2 Sheets--Sheet 1.

J. W. NORCROSS.

Construction of Vessels.

No. 163,941. Patented June 1, 1875.

Fig. 1.

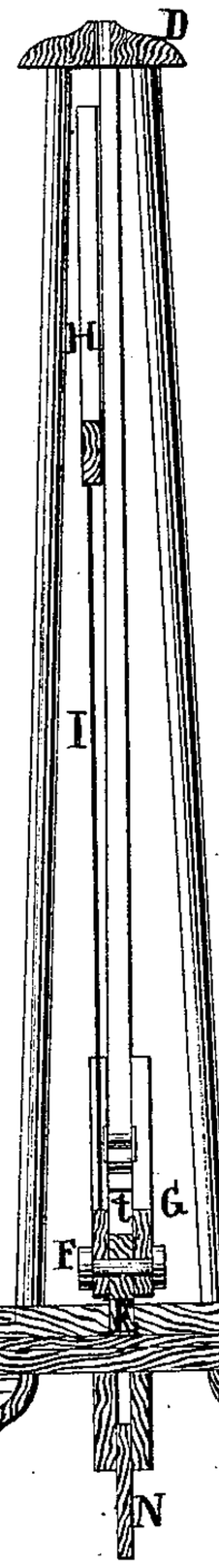


Fig. 2.

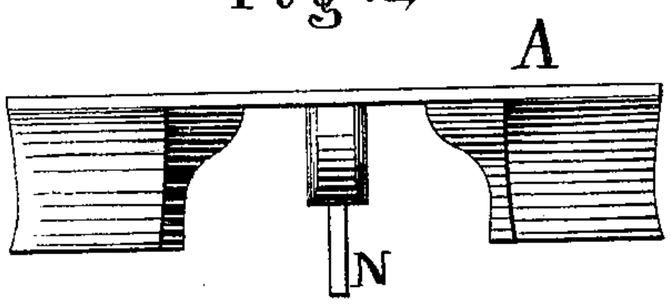
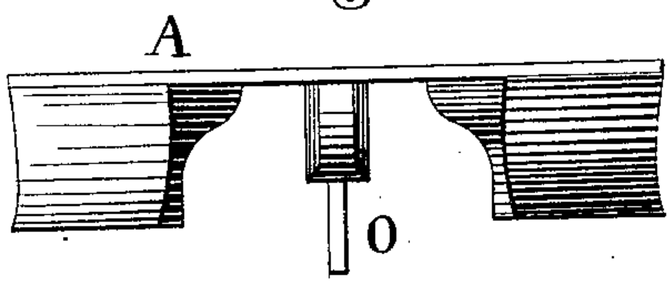


Fig. 3.



Witnesses

Henry Gentner

Chas. Wahlers.

Inventor:

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THE GRAPHIC CO. PHOTO-LITH. 39 & 41 PARK PLACE, N.Y.

2 Sheets--Sheet 2.

J. W. NORCROSS.

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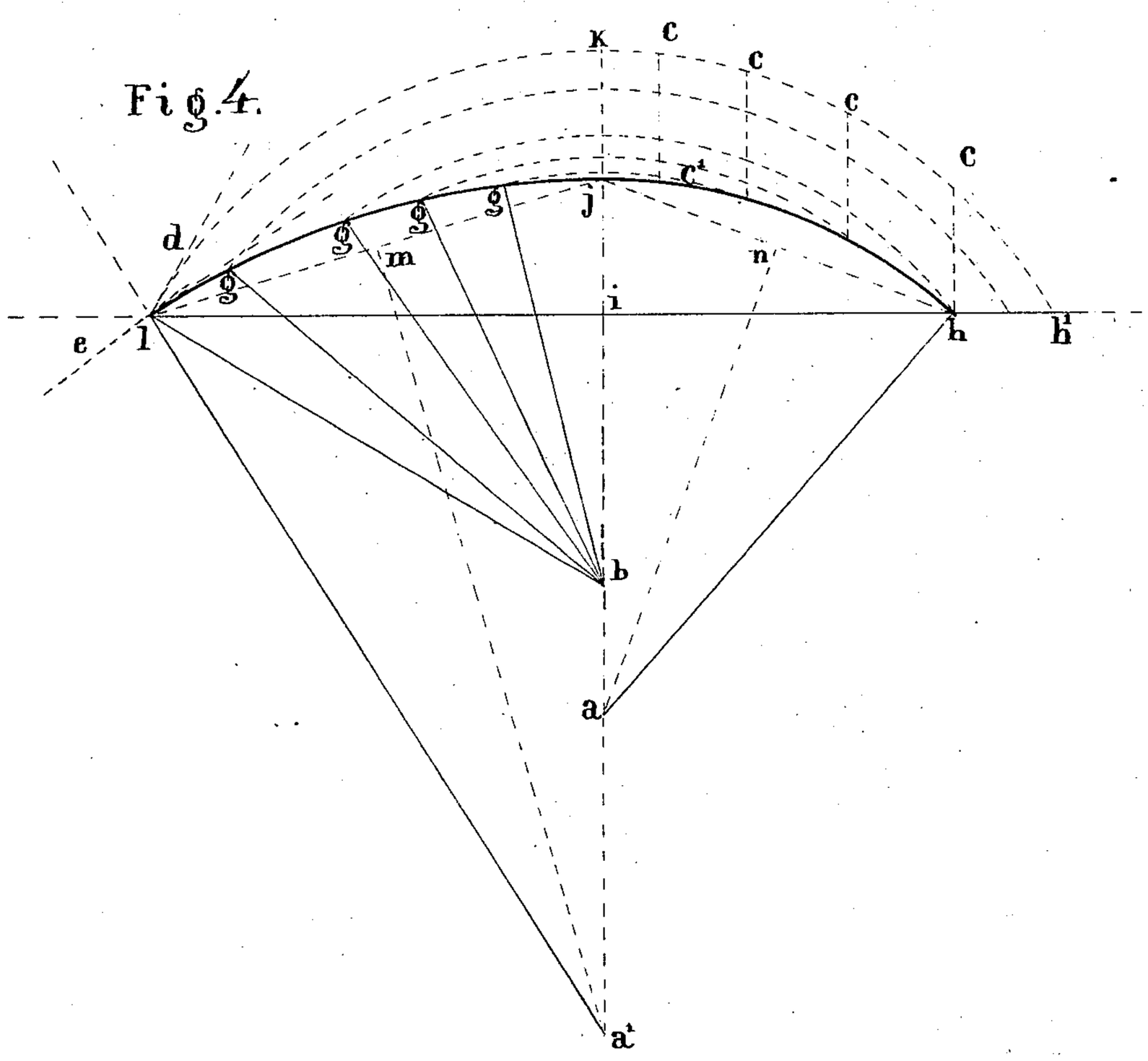
Fig. 4.



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UNITED STATES PATENT OFFICE.

JOSEPH W. NORCROSS, OF EAST BOSTON, MASSACHUSETTS.

IMPROVEMENT IN THE CONSTRUCTION OF VESSELS.

Specification forming part of Letters Patent No. **163,941**, dated June 1, 1875; application filed August 26, 1874.

To all whom it may concern:

Be it known that I, JOSEPH W. NORCROSS, of East Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in the Construction of Vessels, of which the following is a specification:

This invention relates to a vessel the hull of which is so formed that it displaces the water to the best possible advantage, and a vessel of superior strength, speed, and safety is obtained.

This invention is illustrated in the accompanying drawing, in which Figure 1 is a transverse section of the improved vessel. Fig. 2 is a front view. Fig. 3 is a rear view. Fig. 4 is a diagram explaining the method of drafting the lines of my vessel.

Similar letters indicate corresponding parts.

In these drawings, the letter A designates the hull of my vessel, the form of which is derived from laws of nature. A particle of water which is forced aside by coming in contact with the advancing vessel seeks to regain its former position, and if a vessel is shaped in the ordinary manner such particle strikes the side of the vessel again and again before it passes the stern, and thereby the speed of the vessel is materially retarded. The correctness of this theory will be apparent by observing a small piece of wood floating in the water close to the side of a vessel, and it is also sustained by the well-known tendency of "sucking under" which the water has close to the side of a vessel in motion. The speed of a vessel constructed in the ordinary manner is also materially retarded by the vacuum formed in the rear of said vessel. Whenever such vacuum exists the water rushes from all directions to fill it, and the currents produced thereby, particularly those from under the vessel, are in direct opposition to its motion.

The lines of my vessel are formed according to the diagram, Fig. 5, where the letter a' is the center of forward section, and the letter a the center of aft section. b is the center of the course of water. e is a tangent to the forward section, and indicates the plane of excidence. d is the angle of deflection. The lines $b\,g$ show the gradual decrease of this angle until it runs out at the terminus of displacement. The currents of water meet at the point h'. The centers a and a' of the aft and fore sections of the vessel are found in the following manner: I draw a line, $h\,i$, and make this line equal to the distance the vessel will move in one second of time at the required speed—for instance, equal to eighteen feet if the speed of the vessel is to be twelve miles per hour. On the end i of this line I erect a perpendicular line, $i\,j$, and make this equal to the distance the water will move in one second of time in replacement. This distance I have determined by experiment, and I have found it to be three feet, or nearly so. Then I draw the line $j\,h$, and erect on its middle the perpendicular line $n\,a$. The center a' is obtained by elongating the line $i\,j$, making the elongation $j\,k$ equal to $i\,j$, and describing a circle, $k\,l$, with the radius $a\,j$, from the center b; then drawing the line $l\,j$, and erecting on its middle a perpendicular line, $m\,a'$. By these means the width of the vessel will be twice the length of the line $j\,i$, or six feet. If the width is to be greater, the arc $j\,h$ is continued beyond h until a line drawn from the end of the arc parallel to the line $h\,i$ will strike the line $j\,a$ at the required distance from j. In all cases the line $j\,k$ must be made equal to one-half the width of the vessel. This purpose can also be obtained by increasing the radiuses $a\,j$ and $a'\,j'$, and describing arcs concentric to $j\,h$ and $j\,l$.

The arc $l\,j$ I term the line of displacement, and the arc $j\,h$ the line of replacement; and I have found that a chip of wood floating in the water, when struck by the vessel's bow, will be deflected in the circle $l\,k$, and fall back to the point h' without touching the side of the vessel for a second time. If the chip of wood comes in contact with the vessel at either of the points g, Fig. 4, it will be deflected, as indicated by the dotted circles described, from these points, which indicates that the currents of water produced by displacement and replacement will not interfere with the progress of my vessel.

The hull which I have represented in the drawing is composed of two boats. (See Figs. 1, 2, and 3.) In this case the lines of displacement and replacement remain the same on the outside; but on the inside the water-lines are straight. By this construction the water on

the inside of the two boats is simply cut off from the water to be displaced. It cannot escape, as it has nowhere to go, and consequently, aside from friction, it can have no other effect on the vessel. By swelling out the draft-line at the center I impart to my vessel great buoyancy, and a superior quality to float in large waves.

The cross-section of my vessel is shown in Figs. 1, 2, and 3.

It has been the practice to make the cross-sections of most vessels on a convex curve; also to give them "dead rise." The effect of such a form is to deflect or force the water downward, and to move and disturb unnecessary water sometimes quite remote from the line of passage. The cross-section of my vessel is concave at the entrance, so as to deposit the water on the surface at the point of intersection with the horizontal deflection. It being evident that all displacement ends at the greatest width of the vessel, all curves, as a matter of course, end at this point, the sides being vertical, and at right angles to the bottom, while the same are slightly convex toward the stern, as shown in Fig. 4.

The bottom of my vessel is flat; but in order to contend with large waves, said bottom may have a lateral incline, not outward, as is usually done, but inward, so that the work of displacing the water is all done by the outside edge, and the staunchness of the vessel is materially increased.

What I claim as new, and desire to secure by Letters Patent, is—

A vessel the aft section of which forms an arc, *j h*, described from a center, *a*, while its forward section forms an arc, *j l*, described from a center, *a'*, the centers *a* and *a'* being obtained substantially in the manner described, and illustrated in Fig. 4, for the purpose specified.

In testimony that I claim the foregoing I have hereunto set my hand and seal this 14th day of August, 1874.

JOSEPH W. NORCROSS. [L. S.]

Witnesses:
W. HAUFF,
E. F. KASTENHUBER.