C. A. & O. W. HULT.

DRIVING DEVICE FOR BOATS.

APPLICATION FILED APR. 14, 1914.

1,228,776.

Patented June 5, 1917.

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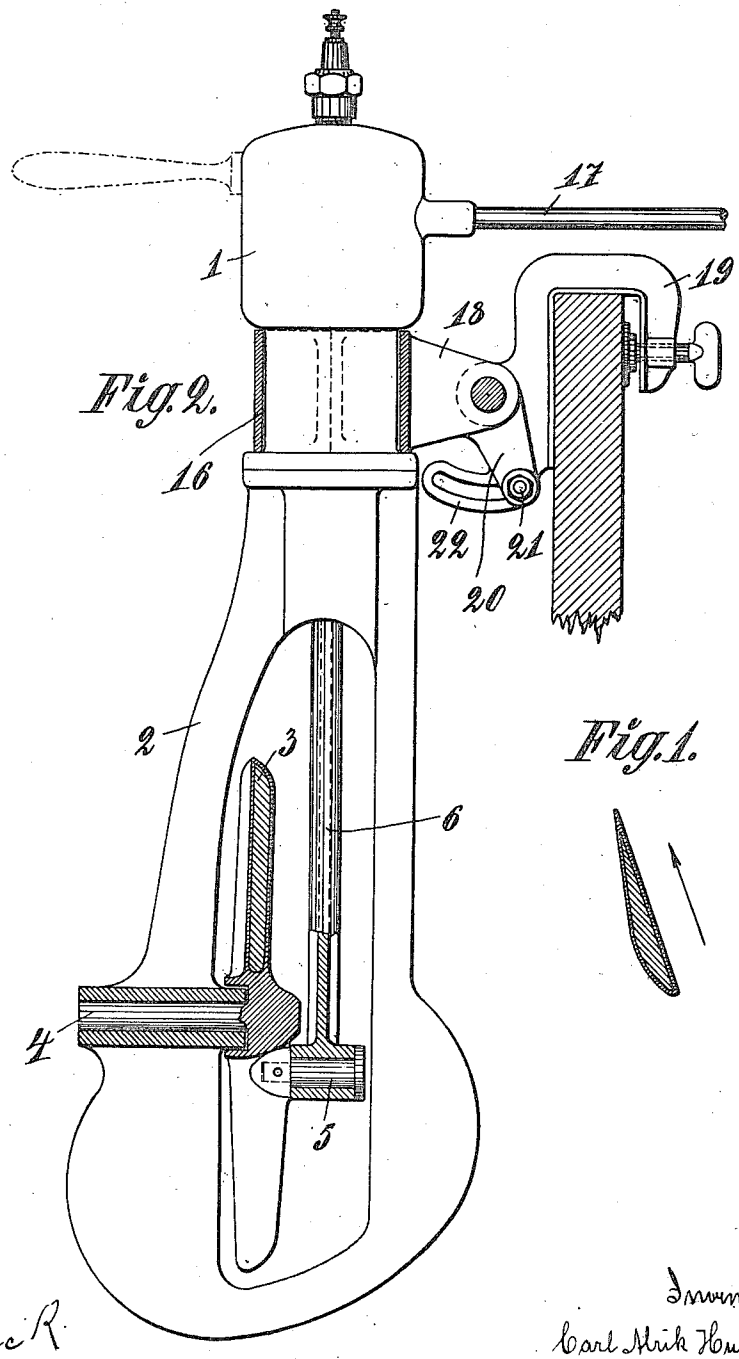


Fig. 2.

Fig. 1.

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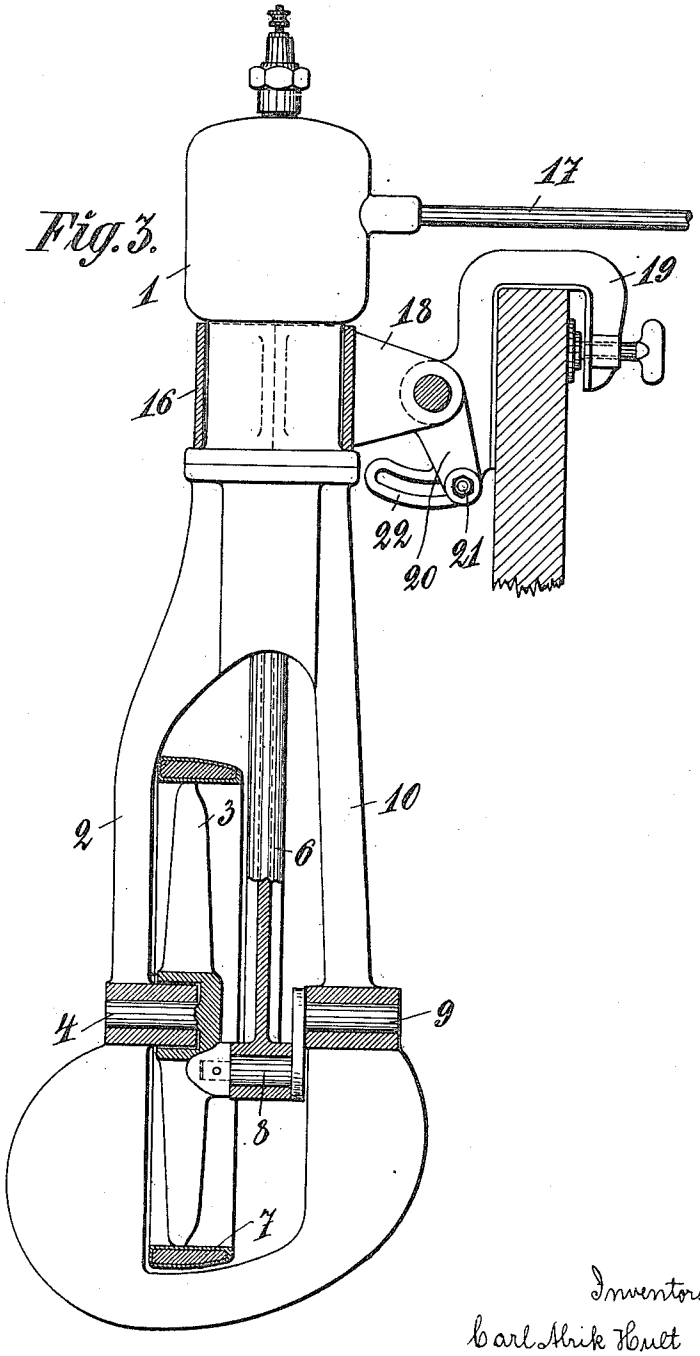
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4 SHEETS—SHEET 2.

Fig. 3.



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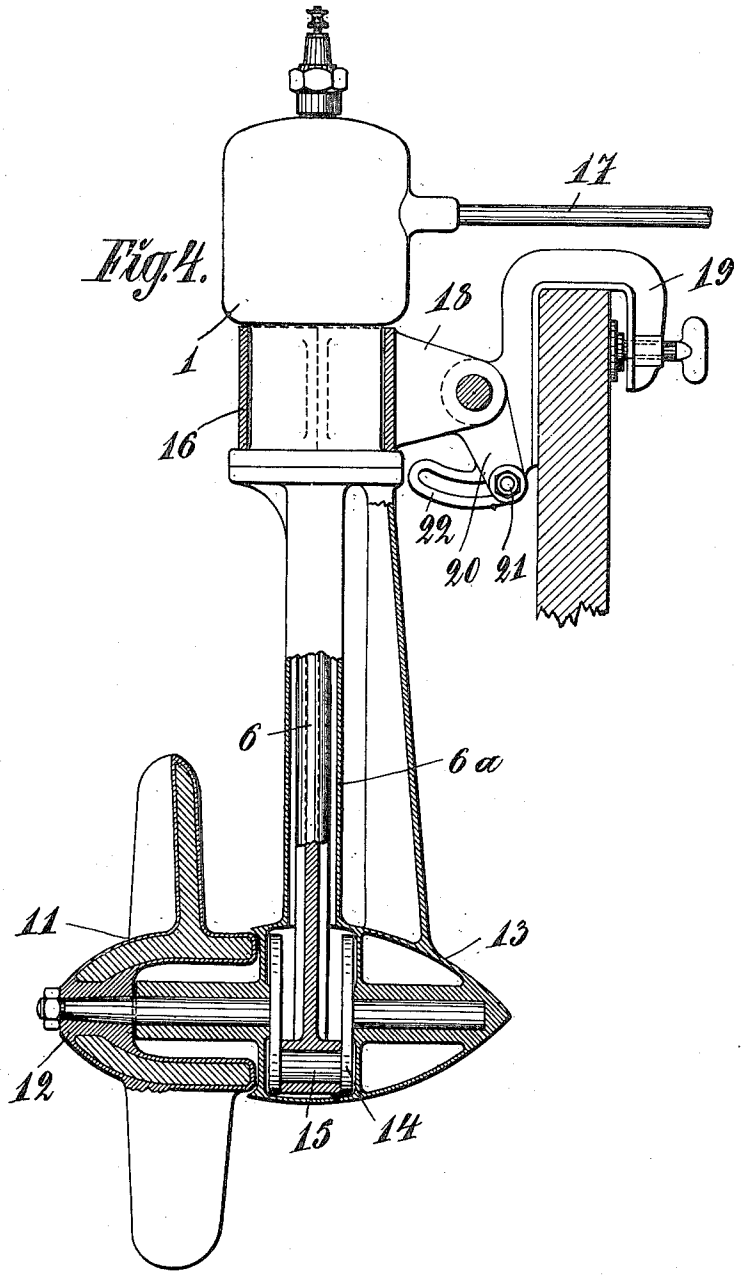
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4 SHEETS—SHEET 3.

Fig. 4.



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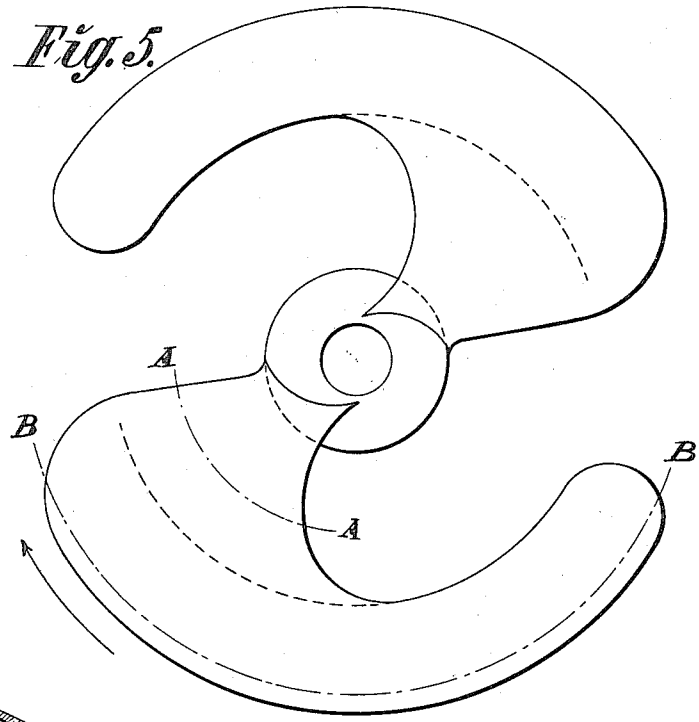
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Fig. 5.



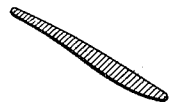
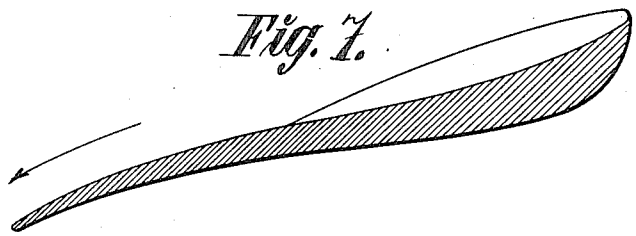


Fig. 6.

Fig. 7.



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UNITED STATES PATENT OFFICE.

CARL ALRIK HULT AND OSCAR WALFRID HULT, OF STOCKHOLM, SWEDEN.

DRIVING DEVICE FOR BOATS.

1,228,776. Specification of Letters Patent. Patented June 5, 1917.

Application filed April 14, 1914. Serial No. 831,696.

To all whom it may concern:

Be it known that we, CARL ALRIK HULT and OSCAR WALFRID HULT, subjects of the King of Sweden, and residents of 1 Inedalsgatan, Stockholm, in the Kingdom of Sweden, have invented certain new and useful Improvements in Driving Devices for Boats, of which the following is a specification, reference being made to the accompanying drawings.

The present invention relates to that type of driving devices for boats termed "outboard motors," and comprising essentially an explosion or combustion motor with a reciprocating piston, a propeller driven by the said motor, and a device for attaching the motor and the propeller to a boat, entirely or partially outside the same. At present outboard motors are customarily provided with a fly wheel which is connected with the propeller by a suitable transmission device.

The principal object of the present invention is to simplify the construction of outboard motors by placing the rotary mass, which has heretofore constituted a fly wheel, on or in the propeller itself. In this manner both the fly wheel and a transmission device between it and the propeller are dispensed with. For the purpose in question the propeller may be made hollow and filled with a substance, the specific weight of which is greater than that of the propeller material, *e. g.* with lead. For the same purpose the propeller may also be connected directly, that is, without any transmission device, with a ring or the like, which may suitably surround the propeller, which will thereby also be protected. In this case, if it be necessary, either the propeller or the ring, or both, may be filled with lead, or the like.

The construction of outboard motors is also, in accordance with this invention, simplified by transmitting the motive power developed by the explosion or combustion motor as directly as possible to the propeller, *e. g.* to a crank pin mounted on the propeller or the ring connected with it, or engaging the propeller or the ring.

The invention also comprises certain structural features of the propeller itself.

In the accompanying drawings are shown by way of example different forms of the present invention. Figure 1 shows a cross section of a propeller blade filled with lead or the like. Fig. 2 shows a side elevation partially in section, of an outboard motor with the propeller blades arranged in accordance with Fig. 1, one of the blades being provided with a pin for the connecting rod of the motor. Fig. 3 is a similar view of an outboard motor, the propeller of which is surrounded by a ring filled with lead or the like, and in which motor the propeller is driven with the aid of a crank pin inserted into it; while Fig. 4 is a view similar to Figs. 1 and 2 of an outboard motor in which a ring inside the propeller blades or the propeller hub, is filled with lead or the like, and the propeller is mounted on a crank shaft driven by the motor. Fig. 5 shows a form of a propeller seen from the rear, while Figs. 6 and 7 show sections taken along the lines A—A and B—B in Fig. 5.

The frame 2 of the explosion motor 1 is in some suitable manner detachably mounted on the boat, and in the said frame the shaft 4 of the propeller 3 is journaled.

In the form indicated in Fig. 2 the propeller blades are filled with lead or some other material, the specific weight of which is greater than that of the walls surrounding it, so that the propeller, when rotating, has the requisite momentum for uniform running, and consequently a separate fly wheel is unnecessary. The propeller blades appear in cross section as shown in Fig. 1. On one of the propeller blades is firmly fixed a crank pin 5, to which the connecting rod 6 of the explosion motor 1 is connected, so that the motive power is transmitted as directly as possible to the propeller.

In the form of the invention shown in Fig. 3, the propeller is surrounded by a ring 7, which is connected with, or made integral with, the propeller blades, which are either solid or filled with lead or the like, the ring being connected with the blades at their free ends and being filled with lead or the like, so that the momentum of the rotary system is sufficiently great. The ring 7 may likewise be solid; however, by employing the lead filling the volume of the rotary system, and the resistance of the water to it is less than it would be if the ring 7 were made solid. In this form a shaft 9 co-axial with the shaft 4 is provided with a crank pin 8, said shaft 9 being journaled in an arm 10 of the frame 2, and the crank pin 8, to which the connecting rod 6 of the motor 1 is connected, is inserted into an aperture in one of the propeller blades, so that the pro-

peller is driven as directly as possible from the motor 1. This form is especially intended for driving devices in which the motor develops considerable motive power; the thrust being taken up not only by that part of the frame 2 which is behind the propeller, but also by the frame part 10 which is in front of the propeller.

In the form of invention shown in Fig. 4 the hub 11 of the propeller is filled with lead or the like and as will be seen from this figure, the propeller blades are also so filled, although they may be solid. In this case too the propeller, in accordance with Fig. 3, may be provided with a filled or solid ring 7. The hub 11 may be regarded as an interior ring (the sleeve 12 directly embracing the propeller shaft 4 will then be regarded as a hub), so that the propeller may be said to be provided with two rings increasing its momentum. In this form of the invention the propeller shaft, which is journaled in bearings in a casing 13 carried by the frame 2, is provided with a crank 14, to the pin 15 of which the connecting rod 6, which together with the crank 14 moves in the casing 13, is connected. Although the transmission of force between the explosion motor and the propeller in this case is not as direct as in the forms indicated in Figs. 2 and 5, the arrangement for this purpose is nevertheless very simple.

In Figs. 5–7 is shown a propeller the mass of which has been increased by the prolongation of the propeller blades. As is most clearly seen from Fig. 5, the outer part of each of the propeller blades is prolonged in the direction of its circumference. By reason of this prolongation and by making such prolongation thicker than the other part of the propeller blade, this part of the blade is comparatively heavy and at the same time long and pointed, as a result of which the blade can with ease screw its way through the water without any appreciably greater loss of friction than in an ordinary propeller. Thus also by this arrangement the mass of the propeller may be such that a fly wheel becomes superfluous. If desired, the propeller in this case too may be filled with lead, or the like.

Instead of being transmitted directly to the propeller, or to one of the propeller blades, the motive power can be transmitted to the ring 7 or the ring 11, or to a crank pin or the like mounted on it or engaging with it.

The filling in the propeller or in the ring or rings renders possible the balancing of the rotary system—*e. g.* with regard to the crank device—in a simple manner.

Propellers intended for outboard motors arranged in accordance with the present invention may—whether they are provided with a ring or rings or not—consist of parts pressed out of sheet metal, which parts are in a suitable manner (*e. g.* by soldering) joined to one another, and between which parts the filling is situated. Also one of the parts may be cast, while the other consists of pressed sheet metal.

The invention also comprises the arrangement in outboard motors that the piston in the motor cylinder, situated above the water surface, is connected with the propeller by means of a connecting rod which extends below the level of the water surface to the crank pin below the said level, from which crank pin the power is transmitted to the propeller either directly (Figs. 2 and 3) or by means of a separate crank (Fig. 4). In this arrangement the connecting rod may either be free, as shown in Figs. 2 and 3, so that it is in immediate contact with the water, or it may be surrounded by a casing 6^a which keeps the water out of contact with it. This latter arrangement is shown in Fig. 4. Experiments made by us have shown that the movement of the connecting rod in the water causes hardly any loss of force. This loss of force is in any case considerably less than the loss of force which occurs in other outboard motors in consequence of the transmission customary in them and situated between the motor and the propeller.

Moreover, the invention comprises a simple device for fixing the motor to a boat in such a manner that it is rotatable around a vertical (or somewhat inclined) axis, so that the steering of the boat or a reversal of its direction of motion can be effected by turning the motor. In the drawings the cylindrical part located immediately below the motor cylinder 1 (see Figs. 2, 3 and 4) is shown rotatably surrounded by a cylindrical sleeve 16, so that the motor—with the aid of a tiller 17 fixed in the motor cylinder—can be turned around a vertical axis, whereby the steering of the boat is effected. The sleeve 16, which consists of two parts held together by suitable means, is connected by an arm 18 with a clamp 19, by means of which the outboard motor is suspended from the boat. From the arm 18 projects an arm 20, carrying a clamping device 21, which cooperates with a slotted guide 22 projecting from the clamp 19, in order to keep the motor in a suitable position independently of the shape of the boat at the stern.

The motor may be provided with some suitable device, such as a handle, indicated in dotted lines in Fig. 2 and arranged on the casing 1 diametrically opposite the tiller 17, for turning the motor half a revolution, when the direction of motion of the boat is to be reversed (and somewhat more for steering when backing).

The device for suspending the motor from the boat may be constructed in other ways than that indicated above. Thus, for in-

stance, the sleeve 16, which may be replaced by an equivalent part, such as a ring or a bow, or a plurality of such parts, may surround the motor cylinder or another part of the motor; the essential point of this part of the invention is that the motor with its appurtenant parts is fixed to the boat in such a manner that it is rotatable around a vertical or somewhat oblique axis. This axis obviously need not coincide with the axis or center line of the motor; these two axes may be parallel to, or somewhat oblique relatively to, one another.

Outboard motors provided with the arrangements above described are very simple in their construction and therefore very cheap. Owing to the fact that the connecting rod drives the propeller as directly as possible, the gearing in ordinary outboard motors and the shafts and bearings used with said gearing are dispensed with, whereby wear and tear and friction are considerably diminished, and a very good efficiency is obtained.

Having now described our invention, what we claim as new and desire to secure by Letters Patent is:

1. In driving apparatus for boats, the combination of an explosive engine having a reciprocable piston therein, means consisting of a sleeve loosely surrounding a part of the engine for supporting said engine from a boat above the surface of the water, whereby said engine is rotatable as a whole about its vertical axis in said supporting means, a propeller of sufficient weight to revolve by momentum without aid of a fly wheel, and a connecting rod extending below the surface of the water, the lower end of said connecting rod being directly connected to said propeller.

2. In driving apparatus for boats, the combination of an explosive engine having a reciprocable piston therein, means consisting of a sleeve loosely surrounding a part of the engine for supporting said engine from a boat above the surface of the water, whereby said engine is rotatable as a whole about its vertical axis in said supporting means, a propeller having an interior filling of a material which is specifically heavier than the walls inclosing said filling and the total weight of which propeller is sufficiently great to revolve by momentum without aid of a fly wheel, and a connecting rod extending below the surface of the water, the lower end of said connecting rod being directly connected to said propeller.

3. In driving apparatus for boats, the combination of an explosive engine having a reciprocable piston therein, means consisting of a sleeve loosely surrounding a part of the engine for supporting said engine from a boat above the surface of the water, whereby said engine is rotatable as a whole about its vertical axis in said supporting means, a propeller having blades of greatest thickness at their outer peripheries and being of sufficient weight to revolve by momentum without aid of a fly wheel, and a connecting rod extending below the surface of the water, the lower end of said connecting rod being directly connected to said propeller.

4. In driving apparatus for boats, the combination of an explosive engine having a reciprocable piston therein, means consisting of a sleeve loosely surrounding a part of the engine for supporting said engine from a boat above the surface of the water, whereby said engine is rotatable as a whole about its vertical axis in said supporting means, a propeller having blades elongated in the direction of the periphery of the propeller and being of sufficient weight to revolve by momentum without aid of a fly wheel, and a connecting rod extending below the surface of the water and having its lower end directly connected to said propeller.

5. In driving apparatus for boats, the combination of an explosive engine having a reciprocable piston therein, a sleeve fixed to the boat and loosely surrounding a part of said engine and in which said engine is suspended and capable of rotating as a whole about its vertical axis, a propeller of sufficient weight to revolve by momentum without aid of a fly wheel, and a connecting rod extending below the surface of the water and having its lower end directly connected to said propeller.

In witness whereof we have hereunto set our hands in presence of two witnesses.

CARL ALRIK HULT.
OSCAR WALFRID HULT.

Witnesses:
CARL TH. SUNDHOLM,
H. B. OHLSSON.