No. 803,172. PATENTED OCT. 31, 1905.

S. LAKE.

SUBMARINE VESSEL.

APPLICATION FILED MAY 28, 1901.

2 SHEETS—SHEET 1.

Fig. 1.

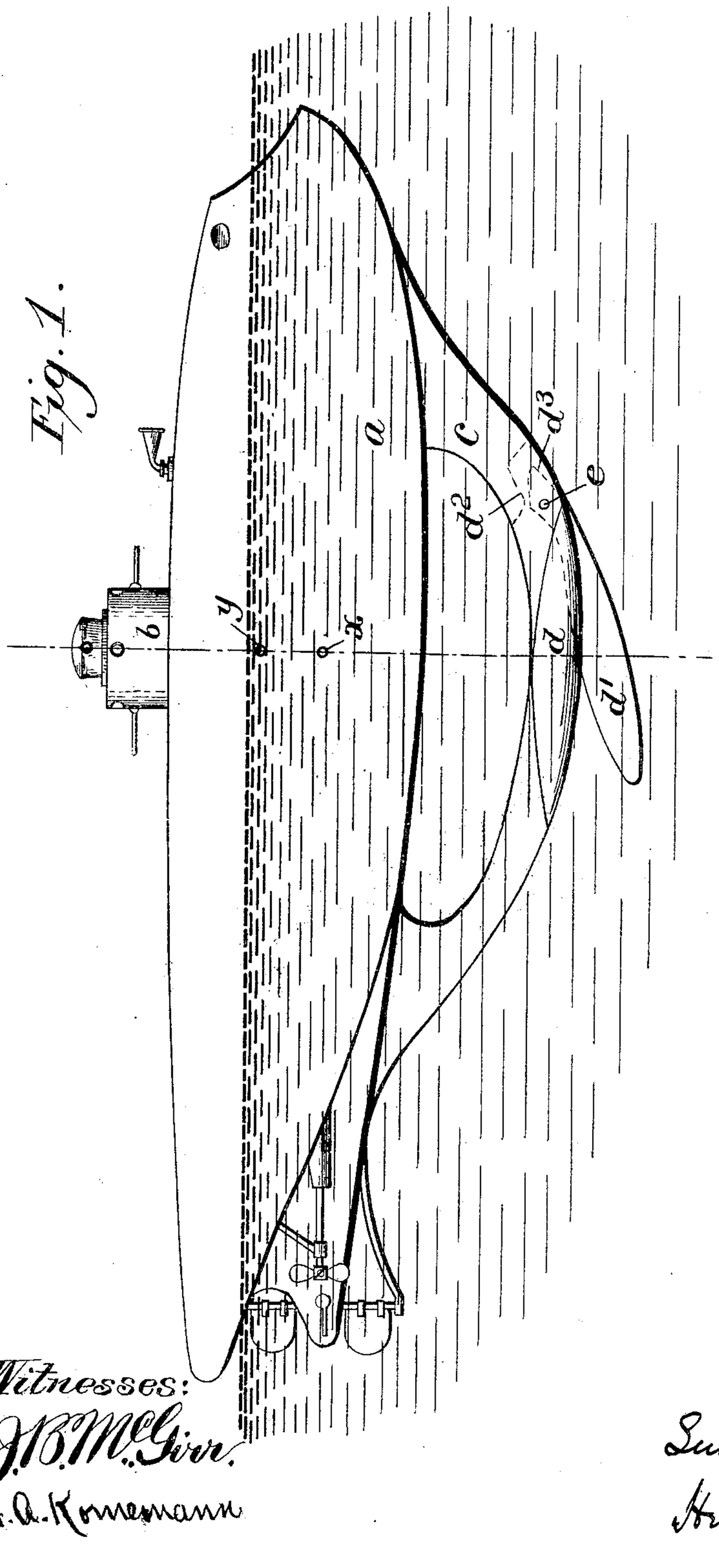
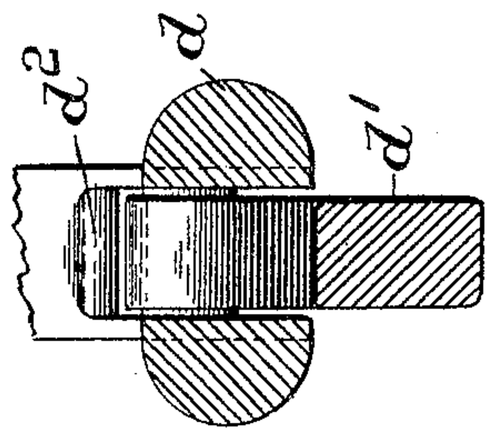


Fig. 2.



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Inventor:
Simon Lake, per
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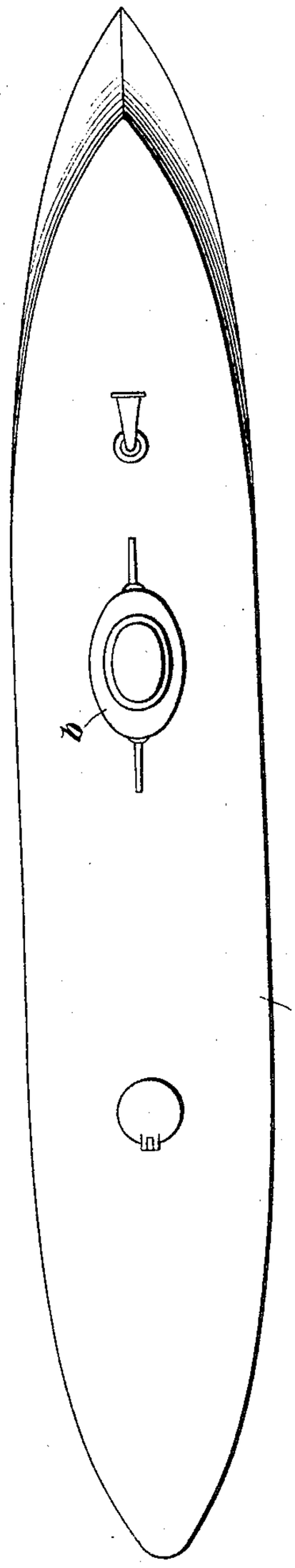

Fig. 3.

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UNITED STATES PATENT OFFICE.

SIMON LAKE, OF BRIDGEPORT, CONNECTICUT.

SUBMARINE VESSEL.

No. 803,172. Specification of Letters Patent. Patented Oct. 31, 1905.

Application filed May 28, 1901. Serial No. 62,209.

To all whom it may concern:

Be it known that I, SIMON LAKE, a citizen of the United States, and a resident of Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Submarine Vessels, of which the following is a specification.

In the construction of submarine torpedo-boats for harbor and coast defense the element of speed is a matter of comparatively little consequence, as their function is one of defensive rather than offensive warfare, in which it is their duty to wait the approach of a hostile vessel or fleet before taking any active steps toward engaging the enemy. In cases, however, wherein the submarine boat is designed for operation with a cruising-squadron and is required to attain the cruising speed of the fleet in which it may be included for offensive operations against the enemy the adaptation of the shape of the hull to the requirements of a faster class of vessels, while accommodating it also to the necessities of its peculiar function, as distinguished from that of its associates, involves certain problems which have heretofore remained unsolved, among which is the matter of fore-and-aft stability. So long as the relative length and breadth of beam for this class of vessels is maintained within a ratio of approximately six to one the hulls may be designed to obviate any tendency to turn over, bow or stern downward, by locating the center of gravity materially below the center of buoyancy in the suitable arrangement of the machinery and water-ballast compartments; but these proportions are found to be unsuited to the delicate lines requisite for high speeds, and it is principally the object of the present invention to provide a means of insuring fore-and-aft stability in vessels of this type requiring the proportion of the length to the breadth of beam to be much greater than that above mentioned.

To this end the invention consists, essentially, in the combination, with the hull, of a depending web or support which sustains a weight at some distance below the lower side of the hull and beneath its center of buoyancy. By locating the weight outside of the hull and maintaining it in a fixed relation thereto the center of gravity of the boat as a whole is lowered to such a degree beneath the center of buoyancy that a decided tendency is created to preserve the boat in its normal fore-and-aft trim and which opposes any relative vertical movement by the bow or stern during submergence. The addition of a conning-tower upon the upper side of the hull adds materially to the righting moment so created, while the formation of the depending weight into a rigid and a depending hinged section enables the latter to perform the additional function of relieving the boat of a portion of its ballast when dragging upon the water-bed and to thus serve as a yielding runner for causing the boat to follow the contour of the water-bed when desired without danger of its striking the latter or any small obstruction thereon, and so damaging its hull.

The invention will be more fully understood by reference to the annexed drawings, in which—

Figure 1 is an elevation representing a submarine boat embodying my present improvement, and Fig. 2 is a transverse section of the ballast-weight applied to the web or support depending from the hull. Fig. 3 is a plan of the boat.

The hull *a* is shown provided upon its upper side with the conning-tower *b* for the look-out or steersman and on its lower side with the depending longitudinal web or support *c*, extending nearly from the bow to the stern, but having upon its extreme lower edge and intermediate of its ends directly beneath the center of gravity of the hull (designated by the letter *x* in Fig. 1) a bulb or enlargement *d*, constituting a ballast-weight for producing a tendency of the boat to maintain its trim when submerged, and thus deprived of the greater portion of its surface stability by the filling of its water-ballast tanks. The web *c* is represented as of skeleton form, constructed as a narrow guard with a transverse opening intermediate the ends beneath the center of gravity and carrying beneath the same the rigid ballast-weight *d*. The bulb or enlargement *d* is spaced a material distance beneath the bottom of the hull and preferably a space exceeding its depth or vertical thickness and is also preferably of a width considerably exceeding the thickness of the supporting-web *c*, all as indicated in the drawings. It is herein shown divided at the center to receive the section *d'*, constituting a weighted arm, which is sustained therein by the pivotal pin *e*, but normally hangs with its lower end beneath the same in a backwardly-inclined position by means of a rigid stop-shoulder d^2 in the rigid section *d*, which engages the toe d^3 of the hinged section upon the opposite side of

the pivotal pin *e*. This hinged section not only contributes its portion of the ballasting-weight while the boat is traveling between the surface and the water-bed, but serves as a yielding skate or runner, depending slightly below the rigid portions of the boat, which when in contact with the bottom transfers its weight to the latter and operates as a moving anchor, to which the boat is moored by its pivotal pin *e*, and is thus caused to follow any irregularities in the surface of the water-bed and avoids small obstructions thereon, which would be liable to damage the hull by impact therewith.

From the foregoing description, in connection with the accompanying drawings, it will be observed that the ballast-weight, although rigidly connected with the hull by means of its web or support, is wholly separated therefrom in the sense that it is located at some distance below the bottom of the same and that it is disposed in a vertical line passing through the center of buoyancy *y* of the hull, as well as its center of gravity *x*. (Indicated in Fig. 1 as slightly beneath the latter.)

In this class of vessels for a given displacement of hull the amount of dead-weight permissible in machinery and permanent ballast is limited, and with a continuous web *c* the spacing of the ballast-weight *d* considerably beneath the body of the hull would involve the employment of an excessive distributed weight in that portion of the web *c* above the weight *d*, which would necessarily require the limitation of the magnitude of the latter, and therefore impair the effectiveness of the present improvement. By giving this web, therefore, a skeleton form and omitting that portion of what would otherwise be a continuous web above the ballast-weight *d* an open space is left above the latter, and the weight thus removed from the web is adapted to be added to the weight *d*, where it becomes far more effective in its increased distance beneath the center of buoyancy. By making the forward portion of the web *c* curved in the form of a runner the boat is adapted to travel over small obstructions upon the water-bed without collision of the hull therewith and its consequent injury.

By locating the conning-tower directly above the center of buoyancy of the hull the stability of the boat is increased both fore and aft and athwartship while under submergence, and this feature is therefore of importance whether employed in conjunction with or independently of the weighted keel or web above described.

What I claim is—

1. A submarine boat comprising a hull, a longitudinal web or support depending therefrom, a weight rigidly attached to said web or support beneath the center of buoyancy of said hull, and a second weight pivotally connected also with said web or support and normally depending below said rigid weight.

2. A submarine boat comprising a hull, a longitudinal web or support depending therefrom, a rigid weight formed integrally upon the lower edge of said web or support beneath the center of buoyancy of said hull, a second weight pivotally connected also to said web or support and normally depending below said rigid weight, and a stop for maintaining said pivoted weight in a rearwardly-inclined position beneath said rigid weight.

3. A submarine boat comprising a hull, a longitudinal web or support depending therefrom, a weight rigidly attached to said web or support and spaced materially below the said hull and beneath the center of gravity of the same, and a yielding arm depending from said hull below said rigid weight.

4. A submarine boat constructed with a hull whose length exceeds five times its breadth of beam and provided with a depending web formed as a narrow guard with a transverse opening intermediate the ends, and a ballast-weight rigidly secured to the lower edge of the same beneath its opening and the center of buoyancy of the hull.

Signed at Elizabeth, in the county of Union and State of New Jersey, this 23d day of May, A. D. 1901.

SIMON LAKE.

Witnesses:
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HENRY J. MILLER.