

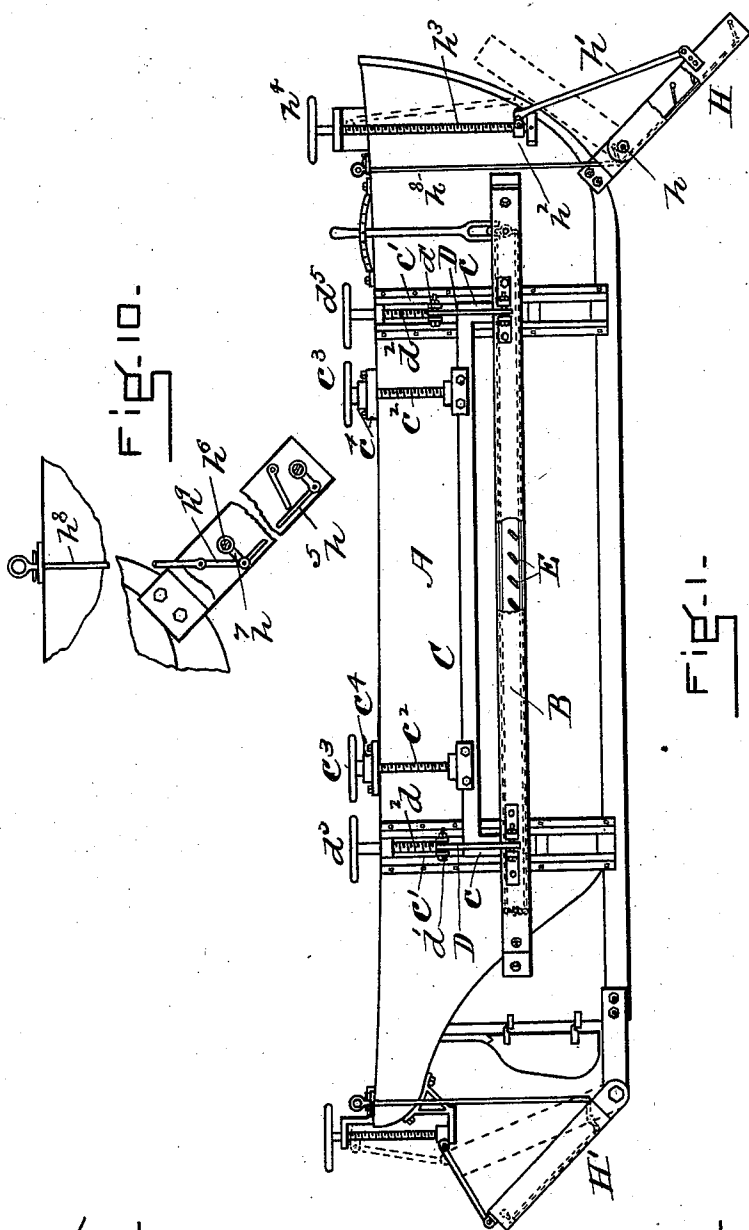
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4 Sheets—Sheet 1.

S. S. SMITH.
WAVE POWER PROPELLER FOR BOATS.

No. 529,882.

Patented Nov. 27, 1894.



WITNESSES
J. W. Dolan.
J. W. Cummings.

INVENTOR
Sidney S. Smith
by his Attys
Clarke & Raymond

(No Model.)

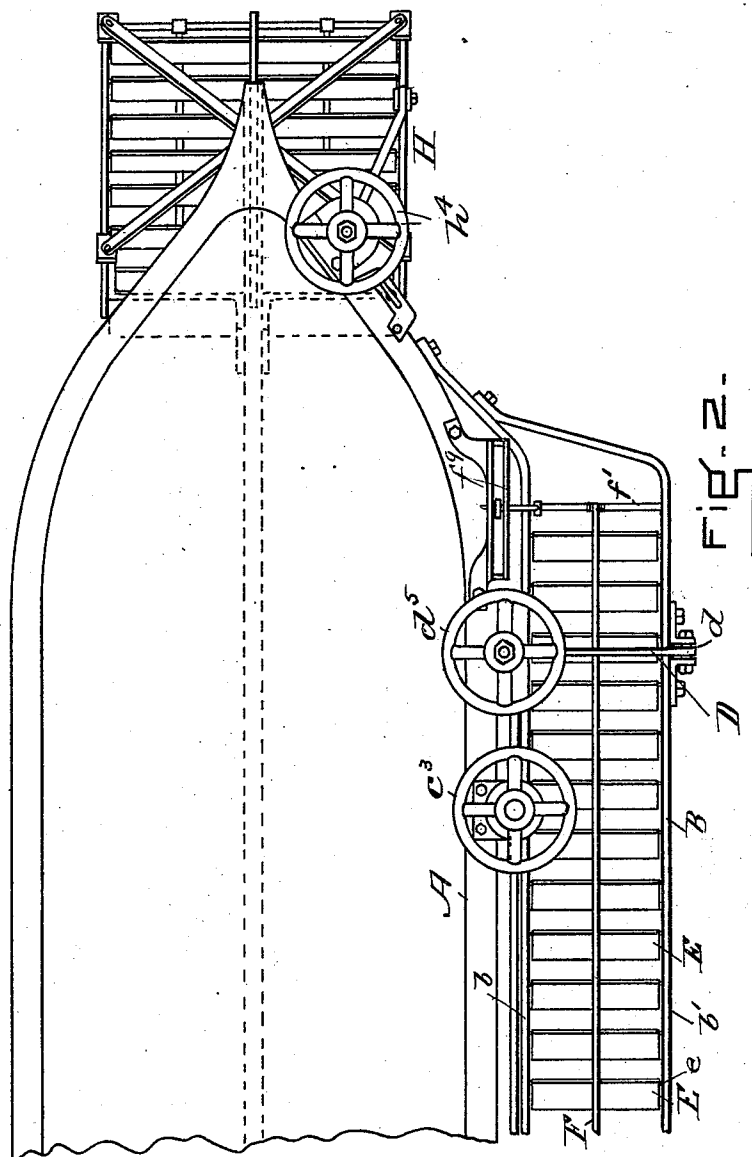
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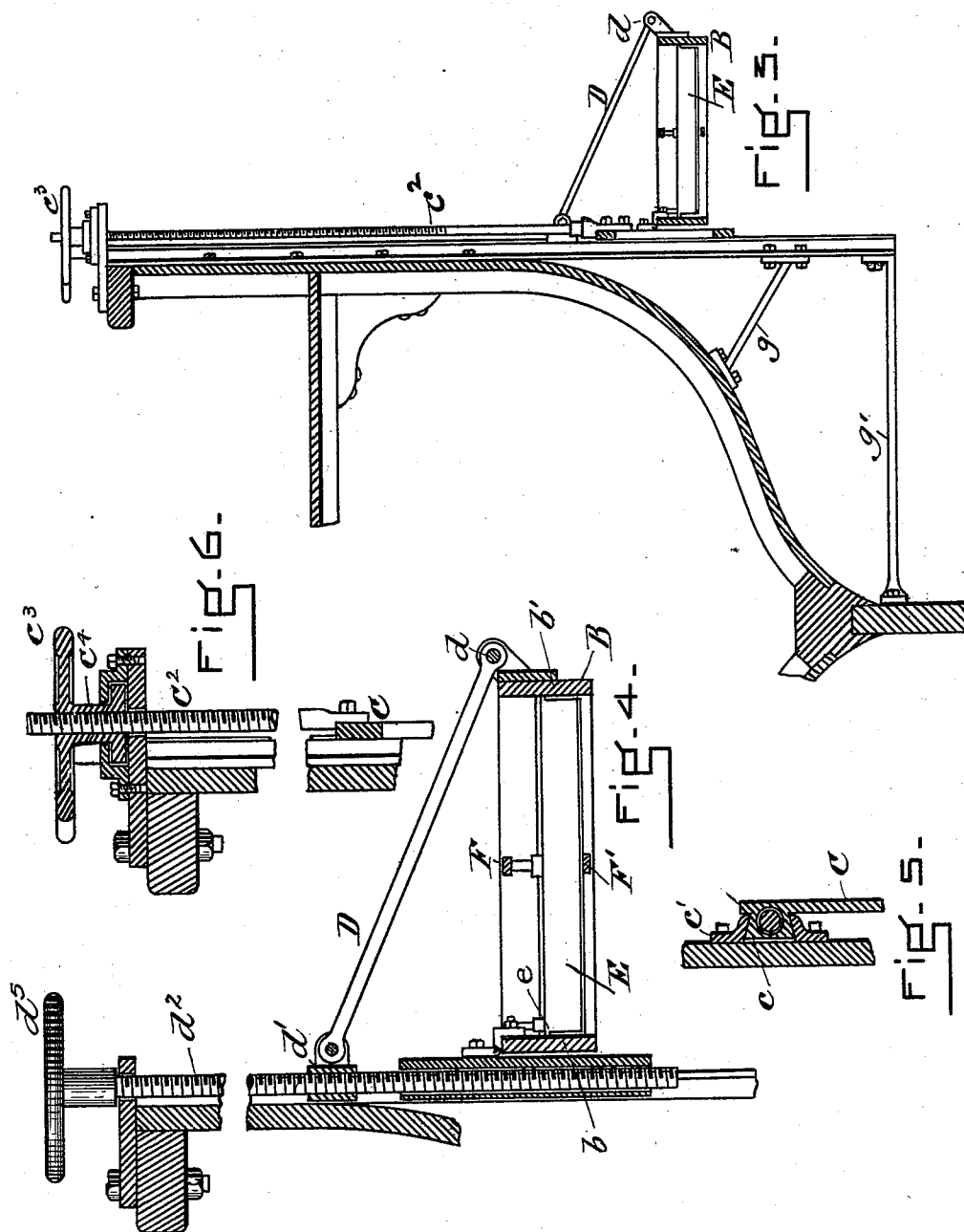
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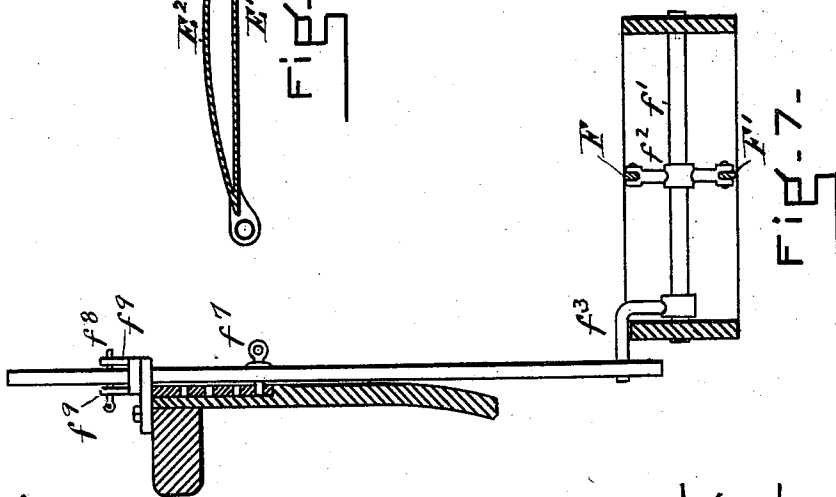
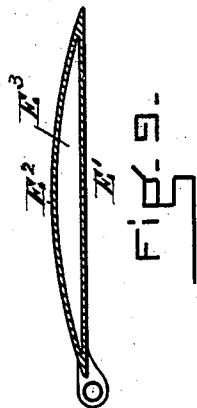
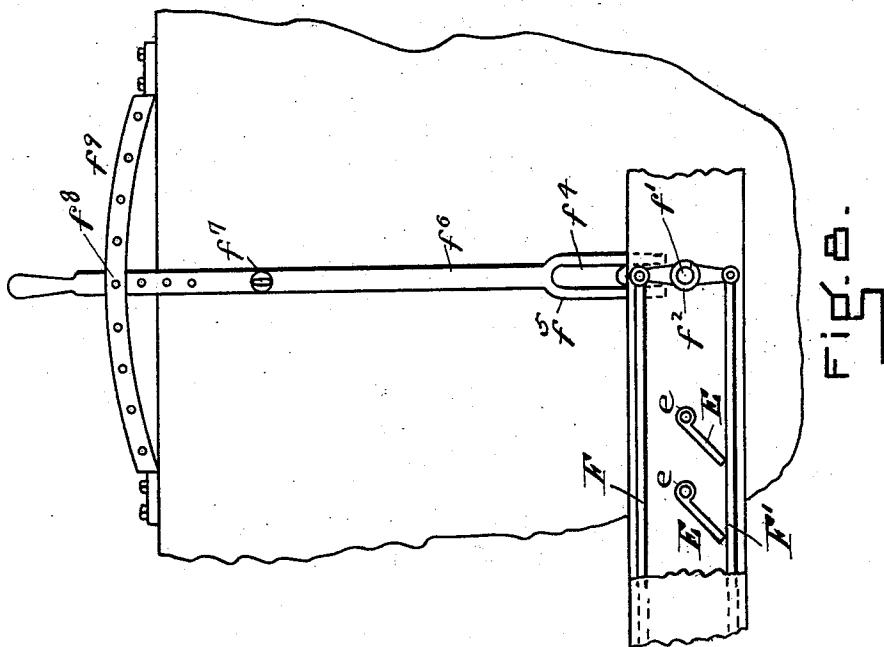
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UNITED STATES PATENT OFFICE.

SIDNEY S. SMITH, OF BOSTON, MASSACHUSETTS.

WAVE-POWER PROPELLER FOR BOATS.

SPECIFICATION forming part of Letters Patent No. 529,882, dated November 27, 1894.

Application filed December 11, 1893. Serial No. 493,386. (No model.)

To all whom it may concern:

Be it known that I, SIDNEY S. SMITH, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Mechanism for Utilizing Wave-Power in the Propulsion of Boats, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification, in explaining its nature.

The invention relates to means or devices attached to the sides or to the bow or stern or both, of boats, for utilizing wave power in the propulsion of said boats, either as the primary motive force, or as an auxiliary to other propelling devices, such as sails, screws, &c.

I have illustrated my invention as carried into action by means of blades which are arranged in suitable frames attached to the boat, and which by their inclination present such surfaces to the waves that the power arising from the vertical movement of the water, and in some instances of the boat, is caused to act against the blades, and in a direction or manner to cause them and the boat to be moved in a forward or onward direction.

The invention further relates to the manner of supporting the blades, and of connecting their frames with the boat or vessel, and for providing the frames with vertical adjustability and with other movements in relation to the sides of the vessel, which will hereinafter be fully set forth.

The invention further relates to means for varying the inclination and extent of movement of the blades.

In the drawings,—Figure 1 is a view in side elevation representing the hull of a boat provided with my improvement. Fig. 2 is a view in plan enlarged of the forward part of a hull having my improvements. Fig. 3 is a view enlarged in vertical section of one side of a hull, and of the propelling devices on that side. Fig. 4 is also a sectional view enlarged, illustrating other features of construction which will hereinafter be more fully described. Figs. 5, 6, 7, 8, 9 and 10 are detail views further illustrating the construction.

The hull A may be of any suitable form or size, and it may be propelled by the devices

herein described alone, or it may be a sailing or steam vessel, in which case the appliances which are the subject of this invention are used as auxiliary propelling devices.

I will first describe the form of my invention used upon the sides of the vessel, and which embrace a long frame B for each side. As this frame and its operative parts and connections with the vessel are the same for both sides, a description of one side will be sufficient. The frame B is preferably rectangular or substantially rectangular in shape, and is of very nearly the full length of the vessel at its water line. It is constructed of any suitable material, and it may be of wood or it may be of metal. For small boats wood will answer. For relatively large vessels an iron framework is preferable. It has the inner rail *b*, and the outer rail *b'*, and these two parts are firmly tied together. The frame should be vertically adjustable in relation to the side of the vessel, because the height of the vessel above the water varies according to the load which it carries, and because it is desirable to adjust the vertical position of the frame to variations in the undulating or wave conditions of the water.

It will be understood that the frame is carried at some distance from the upper level of the water, in order that the downward movement of the waves as well as their upward movement may be utilized. It is also necessary to vary the angle of the blades and frame in relation to the sides of the vessel to suit the conditions of the wind and waves, and also for the purpose of enabling the frame to be turned upward to bring it alongside the vessel when at a wharf or passing through draw-bridges, &c., and this result is reached by hinging the frame upon its inner side to the part or holder which provides its vertical movement. This part or holder is lettered C. See Fig. 1. It is in effect a slide, the ends or sections *c*, of which slide and are guided in vertical slideways or guides *c'*, upon the side of the vessel, see Fig. 5, which shows the slide and slideways as having a dovetail construction. The slide is moved vertically by means of the adjusting screws *c²*, which are turned by the hand wheels *c³*, operated from the deck or other means, the screws being fast to the vessel and turning in nuts *c⁴* on the rail.

The angle of the frame in its relation to the vessel's side is changed and it is turned upward by means of the links D, which are pivoted at their outer ends at d to the outer side of the frame, and at their inner ends to nuts d' which are vertically movable by the screws d^2 . See Figs. 1 and 4. These screws are turned by hand wheels d^3 , or in any other desired way are made fast to the vessel, and engage the nuts d' .

The blades E, carried by the frame B, are pivoted at or near their upper corners e , to the frame, and are relatively long, narrow and thin. They are also made preferably as light as possible, and in Fig. 9 I show in section a shape of blade which I prefer. This blade is made preferably of thin sheet metal or hard rubber, and has the straight surface E' , and the curved surface E^2 , and a cavity E^3 which may be air-tight. When this type of blade is used, I prefer that the flat surface be the under one. It is desirable to limit the range of movement of these blades, and also to vary such range according to the condition of the water and for other reasons, and this result I accomplish by means of the stop-bars F, F', the first above the blades and the second below them, both bars running the full length of the bladed section of the frame, and being connected at each end by the pivoted bars or links f , see Fig. 8, which are in turn pivoted to the cross-rods f' at the center f^2 of their length. One of the rods f' has bearings in the frame to turn therein, and is rigidly secured to the link, and this rod has at its inner end an arm f^3 , see Fig. 7, preferably extending upward and then bent horizontally to enter the long recess f^4 in the forked end f^5 of the lever f^6 , this lever being pivoted at f^7 , and extending above the deck and being locked into any desirable position by means of a pin f^8 passing through one of a series of holes in each of the locking plates f^3 , and through a hole in the lever. See Fig. 7. The bars F, F' are thus provided with an opening and closing movement relatively to each other and uniformly as regards the center of the blades, and there is thus obtained means for controlling and regulating the extent of movement or swing of the blades. These slideways, or rather the parts which provide the slideways for the frame slides c , extend to very nearly the level of the keel of the vessel, and must be united to the side of the vessel and firmly braced, and in Fig. 3 I have shown such parts as bolted to the sides and braced to the bottom by the rods g , g' .

The frames H, H', at the bow and stern of the vessel respectively, carry blades like the blades E. They are provided with a swinging movement, and the angle which they bear to the frame is adjustable. Each frame is pivoted at its inner end h , to the vessel's end and preferably upon a line with or close to the keel, and it is moved or adjusted downward or upward by means of the link h' , pivoted at its lower end to the frame, and having at

its upper end a nut h^2 , which travels on the threaded shaft h^3 , the shaft having on its upper end a hand wheel h^4 by which it is turned. The link h' also serves as a stay or brace for holding the frame in any desired position. The upward movement of the blades carried by these frames is limited by stops, their lower position by the bar h^5 , see Fig. 10, which is connected with cross rods h^6 by the hanging links h^7 , and with a push or draw rod h^8 by a link h^9 .

The device operates in propelling a vessel in the following way, and I will first describe the action of the side blades. A wave rising causes the blades to be turned upward until they come in contact with their upper stops, when they are prevented from turning farther. The upward movement of the wave continuing working against the inclined blades gives a distinct forward impulse to them and the vessel. As it recedes or falls back, the volume of water above the blades (and it must be understood that the blades are quite a little below the normal surface of the water) bearing upon the upper surface of the blades forces them downward until they come in contact with their lower stop when their progress is arrested, and the weight of the water then coming upon the inclined surfaces again, gives a distinct onward movement to the blades, and through them to the vessel, and this action continues as the waves rise and fall. The frames are adjusted vertically, and the blades varied as to their angle by their controlling stops or bars as circumstances may require.

The action of the blades carried by the bow and stern frames is somewhat different from that of the side blades, owing chiefly to the angle at which their supporting frames are held in relation to the boat, the angle being such that the blades present practically a continuous surface from the lower to the upper end of the frame to the water, when there is a vertical movement of water upward, or of the blades downward, the latter action being produced by the lifting and falling of the bow or stern of the vessel, which movement is thus made available for causing a propelling action of the blades.

The blades may be attached to any kind of a vessel or object movable in the water.

Having thus fully described my invention, I claim and desire to secure by Letters Patent of the United States—

1. A device for propelling boats by wave power comprising horizontal frames attached to the sides of a vessel to project horizontally therefrom and carrying blades extending in a direction substantially at a right angle to the keel of the boat and arranged to present surfaces inclined to the movements of the waves, and means for vertically adjusting said frames upon the vessel's sides, as and for the purposes described.

2. In a device for propelling boats by wave power, frames attached to the sides of a vessel to project horizontally therefrom and car-

rying blades arranged to present surfaces inclined to the movements of the waves and means for turning said frames to a vertical position parallel with and adjacent to the sides of the vessel, as and for the purposes described.

3. In a device for propelling boats by wave power, slideways secured to the vessel's sides, slides or a sliding frame guided by said slide-ways and vertically movable by screws operated from the vessel's deck, frames carrying propelling blades hinged upon their inner sides to said vertically movable slides and combined bracing, adjusting and frame elevating devices comprising stay rods and screw shafts to engage nuts carried by the stay rods, which shafts are operated from the vessel's deck, substantially as described.

4. In a device for propelling boats by wave power, the combination with a frame carrying a series of pivoted or hinged blades, of the bars F F' above and below the said blades and connected together, and means for mov-

ing said bars toward and from each other, substantially as described.

5. In a device for propelling boats by wave power, a frame carrying propelling blades and attached to the boat at either end thereof at or near its keel by a hinge or similar connection and means for swinging or moving the frame upon its hinge upward and downward and for holding it in any desired position, as and for the purposes described.

6. In a device for propelling boats by wave power, a frame hinged to either end of the boat at or near its keel to extend outward therefrom and carrying propelling blades, an adjusting screw connected with said frame by a stay link and means for varying the position or angle of the blades in the frame, as and for the purposes described.

SIDNEY S. SMITH.

Witnesses:

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J. M. DOLAN.