(No Model.)

4 Sheets—Sheet 1.

W. COWLES.

FERRY BOAT.

No. 355,682.

Patented Jan. 11, 1887.

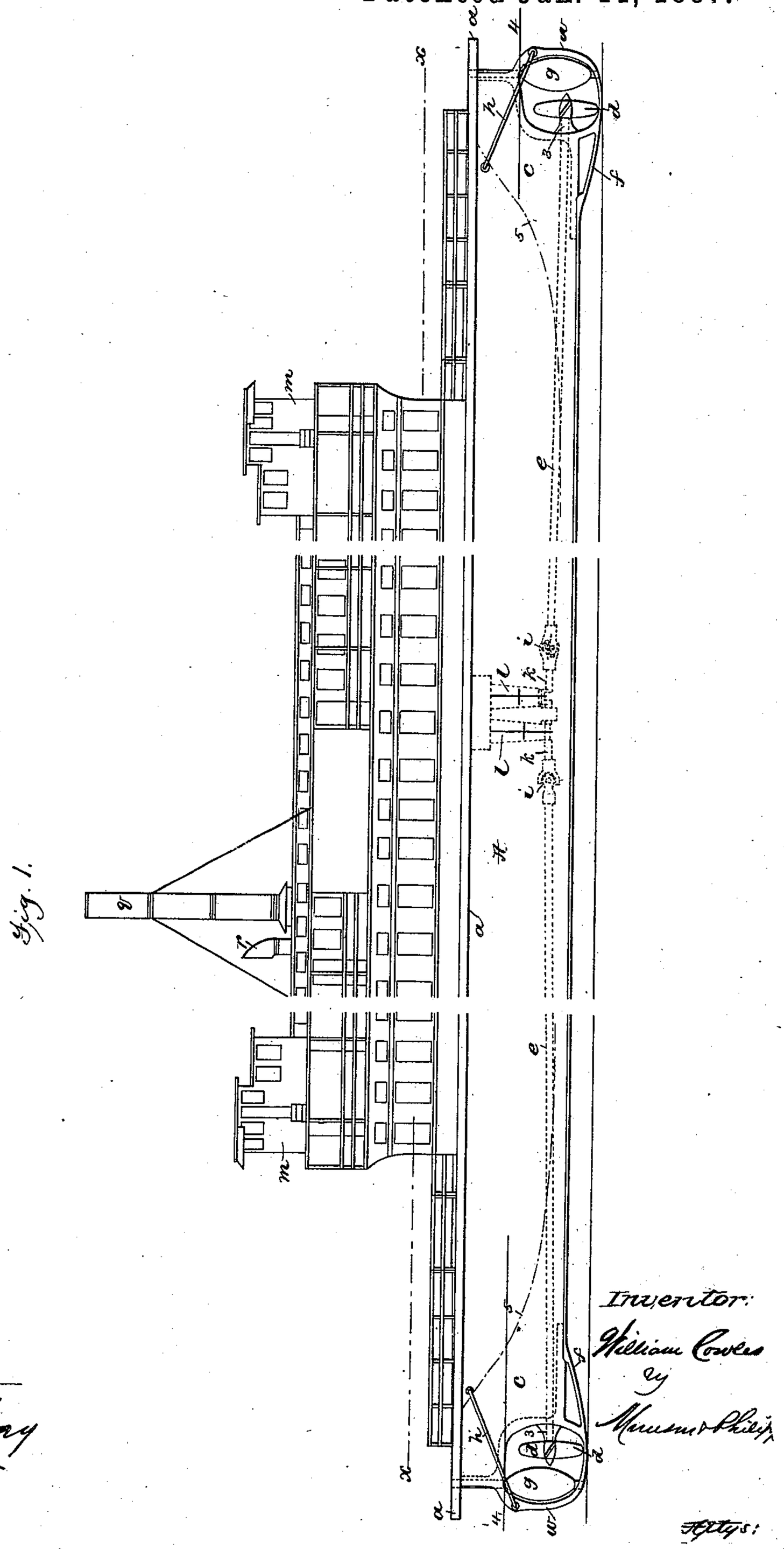

Fig. 1.

Attest:

Geo. H. Bolte.

J. A. Hovey

Inventor:

William Cowles

by

Munson & Philipp

Attys:

(No Model.) 4 Sheets—Sheet 2.

W. COWLES.

FERRY BOAT.

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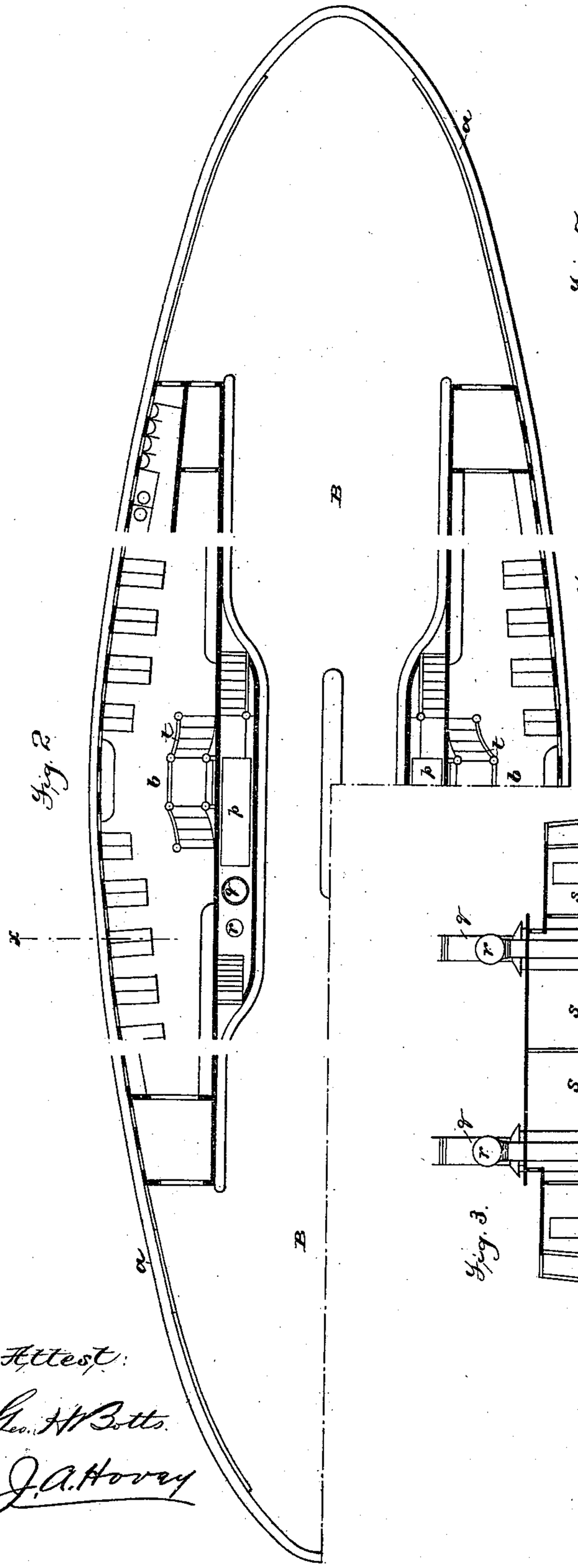

Fig. 2.

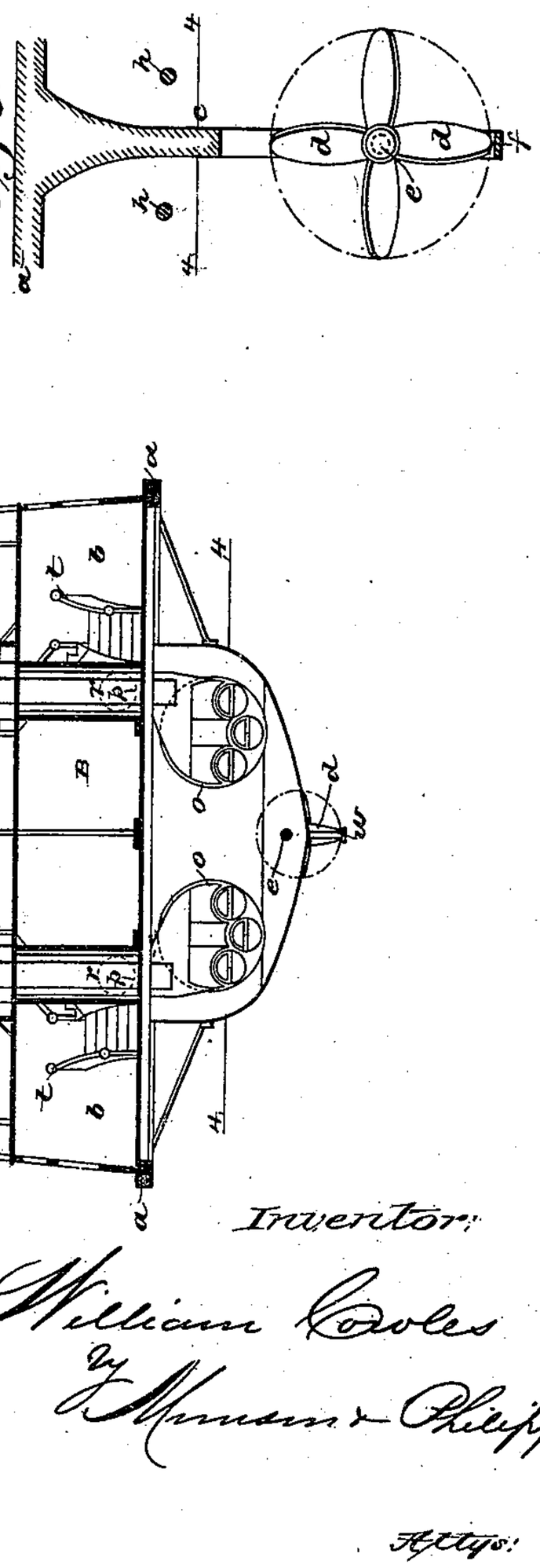

Fig. 3.

Fig. 7.

Fig. 6.

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W. COWLES.

FERRY BOAT.

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Fig. 8.

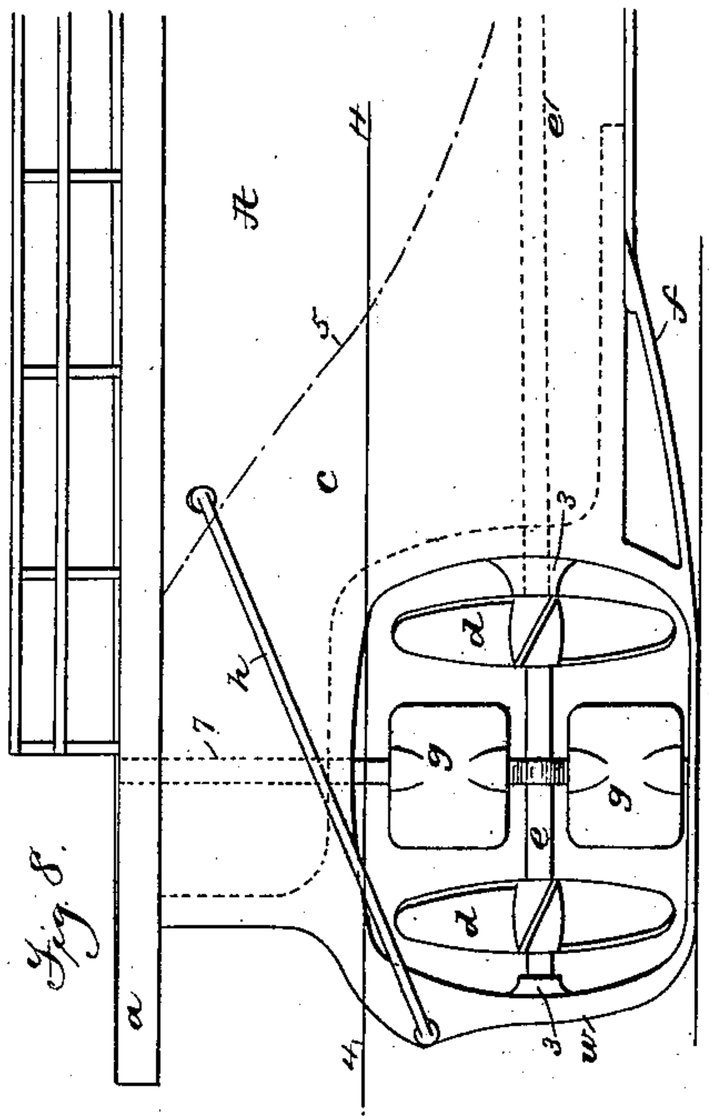


Fig. 9.

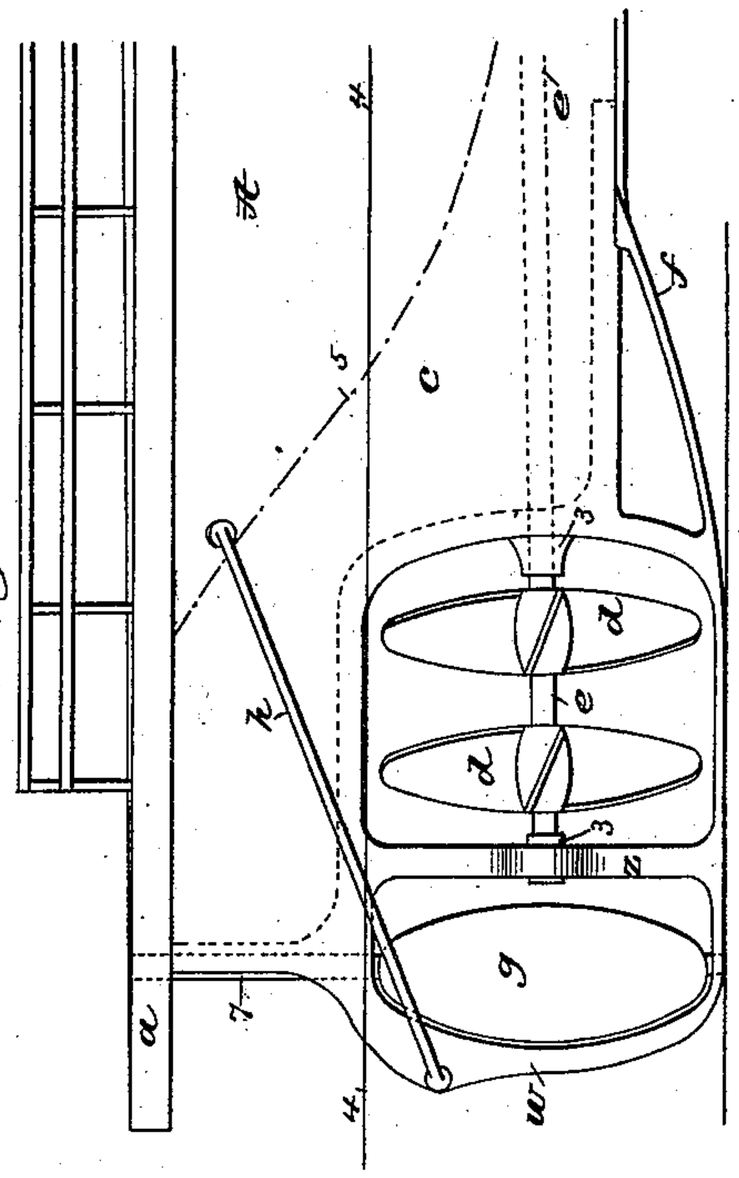


Fig. 4.

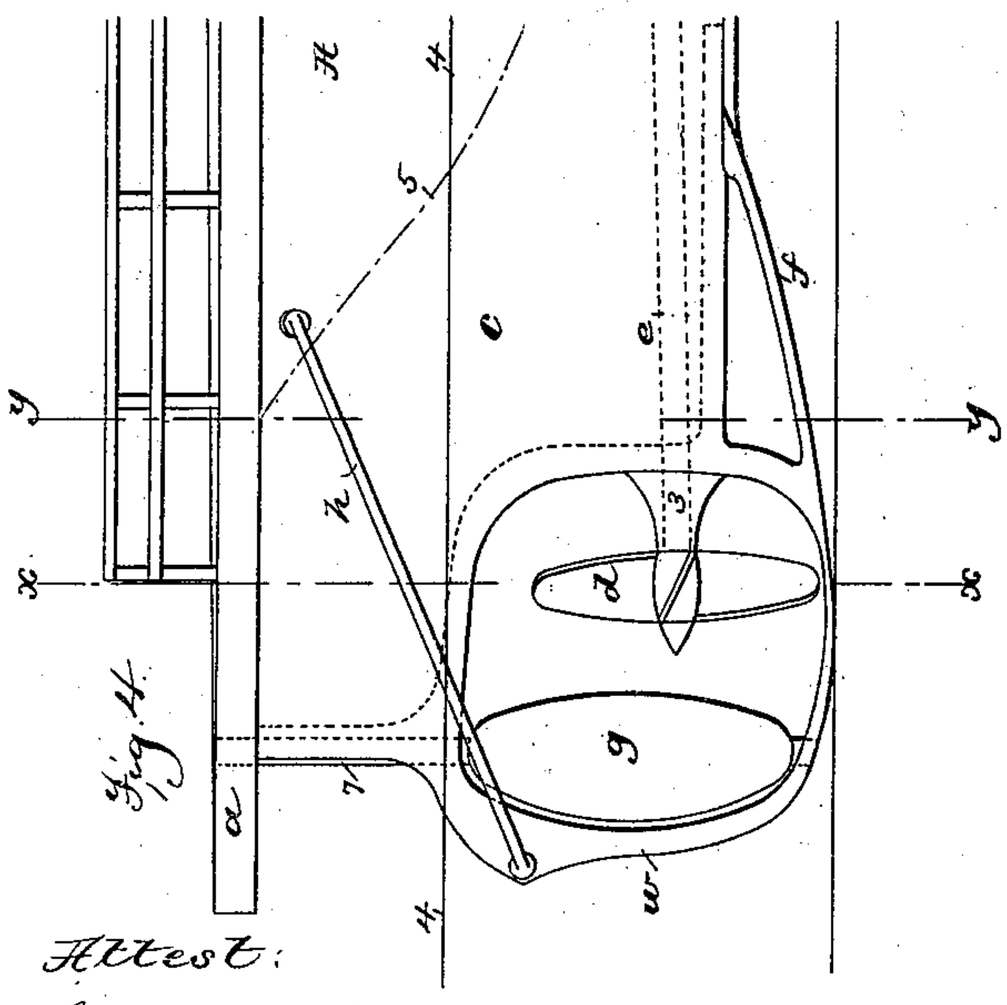
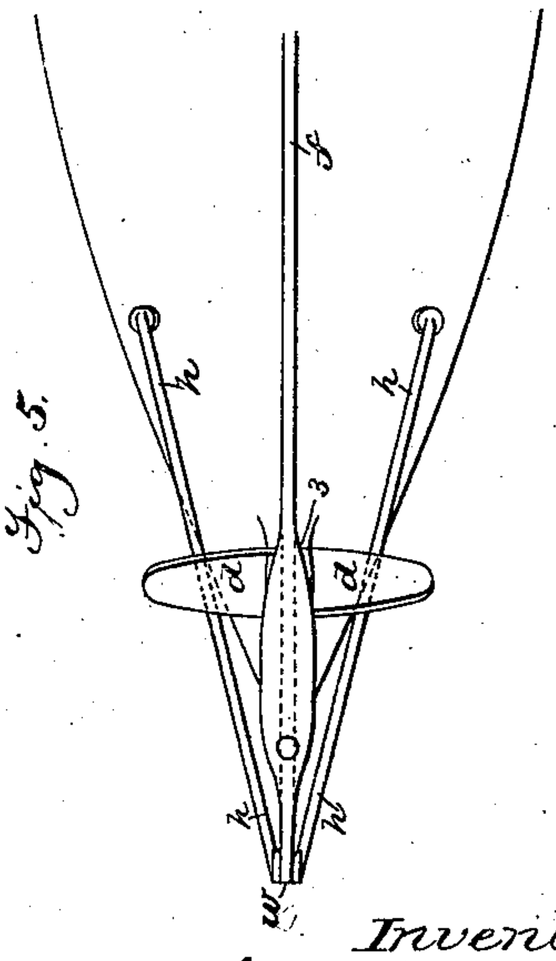


Fig. 5.



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(No Model.) 4 Sheets—Sheet 4.

W. COWLES.

FERRY BOAT.

No. 355,682. Patented Jan. 11, 1887.

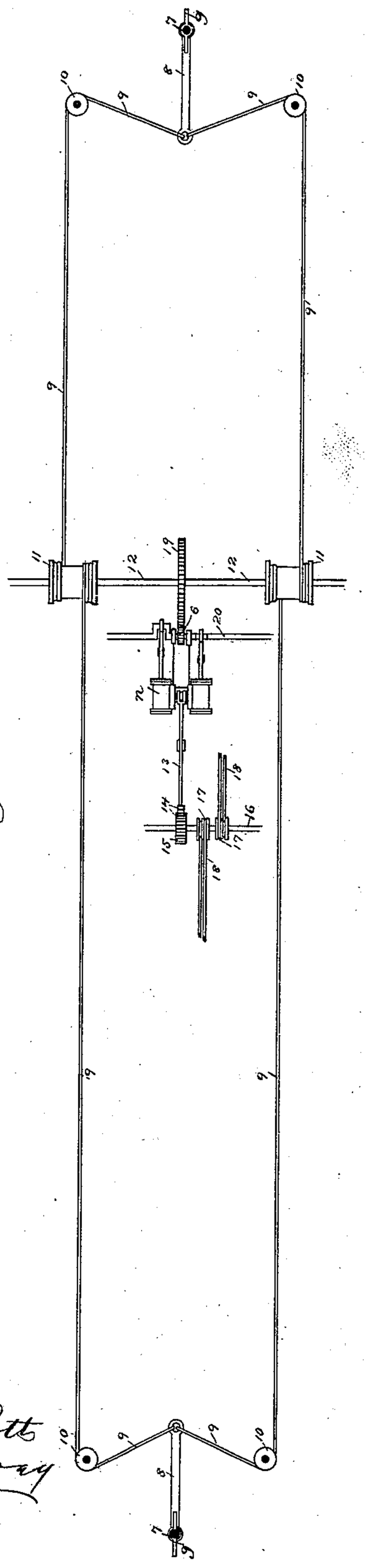

Fig. 10.

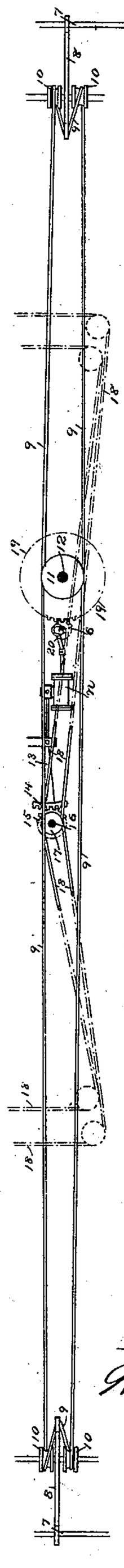

Fig. 11.

Attest
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J. A. Hovey

Inventor:
William Cowles
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Attys.

UNITED STATES PATENT OFFICE.

WILLIAM COWLES, OF BROOKLYN, NEW YORK.

FERRY-BOAT.

SPECIFICATION forming part of Letters Patent No. 355,682, dated January 11, 1887.

Application filed April 24, 1886. Serial No. 200,000. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM COWLES, a citizen of the United States, residing at Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Ferry-Boats, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to that general class of ferry-boats which are driven by screw-propellers instead of by paddle-wheels, and particularly to a boat of this class which is provided with a screw or screws and a rudder at each end, and is designed and adapted to be run with either end foremost.

It is the object of the invention to provide a ferry-boat which can be more readily and quickly maneuvered; which will be less liable to stoppage and damage by reason of ice; which will afford a greater team and passenger capacity in proportion to its size, and which will require a less expenditure of power to transport a given load than those boats heretofore in use.

To these ends the invention consists in various improvements in the construction and organization of the machinery, and also in the arrangement of the various parts of the boat and its machinery by which these results are attained.

As a full understanding of the invention can be best imparted by a detailed description of a boat embodying my improvements, all further preliminary description will be omitted and a full description of the boat given, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of a ferry-boat embodying my improvements. Fig. 2 is a partial horizontal section of the same, taken on the line *x x* of Fig. 1, showing the team-gangway in the center of the boat and the passenger-cabins on the sides. Fig. 3 is a vertical cross-section of the boat taken upon the line *x* of Fig. 2. Fig. 4 is an enlarged side elevation of one end of the boat, showing particularly the rudder, the propeller, and the devices for protecting the latter from ice or other floating matter. Fig. 5 is a bottom plan view of the parts shown in Fig. 4. Fig. 6 is a cross-section taken upon the line *x x* of Fig. 4. Fig. 7 is a similar view taken upon the line *y y* of the same figure. Fig. 8 is a view similar to Fig. 4, illustrating a double propeller and a modified arrangement of the rudder. Fig. 9 is a similar view, illustrating a modified arrangement of the double propeller; and Figs. 10 and 11 are diagrams illustrating the connections for simultaneously operating the rudders at the opposite ends of the boat.

Referring to said drawings, it is to be understood that the hull A of the boat is of substantially the usual form, except that its lines are considerably finer, which is made possible by the lighter weight of the machinery, due to the employment of screws instead of paddle-wheels as a means of propulsion. By this means the movement of the boat through the water is rendered more easy, which is of course a feature of importance. The opposite ends of the hull are made of the same form, as is common in ferry-boats, so that the boat can be run equally well with either end in advance.

The boat is provided with the usual guards, *a*, which project well over the hull at the sides, thus affording a large amount of deck-room.

In ordinary ferry-boats which are propelled by paddle-wheels the wheel-houses occupy a large part of the deck-room formed outside the hull by the projecting guards, and thus render the passenger-cabins small and inconvenient. By dispensing with the paddle-wheels, however, the entire space over the guards is rendered available for the cabins, and the cabins *b* are made to extend through from end to end, instead of being divided by the wheel-houses, and also extend out to the edges of the guards along the whole sides of the boat, and are thus made much more commodious and pleasant. The guards *a* are extended for a considerable distance beyond the ends of the hull, as shown, not only to protect the latter as the boat is run into the slip, but also to protect the screws and rudders, which, for a purpose that will be presently explained, are located considerably farther from the ends of the hull than in ordinary boats. The hull is provided at each end with what may be termed an "exaggerated skeg," *c*, which extends on or about on a line with the keel and

outward to a point near the end of the guards *a*, and affords a bearing and support for the end of the propeller-shaft.

The screw-propellers *d*, which are of substantially the ordinary type, except that both faces of their blades are of the same form, so as to adapt them to work in either direction equally well, are mounted upon the ends of shafts *e*, which extend from a point at or near the middle of the boat, where the engines are located, and are inclined downward, as shown, so as to cause their bearings 3 in the skegs to be on or nearly on a line with the keel. This inclining of the screw-shafts is a feature of importance, as it permits the screws to be more deeply buried in the water, and thus be less liable to injury from floating matter, and also causes the screws to have a better propelling effect. If the shafts *e* were not thus inclined downward toward the ends of the boat, the screws *d* would, as will be seen by reference to the water-line 4, act very near the surface of the water, and if the boat were not heavily laden might project out of the water, and would thus be liable to injury from floating matter, and besides would not give the best propulsion. The screws *d*, as will be observed, are located a considerable distance out from the shoulder of the hull, or point where the hull commences to flare, which point is indicated by the dotted line 5. The purpose of this is to prevent ice and other floating matter from coming in contact with and injuring or interfering with the action of the screws. This is a feature of particular importance, as it is frequently necessary to operate ferry-boats in waters which are at times very much obstructed by floating ice.

It has been found in practice that where a boat is moved through floating ice the cakes of ice, instead of being pushed to one side and remaining on the surface of the water, are to a great extent overridden and forced downward by the bow of the boat and pass along under the hull and rise again at the stern. From this it would result, if the screws were located under and close to the ends of the hull, that the ice as it was forced downward by the bow of the boat would wedge in between the screw and the hull and between the blades of the screw at that end of the boat, and as it rose at the stern of the boat would also act in like manner with the screw at that end of the boat. By locating the screws well out away from the shoulders of the hull, however, sufficient space is provided between the shoulders of the hull and the screws to permit the ice or other floating matter, as it is forced downward by the bow of the boat, to pass entirely in the rear of the bow-screw, and as it rises at the stern to pass in front of the stern-screw, and thus not interfere with either of the screws.

The guards *a*, as will be observed, project sufficiently far beyond the ends of the hull to extend over the exaggerated skegs to a point beyond the screws, thus protecting the screws from being injured by coming into contact with anything directly in front of the boat. It will also be observed, by reference to Fig. 2, that the guards are sufficiently broad at the front and rear ends of the boat to protect the ends of the screw-blades in that direction.

The skegs *c* are provided with strong shoe-pieces *f*, which extend downward and outward beneath the screws, and also afford bearings for the rudders *g*, which are located outside of and in line with the screws, as is usual, and are preferably of the balanced form, as shown. Outside of the rudders there are provided strong cut-waters *w*, which join the shoes and skegs and serve to protect the rudders.

To strengthen the cut-waters and shoes, and also to aid in throwing ice and other floating matter to one side and preventing it, as far as possible, from passing downward under the hull, there are provided strong braces or guards *h*, which extend upward and outward from the cut-waters at a point below the water-line to the ends of the hull, as shown. The form and arrangement of these guards, and also the form of the cut-waters, is such that they have a tendency to raise up and throw to one side any floating matter, instead of riding it down.

The shafts *e* are connected by universal joints *i* to a short horizontal crank-shaft, *k*, upon which the engines *l* act in the usual manner. By this means the two screws at the opposite ends of the boat are in effect mounted upon the same shaft, so that the screw at the bow, as well as the one at the stern, is operated, no matter which end of the boat is in advance. This is a feature of importance, as it has been found in practice that the screw at the bow not only is very effective as a means of propulsion, but aids greatly in maneuvering the boat. By thus using both the bow and stern screws as a means of propulsion it is practicable to make the screws smaller in diameter, and this is desirable in this class of boats, as they are frequently required to be run in shallow or comparatively shallow water. The screw at the bow also performs another important function, in that it induces a rearward current, which tends to keep the ferry-slip free from ice and other floating matter.

In waters where there is much ice there has always been great difficulty in using paddle-wheel boats, because of the tendency which such boats have to drive the ice into the slips, and because when the ice was once driven into the slip the action of the wheels was not such as to take it out. With the present boat, however, any ice which is driven into the slip will be at once carried out by the outward current induced by the bow-screw. Although it is preferable that the shafts *e* should be connected, as shown, it is of course not essential that they should be so connected. They may be independent and provided with separate engines, and yet preserve certain features of the invention. The engines *l* will of course be provided with the usual reversing appara-

tus, by which the movement of the shafts *e* can be reversed to move the boat in opposite directions. By having the shafts *e* connected together, as shown, both screws may be driven by the same engine, thus making the attendance of only one engineer necessary.

The rudders *g* are both connected with the wheel in each of the pilot-houses *m*, so that both are operated simultaneously from either house. By this means the bow, as well as the stern-rudder, is used in steering, and the maneuvering capacity of the boat is thereby increased without increasing the size of the rudders. The connections between the wheels in the pilot-houses and the rudders are illustrated by the diagrams, Figs. 10 and 11. As shown in these figures, the posts 7 of the rudders *g* are provided with tillers 8, which are connected to chains or wire ropes 9, which extend in opposite directions around pulleys 10 and are wound around drums 11 on a single transverse shaft, 12. It will be observed that the connections 9 pass around the drums 11 in reverse directions, so that when the shaft 12 is revolved both rudders are operated simultaneously, but in opposite directions. The drums 11, instead of being located a distance apart, as shown, may of course be arranged side by side, so as to form practically one long drum. By reason of this arrangement it will be seen that the drums for operating both rudders are mounted upon a single shaft, so that both rudders can be operated simultaneously without the use of intermediate connections for transmitting the motion from one operating-drum to the other. The shaft 12 is provided with a gear, 19, which engages with a pinion, 6, on a crank-shaft, 20, which is connected to the rods of a small duplex engine, *n*. The engine *n* is controlled by an ordinary stop, start, and reverse valve—such as is commonly used in connection with elevators—which is connected to a lever, 13, having a segmental gear, 14, which engages with a gear, 15, on a shaft, 16, having pulleys 17, around which pass chains or wire ropes 18, which are connected to the wheels in the pilot-houses *m*. By this means the lever 13 can be operated from either pilot-house, so as to set the engine *n* in motion and revolve the drums 11 in either direction or hold them in any position, and thus operate and control both rudders simultaneously. Any other form of connections may, however, be employed, if preferred, or the shaft 12 may be operated directly from the pilot-houses, instead of through the medium of the motor *n*, without departing wholly from the invention.

The boat being propelled by screws instead of paddle-wheels, the usual beam and its connections are dispensed with and the middle of the deck is left open and unobstructed for the team-gangway B, which by this means is not only brought directly in the center of the boat, thus bringing the load in the center and aiding in balancing the boat, but the gangway is made much larger, so as to accommodate more teams or other freight.

The boilers *o* are arranged at the sides of the hull, so as to balance the boat and also to permit the steam-drums *p*, smoke-stacks *q*, and funnels *r* to pass up between the cabins *b* and team-gangway B, where they will not interfere with the other parts.

As shown in the present case, the boat is provided with upper cabins, *s*, and stairs *t* leading thereto, which of course greatly increases the passenger capacity; but this feature may be omitted without changing the other features of construction.

In conclusion, it is to be remarked that in some cases it may be found desirable to provide each of the shafts *e* with two screws instead of a single screw. Two arrangements of this kind are illustrated in Figs. 8 and 9. As shown in Fig. 8, the shaft *e* is extended and its end is supported in a bearing, 3, in the cut-water *w*, and the two screws *d*, with which it is provided, are located a sufficient distance apart to permit the rudder *g* to be located between them. The arrangement shown in Fig. 9 is much the same, except that the two screws *d* are placed closer together on the shaft and the rudder *g* is located at the end of the shaft outside both of the screws. In this case the bearing 3 for the end of the shaft *e* is formed in a vertical post, *z*, extending from the shoe *f* to the skeg *c*. By employing two screws at each end of the boat in this manner the screws can be made of less diameter than when a single screw is used; and this arrangement will therefore be found advantageous in those cases where the boat is to be run in very shallow water.

I am aware that it has been proposed to provide a boat with a screw-propeller at each end, said propeller being located upon a horizontal shaft which extended the entire length of the boat; and I am also aware that it has been proposed, in boats having a screw at one end, to mount the screw upon a shaft which inclined downward toward the end of the boat and was connected by a flexible coupling to a horizontal shaft which was driven from the engine. I am also aware that war-vessels have been provided with projecting prows or rams which were located below the surface of the water and were inclined inward and upward at the water-line. I do not, therefore, claim either of these features.

What I claim is—

1. The combination, in a boat having a screw or screws at each end, of the rudders *g* at the opposite ends of the boat, the single transverse shaft 12, provided with the drums 11, for operating both rudders, and connections 9, extending from the tillers and passing around the drums in reverse directions, whereby the rotation of the shaft 12 operates both rudders simultaneously, but in opposite directions, substantially as described.

2. The combination, in a boat having a screw

or screws at each end, of the rudders *g* at the opposite ends of the boat, the single transverse shaft 12, provided with the drums 11, for operating both rudders, connections 9, extending from the tillers and passing around the drums in reverse directions, whereby the rotation of the shaft 12 operates the rudders simultaneously, but in opposite directions, and connections, substantially such as described, between the shaft 12 and the wheel in each pilot-house, whereby the shaft may be set in motion from either pilot-house, substantially as described.

3. The combination, in a boat having a screw or screws at each end, of the rudders *g* at the opposite ends of the boat, the single transverse shaft 12, provided with the drums 11, for operating both rudders, connections 9, extending from the tillers and passing around the drums in reverse directions, whereby the rotation of the shaft 12 operates both rudders simultaneously, but in opposite directions, the motor *n*, for operating the shaft 12, and connections between the valve of said motor and each pilot-house, substantially as described.

4. In a boat having a screw or screws at each end, the screw-shafts *e*, extending the length of the boat and inclined downward toward the ends of the boat and connected directly to the crank-shaft of the engine by toggle-joints or flexible couplings, whereby the screws may be sufficiently immersed and the screws at both ends of the boat may be driven by the same engine, substantially as described.

5. In a boat having a plurality of screws on the same shaft at each end of the boat, the screw-shafts *e*, extending the length of the boat and inclined downward toward the ends of the boat and connected directly to the crank-shaft of the engine by toggle-joints or flexible couplings, whereby the screws may be sufficiently immersed and the screws at each end of the boat may be driven by the same engine, substantially as described.

6. In a boat having a screw or screws at each end, the skegs *c*, extended beyond the shoulder of the hull, so as to allow room for floating matter to pass downward and upward between the hull and the screw or screws, in combination with the guards *a*, extended outward and forward, so as to overlie and protect the screws, substantially as described.

7. In a boat having a screw or screws and a rudder at each end, the skegs *c*, extended beyond the shoulder of the hull, so as to allow room for floating matter to pass downward and upward between the hull and the screw or screws, in combination with the guards *a*, extended outward and forward, so as to overlie and protect the screws, and the shoes *f* and cut-waters *w*, extending under and around the screws and rudders, substantially as described.

8. In a boat having a screw or screws at each end, the shoes *f* and the cut-waters *w*, extending under and around the screws and rudders, the cut-waters being inclined inward and upward at the water-line, in combination with the guards *a*, extended outward and forward, so as to overlie and protect the screws and cut-waters, substantially as described.

9. In a boat having a screw or screws at each end, and having cut-waters located outside said screws, the guards or braces *h*, extending upward and outward from the cut-waters at a point below the water line to the hull, substantially as described.

10. A ferry-boat having a screw propeller or propellers and a rudder at each end, and its engines and boilers located below the deck, side cabins extending from the edges of the hull outward to the edges of the guards and along the whole central portion of the boat, a central team-gangway extending from end to end of the boat, and smoke-stacks located between the team-gangway and side cabins, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

WILLIAM COWLES.

Witnesses:
J. A. HOVEY,
JAS. J. KENNEDY.