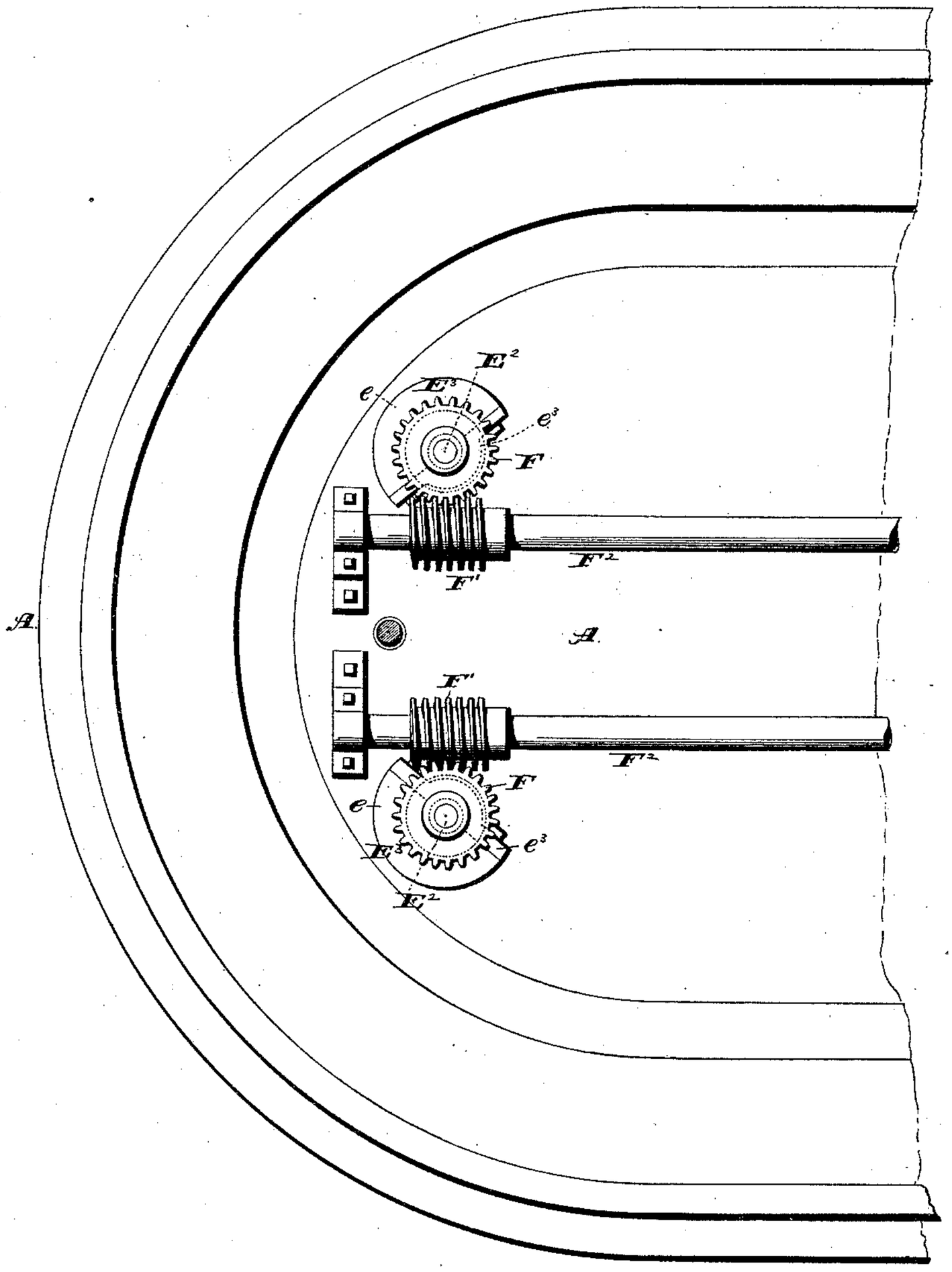
(No Model.) 3 Sheets—Sheet 1.

R. BUCHER.

PADDLE WHEEL FOR VESSELS.

No. 415,611. Patented Nov. 19, 1889.

Fig. 1.



Witnesses
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(No Model.) 3 Sheets—Sheet 2.

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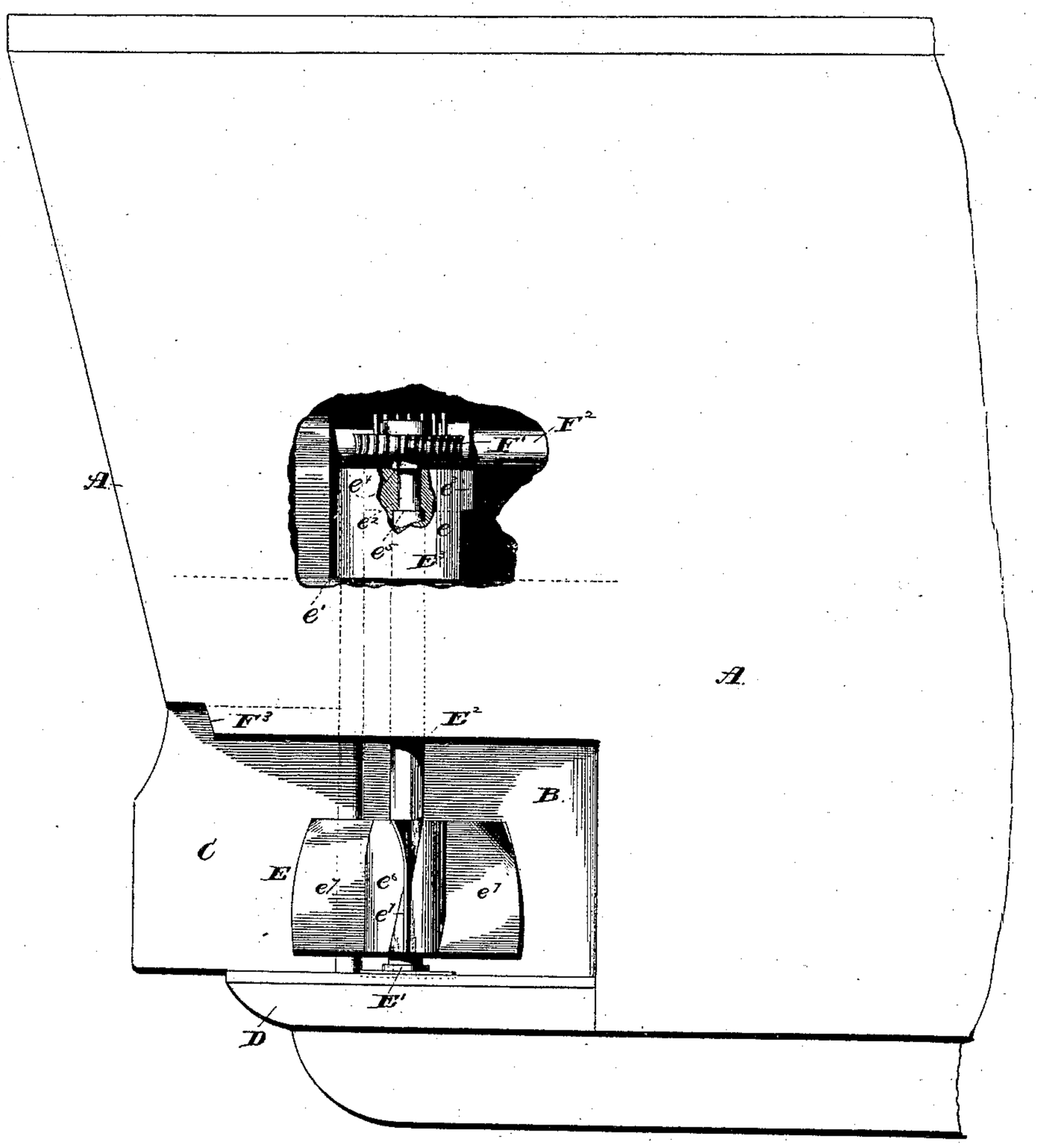
Fig. 2.



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(No Model.) 3 Sheets—Sheet 3.

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Fig. 3.

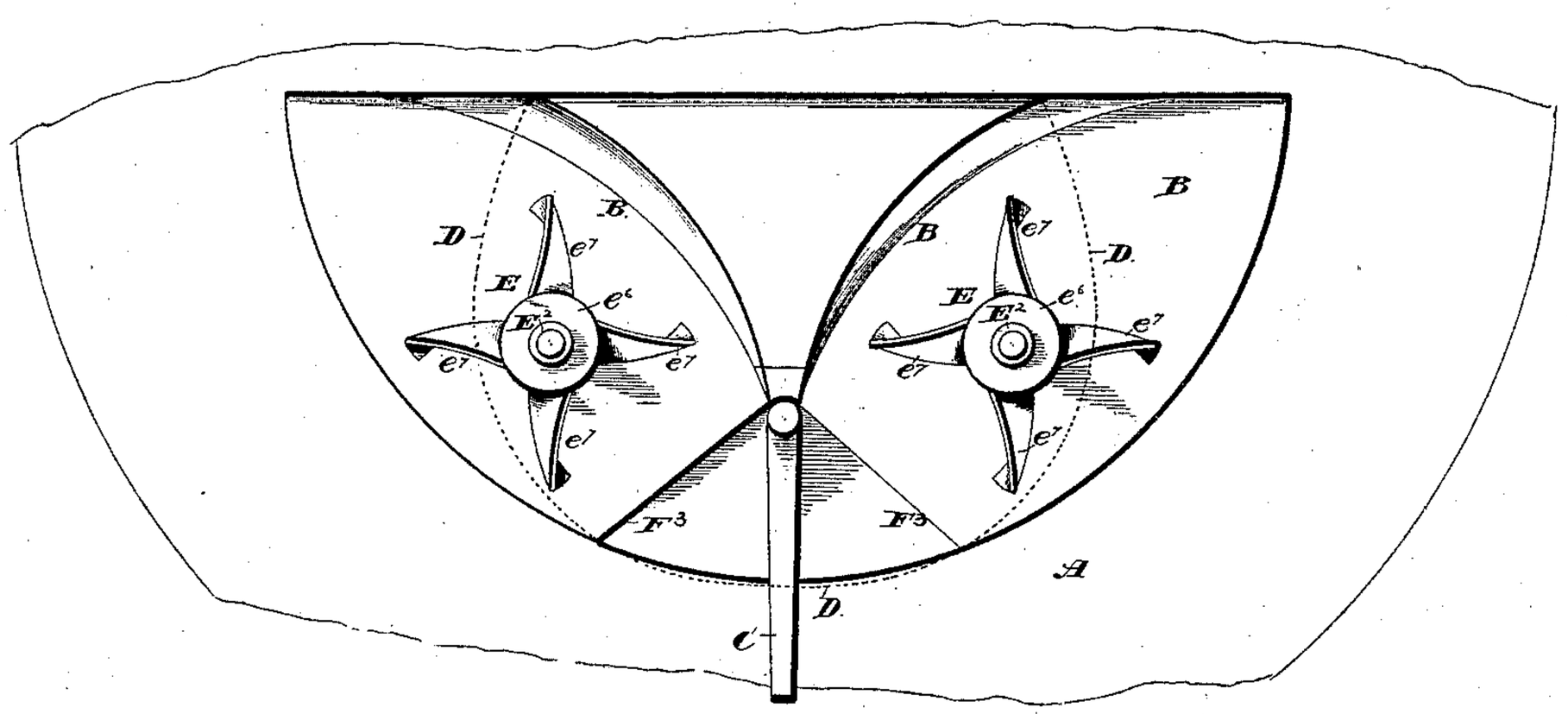
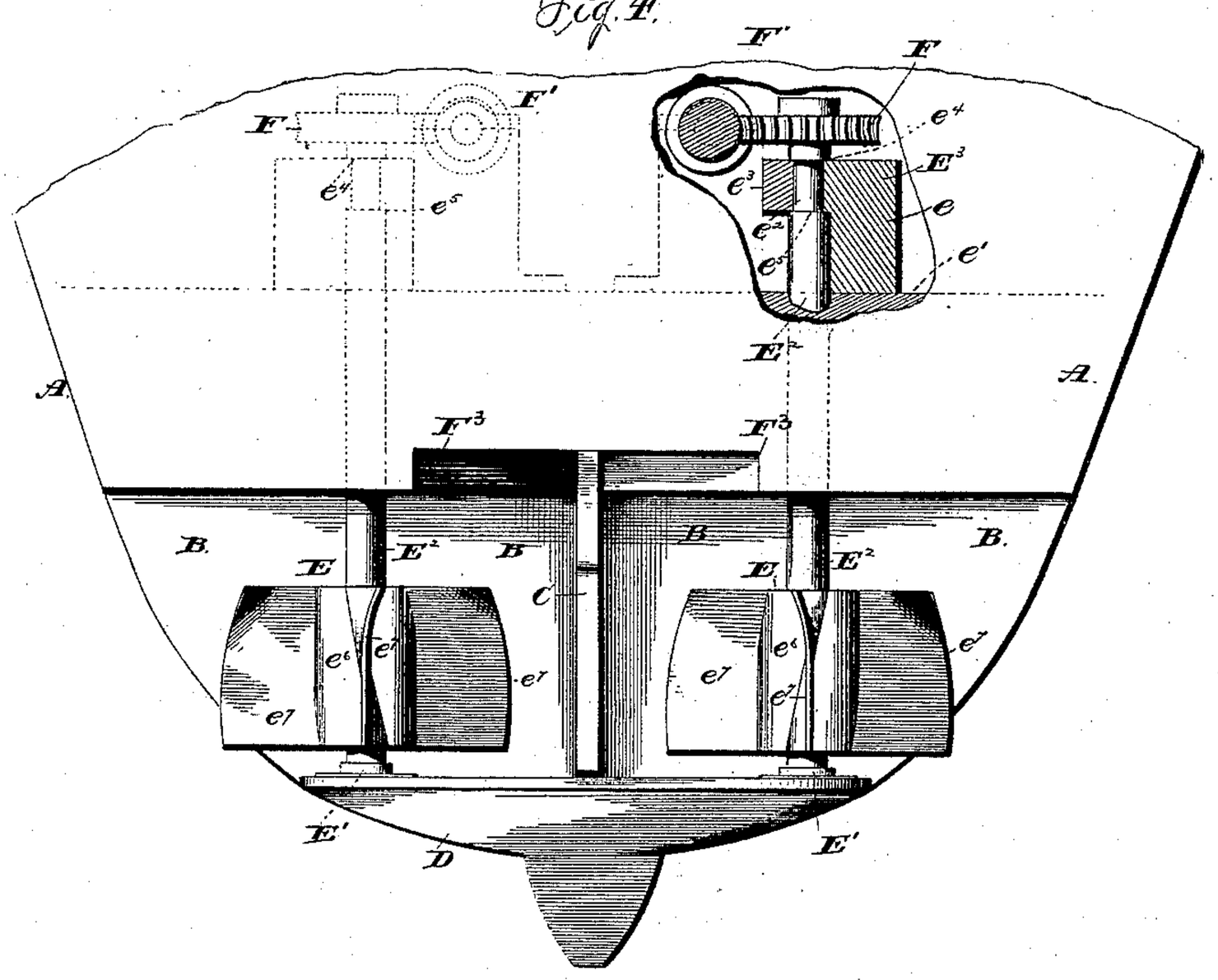


Fig. 4.



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UNITED STATES PATENT OFFICE.

REINHARD BUCHER, OF YONKERS, NEW YORK.

PADDLE-WHEEL FOR VESSELS.

SPECIFICATION forming part of Letters Patent No. 415,611, dated November 19, 1889.

Application filed January 29, 1889. Serial No. 297,905. (No model.)

To all whom it may concern:

Be it known that I, REINHARD BUCHER, of Yonkers, in the county of Westchester, and in the State of New York, have invented certain new and useful Improvements in Ship-Propellers; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 shows in plan view the gearing which I prefer for driving the wheels of my ship-propelling mechanism; Fig. 2, a view in side elevation of the stern of a vessel, showing my propeller in place, part of the hull and of the shaft-supporting bearing being broken away; Fig. 3, a bottom plan view of the same with the wheel-protecting shoe removed, and Fig. 4 a rear elevation of the vessel with the wheels and shoe in place.

Letters of like name and kind refer to like parts in each of the figures.

The object of my invention is to provide improved propelling mechanism for vessels; and to this end my invention consists in the propelling mechanism and in the construction, arrangement, and combination of the parts thereof, as hereinafter specified.

In the drawings, A designates the hull of the vessel, which can be of any desired form, material, or construction.

As shown in Fig. 4, the bottom of the vessel is rounded, as usual, and provided with a suitable keel. At its stern or rear end the hull is provided on opposite sides of the rudder-post with two recesses B B well down toward the bottom of the hull. Each of these recesses is open at its outer and rear sides. At its forward side the wall of the recess runs at first directly inward and then rearward until it meets the plane of the side of the rudder-post, or of the rudder C itself when no rudder-post is used. The walls of the opposite recesses, besides curving inward and rearward toward each other nearly to a meeting point, as shown, also have a forward and downward inclination, which is preferably on a concave curve, though not necessarily so. With this construction any water thrown or forced from the rear forward against the inner wall of either recess will be directed by such wall both outward and downward toward the open side of the recess.

A shoe D, extending out horizontally below the rudder C, forms a bottom for the two recesses B B and serves as a protection for the two wheels E E, which I place one in each recess. It also serves to support the lower bearings E′ E′ for the two vertical shafts E^2 E^2, upon which the wheels are fixed. These shafts pass up through openings in the upper sides of the recesses B B, and at their upper ends are engaged and supported by suitable journal-bearings E^3 E^3—one for each shaft—attached to suitable supporting frames or timbers within the vessel. I prefer to support each shaft and hold it against up or down thrust by the respective bearing E^3, so that none of the weight of the shaft or strain of its thrust shall come upon the shoe. The steps or bearings E′ E′ on the shoe need then to serve only to steady the shafts and hold them in line with their upper supporting-bearings. These latter bearings I prefer to make as shown in the drawings. (See Figs. 2 and 4.) A block *e*, supported on and secured to a suitable foundation *e′* within the vessel, has in it a vertical groove adapted to form a half-bearing for a portion e^2 of the respective shaft. A half box or bearing e^3, bolted to the block *e*, serves to complete the shaft-bearing and to entirely inclose the shaft portion e^2. On the shaft, respectively above and below the journal box or bearing thus formed, are the shoulders e^4 e^5. The upper shoulder e^4, resting, as shown, upon the upper end or top of the bearing, serves to support the weight of the shaft and wheel thereon, while the lower shoulder, engaging the under side of the bearing, takes all upward thrust of the shaft and keeps the lower end of the shaft down in its bearing on shoe D. Upon the upper end of each shaft, above its upper bearing, is a worm-wheel F, which gears with and is driven by a worm F′ on a horizontal shaft F^2, supported in suitable bearings within the vessel. There is one of these shafts for each wheel-shaft.

Any desired form of motor can be used to drive the worm-shafts; but it is intended that each shaft shall be connected with a separate engine, so that the two shafts can be rotated independently of each other at different speeds and in either direction.

I have shown no motor or engine for rotat-

ing the shafts, as any desired one of the well-known forms of engines can be used for such purpose without departure from my invention.

While I do not limit myself to any particular kind of means for driving the worm-shafts, I also desire it to be understood that I do not confine myself to the worm-gearing shown as connecting the driving and the wheel-carrying shafts. Instead of the worm-gearing a bevel-pinion and gear can be used, as will be well understood by any mechanic.

In the drawings I have shown but one bearing for each worm-shaft supporting the rear end of the same. Such bearing can be adapted to prevent end-thrust of the worm-shaft in either direction, as is the bearing for the upper end of each wheel-shaft, or to prevent rearward movement of the shaft only, while another bearing (not shown) takes up end-thrust in the other direction.

The wheels E E are, as shown, four-bladed ones; but I do not limit myself to such number of blades. Each wheel consists, essentially, of a hub e^6, fixed on the respective shaft, and the blades e^7 e^7, projecting outward from the hub, of such length as to extend beyond the outer open side of the wheel-recess into position to engage the water passing the recess as the vessel moves through the water. As with the wheel-recesses situated low down in the stern, as shown and described, the direction of the flow of the water from the ship's bottom past the wheel-recess is upward as well as rearward, I set the blades of the respective wheels at an angle to the hub-axis, so that the blades shall be at right angles to the flow of the water coming within their reach. With a wheel shaft and hub vertical and flat blades set in planes radial from the hub-axis the blades would not, I have found by experience, strike into and engage the water reaching them so as to get the best hold thereon. The blades of my wheels are therefore set at an angle to the respective wheel or shaft axis substantially equal to the angle of inclination of the upward rearward movement of the water past the wheel-recess.

To counteract the tendency of the blades so set to force the water engaged by them upward as well as rearward as the wheel turns to move the blades projecting beyond the recess side rearward to force the vessel forward, and to prevent the tendency of the wheels to submerge the stern, I curve the upper and outer portions of the blades over and forward with reference to the travel of the blades as the wheels revolve in the direction just stated. This curvature can be made to extend throughout the upper portion of the blade to the point of attachment to the hub; but that is not necessary. With the upper and outer portions of the blades thus bent the direction of the flow of the water which reaches and is engaged by the wheel-blades will be changed from an upward and rearward to a directly rearward one. The curved upper and outer portions of the wheel-blades, tending as they do to throw the water engaged by them slightly downward, counteract the tendency of the other portions of the blades to throw it upward. The direct rearward forcing of the water by the blades which is thus secured enables the best results as to speed to be obtained without tendency to submergence of the stern.

In order to secure easy clearance of the water as it travels rearward off of a blade, and to prevent, as far as possible, the carrying of the water around inward and forward within the wheel-recess, I prefer to bend the outer and lower portion of each blade slightly rearward with reference to the travel of the blade as the wheel revolves to move the vessel forward, so that the outer edge of this portion of the blade stands about in a plane radial from the wheel-axis, as shown in Fig. 2. With this construction the water will, as a blade travels around inward, pass easily rearward off of the blade, instead of being carried around with the blade inward and forward within the wheel-recess.

As some water will be caused by the rotation of the wheels to flow into the rear sides of the wheel-recesses and then forward, I make the inner walls of the recesses curved, as shown in the drawings and described hereinbefore. With this curvature of the recess-walls there is no obstruction to the free flowing of any water around through one of the recesses. The recess-wall, with its curvature set forth, directs the water striking it forward and outward, while its downward and forward inclination gives the water a downward inclination. As it issues from the forward portion of the recess, the water will then have a downward as well as outward direction.

In order to correspond with the shape of the inner wall of the respective recess, the upper portions of the blades of each wheel are made slightly shorter than the lower portions, so that as seen in front or rear elevation each blade has the line of its outer edge curved slightly upward and inward.

In order to prevent the rudder being jammed around against either wheel, I provide on the vessel's stern, on opposite sides, the shoulders or stops F^3 F^3, to engage and stop the rudder before it moves far enough to strike a wheel. I prefer to carry the rudder well out to the rear of or beyond the wheels, as shown in Figs. 2 and 3, so that the water thrown inward and rearward in opposite directions by the action of the two wheels will, upon striking the sides of the rudder, be turned directly to the rear thereby. With the wheels rotating with equal speed in opposite directions, as when the vessel is being propelled forward, the action of the water thrown against the opposite sides of the rudder by the wheels will be equal, and there will be no tendency to turn the rudder one way or the other. The rudder will therefore re-

main in its central position, and the vessel will move forward in a straight line. If the rudder be turned to one side, the water striking it from the wheels will be directed by the rudder to that side, and because of the direction of its flow will tend to turn the vessel. The steering of the vessel can also be performed, as indicated hereinbefore, by driving the wheels at different speeds or by changing their relative directions of rotation.

Having thus described my invention, what I claim is—

1. As a means for propelling vessels, two wheels rotating on upright axes on opposite sides of the stern of the vessel and having their blades set at an angle to their axes, the lower portions of said blades moving in advance of the upper portions thereof when the vessel is moving forward, substantially as described.

2. As a means for propelling vessels, two wheels rotating on upright axes, the blades of said wheels being set at an angle to said axes, the lower portions of said blades moving in advance of the upper portions thereof when the vessel is moving forward, said wheels being situated on opposite sides of the stern of the vessel and with their outer blades in engaging position with the water, substantially as described.

3. In combination with the hull of a vessel having recesses on opposite sides of the stern, the wheels rotating on vertical axes in said recesses, the blades of said wheels being set at an angle to said axes, the lower portions of said blades moving in advance of the upper portions thereof when the vessel is moving forward, substantially as described.

4. In combination with the hull of a vessel having the two wheel-receiving recesses at its stern on opposite sides thereof, the horizontally-rotating wheels in such recesses, each wheel having its blades set at an angle to the wheel-axis and with their upper and outer portions curved over in a direction opposite to the incline of the blade, substantially as and for the purpose described.

5. In combination with the hull of a vessel having the two wheel-receiving recesses at opposite sides of its stern, the horizontally-rotating wheels in such recesses, each having its blades set at an angle to its axis, with their upper and outer portions bent over in a direction opposite to the inclination of the blade to the wheel-axis and their outer and lower corners bent in a direction opposite to that of the bending of the upper and outer portions, and means for rotating the wheels, substantially as and for the purpose specified.

6. In combination with the hull of a vessel having at opposite sides of its stern the wheel-receiving recesses, with their inner walls curved forward and outward and also inclined downward and forward, the horizontally-rotating wheels in such recesses, with blades to project beyond the outer sides of the recesses, and means for rotating the wheels, substantially as and for the purpose described.

7. In combination with the hull of a vessel having at its stern the opposite recesses, with their inner walls curved forward and outward and inclined downward and forward, the horizontally-rotating wheels in the recesses, each wheel having its blades set on its hub at an angle to its axis and the upper and lower outer portions bent or inclined in opposite directions with reference to the main portions of the blades, and means for rotating the wheels, substantially as and for the purpose specified.

8. In combination with the hull of a vessel having the two wheel-receiving recesses, the horizontally-rotating wheels in such recesses, the shafts carrying the wheels, bearings for the upper portions of the shafts adapted to support the weight of the shafts and wheels and take up all upward thrust of the shafts, a shoe below the wheel-recesses, bearings on such shoe for the lower ends of the wheel-shafts, and suitable gearing for rotating the shafts, substantially as and for the purpose set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 25th day of January, 1889.

REINHARD BUCHER.

Witnesses:
FREDERICK TSELI,
ANTONY SMHOFF.