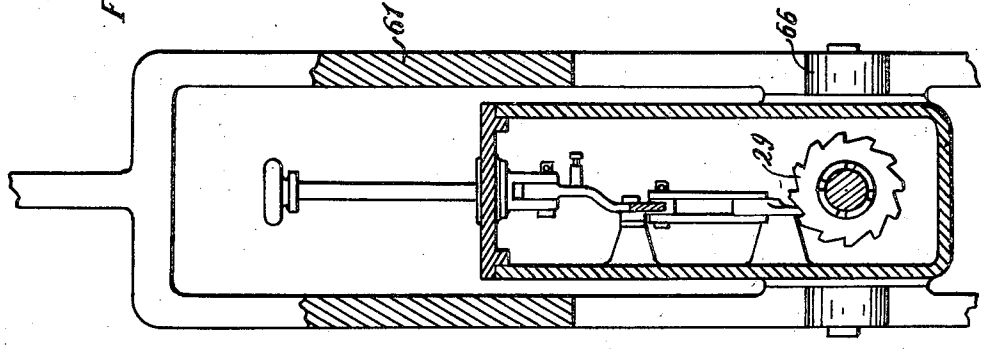


Fig. 3

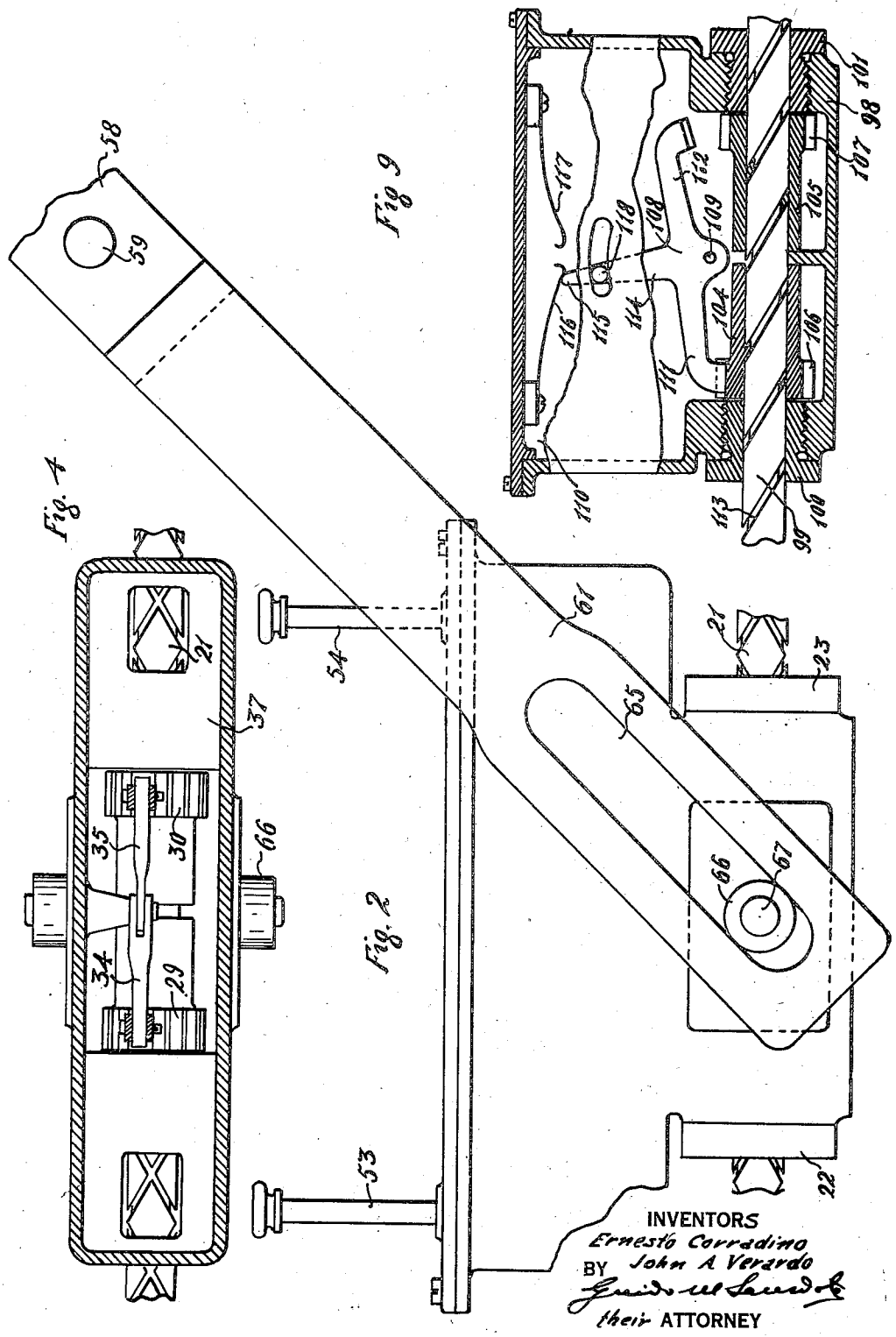


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Filed Sept. 7, 1933 5 Sheets-Sheet 2



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PROPELLING MECHANISM

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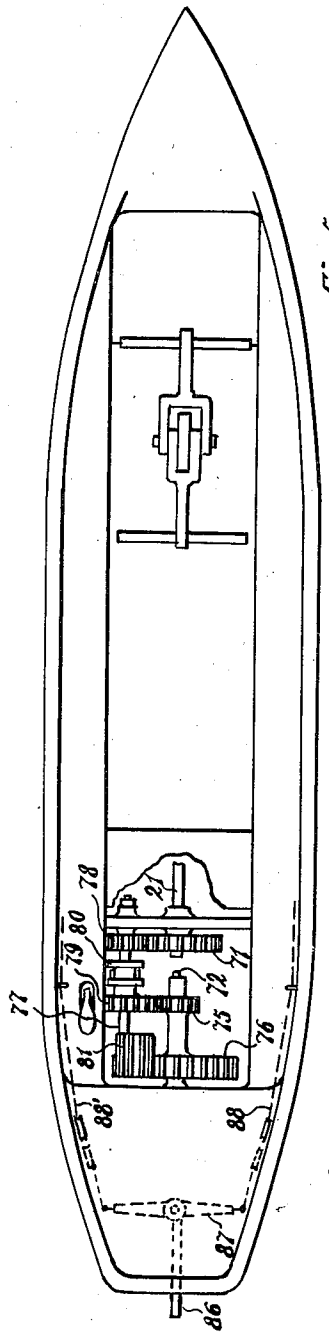


Fig. 5

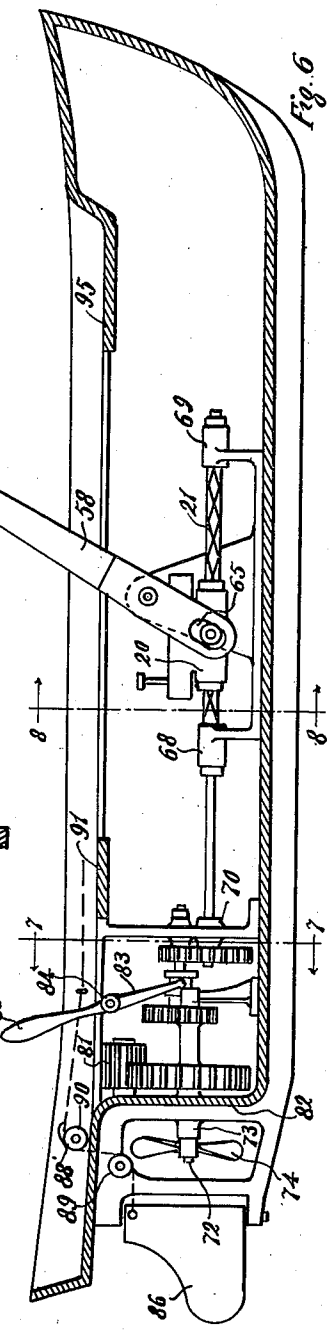


Fig. 6

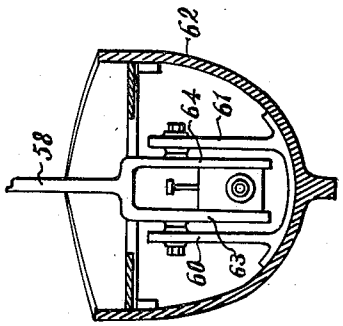


Fig. 8

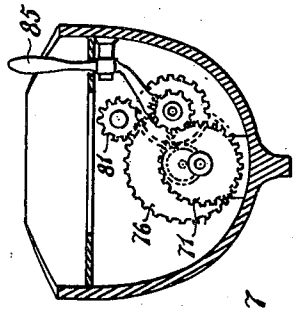


Fig. 7

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PROPELLING MECHANISM

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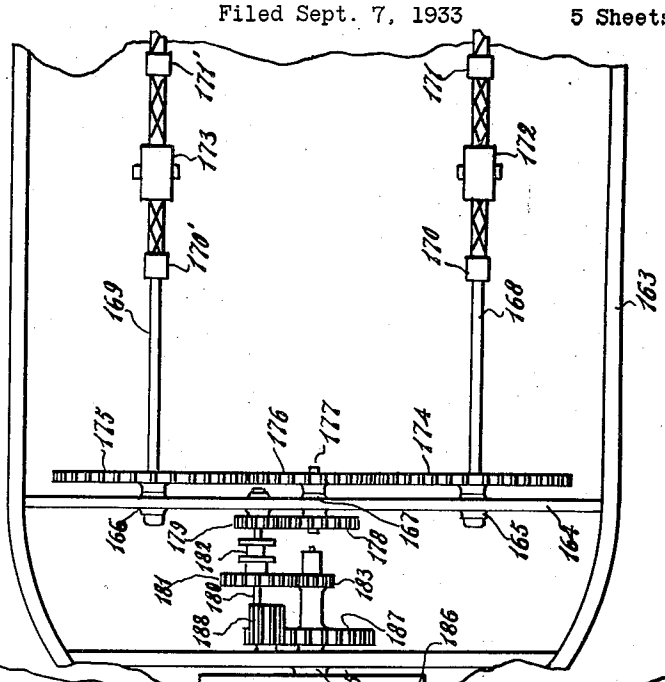


Fig. 9.

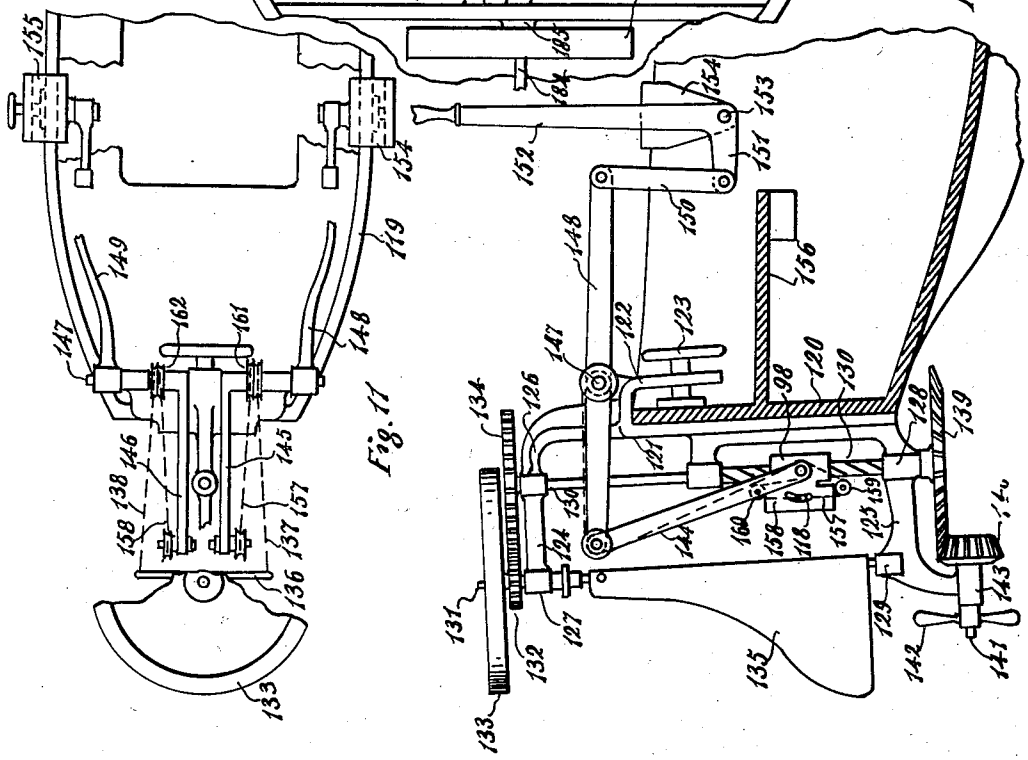


Fig. 10.

Fig. 11

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PROPELLING MECHANISM

Filed Sept. 7, 1933 5 Sheets-Sheet 5

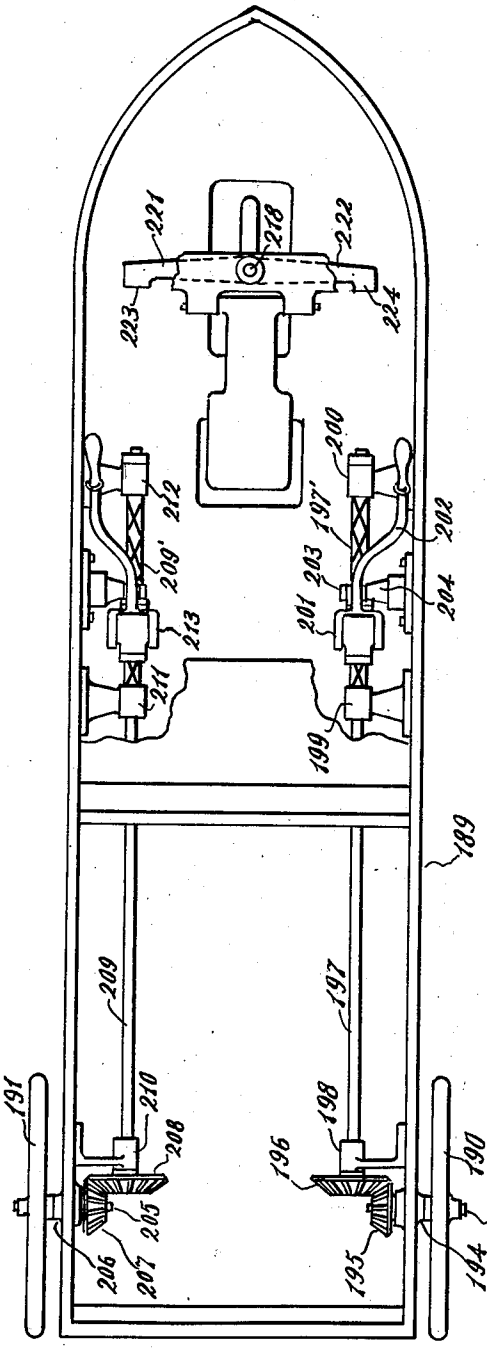


Fig. 13

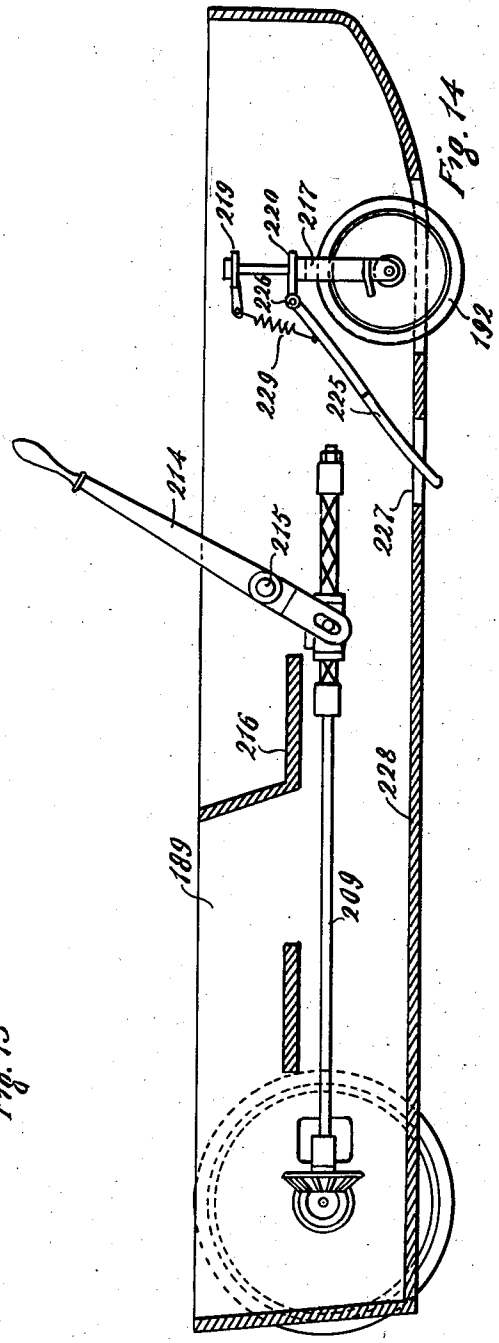


Fig. 14

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UNITED STATES PATENT OFFICE

2,084,321

PROPELLING MECHANISM

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Application September 7, 1933, Serial No. 688,506

4 Claims. (Cl. 74—57)

This invention relates to the art of propelling boats and other conveyances and more particularly refers to improvements in propelling mechanisms, adapted to be manually operated.

As a general rule, hand-operated propelling mechanisms consist of arrangements of various elements whereby reciprocating motion produced by the hands or feet of the operator is transformed into rotatory motion of the propelling element; said propelling element in a boat, for instance, being a propeller and in a land vehicle being a wheel or set of wheels.

The primary object of the present invention is to provide in a land or water conveyance, a novel and improved type of propelling mechanism, adapted to be manually operated and comprising a minimum number of parts; said mechanism being particularly designed for the efficient utilization of the power generated by the operator and permitting said power to be exerted in the easiest and least fatiguing manner.

Another object is to provide a novel and improved type of manually-operated propelling mechanism, comprising a reciprocating member adapted to be made operative at will in one or the other direction, or both in order to more efficiently utilize the power exerted by the operator.

A further object is to provide a novel and improved propelling mechanism, particularly adapted for the propulsion of boats, said mechanism consisting of a minimum number of parts and being, therefore, adapted to be made in extremely compact and rugged form, so as to occupy a minmum of space and provide a maximum of operating efficiency.

A still further object is to provide a hand-operable conveyance, comprising as a part of its equipment the improved mechanism forming the main object of the present invention.

Other objects and advantages of the present invention will more fully appear as the description proceeds and will be set forth and claimed in the appended claims.

Our invention is illustrated by way of example in the accompanying drawings, in which:

Fig. 1 is a central longitudinal section through an actuating device, which may be used as a part of our propelling mechanism;

Fig. 2 is a side elevation thereof;

Fig. 3 is a cross section view through line 3—3 of Fig. 1;

Fig. 4 is a plan sectional view of the same through line 4—4 of Fig. 1;

Fig. 5 is a plan view of a boat equipped with a propelling mechanism, including the device shown in Figs. 1 to 4;

Fig. 6 is a vertical longitudinal section thereof;

Fig. 7 is a vertical cross section thereof through line 7—7 of Fig. 6;

Fig. 8 is a vertical cross section of the same through line 8—8 of Fig. 6; and

Fig. 9 is a fragmentary plan view of a portion of a boat near its rear end, embodying our invention in a different form.

The main characteristic of our invention is the use in connection with a propelling mechanism of an actuating device, adapted to be made in an extremely compact form, permitting of directly and efficiently transforming the reciprocating motion of a hand-operated lever into rotary motion of a power shaft.

The actuating device can be so designed that reciprocating movement of the actuator can be transformed into either continuous or intermittent rotary motion in one direction of the shaft controlled thereby.

The operation of the actuating device is based on the mutual transformation of reciprocating into rotary motion and vice versa, which can take place between a male and a female threaded element when the thread is sufficiently inclined to permit axial sliding of one element with respect to the other. Broadly speaking, means of this character for transforming reciprocating into rotary motion are not new, their use being well known, for instance, in connection with certain types of hand-operated drills.

The actuating device illustrated in Figs. 1 to 4 comprises an actuator 20, slidably inserted over a threaded shaft 21, by means of two coaxial but axially spaced bushings 22, 23, which are preferably removable and are, therefore, threaded and screwed into the opposite ends of the body of actuator 20, as shown at 24, 25.

The body of actuator 20 is hollow and forms a chamber 26 within which are housed two nuts 27, 28, which are formed with a ratchet portion 29, 30, said nuts being inserted over threaded shaft 21 and being internally threaded so as to be operatively associated therewith.

Chamber 26 is divided into two sections, each corresponding in length to the nut 27 or 28, housed therein, by a rib 31, which forms an abutment for the inner end of said nuts.

Threaded shaft 21 is shown with two intersecting sets of threads 32—32′ and 33—33′, one set consisting of two parallel right hand threads and the other set consisting of two similar parallel left hand threads. One of the nuts, for in-

stance, nut 28 is provided with internal threads, engaging the right hand threads 32—32′ of shaft 21, whereas the other nut 27 is provided with internal threads engaging the set of left hand threads 33—33′.

It is, therefore, obvious that if the actuator is axially shifted in one direction with respect to shaft 21, while said shaft is restrained against rotation, one of the nuts will rotate in one direction and the other nut will rotate in the opposite direction; and if the actuator is axially shifted in the opposite direction the two nuts will reverse their respective directions of rotation. In a similar manner, if the actuator is axially shifted with respect to the shaft, while the shaft is permitted to rotate, and one or the other nut is restrained against rotation, the shaft will be alternately rotated first in one and then in the other direction during reciprocating motion of the actuator.

It is, of course, also possible to restrain one or the other nut against rotation in one direction only, in which case the shaft will be rotated intermittently in the same direction when the actuator is caused to reciprocate with respect thereto.

From these remarks it follows that if one of the nuts is restrained against rotation in one sense when the actuator is axially shifted in one direction and the other nut is restrained against rotation in the same sense when the actuator is shifted in the opposite direction, the first nut will cause rotation of the shaft in a given direction and the second nut will cause rotation of said shaft in the same direction; so that reciprocating motion of the actuator results in this case in a continuous rotary motion of shaft 21 in a given direction.

Referring to Fig. 3, it is seen that both nuts are restrained against rotation in a clockwise direction while being free to rotate in a counterclockwise direction. This end is attained by means of two pawls 34, 35, respectively engaging ratchet portions 29, 30, of nuts 27, 28, said pawls being pivotally mounted at a central point 36. The actuator is formed with an upper chamber 37, in which are housed two levers 38, 39, pivotally mounted at 40, 41, respectively, said levers extending in two oppositely inclined directions and each having an inner arm 42, 43, connected to pawls 34, 35, by means of links 44, 45, respectively, and a longer arm 46, 47, said arms 46, 47, being connected to each other by a spring 48.

Levers 38, 39 are so arranged that spring 48 acts as a snap-over spring when either or both of said levers 38, 39, are swung from one of their extreme positions to the other. For instance, if lever 38 is swung to position 38′, shown in dotted lines, spring 48 will be caused to pass beyond the dead point and will, therefore, come to occupy the position shown in dotted lines at 48′, where it retains lever 38 in its new position with respect to lever 39, the position of which has remained unchanged. In the new position 38′ of lever 38, pawl 34 will have been moved to a position where it no longer engages nut 27, so that said nut is no longer restrained against rotation in either direction. In a similar manner, lever 39 can be moved to its other extreme position while the position of lever 38 is left unchanged, so that pawl 35 will become disengaged from nut 28 while nut 27 will still be engaged by pawl 34; or else both lever 38 and lever 39 can be moved to their extreme positions where both nuts will be disengaged from their respective pawls.

In order to swing levers 38, 39, from one position to the other, the outer end of each one of said levers is slotted, as shown at 49, 50, and engages a pin 51—52, with which the lower end of a push rod 53—54 is provided. Said push rods project through the cover 55 of chamber 37 and can be depressed by means of buttons 56, 57.

It is thus seen that by virtue of the arrangement described, it is possible to set both pawls into engagement with their respective nuts so that reciprocating motion of the actuator will be transformed into continuous rotary motion of shaft 21 in a given direction; or one of the pawls can be set in its disengaged position so that intermittent rotary motion of the shaft in the same direction will be caused when the actuator is shifted in one direction, the shaft remaining stationary when the actuator is shifted in the opposite direction; or the other pawl can be set in its disengaged position while the former is set in its position of engagement, with the result that the actuator will become inoperative when shifted in the direction in which it was formerly operative, and will become operative when shifted in the direction in which it was formerly inoperative; or else both pawls can be set in their disengaged position, with the result that reciprocating motion of the actuator will not cause any rotary motion of the shaft but will only cause the nuts to rotate idly with respect to said shaft, in opposite directions; their respective direction of rotation changing with each change in the direction of the movement of the actuator.

A propelling mechanism, in which the device just described can be employed to advantage, is illustrated in Figs. 5 to 8. From said figures and from Figs. 2 to 4, it will be seen that the reciprocating movement of the actuator 20, with respect to threaded shaft 21, can be produced by means of a forked lever 58, pivotally mounted on horizontal pivots 59 of brackets 60, 61 upwardly extending from the bottom of boat 62. The two transversely spaced prongs 63, 64 of forked lever 58 are each provided with a slot 65, which operatively engages a roller 66, mounted on pin 67, laterally projecting from the body of actuator 20. The actuator can axially reciprocate with respect to threaded shaft 21, inserted therethrough, causing said shaft to rotate in the manner previously explained; and the reciprocating movement of the actuator can be produced by swinging lever 58 back and forth, as will be understood.

Shaft 21 is mounted on supports 68, 69, and extends rearwardly and through another support 70, the rearmost end of said shaft carrying a gear wheel 71. At the rear end of the boat is rotatably mounted a propeller shaft 72, projecting through the rear end support 73 and carrying a propeller 74. The front or inner portion of said propeller shaft carries a pinion 75 and a toothed flywheel 76. The rotary movement of shaft 21 is transmitted to the propeller shaft 72 through the intermediary of a countershaft 77, carrying a pinion 78, permanently in mesh with gear wheel 71, and a gear wheel 79, normally in mesh with pinion 75.

Gear wheel 79 is formed integral with a clutch collar 80 and is shiftable along countershaft 77, so that if said gear wheel is shifted immediately to the left of pinion 75 propeller shaft 72 will become disconnected and if said gear wheel 79 is further shifted in the same direction it will mesh with an idler pinion 81, mounted on rear frame 82, said pinion 81 being permanently in mesh with toothed flywheel 76.

Gear wheel 79 can be shifted by means of a clutch lever 83, pivotally mounted at 84 and provided with an operating handle 85. It will thus

be seen that by operation of clutch lever 83, it is possible to set the transmission gearing for forward, or neutral, or reverse rotation of the propeller shaft. The boat is also preferably provided with a rudder 86, having a cross member 87, adapted to be actuated by wires or cables, such as 88, 88', riding on guide pulleys 89, 90, in the usual manner.

The arrangement described permits of a man sitting at the rear, upon seat 91, operating the clutch and the rudder whenever necessary, the position of seat 91 permitting also the normal operation of lever 58 by the same man. If only one man is manning the boat, one of push rods 53, 54, will be pressed down so as to disengage the corresponding pawl 34, 35, from its respective nut 27, 28, shown in Fig. 1; the pawl left in an operative position being the one corresponding to the swinging movement of lever 58 towards the rear, that is, when the operator can exert a pull on said lever to best advantage. For this purpose the lever is preferably provided with a link 92, pivotally mounted at 93, to the upper end of said lever 58, said link being provided with a cross handle 94, adapted to be conveniently grasped by the hands of the operator.

Another operator can occupy seat 95 at the forward end of the boat, facing the other operator. In this case, another link 96, also pivoted at 93, to lever 58 can be added, said link 96 being provided with a cross handle 97, adapted to be grasped by the hands of the second operator.

It will be understood that when only one operator is manning the boat, threaded shaft 21 will be actuated intermittently at each forward stroke of actuator 20, whereas when two operators are available, both the forward and the rearward strokes of actuator 20 will cause shaft 21 to rotate, so that the rotation of shaft 21 is practically continuous, both pawls 34, 35, being, of course, made operative.

It is thus seen that by simple manipulation of push rods 53, 54, the mechanism can be set by one or the other man, or both, while clutch lever 83 and cables 88, 88', complete the means for controlling the operation of the boat by reversing the propelling action and by steering.

Our propelling device can also be applied to boats of relatively large size, such as life-saving boats, for instance, where crews of four to ten, or more, men can be employed to man the boat. Such boats are usually wide enough to permit two rows of men to sit side by side and, therefore, two threaded shafts, each operated by the men in one of the rows, can be provided. An arrangement of this type is illustrated in Fig. 9, where 163 designates a life saving boat, a portion of which near the rear end thereof only is shown.

A cross member 164 is provided with bearings 165, 166, equidistant from and located one at each side of central bearing 167. Bearings 165, 166, support the rear ends of shafts 168, 169, respectively, which have threaded portions between supports, such as 170, 171, etc., 170', 171', etc., an actuator such as 172, 173, being provided between each set of supports.

It will thus be understood that each shaft 168, 169, can be manned by two or more men, sitting one in front of the other in a longitudinal row, the threads in shafts 168, 169, and in their corresponding actuators being so arranged that shafts 168, 169, rotate in reverse directions.

Said shafts are each provided at the rear end with a gear wheel 174, 175, said gear wheels being in mesh with a central gear wheel 176, carried by shaft 177, rotatably mounted in bearing 167. The rear end of shaft 177 carries a gear wheel 178, which is in mesh with a pinion 179, carried by a countershaft 180.

As described in connection with the arrangement of Figs. 5 to 8, countershaft 180 carries a gear wheel 181, shiftable along said countershaft by means of a clutch collar 182. Said gear wheel 181 is normally in mesh with the pinion 183, carried by propeller shaft 184, rotatably mounted in bearing 185, said propeller shaft carrying a flywheel 186 and a gear wheel 187. Gear wheel 187 is permanently in mesh with an idler pinion 188 with which gear wheel 181 will mesh when said gear wheel is shifted to the left with respect to Fig. 9, in order to produce reverse motion of the propeller shaft.

Thus, wheel 190 is fixed on a shaft 193, rotatably mounted in a bearing 194 and carrying at its inner end a conical pinion 195. Said pinion is in mesh with a conical gear wheel 196, carried by longitudinal shaft 197, which is rotatably mounted in supports 198, 199, 200. The front portion 197' of said shaft 197, intervening between supports 199, 200, is threaded with both right and left threads and carries an actuator 201 of the type shown in Fig. 1. Said actuator is operated by means of a hand lever 202, pivotally mounted at 203 onto bracket 204, inwardly extending from the side of body 189.

It will be observed that the threaded shafts can rotate in the direction in which they are driven by their actuating device, even if their actuating device is held stationary; therefore, even if the actuating levers or lever are operative in one direction only, producing an intermittent driving action, the propelling mechanism can be provided at some convenient point with a flywheel, as shown, rendering its action virtually continuous.

The constructional details of our invention may vary from those shown without departing from the inventive idea; the drawings will, therefore, be understood as being intended for illustrative purposes only and not in a limiting sense. We, accordingly, reserve the right to carry our invention into practice in all those ways and manners which may enter, fairly, into the scope of the appended claims.

We claim:

1. A device of the class described comprising a rotatably mounted shaft having relatively steep left and right hand threads, and an actuating device for said shaft, including an actuator mounted on and reciprocatable along said shaft, two internally threaded nut elements inserted over said shaft within said actuator, one of said nut elements engaging the left hand thread and the other the right hand thread of said shaft, a ratchet integral with each nut adapted, when engaged by a pawl, to prevent rotation of said nut in a given direction, which is the same for both nuts, a pivotally mounted pawl movable in a plane parallel to the axis of said shaft adapted to be set in and out of engagement with each ratchet, a lever for actuating each pawl, and a snap over spring interposed between the two levers, adapted to hold either or both pawls in their operative or inoperative position.

2. A device of the class described comprising a rotatably mounted shaft having relatively steep left and right hand threads, and an actuating device for said shaft, including an actuator

mounted on and reciprocatable along said shaft, two internally threaded nut elements inserted over said shaft within said actuator, one of said nut elements engaging the left hand thread and the other the right hand thread of said shaft, a ratchet integral with each nut adapted, when engaged by a pawl, to prevent rotation of said nut in a given direction, which is the same for both nuts, a pivotally mounted pawl movable in a plane parallel to the axis of said shaft adapted to be set in and out of engagement with each ratchet, a lever for actuating each pawl, means for operating each lever independently of the other, and a snap over spring connecting the two levers, said spring being adapted to hold either or both pawls in their operative or inoperative position.

3. A device of the class described, comprising a shaft having relatively steep left and right hand threads, an actuating device for said shaft, including an actuator mounted on and reciprocatable along said shaft, two internally threaded nut elements inserted over said shaft, mounted to follow the axial displacements of said actuator, one of said nut elements engaging the left hand thread and the other the right hand thread of said shaft, means for selectively restraining either or both of said nut elements against rotation in the same direction, while at the same time permitting rotation thereof in the opposite direction, a pivotally mounted lever oscillatable in a vertical plane, for causing reciprocating movement of said actuator, and two handle members mounted on and extending in opposite directions in the plane of its movement from the upper end of said lever.

4. A conveyance comprising a shaft having relatively steep left and right hand threads, an actuating device for said shaft, including an actuator mounted on and reciprocatable along said shaft, two internally threaded nut elements inserted over said shaft, mounted to follow the axial displacements of said actuator, one of said nut elements engaging the left hand thread and the other the right hand thread of said shaft, means for selectively restraining either or both of said nut elements against rotation in the same direction, while at the same time permitting rotation thereof in the opposite direction, a pivotally mounted lever oscillatable in a vertical plane, for causing reciprocating movement of said actuator, and two handle members pivotally mounted on and adapted to extend in opposite directions in the plane of its movement from the upper end of said lever.

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