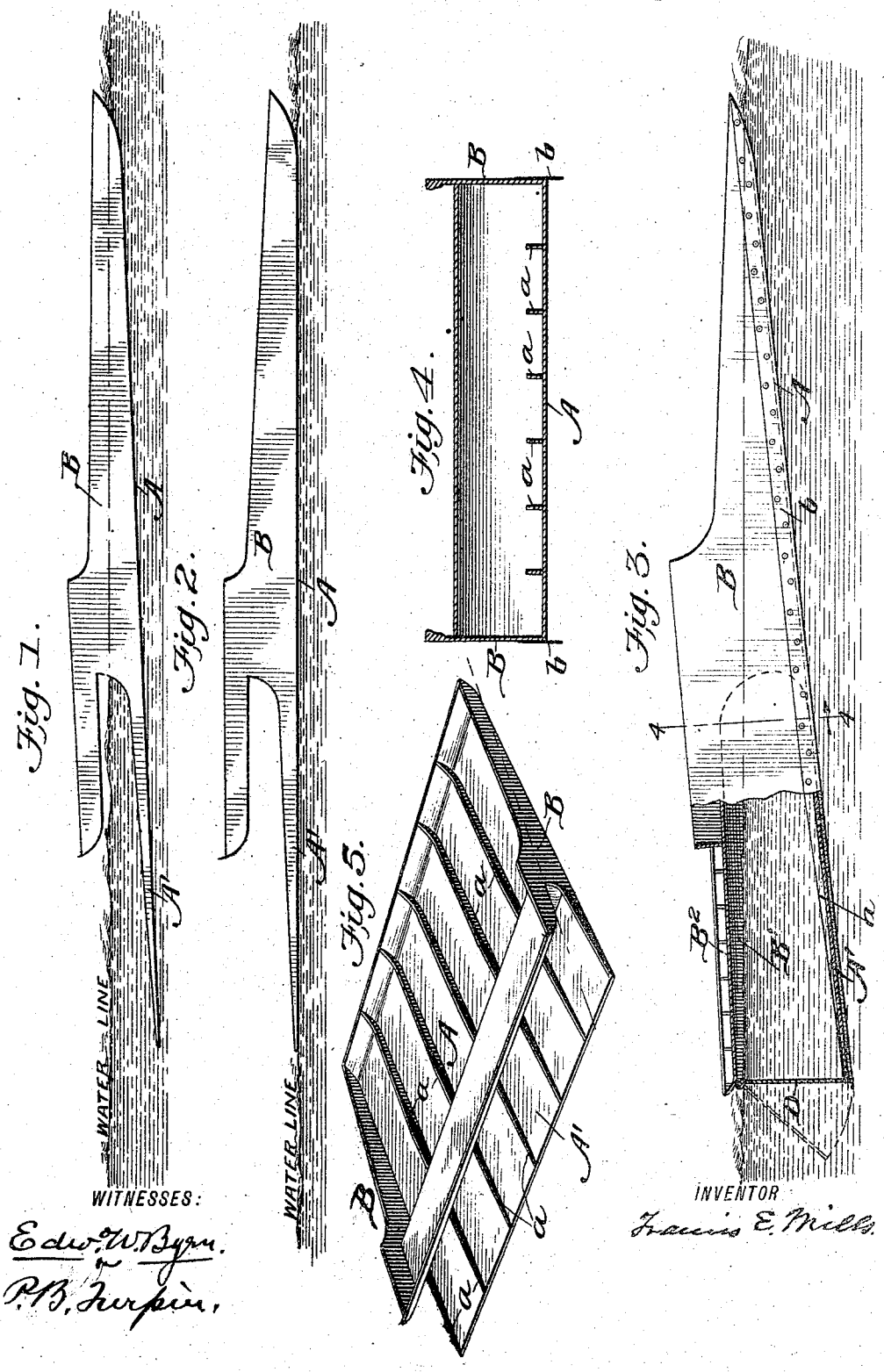
(No Model.)

F. E. MILLS.

BOAT.

No. 590,845. Patented Sept. 28, 1897.


Fig. 1.
B
A
A'
WATER LINE
Fig. 2.
B
A
A'
WATER LINE
Fig. 4.
B
b
a
a
a

UNITED STATES PATENT OFFICE.

FRANCIS E. MILLS, OF WASHINGTON, DISTRICT OF COLUMBIA.

BOAT.

SPECIFICATION forming part of Letters Patent No. 590,845, dated September 28, 1897.

Application filed July 9, 1896. Serial No. 598,550. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS E. MILLS, of Washington, in the District of Columbia, have invented a new and useful Improvement in Boats, of which the following is a specification.

The object of the invention is to construct a boat or water-craft of such form that in moving forward it will lift itself to the surface and aided by the *vis inertia* of that fluid will swiftly glide or ricochet upon the top of the water.

To this end it consists of a boat whose bottom is a straight line extending from a point near the bow to the stern and arranged to stand at an angle to the water-line with the bow the highest, the bottom being extended past the stern or rear portion of the hull in the form of a broad tail whose transverse section occupies a horizontal plane and lies submerged in the water when at rest, but causes the boat to rise to the surface and glide or ricochet thereupon after the manner of a toboggan-sled or skipping stone when in rapid motion, as hereinafter fully described.

Figure 1 is a side view of my boat when at rest in the water. Fig. 2 is a side view when in rapid motion. Fig. 3 is a side view showing a rear-deck extension and provision for backing. Fig. 4 is a vertical cross-section through line 4 4 of Fig. 3, and Fig. 5 is a perspective view of a boat of such proportions as best adapted to produce the ricochet effect.

The form of the boat will be readily understood by reference to the accompanying drawings. Its bottom A is broad, flat, and level in its cross-sections, and with the exception of a short upward curve at the bow is longitudinally straight to the extreme rear end. Its sides B B are vertical and parallel. When loaded and stationary, as in Fig. 1, the forward end lies buoyed upon the surface, while the rear end is entirely submerged. The buoyant portion of the boat, which sustains the load and from which the water is necessarily excluded, covers about two-thirds ($\frac{2}{3}$) the entire length of the bottom, (more or less,) the rear part A′ being simply a prolongation of the inclined bottom under water, constituting a "submerged tail." The load should be so placed or distributed that the center of gravity of the boat and cargo shall be nearly over the center of the straight portion of the entire bottom. When constructed and loaded in this manner, the rear end of the craft, having less buoyancy and displacing less water than the forward end, necessarily sinks much lower and gives the entire bottom floor considerable inclination downward and backward, and this is essential to its proper action.

Operation: If while in this position the boat is moved forward by a horizontal impulse, the oblique impact of the water acting upon nearly equal areas of the inclined bottom and with equal force both forward of and behind its center of gravity lifts the entire boat, (not the forward end only,) and as its forward motion increases it is made to mount the surface, as in Fig. 2, and sustained by the *vis inertia* of that fluid glides or ricochets over the top of the water with practically no resistance of the kind encountered when plowing through and displacing the water.

The foregoing description covers the most essential features of the craft and all that are shown in Figs. 1 and 2; but for the entire safety, convenience, and comfort of those riding in the boat some other accessories are desirable, which I will now describe, to wit: first, a "rear deck," on which persons can walk to the extreme rear end in getting on and off the craft; second, a "backwater-check" to prevent any sudden rush of water against the submerged tail when it is compelled to stop while traveling downstream or in backing; third, "side fins" to produce an air-cushion between the ricochetting bottom and the water in order to relieve it of any unpleasant jolting or jar.

As a support to the floor B^2 of a rear deck and also to further stiffen the submerged tail, I attach to the latter two rigid side pieces B′, extending considerably above the surface of the water. It is not necessary that these sides be water-tight. The deck, however, should be tight enough to exclude the water when persons are walking on it and also to act as a buoy to prevent the rear end of the craft from sinking lower than desirable while

lying in rough water. When in motion, the entire craft is on the top of the water, but on stopping the rear end sinks down gradually to the position shown in Fig. 1. This in still water causes no inconvenience, but should it be compelled to stop suddenly while descending a rapid stream the forcible rush of the running water against the inclined tail might carry it down so far as to threaten the submergence of the entire boat, and to guard against the possibility of any such result I provide a backwater-check, (see Fig. 3,) which is simply a light pendent flap D, hinged to the rear end of the floor of the rear deck, long enough to reach across the boat and wide enough when hanging vertically to reach the end of the submerged tail. This flap works automatically. It opens outwardly when the water flows off the tail in starting and closes against the end of the tail when it tends to rush inward either from the flow of the current or in backing. It is not intended to entirely exclude the water, (not closing up "water-tight,") but simply to check a violent rush of a large body of running water against the inclined stern.

In smooth water the boat will have a slight rising and falling or gently undulating motion which will not be unpleasant; but should the surface be a little rough it might sometimes come down so hard upon the water as to cause a disagreeable jolt or jar, and to relieve it of this I attach to each side of the boat, extending its whole length, (see Fig. 4,) a rigid strip *b* of thin metal, its lower edge reaching down vertically into the water a few inches below the bottom. I call these "side fins." They are fastened firmly to the outer sides of the boat with screws. The object of these fins is to prevent the air being forced out sidewise from under the bottom as the inclined floor descends upon the water in ricochetting, thus furnishing it practically with an air-cushion. The same result, to some extent at least, can be secured by dispensing with these side fins and substituting elastic cushions for the seats of the passengers.

The entire bottom of the craft, including the submerged tail, is made rigid by tapering longitudinal ribs *a*, firmly fastened to its upper side, the under side being left smooth.

Relative dimensions.—As the craft is not intended to displace the water in running, but the water is expected to displace and sustain the boat, the highest results in speed will be attained by placing the greater dimension of the bottom transversely to the line of motion for the following reason: When in motion the loaded plane is constantly encountering and bearing down upon a new section of water that lies entirely quiescent and whose inertia resists the tendency of the superincumbent weight to dash it suddenly downward out of its quiescent position. It may be moved gradually, but not instantaneously. It requires time as well as pressure to displace the body of water underneath, and (as we do not wish to displace it) the less time the area of the plane occupies in passing over an equal area of the water the less tendency there will be to displace it and the more perfectly its *vis inertia* will be utilized. For example, should the dimensions of the bottom be eight by four feet (giving an area of thirty-two square feet) if we place the longer dimension transverse to the line of motion it will glide over that area of water in one-half of the time and have only half the tendency to sink that it would if the narrow end had been placed forward. This principle is seen illustrated in "sailing" birds, their wings being relatively narrow in the direction of flight and long transversely. Hence, whenever the nature of the service required of this craft permits of it I make the dimension of the bottom in the direction of the line of motion considerably less than its transverse dimension, as shown, for instance, in Fig. 5.

The boat is to be guided by a rudder, placed either at the bow or stern, and is to be driven by any suitable power, and whenever desired it may be supplied with a thin centerboard and sails and driven by the wind.

Though this form of craft is peculiarly adapted for light and swift traveling, by giving it the proper dimensions and rigidity it may be employed for heavy cargoes and driven by power. It is designed mainly for use on inland waters. There are many thousand miles of rivers on this continent and all over the world now utterly unnavigable by reason of their shallowness, which could be made attractive and busy thoroughfares of travel and commerce by the employment of these boats.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A boat or water-craft having its front portion made buoyant and the rear portion made as a submergeable tail arranged to bear flatwise upon the water, the said rear and front portions being rigidly connected together with a continuous bottom line, substantially as and for the purpose described.

2. A boat or water-craft having at the lower part of its rear end a tail substantially horizontal in cross-section, and having an overhanging rear deck with side pieces extending to the rear end of the tail and provided with a hinged door or flap forming a backwater-check, substantially as and for the purpose described.

3. A boat or water-craft having a flat bottom provided at its rear end with a tail substantially horizontal in cross-section, and provided also with downwardly-projecting vertical blades or fins along the edges of its bottom, substantially as and for the purpose described.

4. A boat or water-craft having a flat bottom extended beyond the stern in the form

of a tail substantially horizontal in cross-section, said boat being of greater dimension transversely to the line of the boat's motion than it is parallel to the line of its motion, substantially as and for the purpose described.

5. A boat or water-craft having its bottom substantially horizontal in cross-section and having its buoyant-hull portion or hold terminating some distance in advance of the rear end of its said bottom, said rear end being open to the water and submergeable, substantially as and for the purpose described.

FRANCIS E. MILLS.

Witnesses:
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P. B. TURPIN.