No. 646,859. Patented Apr. 3, 1900.

W. B. MOTHERAL.

VESSEL.

(Application filed Feb. 16, 1899. Renewed Nov. 21, 1899.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 6.

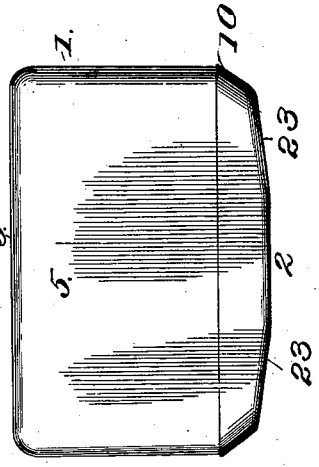
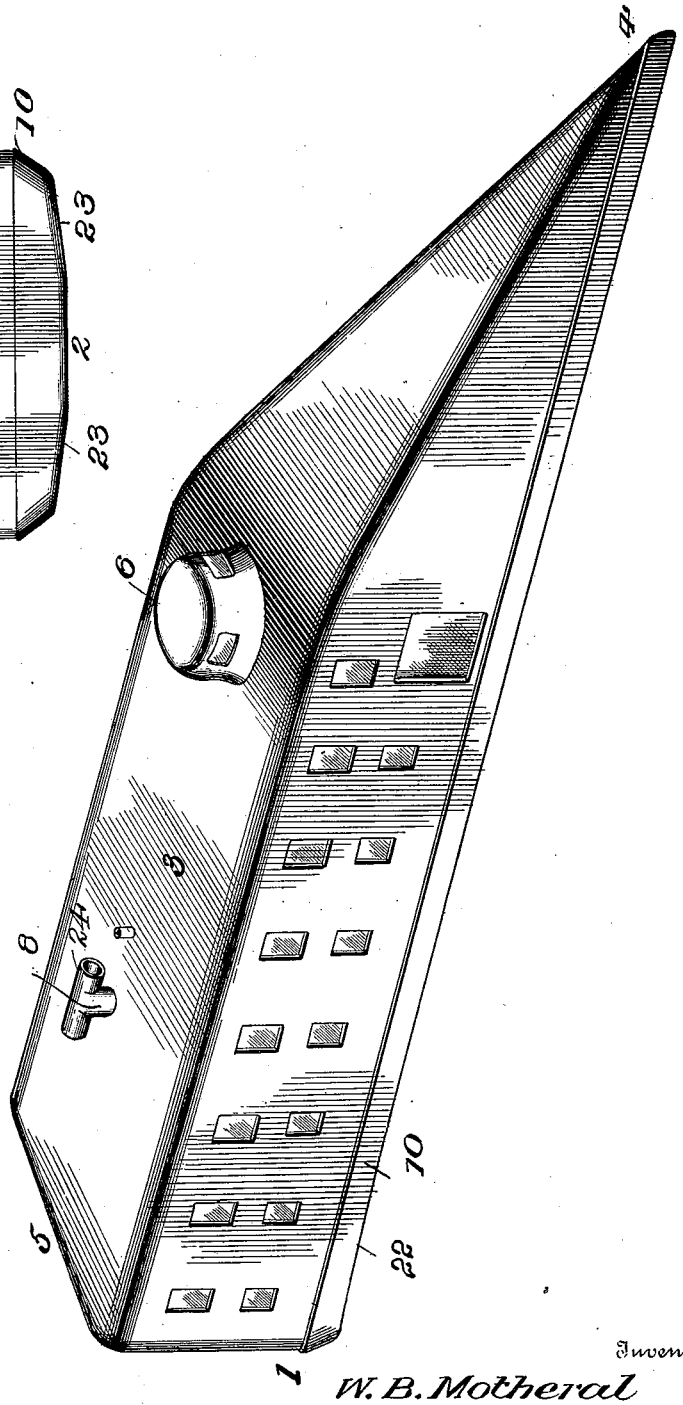


Fig. 7.



Witnesses
Jas. Mimie
Glasys L. Thompson

Inventor
W. B. Motheral
by R. A. B. Lacey his Attorney

No. 646,859. Patented Apr. 3, 1900.

W. B. MOTHERAL.

VESSEL.

(Application filed Feb. 16, 1899. Renewed Nov. 21, 1899.)

(No Model.) 3 Sheets—Sheet 2.

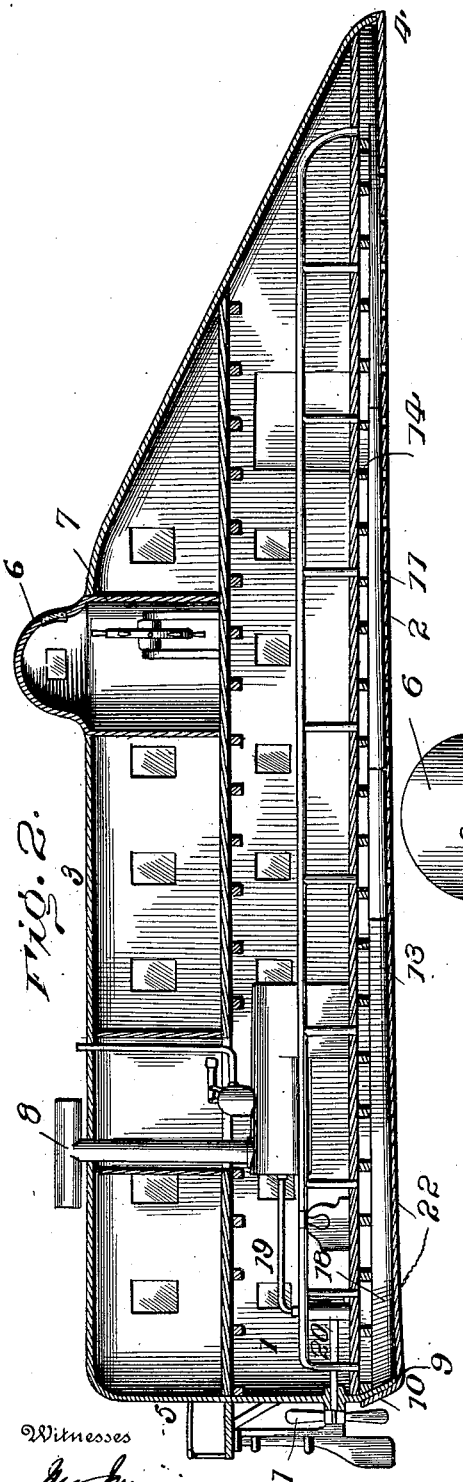


Fig. 2.

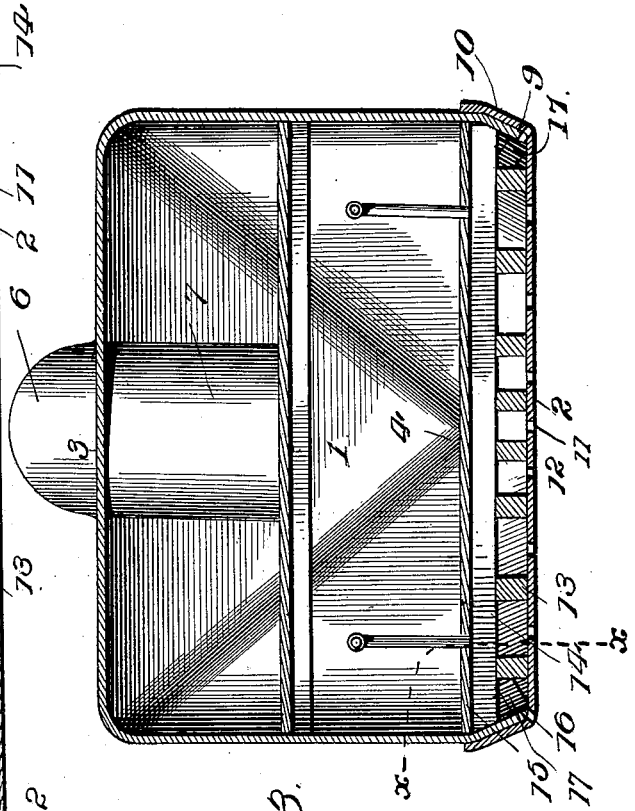


Fig. 3.

Witnesses
Geo. Smith
Alberta L. Thompson

Inventor
W. B. Motheral
By R. A. P. Lacey
Atty
Attorneys

No. 646,859. Patented Apr. 3, 1900.

W. B. MOTHERAL.

VESSEL.

(No Model.) (Application filed Feb. 16, 1899. Renewed Nov. 21, 1899.)

3 Sheets—Sheet 3.

Fig. 4.

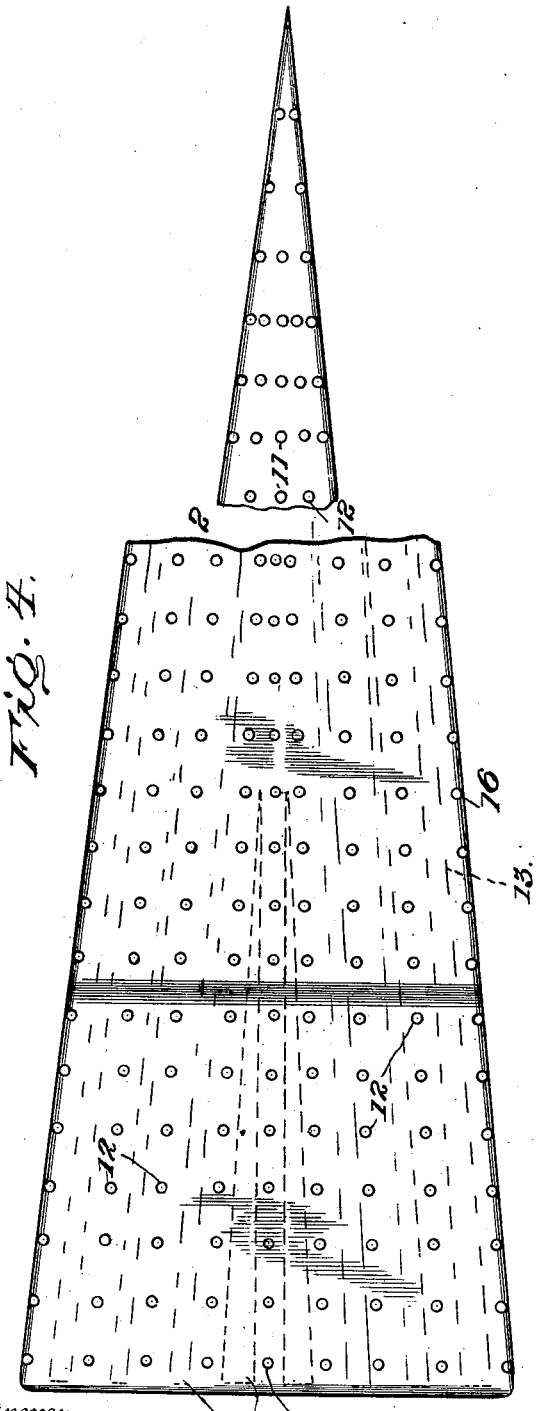
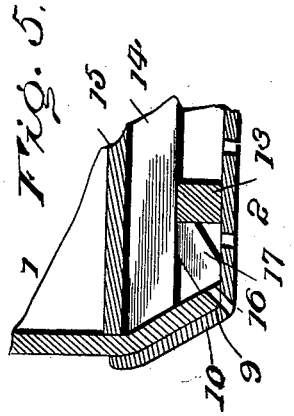


Fig. 5.



Witnesses
Jno. Imrie
Gladys L. Thompson

Inventor
W. B. Motheral
by R. H. Lacey
Att'y & Attorneys

UNITED STATES PATENT OFFICE.

WILLIAM B. MOTHERAL, OF NORTH McGREGOR, IOWA.

VESSEL.

SPECIFICATION forming part of Letters Patent No. 646,859, dated April 3, 1900.

Application filed February 16, 1899. Renewed November 21, 1899. Serial No. 737,819. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM B. MOTHERAL, a citizen of the United States, residing at North McGregor, in the county of Clayton and State of Iowa, have invented certain new and useful Improvements in Boats; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to boats of the type which reduce the water friction by directing air under pressure at all points of water contact, and consequently minimize the displacement by the interposition of a sheet of air and institute a friction of the latter almost exclusively, and particularly when traveling at a high rate of speed, and which is materially less than the water friction impeding the ordinary boat, with a displacement proportionate to weight and dimension.

Structurally the boat is cuneiform and comprises a double bottom with an intervening chamber, the lower wall being of sheet metal, with apertures therein extending from stern to bow in regular sequence and conforming in lines of direction to the opposite sides, said lines of apertures being intercepted or partitioned from each other by beams affixed on said lower wall and the outer ones at the same angle as said sides and the inner ones regularly varying inward, and thereby subdivide the chamber into channels, which will cause an equal exudation of air through all the apertures. The stern curves downward to a slight extent to increase the pressure on the water at this point and induces a rise of the same. A series of apertures are also located at the angle of juncture of the bottom wall with the sides to eliminate the friction that would otherwise exist at said points. Above the bottom the boat is shaped to give the best results from a standpoint of least obstruction and gradually slopes at top from the tip of the bow upwardly over the rear to avoid formation as much as possible of any resisting projections and cause the atmospheric air to freely slip over the same toward and off the stern.

In the accompanying drawings, Figure 1 is a perspective view of a boat embodying the invention. Fig. 2 is a longitudinal vertical section of the same. Fig. 3 is a transverse vertical section, on a larger scale, taken at a point about midway of the length of the boat. Fig. 4 is a top plan view of a part of the bottom of the boat, broken through to admit of illustration on a large scale. Fig. 5 is an enlarged section on the line x x, Fig. 3. Fig. 6 is an enlarged transverse vertical section of the boat-bottom, showing a modification.

Referring to the drawings, wherein similar numerals are utilized to indicate corresponding parts in the several views, the numeral 1 designates the hull, which is cuneiform, particularly on opposite sides, and has a keelless flat bottom 2 of a similar configuration, and the top 3 longitudinally from the tip of the bow 4 to a suitable intermediate point is sloped downwardly, and from the upper termination of the latter rearward to the stern 5 the said top is horizontal. Nearer the bow a spherical dome or cap 6 is situated and forms the top of a pilot-inclosure 7, which depends below the adjacent deck and is provided with a sight-opening having a suitable transparent plate therein constructed to operate in accordance with any of the now well-known and approved forms of such devices. The top in rear of said dome or cap is intended to be closed and without obstruction, and the smoke-stack 8 sets low and is formed in a manner as will be more particularly hereinafter set forth. From the front the top is closed down and runs upward and rearward gradually from the dome or cap 6. By means of this entire top contour the atmospheric air is caused to flow or slip easily over the same, and very little, if any, obstructive interference results. This is particularly true when strong head-winds are encountered, and the boat will be more satisfactorily managed and the progressive velocity less impaired in view of this special construction than under other conditions where obstructions are present.

The bottom 2 is formed of any suitable sheet metal having the necessary characteristics for the purpose and overlaps the adjacent edges of the bottom sides 9, as at 10. A central line of apertures 11 are formed in this bottom, and on either side are other lines of apertures 12, which are parallel with opposite

sides of the bottom and laterally spaced apart at regular intervals toward the central line. The lines of apertures 12 are wider apart at the stern than at the bow and converge toward the latter, so that as the transverse distance diminishes they fall short of equal longitudinal extent at the front or a point where so many are not necessary and could not be practically located, and thus provide for proportionately supplying the amount of air required to maintain an equilibrium throughout the entire bottom length and in accord with the width of water-contacting surface.

Between the lines of apertures in the bottom beams 13 are fixed to the upper side, the outermost ones being disposed at an angle parallel with the opposite sides and gradually changing angle as they approach the center. These beams taper regularly toward their front ends and vary in length, the outer ones being longer than the contiguous inner ones and together form elongated channels to more uniformly direct the air under pressure to the several lines of apertures throughout the length of the bottom.

Resting in fixed position on the beams 13 at regular desired intervals are transverse ribs 14, to which a floor 15, forming the upper inclosure of the air-compartment, is applied. The surrounding edge portions of the bottom 2 are overlapped or turned up and secured over the lower terminating parts of the opposite sides 9 of the bottom, as before set forth, as well as the stern, and at the bend the said bottom is also provided with apertures 16. From the opposite ends of the ribs 14 braces 17 extend down to the inner lower edges of the sides 9 to resist lateral strain or crushing that might result from striking extraneous objects, and said apertures 16 are between said braces and materially reduce the water contact by also having an outflow of air under pressure adjacent these parts and where an obstructing drag would also otherwise exist. The said sides and stern are also disposed at an inward angle of inclination. The sides by this contour have an easement in clearance of the side water-wall during the forward movement of the boat; but practically this shape enlarges the capacity of the boat above the water and load line. The stern as shaped in this manner will stand free more readily from the churn or rear suction and encourage the institution of what can be termed a "minus" pressure, which arises by the quick and pull-away movement due to the rapid progressive velocity of the boat. The air-compartment thus formed is tight, so far as undesirable leakage is concerned or the escape of air, except through the apertures of the various parts of the bottom 2, as described, and air is fed thereto by a suitable apparatus 18, controlled in its operations by a steam or other motive power generator 19, having connection with a propeller-shaft 20, provided with a suitable propeller 21.

In the main figures of the drawings the rear part of the bottom 2, adjacent the stern, has a slight downward curvature, as at 22, the arc of the curve having an extended radius, and a pressure on the water and slip-over during the rise is set up by this means at the said stern. In other respects the boat thus far described is supplied with the usual decks and appurtenances of ordinary boats, and variations and additions will depend solely on the proportions and dimensions as well as the intended use.

In Fig. 6 a slight modification is shown and consists in forming opposite portions of the bottom with slight upward bevels 23, which are wider at the stern and proportionately diminish toward the bow. The purpose of these opposite bevels is to overcome the lateral water contact or buttage to a still greater degree, and consequently reduce the entire friction of resistance and cause a more sensitive response to the driving influence of the propulsive means.

In position in the water the improved boat has a greater depression at the stern than at the bow, the latter being almost clear, and this is dependent on the weight and dimensions, as well as the load. When the boat is at dock or anchored, the lower air-compartment is kept full of air to prevent the water from running through the various apertures in the bottom 2, and the air-supply pressure is at all times maintained in excess of the amount actually needed to effectually operate in the desired manner. The reason for this is that in forward motion the bow rises and the air flows out the front apertures first, and without the excessive supply-pressure the equilibrium of air in the entire compartment would be varied and rendered deficient to produce an equable distribution at all points on the bottom from bow to stern. After the rise of the bow the boat elevates regularly toward the stern, the latter being raised last, and the air flows out the several lines of apertures toward the rear in sequence, and a sheet or stratum of air is established between the bottom 2 and the water, and at the same time the air is released through the edge apertures 16 to diminish the lateral water contact. The pressure of the air-supply will be sufficient to overcome the water contact or friction, as well as suctional tendencies, and the interposed stratum will be of a forceful effect proportionate to the transverse dimension of different parts of the bottom or the number of air-feeding apertures, which are greater at the wider parts than the adjacent or advance narrower portions. By this means the bottom of the improved boat has an air lubrication, which will encourage an increased velocity under the same motive power as in boats of common form.

The stack 8 has a horizontal funnel 24 mounted thereon and open at both ends, which serves to create sufficient draft and also drive

the smoke rearwardly over the stern and also materially reduces the obstruction to atmospheric pressure at this point.

Having thus described the invention, what is claimed as new is—

In a boat of the type described, a substructure comprising an air-compartment closed at its edges by the sides of the hull and at its top and bottom by a floor and a sheet-metal covering, the latter having its edge portions upwardly divergent and overlapping the lower edge portions of the sides which are inwardly deflected and secured thereto, and having lines of apertures in the surface rearwardly divergent and regularly spaced and in the bend, longitudinally-disposed beams rearwardly divergent, tapering and placed between the lines of apertures, transverse ribs placed upon the longitudinal beams and supporting the floor, downwardly-divergent braces interposed between the end portions of the transverse ribs and the inner lower edges of the bent-up sides and disposed to come between the apertures at the bend of the said sides, and means for charging the compartment with air under pressure, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM B. MOTHERAL, [L. S.]

Witnesses:
GLADYS L. THOMPSON,
GENEVIEVE MATTHEWS.