No. 682,213. | Patented Sept. 10, 1901.

E. E. MARCHAND.

HYDRAULIC PROPELLER FOR SHIPS.

(Application filed Sept. 19, 1900.)

(No Model.) | 2 Sheets—Sheet 1.

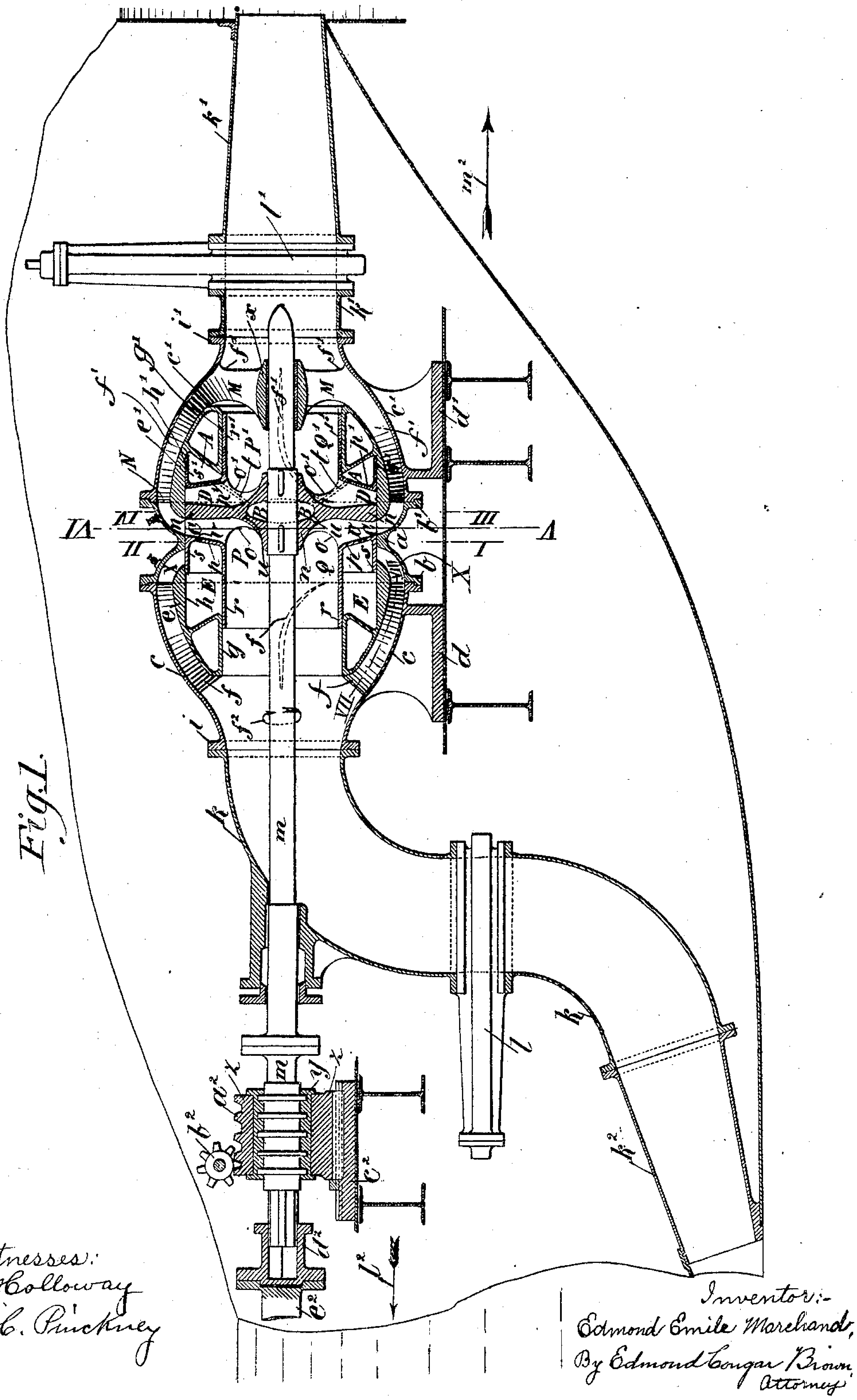

Fig. 1.

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Fig. 2

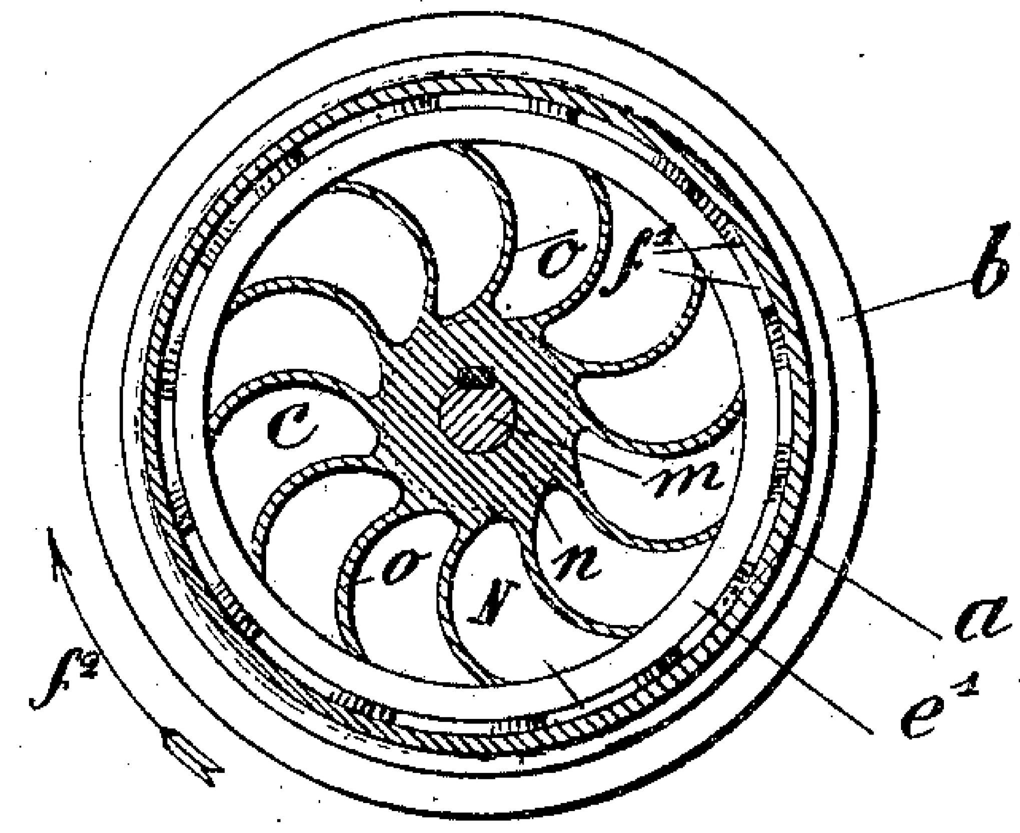
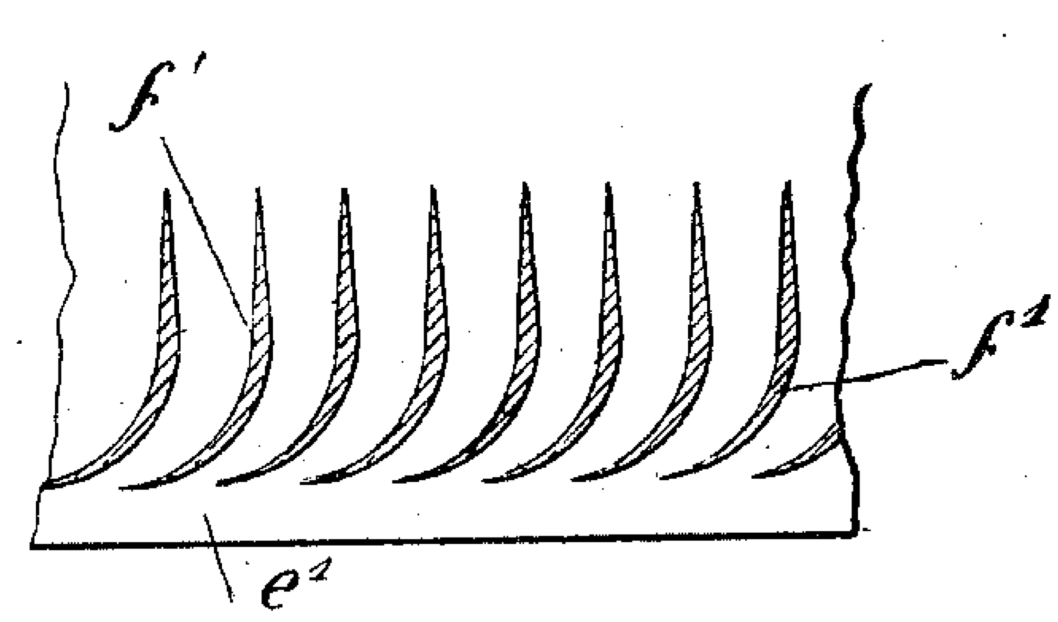


Fig. 3



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UNITED STATES PATENT OFFICE.

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HYDRAULIC PROPELLER FOR SHIPS.

SPECIFICATION forming part of Letters Patent No. 682,213, dated September 10, 1901.

Application filed September 19, 1900. Serial No. 30,475. (No model.)

To all whom it may concern:

Be it known that I, EDMOND EMILE MARCHAND, Bey, a citizen of France, residing in Paris, in the Republic of France, have invented certain new and useful Improvements in Hydraulic Pumps so as to Adapt Them for Use as Propellers for Ships, of which the following is a specification.

My invention relates to improvements in propellers, or, to put it more correctly, in hydraulic pumps of the centrifugal type, so as to adapt them for use as propellers; and the objects of these improvements are to provide a propeller of great power whereby all sorts of ships, large or small, may be propelled in either direction without reversing the driving mechanism and whereby the shock inherent to screw-propellers is avoided or at least greatly reduced. I attain these objects by a turbine or hydraulic pump of the centrifugal type which may be acted on by hand or by any other source of energy and which is adapted to the purpose by the arrangements hereinafter to be described.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal section through the axis of the said pump or turbine. Fig. 2 is a cross-section along line V VI in Fig. 1; and Fig. 3 represents the development of a part of the ribs of the paddles, these ribs being in cross-section on line VII VIII of Fig. 1.

The propelling-pump consists of a stationary body built on an axis, as indicated by the line I II and of a movable part on the axis III IV. The stationary body of the same is composed of a center part *a*, suitably arranged and provided with mouthpieces *b b'*, by means of which it is fastened to the two turbine-cases *c c'*, which, being supported by the hangers *d d'*, are solid with the counter-cases *e e'* by means of the curved ribs *f f'*, disposed on an axial plan, as shown by dotted lines. These ribs have, furthermore, the purpose and effect of changing the rotary movement of the water when it escapes from the turbine in a straight axial movement. The number of ribs *f f'* corresponds with the number of ribs or paddles of the turbines and may be made somewhat greater or smaller than the latter, but in any case the number of the ribs is greater than two or four. It will be well to place these ribs not too far apart from each other. They have, as it will be noticed, their concavity turned in the direction of the rotation. The cases *e e'* are bored so as to form two cylindrical surfaces *g g'* and *h h'*. At their ends they have mouthpieces *i i'*, on which the tubes *k k'* are fastened. These tubes, which may be either conical or cylindrical, have each a lock *l l'*, by means of which the turbine or propeller may be shut off from the water, so that its different parts may be cleaned or repaired, if necessary. The tube *k* may be curved or bent twice, so as to reach the water by means of the conical or cylindrical tube k^2.

The moving body consists of a double turbine mounted on the revolving shaft *m*. The turbine is composed of the part *n*, fastened to which are, by means of the ribs *o o'*, the wings *p p'*. These wings are provided with the cylindric parts *r r'* and *s s'*, suitably adjusted, so that they form a tight joint within the hollow cylindric parts *g g'* and *h h'*. The ribs *o o'* of the back turbine are bored so that the holes *t t* bring the space A in communication with the interior part B by means of the rotating apparatus, which for its part is in communication through the holes *u u* with the suction-chamber P Q. Moreover, the wing *p* being likewise provided with holes *v v* it brings the space E in communication with the chamber C of the same turbine. It will be noticed that the curved ribs *o o'* turn their convexities in the direction of the rotation—that is to say, they are curved in a way opposite to that of the directing-ribs *f f'* of the stationary body *e e* and *e' e'*.

The shaft *m*, upon which the rotating body is mounted, is supported inside of the turbine-case by the nave *x*, kept in position by one or several ribs, which may be a continuation of the ribs heretofore mentioned. The other end of the shaft, which may be made of several parts in order to facilitate its manufacturing and mounting, comes out of the turbine case or way by an opening made tight in a proper manner and rest in the bearing *y* on the plumber-block *z*, the cap of which is provided with a rack a^2, moved by a pinion b^2. The plumber-block is movable in the line of the axis of the shaft m. The hanger c^2 is arranged in a manner that the plumber-block z can glide on it. A muff d^2 serves to couple shaft m to the driving-shaft e^2 of the engine which provides the motive power.

The working of the apparatus is as follows: When the shaft m turns in the direction of the arrow f^2, the turbine, composed of the part n, the ribs o, and the wing p, sucks the water, forcing it to follow its rotary movement and to enter into the space between the part n and the wing p, from where it is forced into the space comprised between the walls c' and e'. Coming out of this space in annular section it gathers to a single jet and leaves the turbine through the tube k', driving the ship forward through the reaction of its inertia and speed. When leaving the turbine, the water is in a rotating movement around the axis of the shaft of the apparatus as long as it finds itself in the intermediate annular space N; but as soon as it leaves this space it is forced into the passages left by the ribs f', so that it arrives in M in an axial direction in the plane of rotation of the turning apparatus. Now let us suppose the apparatus be disposed in the stern of the ship. It is evident that the latter will be driven in the direction of the arrow l^2—that is to say, forward. During this forward movement of the ship the space A must needs be under the same pressure as the suction-chamber P Q, and the space E will be under a very strong pressure, resulting from the centrifugal power which is due to the distance between the holes v and the axis of rotation, so that there will be a strong pressure on the whole of the wing p. Owing to the pressure in the suction-room P Q, there will be a push on the section P′ Q′, acting from backward to forward, and to this pushing force will be added a pressure acting in the same direction and resulting from the pushing on the wing p'. This double pressure may be equilibrated at will, at least more or less, by the pressure which in proportion to the distance between the holes v v and the axis of rotation is brought on the wing p from forward to backward, so that during the forward movement of the ship the axial shock on the shaft and from the latter transmitted to the plumber-block z is nearly equal to null or at least very much reduced. The propelling jolts of the apparatus will therefore affect the ship only very little, though they be communicated to the latter by the plumber-block z and still more from the parts c c' through the hangers d d'. The water contained in spaces A and E would be at the same centrifugal pressure if the orifices of the holes t opening into the space A were at the same distance from the axis of rotation as the holes v. On the other hand, it is certain that if the spaces A and E were filled with water, but entirely closed, the revolving body would be immovable longitudinally, which would not prevent the apparatus from turning or the ship from advancing or going backward. In such case, the water being non-compressible, the propulsive pressure would apply itself entirely to the stationary body c or c' in accordance with the direction of the travel, and consequently upon corresponding hangers d or d', without affecting block z wherever it may be. The same phenomenon appears when the spaces A and E communicate through the holes t, u, and v with the chamber P Q. When said two spaces receive the same centrifugal pressure, as has been stated before, the pressure upon the revolving apparatus is equalized, while the aforesaid holes permit of longitudinal displacement; but the propulsive pressure will apply itself entirely to the stationary bodies c and c' without being transmitted to the block z. This results in the great advantage that the friction on the plumber-block z, which is unavoidable with screw-propellers, is nearly completely suppressed.

In order to obtain the backward movement of the ship, the speed of the driving-engine is to be decreased, and then the plumber-block z is moved so that the back turbine of the apparatus turn in front of the annular outlet x. In this state of the machine the water will be sucked by the tube k' and forced across the annular section of the stationary body c and c' in order to leave the turbine through the tube k k^2. It is evident that now, while the water runs through the apparatus in an opposite direction, its reaction must necessarily drive the ship backward—that is to say, in the direction of the arrow m^2. It is true that during the backward movement of the ship the apparatus will be less well equilibrated than during the forward movement of the same; but, considering the fact that the backward movement of the ship is less important than its forward movement, there is no great harm in it when the conditions of the backward movement are not quite as good as those of the forward movement. During the backward movement of the ship the space E is under a centrifugal pressure, which, depending on the position of the holes v, effects a pushing on the wing p, which is increased by another pressure brought to bear on the section P Q, owing to the pressure in the suction-chamber P′ Q′. This double pressure is partly equilibrated by the strong pressure in the space A, which acts on the wing p'—that is to say, in a direction opposite to the double pressure first mentioned. It follows that the total shock exercised on the plumber-block will be equal to the difference between the two opposite pressures; but at all events, the shock depending on the distance between the holes v and the axis of rotation, it may be made relatively little. Anyhow, the jolting resulting from the work of the propeller, as weak as it may be, is transmitted to the body of the ship, partly through the plumber-block z and partly through the hangers d and d' of the propelling apparatus.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A hydraulic propeller for ships comprising two turbines placed symmetrically back to back, one against the other, a shaft upon which said turbines are mounted and having one of its ends resting upon a bearing arranged upon a slide parallel with the axle, the cover of which carries a rack in engagement with a pinion actuating it, two opposing parts also symmetrical and stationary in which are inclosed the movable turbines and which at their free ends terminate in suction or discharge pipes, be the same straight, cylindrical or conical, or bent in the form of a double bend so as to permit said shaft to pass through a suitable stuffing-box, substantially as described above.

2. A hydraulic propeller for ships comprising two turbines placed symmetrically back to back one against the other and provided with radial ribs curved in the direction of the rotation of the turbines, a shaft carrying said turbines and having one of its ends resting upon a bearing arranged upon a slide, the cover of which carries a rack in engagement with a pinion actuating it, two stationary opposing parts placed back to back symmetrically and in the interior and cylindrical portion of which are arranged said movable turbines, said two opposing parts being capable of being constructed in three parts and being provided with two annular spaces, opposite to each of which may alternately be placed the similar annular opening of one of the movable radial turbines, the said annular spaces of the opposing parts communicating respectively with suction and discharge pipes through conduits or channels provided between the radial ribs or paddles at their beginning and curved suitably afterward, but in directions opposite to the paddles of the movable turbines, in such manner as to discharge in nearly axial directions in said suction and discharge pipes, substantially as described above.

3. A hydraulic propeller for ships, comprising two radial turbines placed symmetrically back to back one against the other and supported by a shaft which at one of its ends is mounted upon a bearing arranged upon a slide placed parallel with the axis of the turbines and the cover of which carries a rack engaging with a pinion actuating the same; two opposing parts for said turbines and two tubes for suction and discharge, be the same straight, cylindrical or conical or suitably curved for permitting the passage of the shaft carrying said turbines; the latter each carrying on opposite sides two cylindrical walls of different diameters and arranged in the opposing parts which for such purpose are bored out to two different diameters and which are equal, respectively, to the exterior diameters of said cylindrical walls, in such manner as to form two circular spaces, of which that which is situated forward, in the sense of the forward movement, communicates with the space of the corresponding turbine through a number of suitable holes passing through the cheek of said turbine and distant from the axis of the latter to a given extent, so that the span formed by the cylindrical walls and the opposing part of the forward turbine communicates by means of a series of holes which pass through the ribs or paddles of the latter turbine with the space provided in the middle of the turbines placed back to back one against the other, which latter space communicates by means of another series of holes with the interior of the rear turbine substantially as described above.

Signed at Paris, France, this 30th day of August, 1900.

EDMOND EMILE MARCHAND.

Witnesses:

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CHARLES MENGELZ.