No. 742,693. PATENTED OCT. 27, 1903.

C. A. MANKER.

MARINE PROPELLER.

APPLICATION FILED JAN. 15, 1902.

NO MODEL.

Fig. 1.

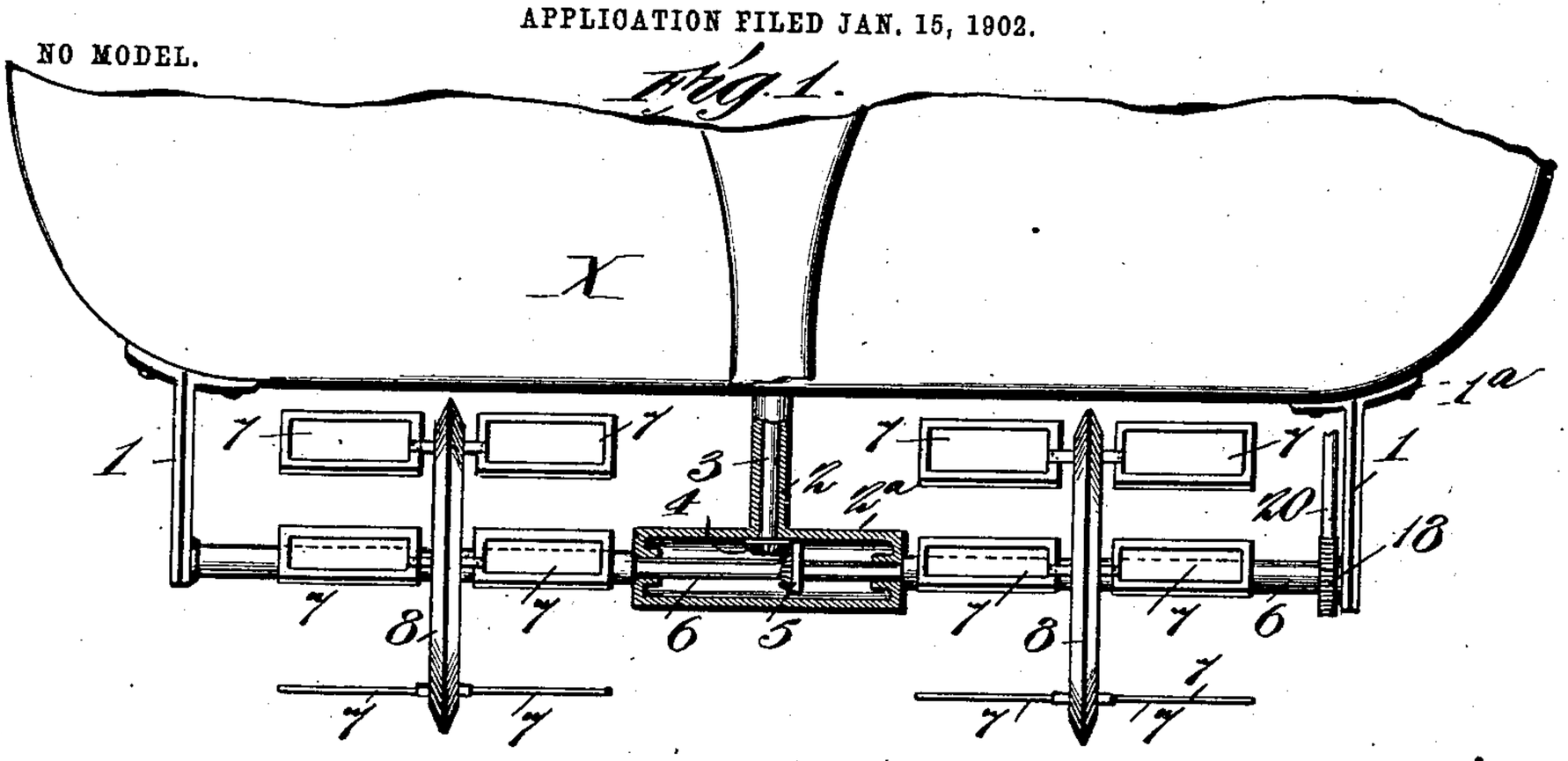


Fig. 2.

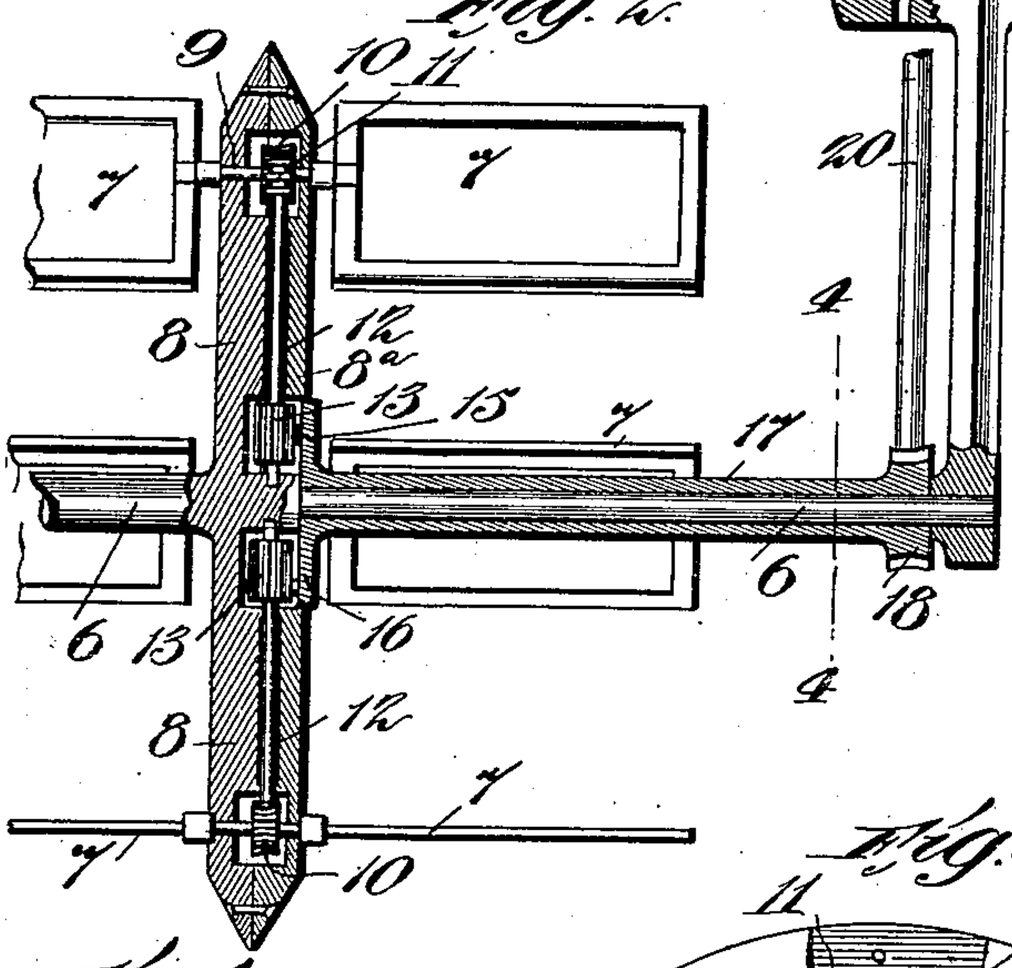


Fig. 4.

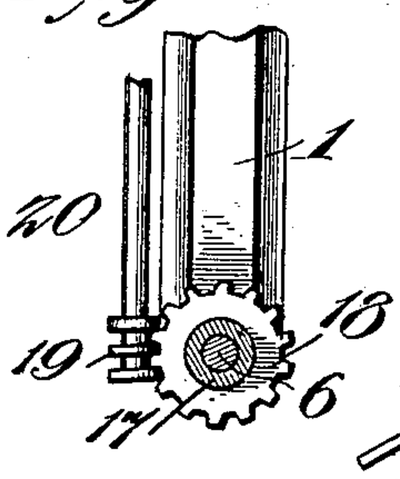


Fig. 3.

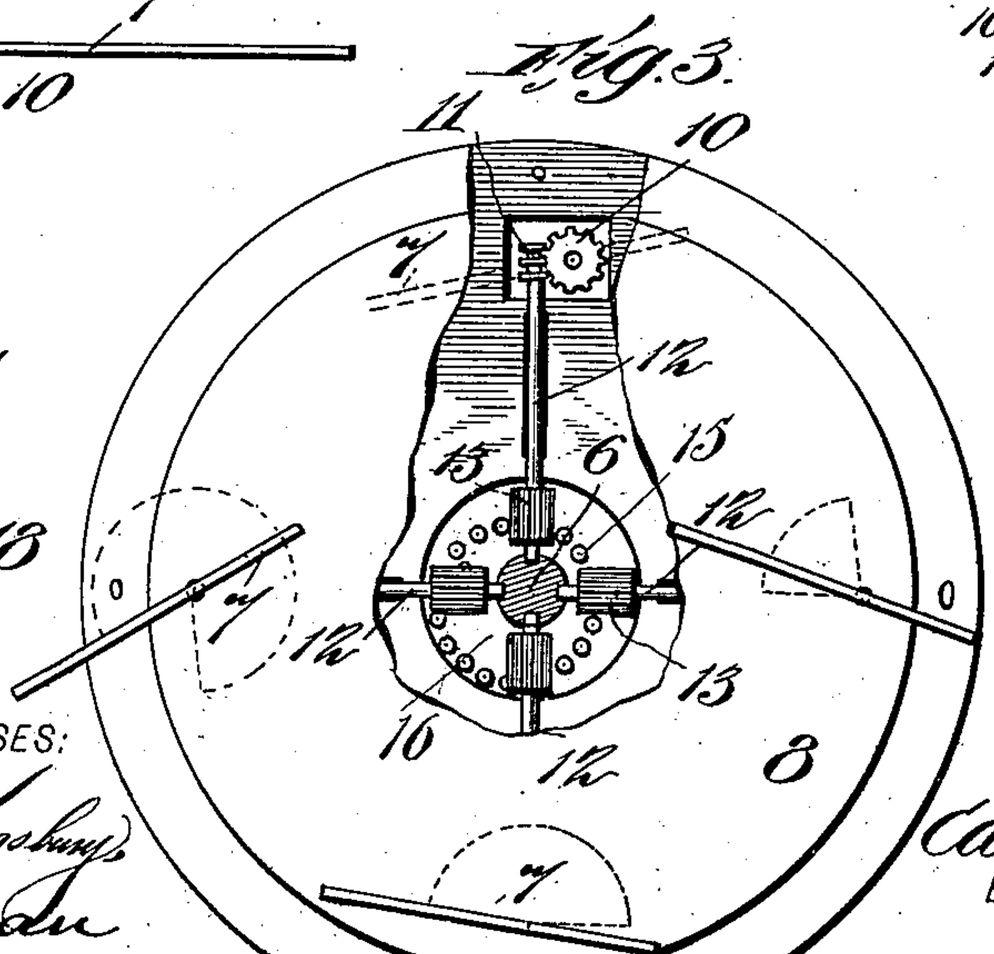


Fig. 5.

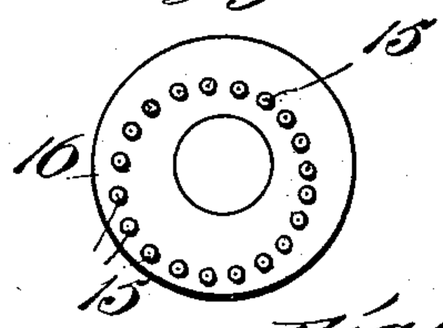
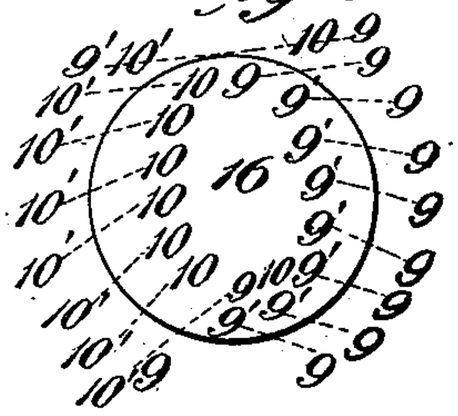


Fig. 6.



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No. 742,693. Patented October 27, 1903.

UNITED STATES PATENT OFFICE.

CAREY ALAN MANKER, OF PEARL, ILLINOIS.

MARINE PROPELLER.

SPECIFICATION forming part of Letters Patent No. 742,693, dated October 27, 1903.

Application filed January 15, 1902. Serial No. 89,879. (No model.)

To all whom it may concern:

Be it known that I, CAREY ALAN MANKER, a citizen of the United States, and a resident of Pearl, in the county of Pike and State of Illinois, have made certain new and useful Improvements in Marine Propellers, of which the following is a specification.

It is the object of my invention to provide an improvement in that class of propellers in which feathering-blades are employed—that is to say, blades adapted to assume varying angles to the mobile fluid as they revolve.

My propeller is primarily intended for use in marine propulsion; but it may be employed in aerial navigation under certain conditions.

The features of construction, arrangement, combination, and operation of parts embodying the invention are as hereinafter described, and specifically indicated in the claims, reference being had to accompanying drawings, in which—

Figure 1 is an end view of a boat with my improved propeller attached, a portion of the latter being shown in section. Fig. 2 is an enlarged sectional view of the propelling apparatus. Fig. 3 is in part a side view and in part a section of a portion of the propelling apparatus. Fig. 4 is a transverse section on the line 4 4 of Fig. 2. Fig. 5 is a face view of the cam-wheel by which the angles of the propelling-blades are changed. Fig. 6 is a diagrammatic view illustrating the positions assumed by the propelling-blades in their revolution around a central axis.

My improved propelling mechanism is attached to the under side of a boat, which is preferably constructed flat to adapt it to rise easily upon the surface of the water. In case my improved propeller is applied for aerial navigation it will be understood that an aeroplane will occupy the place of the boat. The propeller proper is supported by two outer hangers 1, whose upper ends 1^a (see Fig. 2) are extended and suitably constructed to adapt them to be firmly bolted to the boat X and by a central hanger 2, which is tubular to adapt it to receive a driving-shaft 3. The latter extends into the interior of the boat or above the same, as the case may be, and is connected with a suitable motor. On the lower end of the shaft 3 is a bevel-gear 4, which meshes with the corresponding gear 5, keyed upon the horizontal propeller-shaft proper, 6. The said shaft is journaled at its ends in the outer pendent hangers 1 and also in the horizontal tubular extension 2^a of the central hanger 2. As shown in Fig. 1, such extension 2^a is, in effect, a tubular boxing and journal-box for the gears 4 5 and shaft 6. The propellers proper are mounted on the shaft 6 at points intermediate of the hangers 1 1 and 2. The main feature of the propellers is a series of blades 7, which extend horizontally on opposite sides of circular plates or disks 8, that are arranged radially to the shaft 6 and which preferably form in part at least an integral portion thereof—that is to say, the main portion of the plate or disk 8 is constructed integrally with the shaft 6 and provided with recesses or grooves adapted to receive gears and shafts forming the mechanism required for feathering the blades 7 or for adjusting them at different angles as they revolve around a central axis 6. As shown in Fig. 3, four blades 7 are employed, the same being arranged equidistantly around the radial disk or plate 8. A cap or cover 8^a (see Fig. 2) may be applied to cover the mechanism by which the angle of the blades is adjusted, such part 8^a forming thus practically a structural part of the disk 8. The blades 7 are arranged in pairs and directly opposite each other, being connected by a shaft 9, which passes transversely through the disk 8 and its cap 8^a. On each of the several shafts 9, which thus connect two opposite blades, is keyed a pinion 10. (See Figs. 2 and 3.) Practically these pinions are so constructed as to be adapted to engage a worm 11, forming part of or keyed upon the several radial shafts 12. The latter are journaled at their outer ends in the disk 8 and at their inner ends in the hub formed on the shaft 6. Thus a shaft 12 extends radially from the propeller-shaft 6 to each of the shafts 9, connecting a pair of blades 7. On the inner ends of shafts 12 are mounted elongated spur-pinions 13, which engage pins 15, (see Fig. 5,) arranged on the face of a cam wheel or disk 16. The latter is formed or keyed upon the inner end of a long sleeve 17, which extends from each disk 8 to the adjacent hanger 1 and whose outer end is provided with a worm-pinion 18, with which a worm

19 engages, as shown in Fig. 4. This worm is fixed on a vertical shaft 20, that in practice extends up through the bottom of the boat, and is provided with means for rotating it, as required, to change the inclination or angle of the blades 7.

As shown in Fig. 5, the teeth 15 of the wheel 16 are set eccentrically—that is to say, they are so arranged as to form practically an oval—a portion of them being set nearer the center of the wheel than its periphery. For convenience of description the member 16, provided with teeth 15, will be hereinafter termed the "cam." This cam is fixed in position while the propeller operates; but it may be shifted around the axis 6 while the propeller is in operation, if desired. It is both shifted and locked in position by means of the worm 19 and the shaft 20. It is apparent that, owing to the eccentric position of the teeth 15 of the cam, the worm-shafts 12 will be rotated at greater speed during a part of the revolution of the propellers than during the remaining portion of the same. The shafts 9, connecting the opposite blades 7, are attached to the latter at a point slightly removed from the center of their inner ends, as shown in Figs. 2 and 3.

From the foregoing description the operation of the propeller as a whole may now be understood. When the shaft 2 is driven, it is obvious the propellers will be revolved bodily around the central axis 6 and that by reason of the pinions 13 of the radial worm-shafts 12 engaging the teeth of the fixed cam 16 and worm-pinions 10 on the blade-shafts 9 the blades themselves will also be rotated on their own axes at the same time they are carried bodily around the axis 6. In other words, the blades 7 have practically a planetary motion. In a sense the blades 7 do not rotate; but by reason of the eccentric position of the teeth of cam 16 they have an accelerated and retarded motion in the course of each revolution. By such acceleration and retardation the blades are caused to assume different angles to the horizontal in the course of each revolution. The different positions or angles assumed are represented diagrammatically in Fig. 6, where the dotted lines joining the several groups of figures 9 9, 9′ 9, and 10 10′ indicate the blades. Thus as the propellers are revolved the blades on the front or descending side impinge on the water or air, so as to have both a lifting and propelling effect, while the rear or pendent blades come up at an increased angle, so as to allow an impingement of the mobile medium under or against their under surfaces. In this I claim that there is a lifting action even when the blades ascend, as well as when descending, and involving the principle of counter-leverage. The preponderance of weight is, however, borne by the descending blades according to the power utilized, and since in practice the under surface of the boat X will be at an upward inclination to the horizontal it will tend to ride up on the mobile medium, and this tendency will be increased correspondingly to the power applied and the consequent rapidity of propulsion. It will be understood that through the medium of the worm-shaft 20 the sleeve 17 and cam 16 will be so adjusted around the propeller-shaft 6 as to vary the angles of the blades 7 in their ascending and descending relations. This angle may be such that the lifting action of the blade 7 will be applied entirely upon the descending stroke, the blades being so adjusted on the ascending side as to offer minimum resistance to the water.

It is to be understood that the means for adjusting the angles of the blades 7 permits them to be so positioned or placed as to propel the boat in the reverse direction or backward when the rotation of the shaft 6 is reversed.

What I claim is—

1. An improved propelling mechanism comprising a central horizontal shaft, and rotatable blade-carrier mounted thereon, blades journaled in said carrier, means for rotating them on their axes as they revolve bodily around the shaft, whereby their angles are varied as required, and means for retarding or accelerating the velocity of rotation of the blades in their downward movement as compared with their upward movement, substantially as shown and described.

2. In a propeller of the class described, the combination with a central shaft and a carrier mounted at right angles thereto, of blades extending laterally from such carrier and having worm-pinions on their axes, and radial worm-shafts engaging such pinions and having elongated spur-pinions on their inner ends; and a cam having a series of teeth arranged eccentrically and adapted to engage the spur-pinions, as shown and described.

3. In a propeller of the class described, the combination, with a rotatable shaft arranged horizontally, and a disk or rigid blade-carrier arranged at right angles thereto and revolving with the same, of a series of propelling-blades projecting laterally from such carrier, a cam-wheel having teeth set eccentrically and mounted rotatably upon the central shaft, radial shafts and other gearing whereby the said cam is operatively connected with the blade-shafts, and means for adjusting the cam around the shaft, for varying the angles of the blades while bodily rotating around the shaft, substantially as shown and described.

4. The improved propeller comprising the central horizontal shaft, blade-carriers fixed thereon and revolving therewith, propelling-blades arranged in pairs opposite each other and connected by axes passing transversely through the said carrier, worm-pinnions mounted on such axes, a series of worm-shafts extending radially from the central shaft to the axes of the blades and provided with the

worm and spur-pinion at their opposite ends, a cam-wheel having teeth set eccentrically and engaging the spur-pinions, and means for adjusting such cam around the shaft, as and for the purpose specified.

5. The combination, with a boat-hull or equivalent having a substantially flat bottom, of hangers attached thereto and pendent therefrom, a horizontal shaft journaled in said hangers, a central shaft projecting through the bottom of the hull and operatively connected with the transverse shaft, and propellers mounted on said shaft and bodily rotatable therewith and also rotating upon their own axes, the said propellers comprising substantially a series of pairs of blades, a carrier mounted on the transverse shaft at right angles thereto, and means for varying the angles of the blades while being bodily revolved, substantially as described.

In testimony whereof I have signed my name to this specification, as well as to five plates of drawings herewith, in the presence of two subscribing witnesses.

CAREY ALAN MANKER.

Witnesses:
SCOTT MOORE,
B. HEAVNER.