No. 659,858. Patented Oct. 16, 1900.

C. M. PALMER.

PROPELLING MECHANISM.

(Application filed Aug. 1, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

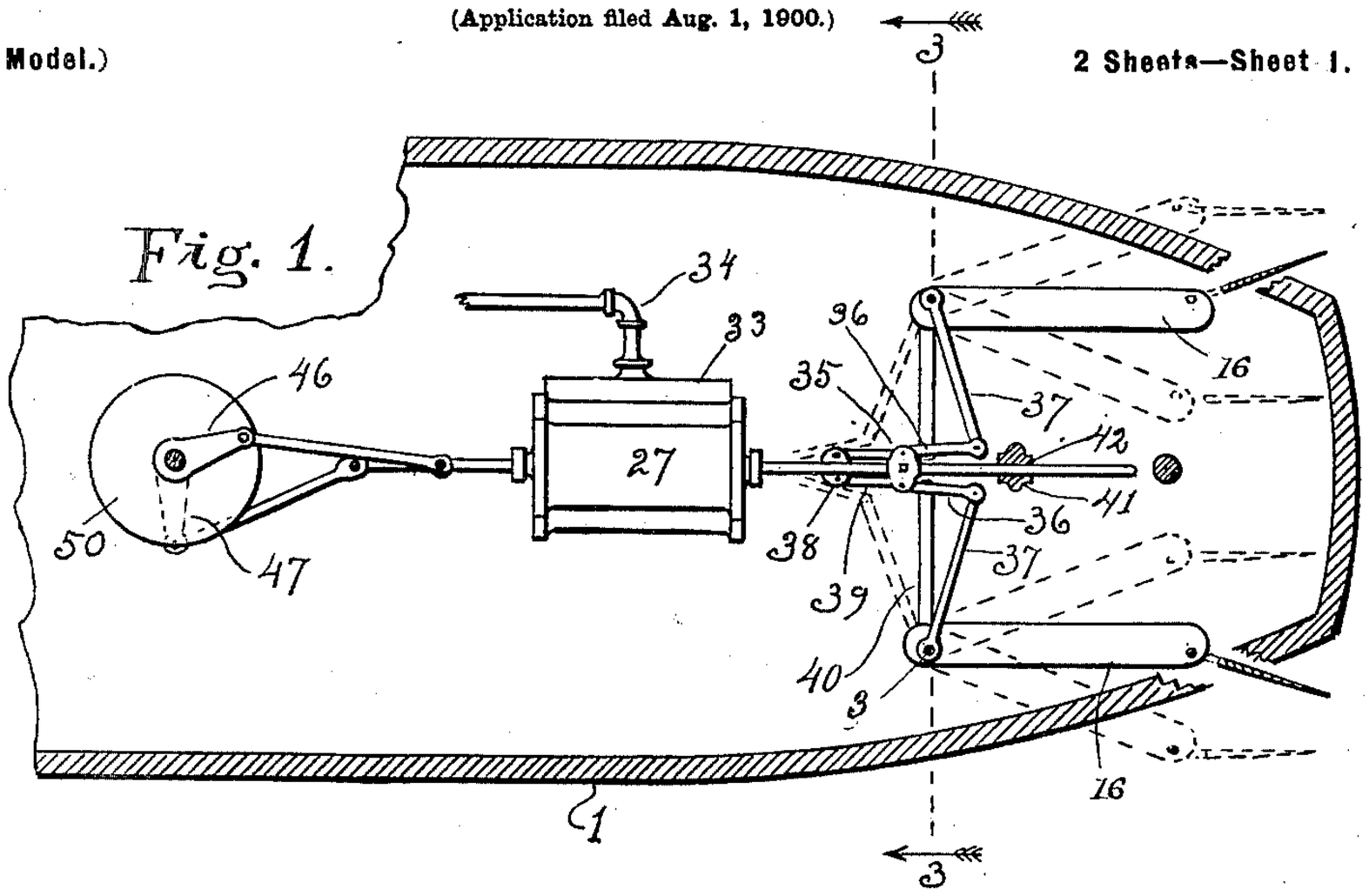


Fig. 2.

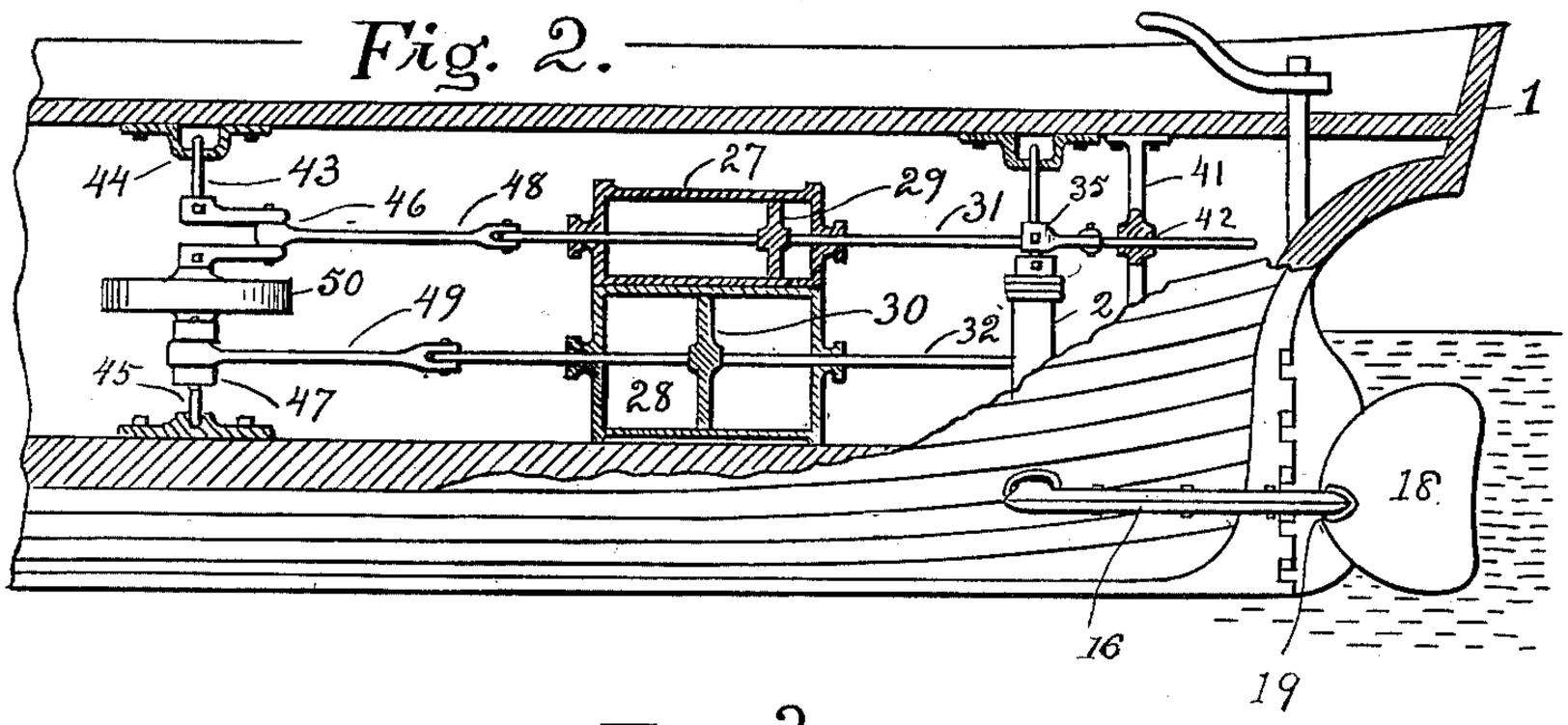
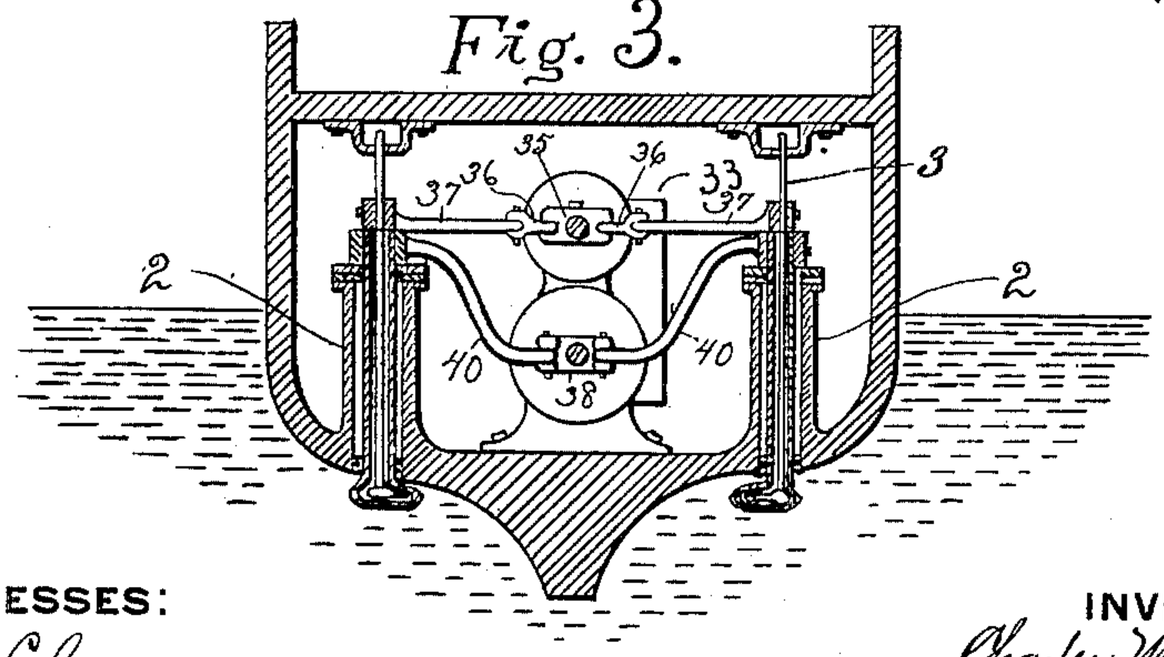


Fig. 3.



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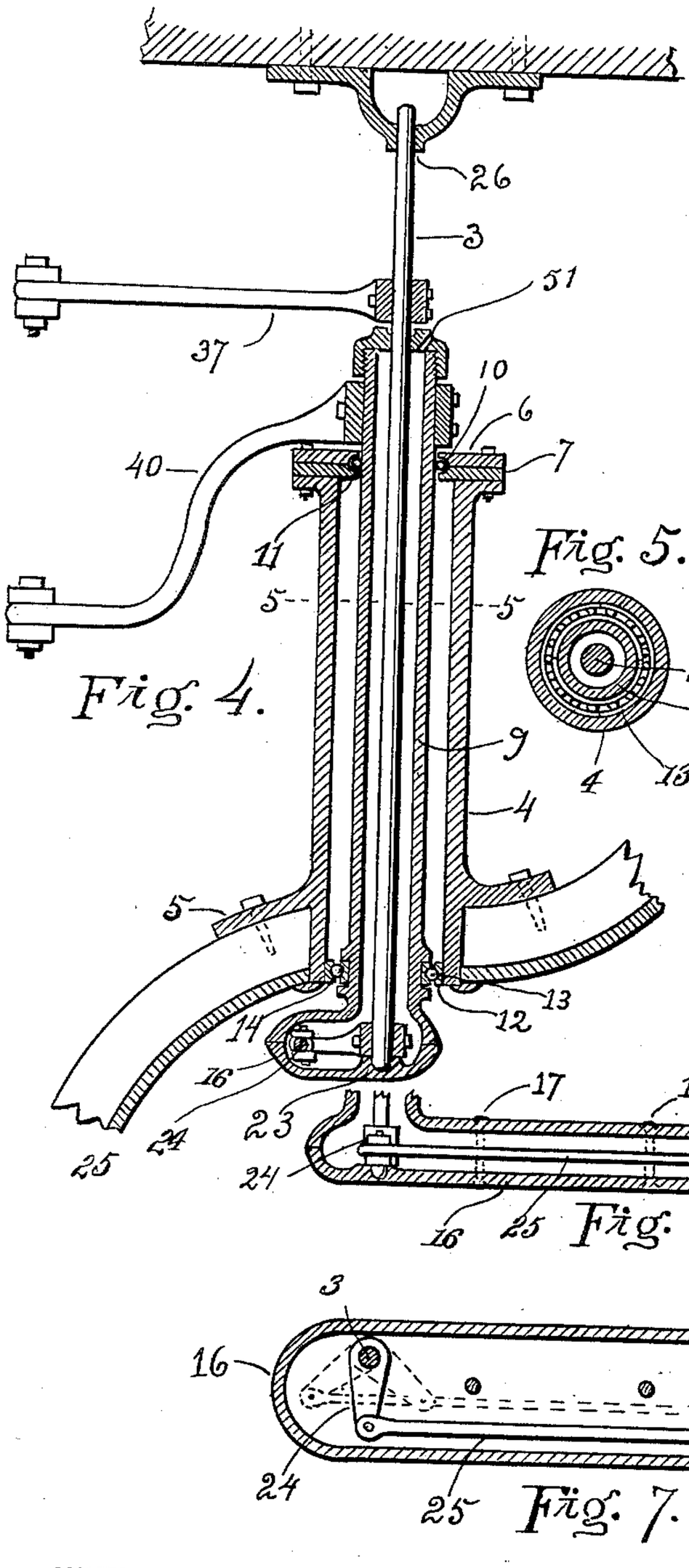

Fig. 4.

Fig. 5.

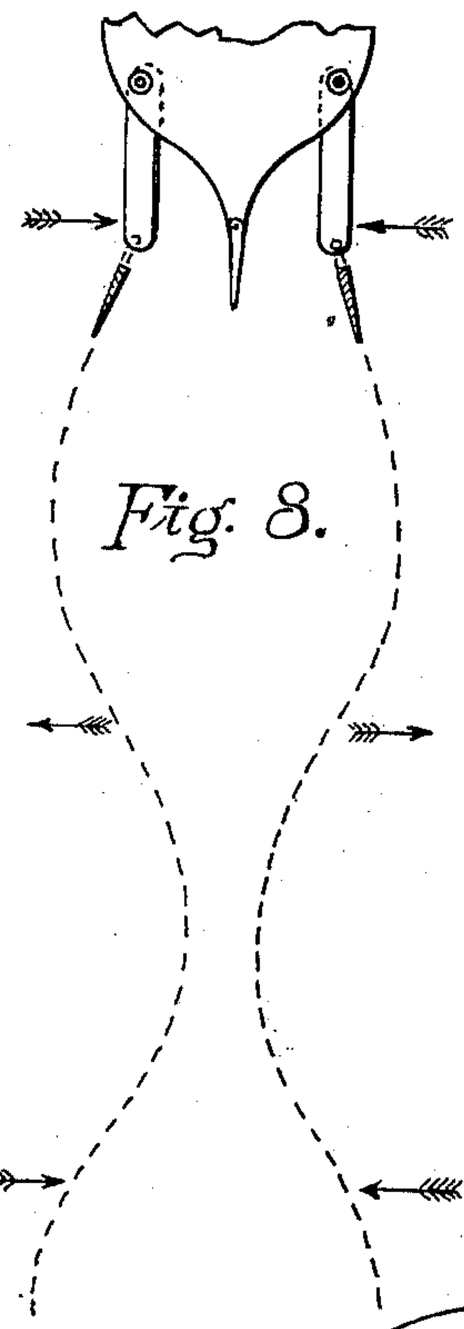

Fig. 8.

Fig. 6.

Fig. 7.

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CHARLES M. PALMER, OF CHICAGO, ILLINOIS.

PROPELLING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 659,858, dated October 16, 1900.

Application filed August 1, 1900. Serial No. 25,517. (No model.)

To all whom it may concern:

Be it known that I, CHARLES M. PALMER, of No. 1207 Monadnock Building, Chicago, Cook county, Illinois, have invented certain new and useful Improvements in Propelling Mechanism, of which the following is a specification.

This invention relates to improvements in propelling mechanism, and while shown herein as embodied in the form of a propelling mechanism adapted for propelling a boat, yet it is to be understood that the mechanism may be adapted for other purposes.

The salient object of the invention is to provide a mechanism or mechanical movement whereby a movement is imparted to a propelling-blade in many respects analogous to the movement of the tail-fin of a fish—that is to say, the propelling-blade is so mounted as to be reciprocated bodily through a determined lateral distance and simultaneously oscillated upon its own axis, so as to present its acting surface in a suitably-inclined position to the resisting medium, the controlling mechanism being so constructed and arranged as to automatically shift the angle of presentation in accordance with the change in direction of the bodily movement of the blade.

The invention also has for its object to provide improvements in the details of construction of the mechanism whereby the movement referred to is secured, to provide a duplicate coöperating mechanism so constructed and arranged that a pair or plurality of propeller-blades act together and in such a manner as to counteract the tendency of each other to impart an indirect motion to the hull of the boat, and in general to provide an improved construction of the character referred to.

To these ends the invention consists in the matters hereinafter described, and the same will be readily understood from the following description, reference being had to the accompanying drawings, in which—

Figure 1 is a horizontal sectional view of the stern end portion of a boat-hull, the propelling mechanism being shown principally in plan, but with certain parts also in horizontal section. Fig. 2 is a central longitudinal vertical section of the parts shown in Fig. 1, one of the propeller-blades, however, being shown in side elevation, together with the adjacent parts of the hull. Fig. 3 is a transverse vertical sectional view taken on line 3 3 of Fig. 1 and looking forwardly or in the direction of the arrows. Fig. 4 is an enlarged detail view of parts, taken on the same section as that indicated in Fig. 3. Fig. 5 is a horizontal sectional view taken on line 5 5 of Fig. 4. Fig. 6 is a vertical axial section of the propeller-blade arm with the propeller-blade connected therewith shown in side elevation. Fig. 7 is a central longitudinal sectional view of one of the propeller-arms, and Fig. 8 is a diagrammatic view illustrating the sinuous paths of the two propeller-blades.

Referring to said drawings, 1 designates as a whole the hull of the boat, and 2 two suitable tubular wells, through which extend vertically-arranged rock-shafts 3, which serve to impart movement to the propeller-blades. In the construction shown herein each well desirably comprises an outer tubular member or casing 4, having its lower end arranged to extend through the hull, as best indicated in Fig. 4, and provided at points coincident with the inner surface of the hull with a radial flange or base portion 5, whereby it is suitably secured to the hull to extend rigidly in a vertical position. Said casing is desirably constructed to extend at its upper end well above the water-level and is conveniently and as shown herein closed at its upper end, except for a central passage thereto, by means of a pair of superposed cap-plates 6 7, centrally apertured, as indicated at 8, to receive a hollow oscillatory propeller-arm shaft 9, the inner periphery of said cap-plates being desirably grooved, as indicated at 10, to provide a ball-race, between which and the exterior of the said propeller-arm shaft is inserted a set of roller-balls 11. At its lower end the outer casing 4 is desirably provided with an inwardly-projecting flange or ring 12, provided in its interior with a ball-race 13, between which and the adjacent lower end of the propelling-arm shaft is inserted a second set of roller-balls 14.

Formed integrally or suitably connected with the lower end of the hollow propeller-arm shaft is a hollow propeller-arm 15, desirably

and as shown herein made of horizontal flattened tubular form and having closed rounded ends 16, as best indicated in Figs. 6 and 7. In the preferred embodiment illustrated said propeller-arm is made of two members united with each other in a horizontal plane, extending axially of the propeller-arm, and conveniently made rigid with each other by means of a plurality of through rivets or bolts 17, which are so located as not to interfere with the moving parts contained within said propeller-arm, to be hereinafter described.

18 designates as a whole the propeller-blade, which may be of any desirable outline or contour and consists of a flat vertically-disposed plate provided at its front side with a vertically-disposed pivot-axis 19, which engages a suitable bearing-aperture 20, formed through the swinging end of the propeller-arm 15. Adjacent to and in rear of said pivot the propeller-blade is provided with an aperture 21, which permits its free oscillation relatively to the propeller-arm. At a point within the propeller-arm the pivot 19 of the propeller-blade is provided with a rigid crank-arm 22, extending horizontally at right angles to the propeller-blade.

The rock-shaft 3, hereinbefore mentioned, extends downwardly through the hollow propeller-arm shaft and has bearing in a suitable step or recess 23, formed in the bottom wall of the propeller-arm, and upon the lower end of said rock-shaft is mounted a second rigid crank-arm 24, arranged to extend parallel with the crank-arm 22.

25 designates a connecting-link connecting the outer ends of the crank-arms 22 and 24. The upper end of the rock-shaft 3 is arranged to extend above the upper end of the hollow propeller-arm shaft, and desirably is supported in an overhead bearing 26, mounted upon the under side of the overhead deck, as indicated clearly in Fig. 4.

It will be obvious that by means of a construction thus far described a lateral oscillatory movement may be imparted to the propeller-blade through the medium of the rock-shaft 3 independently of the movement or position of the propeller-arm 15.

Describing now the mechanism whereby independent oscillatory movements are imparted to the rock-shaft 3 and to the hollow propeller-arm shaft 9, referring to Figs. 1, 2, and 3, 27 28 designate a pair of engine-cylinders mounted one above the other in parallel relation to each other and conveniently at a point located some distance forwardly from the forward ends of the propeller-arms and on a line extending centrally between said propeller-arms. Within each cylinder is located a suitable driving-piston, as 29 30, respectively, with which are respectively connected piston-rods 31 32, which extend out through and beyond both end walls of the respective cylinders. The cylinders are provided with a suitable steam-chest 33, through which steam is admitted to the respective cylinders from any suitable source of supply—as, for example, through the supply-pipe 34. Upon the upper piston-rod 31 is rigidly mounted a connecting-block 35, and with the opposite sides of this block are pivotally connected two links 36, the opposite ends of which extend to and are pivotally engaged with the swinging ends of a pair of crank-arms 37, respectively, united rigidly with the rock-shafts 3. Similarly upon the piston-rod 32 is mounted a connecting-block 38, to the opposite sides of which are pivotally connected links 39, which are respectively engaged at their opposite ends with the ends of crank-arms 40, mounted rigidly upon the hollow propeller-arm shafts 9. In order to support the outer ends of said piston-rods 31 and 32, so as to prevent the latter from being thrown out of alinement by the working strain thereon, guides are provided through which the ends of said piston-rods extend, such guides being conveniently provided herein by means of an upright 41, secured to extend between the upper and lower decks and provided with bearing-apertures 42, arranged in alinement with the several piston-rods.

It will be obvious that by means of the hereinbefore-described construction a positive oscillatory movement will be imparted to the oscillatory shafts 3 and to the hollow propeller-arm shafts 9 through the reciprocation of the respective pistons in said cylinders. It is to be noted, however, that while the pistons of the two cylinders operate synchronously, yet they are so timed as to not move together, but to move one in advance of the other, and are so controlled as to have a varying rate of speed relatively to each other.

Describing now the mechanism whereby the movement of the pistons is controlled to this end, 43 designates a vertically-disposed shaft arranged at some distance in front of and in alinement with the cylinders 27 28, mounted in suitable bearings 44 45 and provided intermediate its length with two cranks 46 47, arranged at a little more than ninety degrees apart angularly, one of said cranks, as 46, being connected with the forward end of the piston-rod 31 by means of a link 48, while the other crank is similarly connected with the piston-rod 32 by means of a link 39. Preferably also a fly-wheel 50 is mounted upon said crank-shaft to assist in controlling and rendering more uniform the revolution of the shaft. With the two pistons of the cylinders thus positively connected in a certain relation to each other it will be obvious that a peculiar movement will be imparted to the propeller-blades—that is to say, during that part of the movement when the piston 30 is moving most rapidly—*i. e.*, during its travel through the central part of the cylinder—piston 29 will be performing a slower part of its movement, and the propeller-blade will therefore have but little oscillatory move-

ment relatively to the propeller-arm during this time. It will be seen that by reason of the angular relation which the several parts bear to each other the propeller-blades during any given movement of the propeller-arms bodily in one direction will be held in a rearwardly-inclined position relatively to such propeller-arm during the principal part of its stroke; but as it approaches the limit of movement in either direction the crank-arm 46 will at the same time be brought into that part of its revolution which will impart to the connected piston its most rapid movement, so that the blade will be rapidly reversed to an oppositely-inclined position relatively to the return movement of the propeller-arm, this reversal occurring just enough later than the reversal in the movement of the propeller-arm to secure the most effective movement of the blade.

When a pair of propeller-blades are used, as shown in the present instance, they will be so connected, as described herein, as to simultaneously approach toward and recede from each other, so that the combined propelling effect of the two blades will be a directly-forward movement. This travel of the blades relatively to each other is indicated clearly in the diagrammatic Fig. 8, the arrows therein indicating the direction of movement of the propeller-blades in the respective portions of their paths. It will be obvious that if the propeller-blades be located close enough together, so that the action of one will disturb the resisting medium acted upon by the other, then as the blades approach each other they will mutually assist in the effective movement to the extent that they reciprocally hold the resisting medium from displacement. It will of course be understood that a single propelling arm and blade may be used instead of the duplex arrangement described.

The peculiar construction described herein, wherein the propeller-arm is made hollow and the hollow thereof arranged to communicate with a hollow actuating-shaft, is a feature of importance, for the reason that by making these members practically liquid-tight they may be filled with oil, so that the operative mechanism therein will work continuously in a bath of oil. It is to be understood, therefore, that the joints of the construction described herein will be made practically liquid-tight and the cavities thereof preferably filled with oil. To this end the cap, which is arranged to close the upper end of the hollow shaft 9, is provided with an oil-inlet 51.

While I have herein shown and described the mechanism as embodied in a boat-propelling apparatus, it will be obvious that the same principle may be adapted to other purposes. For example, the propeller-blades actuated in substantially the same manner might be employed for propelling along a fluid, or, in other words, the same principle might be embodied in a pump, or, vice versa, the invention might be embodied in a mechanism wherein a moving fluid acted upon the blade to reciprocate the latter—as, for example, in a motor.

While I have herein shown and described what I deem to be a preferred embodiment of my invention for the specific application illustrated, yet it is to be understood that the details thereof may be modified without departing from the invention, and I do not therefore wish to be limited to this particular application or to the details shown and described herein, except as they may be made the subject of specific claims, but, on the contrary, wish the invention to be understood as extending in its broader scope to any mechanism wherein the peculiar movement of a blade described is utilized in transmitting power to or from fluids. It is therefore to be understood that the terms "propeller-blade" and "propelling mechanism," especially as used in the claims, are to be construed as generic and as intended to apply equally whether the blade acts upon the fluid or the fluid acts upon the blade.

I claim as my invention—

1. In a propelling mechanism, the combination of a propeller-blade pivotally mounted to oscillate on an axis extending coincident with or parallel to its plane, mechanism for imparting a bodily vibratory movement to said blade in a direction transversely of its plane and mechanism for simultaneously imparting oscillatory movement thereto upon its pivotal axis, substantially as described.

2. In a propelling mechanism, the combination of a propeller-blade pivotally mounted to oscillate on an axis extending coincident with or parallel to its plane and located within the longitudinal limits of its length, mechanism for imparting a bodily movement to said blade in a direction transversely of its plane and mechanism for simultaneously imparting oscillatory movement thereto upon its pivotal axis, substantially as described.

3. In a propelling mechanism, the combination of a propeller-blade pivotally mounted to oscillate on an axis extending coincident with or parallel to its plane, mechanism for imparting a bodily vibratory movement to said blade in a direction transversely of its plane and mechanism for simultaneously imparting an oscillatory movement thereto upon its pivotal axis, said actuating mechanisms being arranged to operate synchronously, but so timed as to bring the reversals of direction of bodily movement and pivotal movement at different periods, as and for the purpose set forth.

4. In a propelling mechanism, the combination of a propeller-blade pivotally mounted to oscillate on an axis extending coincident with or parallel to its plane, mechanism for imparting a bodily vibratory movement to said blade in a direction transversely of

its plane and mechanism for simultaneously imparting an oscillatory movement thereto upon its pivotal axis, said actuating mechanisms each comprising a rotary element with which the respective operating devices have cranked or equivalent connection, said rotary elements being actuated to perform synchronous revolutions and said cranked connections being arranged in angular relation to each other, substantially as and for the purpose described.

5. In a propelling mechanism, the combination of a propeller-blade, a swinging arm pivotally mounted at one end and with the outer end of which said propeller-blade has pivotal connection upon an axis extending coincident with or parallel to its plane, mechanism for imparting a vibratory movement to said arm upon its pivotal axis and mechanism for imparting a synchronous oscillatory movement to said propeller-blade, as and for the purpose set forth.

6. In a propelling mechanism, the combination of a propeller-blade, a swinging arm pivotally mounted at one end, with the outer end of which said propeller-blade has pivotal connection upon an axis extending coincident with or parallel to its plane, mechanism for imparting a vibratory movement to said arm upon its pivotal axis, comprising a crank-arm connected with the pivot of the arm and a reciprocatory member imparting movement to said crank-arm and mechanism for oscillating said propeller-blade upon its own pivotal axis synchronously with the vibrations of the swinging arm, comprising a crank-arm connected with the pivot of the propeller-blade, a second crank-arm connected with a shaft arranged concentric with the pivotal axis of the swinging arm, a link connecting said crank-arms in parallel relation, a second cranked arm upon said last-mentioned shaft and a reciprocatory member acting upon the latter crank-arm, substantially as described.

7. In a propelling mechanism, the combination of a propeller-blade, a swinging arm pivotally mounted at one end with the outer end of which said propeller-blade has pivotal connection upon an axis extending coincident with or parallel to its plane, mechanism for imparting a vibratory movement to said arm upon its pivotal axis, comprising a crank-arm connected with the pivot of the arm and a reciprocatory member imparting movement to said crank-arm and mechanism for oscillating said propeller-blade upon its own pivotal axis synchronously with the vibrations of the swinging arm, comprising a crank-arm connected with the pivot of the propeller-blade, a second crank-arm connected with a shaft arranged concentric with the pivotal axis of the swinging arm, a link connecting said crank-arms in parallel relation, a second crank upon said last-mentioned shaft and a reciprocatory member acting upon the latter crank-arm, said two reciprocatory members being each connected with a common crank-shaft, the cranks whereof are arranged in angular relation to each other, as and for the purpose set forth.

8. In a propelling mechanism, the combination of a propeller-blade, a swinging arm pivotally mounted at one end with the outer end of which said propeller-blade has pivotal connection upon an axis extending coincident with or parallel to its plane, mechanism for imparting a vibratory movement to said arm upon its pivotal axis, comprising a crank-arm connected with the pivot of the arm and a reciprocatory member imparting movement to said crank-arm and mechanism for oscillating said propeller-blade upon its own pivotal axis synchronously with the vibrations of the swinging arm, comprising a crank-arm connected with the pivot of the propeller-blade, a second crank-arm connected with a shaft arranged concentric with the pivotal axis of the swinging arm, a link connecting said crank-arms in parallel relation, a second crank upon said last-mentioned shaft and a reciprocatory member acting upon the latter crank-arm, said two reciprocatory members comprising a pair of pistons arranged within individual power-cylinders and means for controlling the relative movement of said pistons, comprising a cranked shaft provided with a pair of cranks arranged at an angle with each other and connecting-links connecting said pistons with the respective cranks, as and for the purpose set forth.

9. In a mechanism of the character described, the combination with a boat-hull of a hollow propeller-blade arm having pivotal connection at one end with said hull upon a vertical axis, a propeller-blade pivotally mounted upon the swinging end of said arm upon a vertical axis and arranged to stand in a vertical plane, the pivot of said propeller-blade being arranged to extend through the hollow portion of the arm, a rock-shaft arranged to extend through the hollow portion of the opposite end of said arm, coincident with the pivotal axis of the arm, crank-arms upon said rock-shaft mounted upon the pivot of the propeller-blade at points within the hollow arm, a connecting-link uniting said crank-arms in parallel relation, means for oscillating said rock-shaft and means for imparting a vibratory movement to the arm, substantially as described.

10. In a mechanism of the character described, the combination with a boat-hull of a pair of propeller-blade arms pivotally mounted upon said hull in laterally-opposite direction to each other and upon parallel axes so as to oscillate toward and from each other, a propeller-blade pivotally mounted upon the swinging end of each arm upon parallel axes arranged at right angles to the plane of movement of the swinging arms, means for imparting vibratory movement to said swinging arms whereby they are caused to simultaneously

approach and recede from each other and means for imparting a synchronous movement to each propeller-blade, whereby the latter are caused to assume a forwardly-convergent angle with relation to each other during the principal part of their bodily approaching movement and a forwardly-divergent angle with relation to each other during the principal part of their bodily movement in a direction away from each other, as and for the purpose set forth.

CHARLES M. PALMER.

Witnesses:
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FREDERICK C. GOODWIN.