

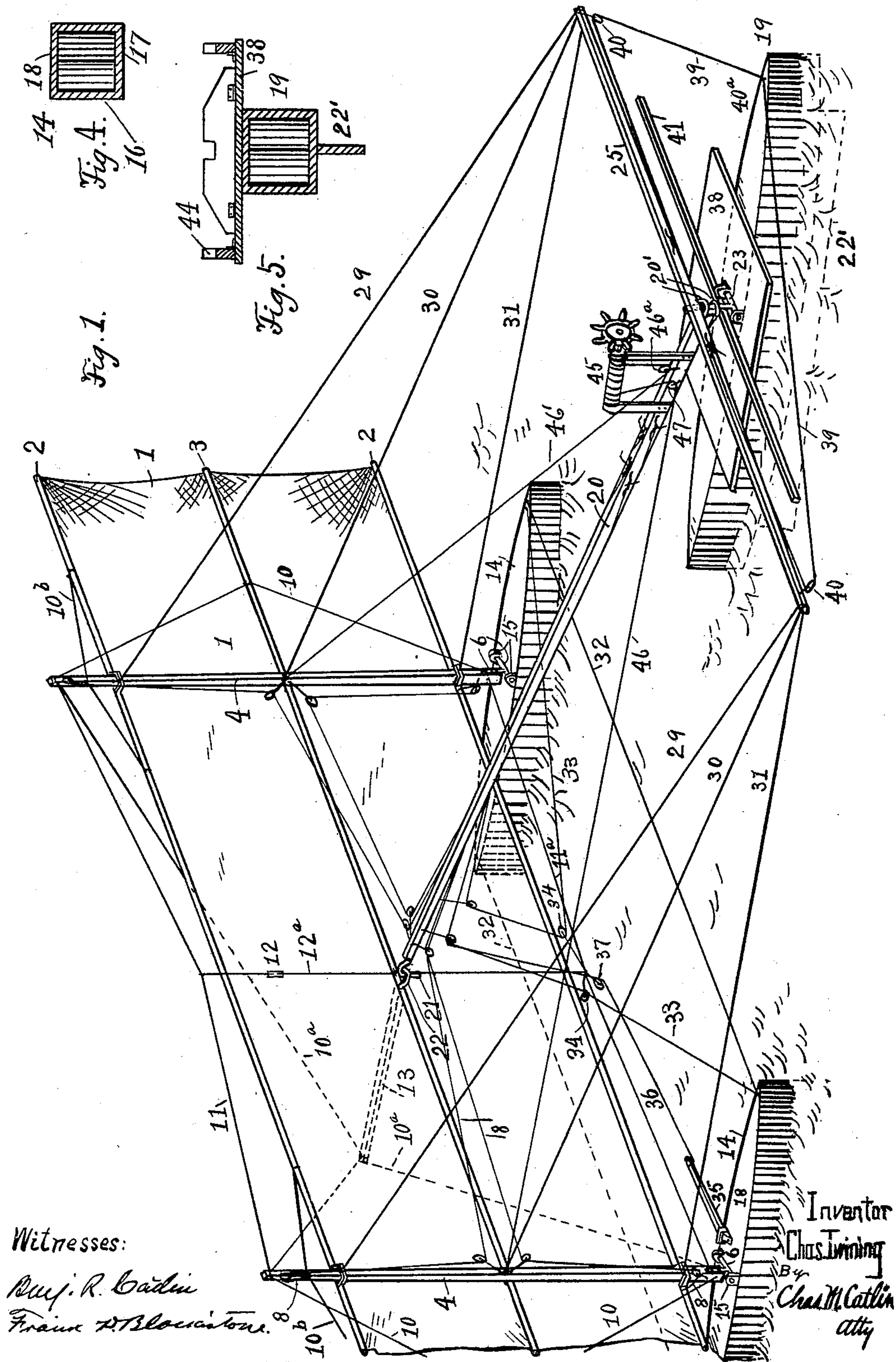
(No Model.)

4 Sheets—Sheet 1.

C. TWINING.
VESSEL AND SAIL AND RIGGING THEREFOR.

No. 606,104.

Patented June 21, 1898.



Witnesses:

Ruf. R. Gordin

Frank R. Blount

Inventor

Chas. Twining

Chas. M. Catlin

atty

(No Model.)

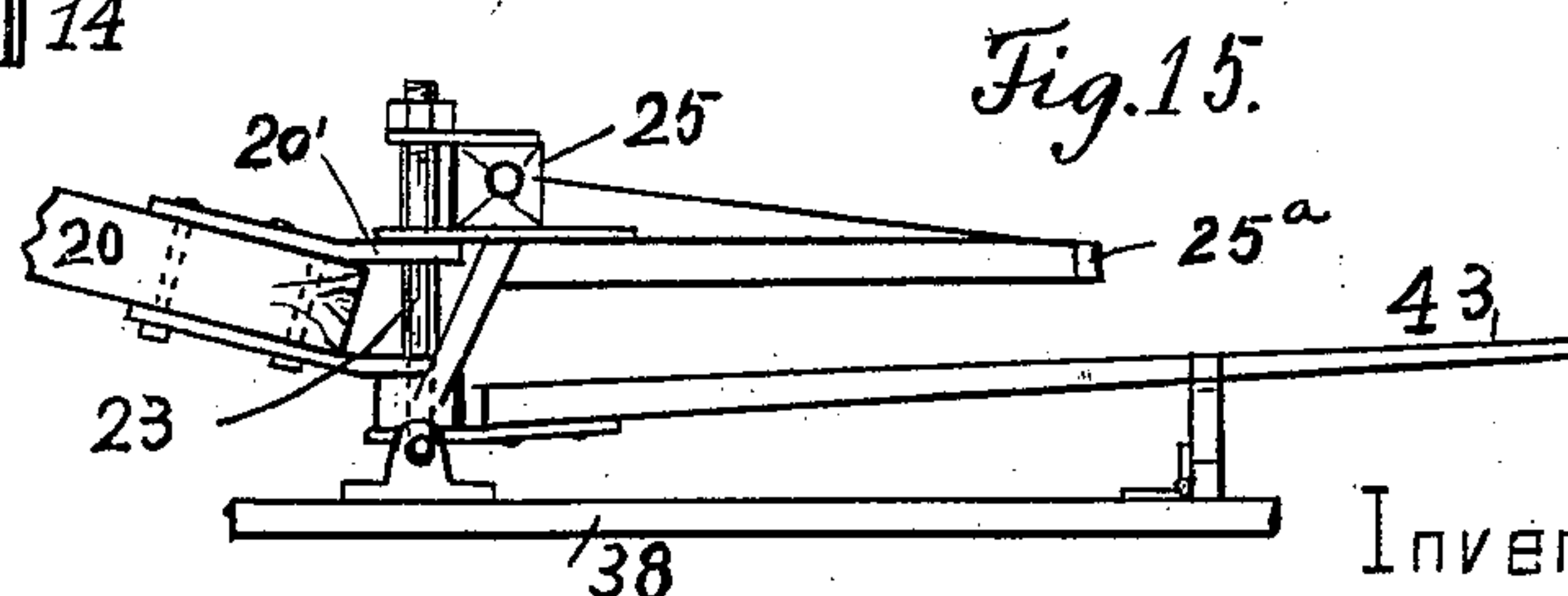
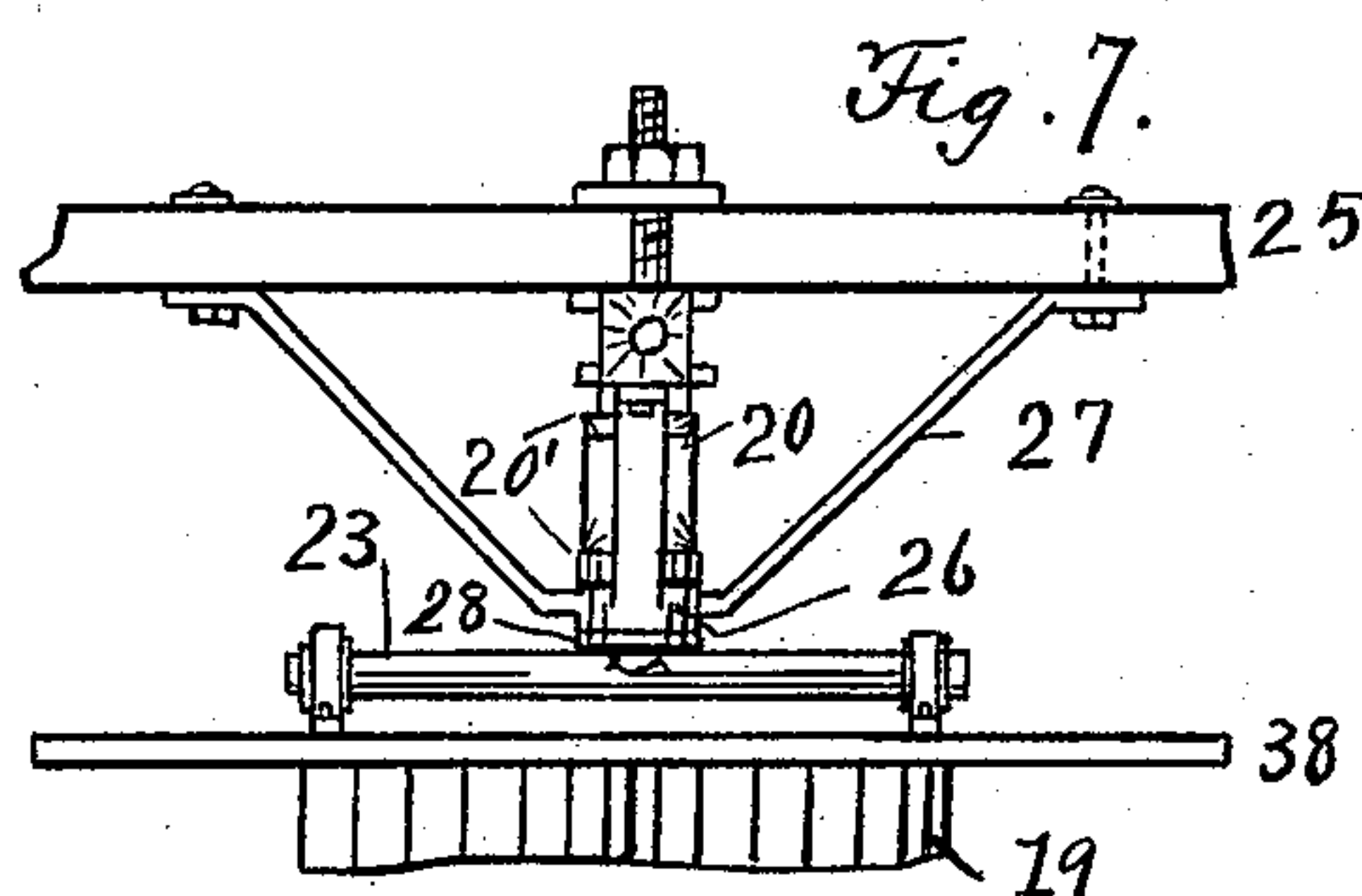
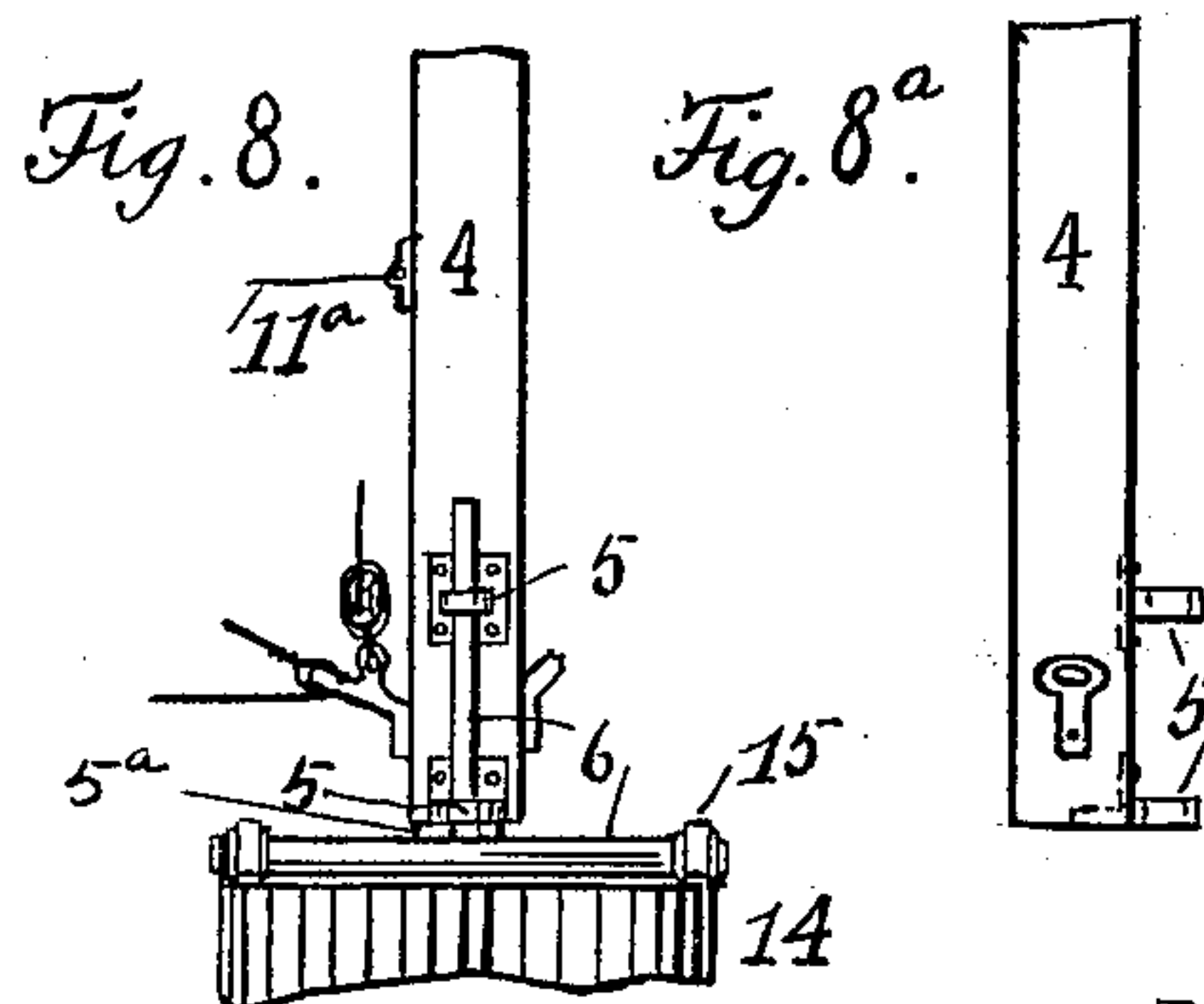
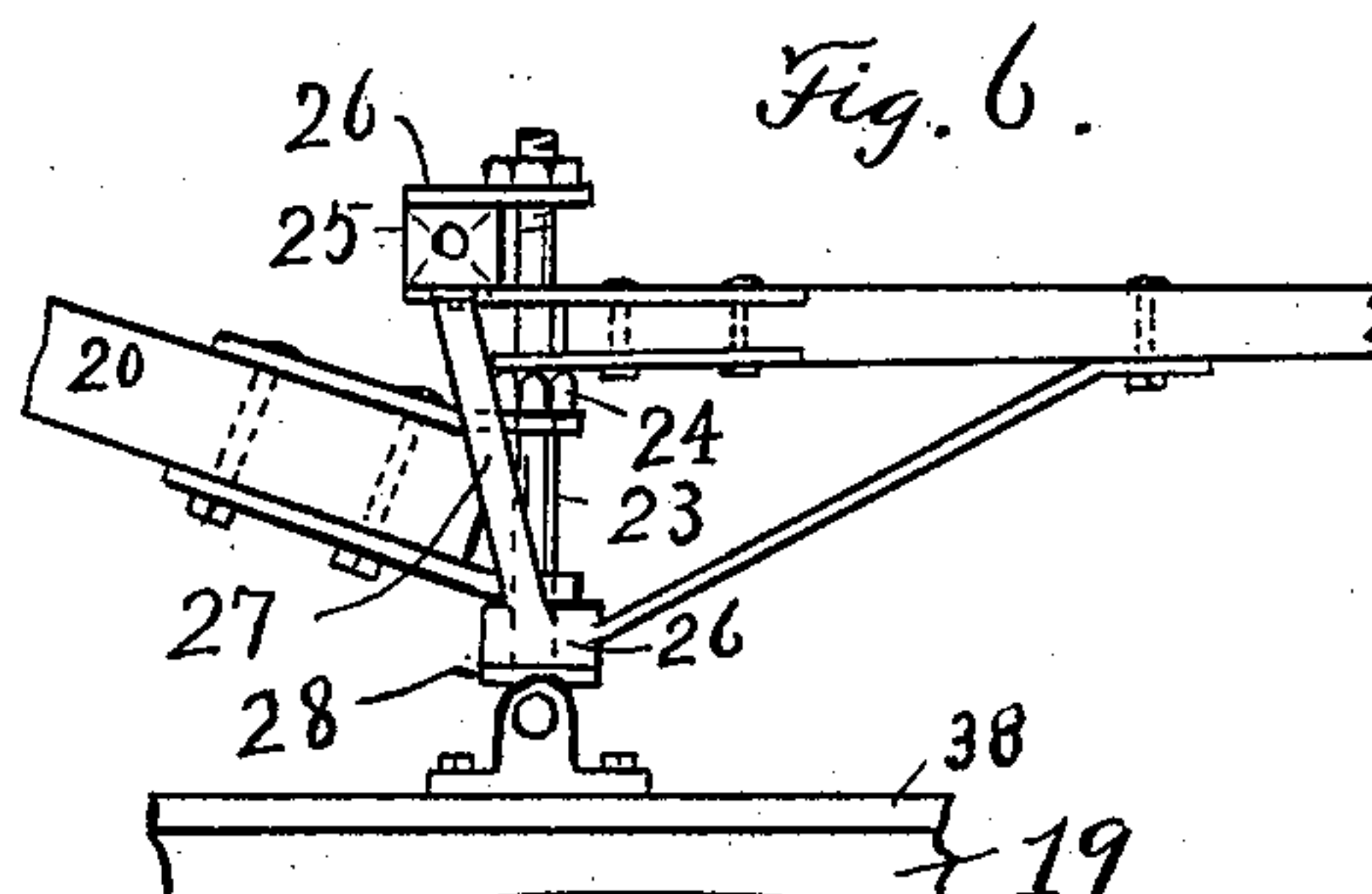
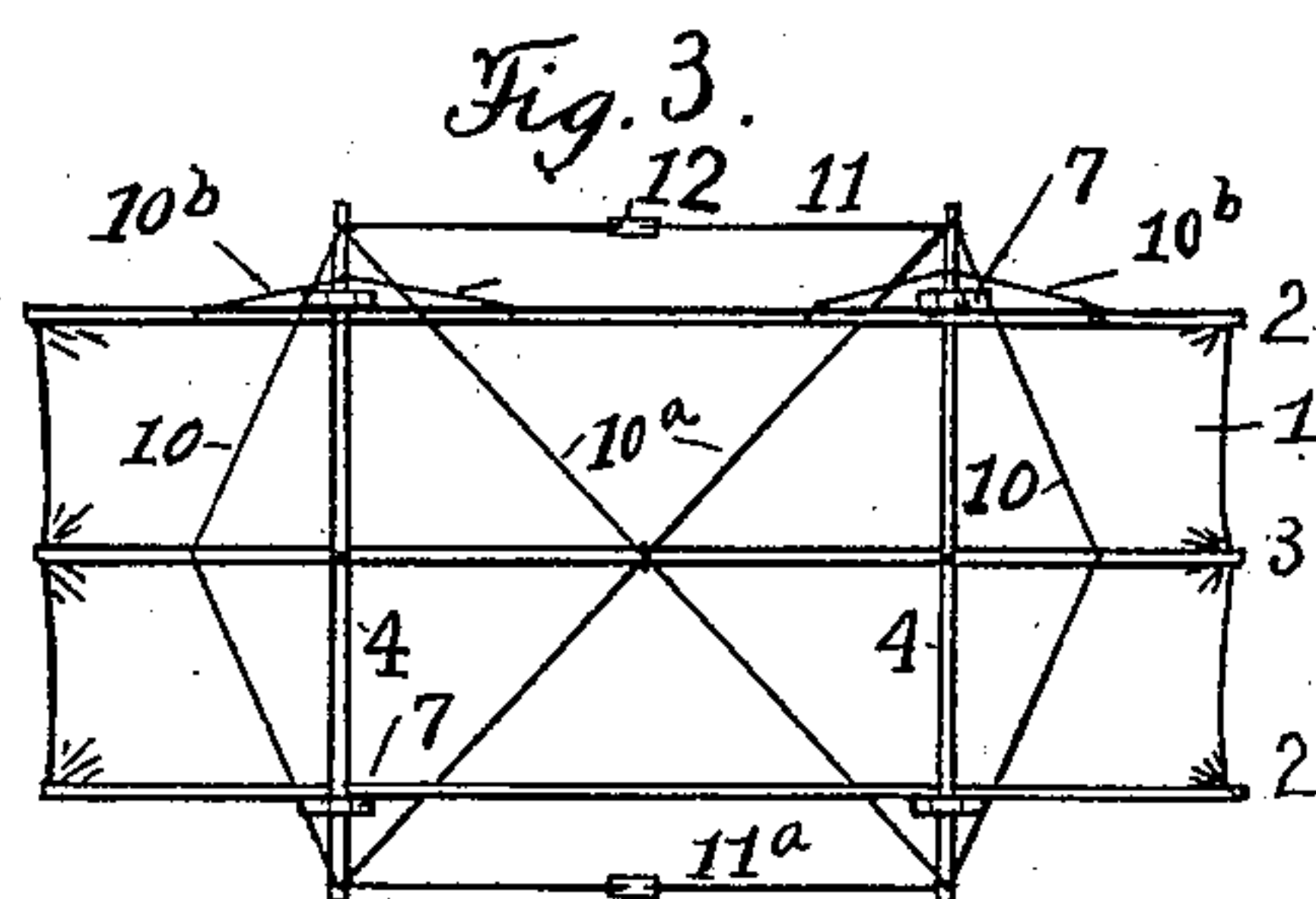
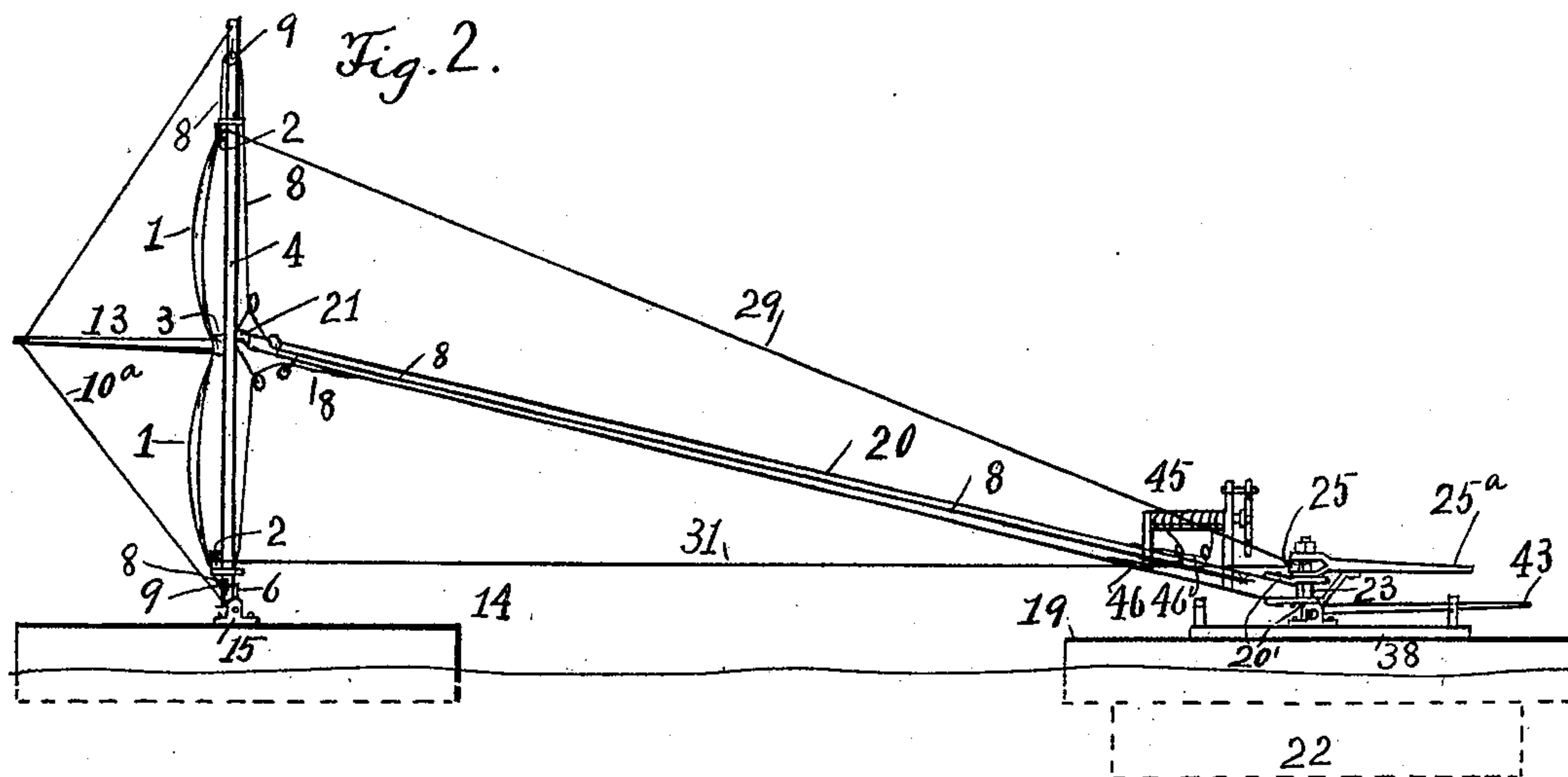
4 Sheets—Sheet 2.

C. TWINING.

VESSEL AND SAIL AND RIGGING THEREFOR.

No. 606,104.

Patented June 21, 1898.



Witnesses:

Ruf. R. Gailin
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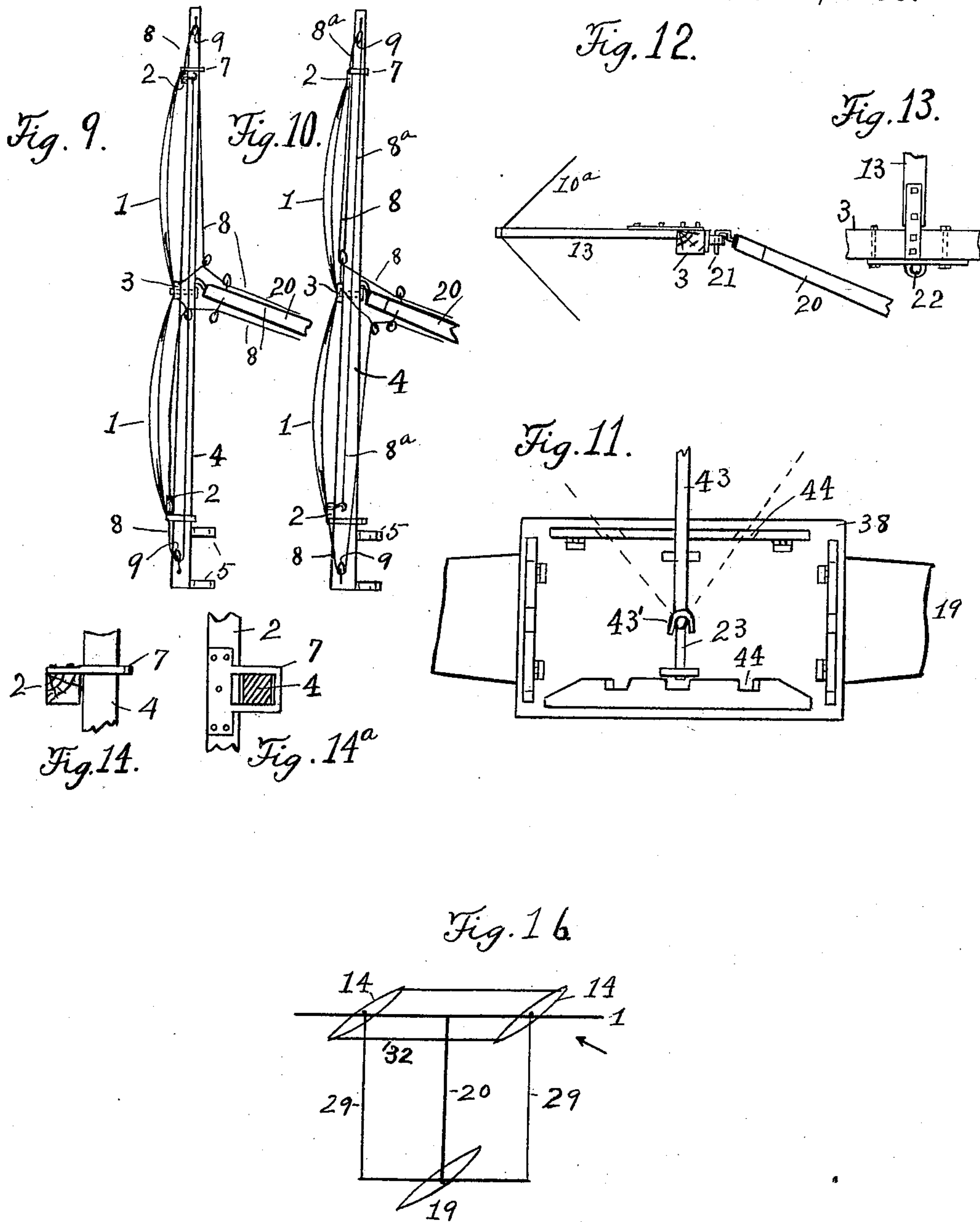
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4 Sheets—Sheet 3.

C. TWINING.
VESSEL AND SAIL AND RIGGING THEREFOR.

No. 606,104

Patented June 21, 1898.



Witnesses:

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Franc. P. Bloemstone

Inventor:

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By Charles M. Catlin,
att'y.

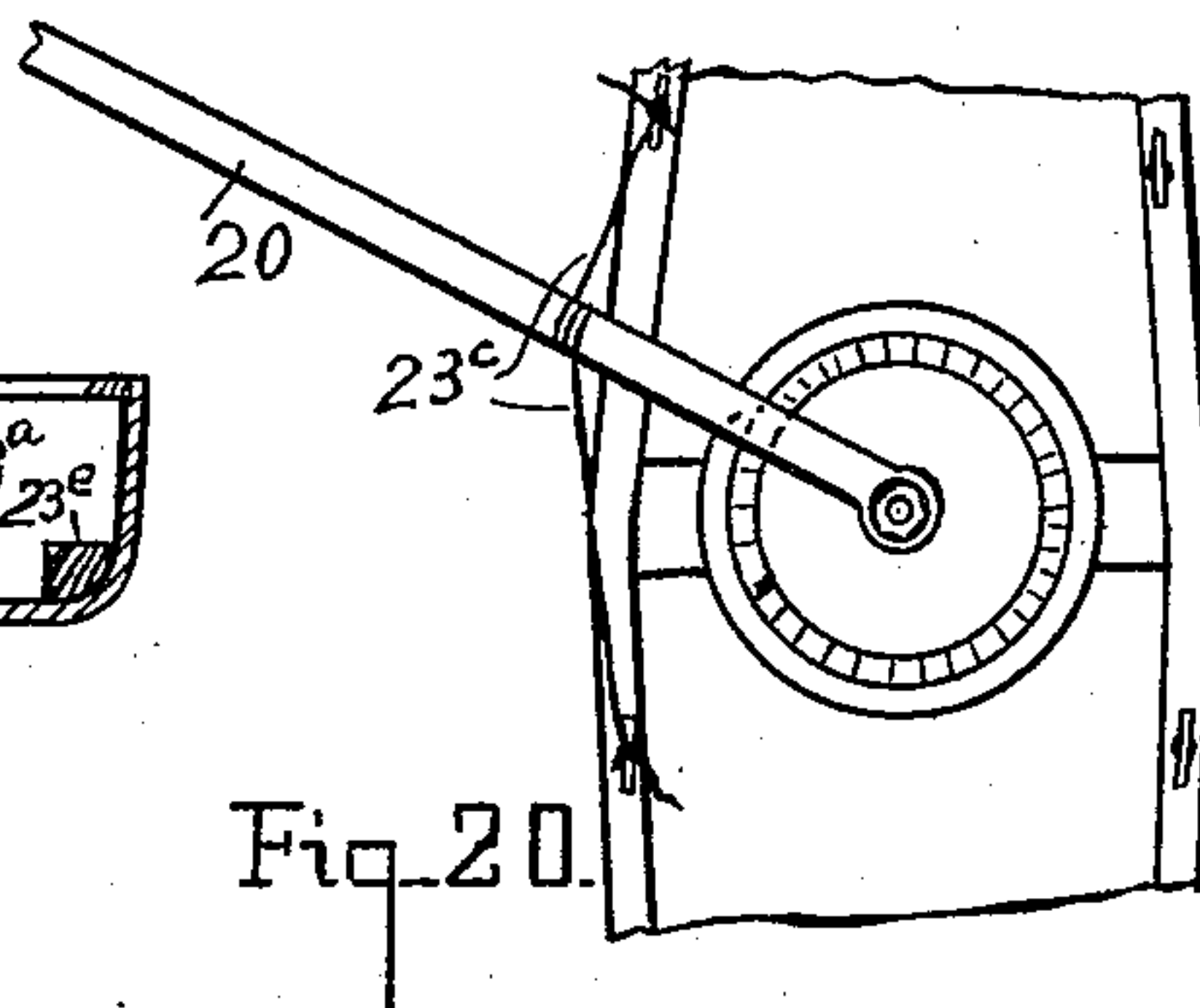
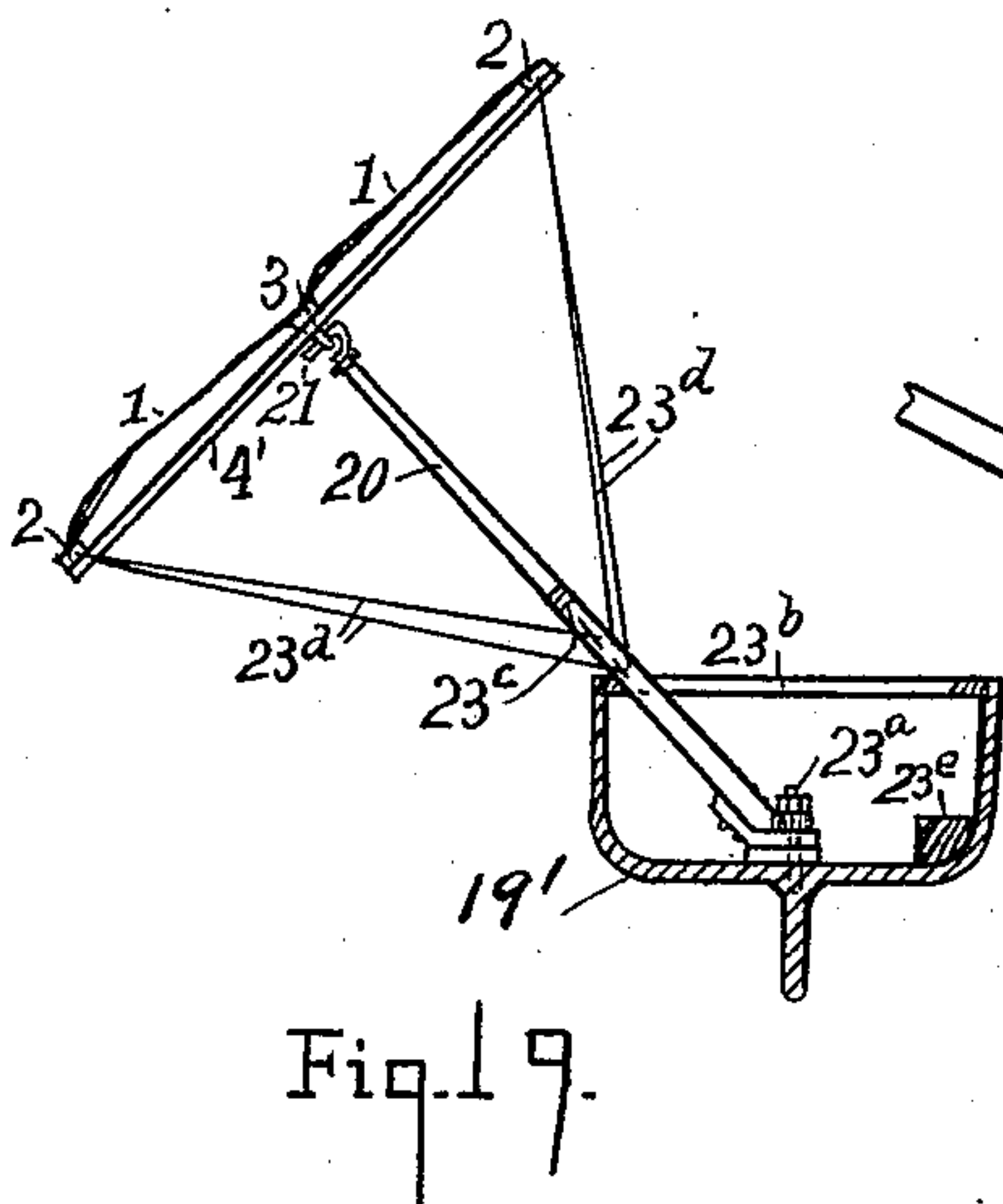
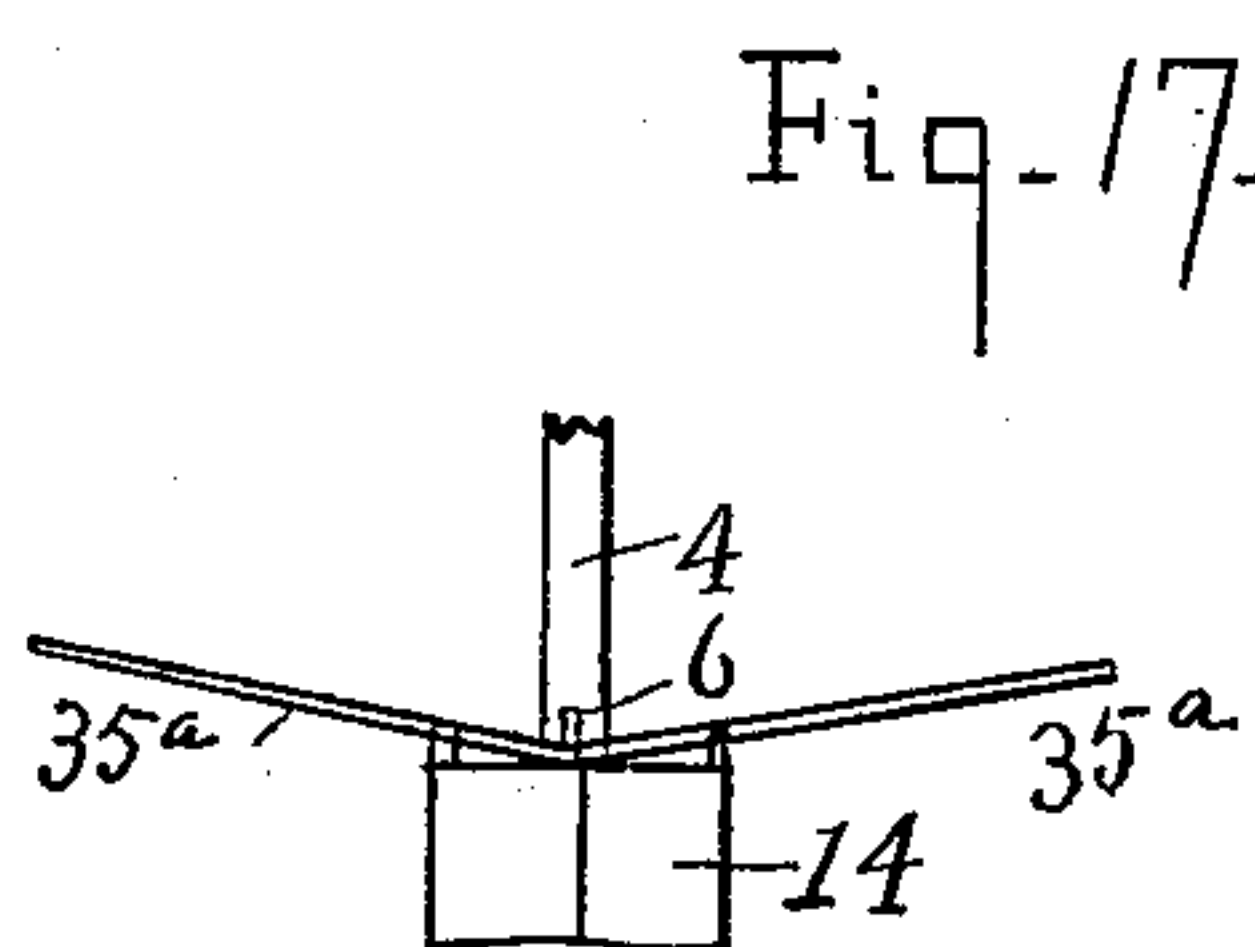
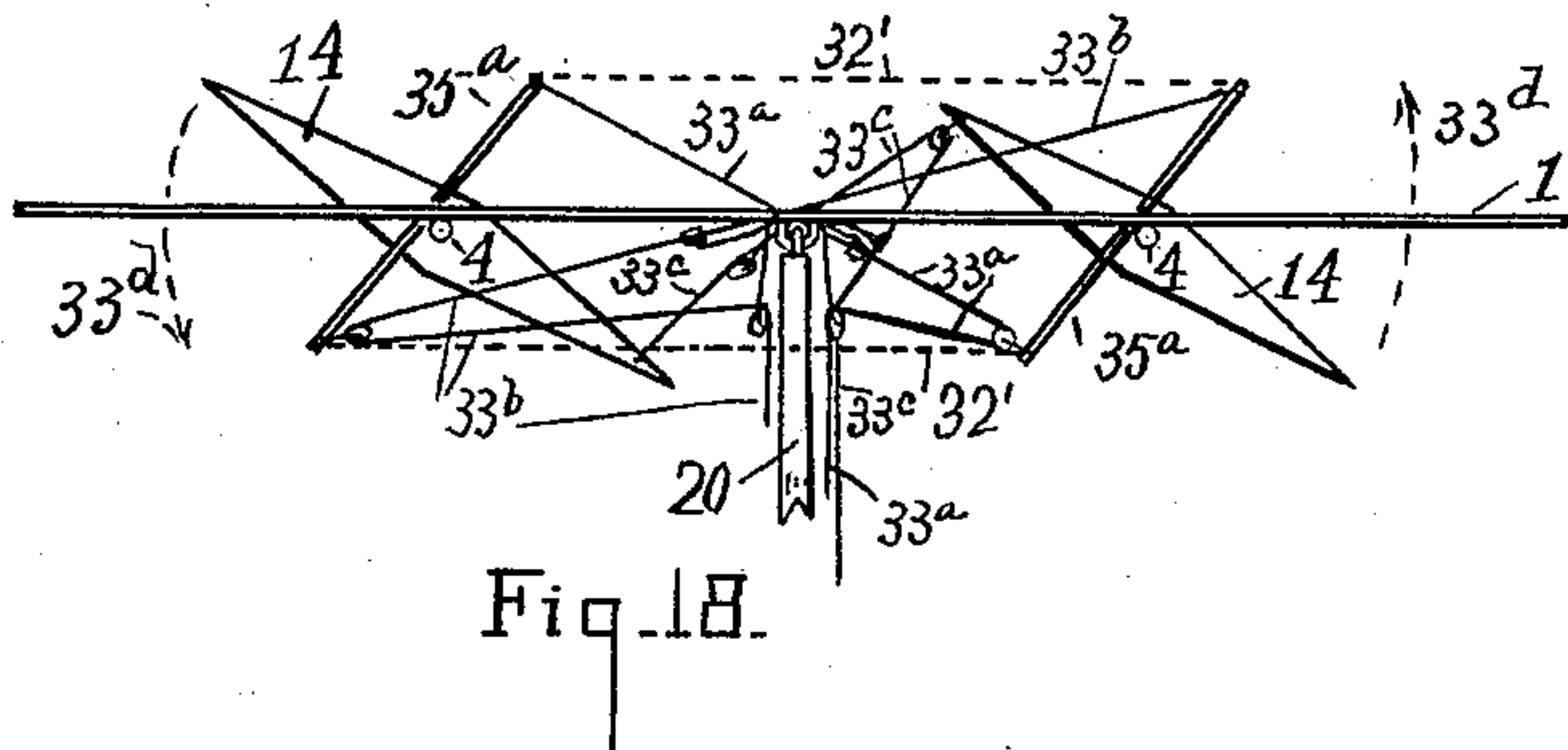
(No Model.)

4 Sheets—Sheet 4.

C. TWINING.
VESSEL AND SAIL AND RIGGING THEREFOR.

No. 606,104.

Patented June 21, 1898.



Witnesses:

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Franc. P. Blodgett

Inventor:

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Atty.

UNITED STATES PATENT OFFICE.

CHARLES TWINING, OF HALIFAX, CANADA.

VESSEL AND SAIL AND RIGGING THEREFOR.

SPECIFICATION forming part of Letters Patent No. 606,104, dated June 21, 1898.

Application filed September 29, 1897. Serial No. 653,464. (No model.) Patented in England September 30, 1896, No. 21,635.

To all whom it may concern:

Be it known that I, CHARLES TWINING, a subject of the Queen of Great Britain, and a resident of Halifax, Nova Scotia, Canada, have invented certain new and useful Improvements in Vessels and in Sails and Rigging Therefor, (patented in Great Britain, No. 21,635, September 30, 1896,) of which the following is a specification.

10 The main object of this invention is to provide sailing apparatus of improved stability, speed, and ease of control; and the invention consists in means, as hereinafter pointed out, for the accomplishment of said object.

15 In the drawings, Figure 1 is a perspective view of the preferred apparatus. Fig. 2 is a side view. Fig. 3 is a rear face view of the sail with yards and masts. Fig. 4 is a central vertical transverse section of one of the small hulls. Fig. 5 is a similar view of the main hull. Figs. 6 and 7 are views at right angles, showing one arrangement at the pivot of the main hull. Figs. 8 and 8^a show at right angles to each other the connection of a mast to one of the small hulls. Figs. 9 and 10 show modes of spreading the sails. Fig. 11 is a plan view of the main hull. Figs. 12 and 13 show connection of the inclined spar to the middle sail-yard. Figs. 14 and 14^a show connection of sail-yard to a mast. Fig. 15 shows the connection of inclined spar and end yard to pivot and means for bracing the end yard. Fig. 18 shows modified means for connecting and operating the small hulls. Fig. 17 shows the arrangement-bars on the small hulls. Fig. 16 is a diagram showing the hulls at an angle with the plane of the sail. Fig. 19 shows a modified arrangement of sail, the view showing a central transverse section of a boat; and Fig. 20 is a partial plan of said boat.

40 In this sailing apparatus a single sail 1, preferably rectangular and about four times as long as it is wide or deep, is used. This sail is stretched and fastened along its long edges to horizontal rods 2, called "sail-yards." There is also a middle yard 3, to which the sail is fastened along the middle of the sail parallel with yards 2.

50 Secured to the middle yard, about one-quarter of its length from each end, is a vertical mast 4, there being two such masts, which are a little taller than the width or depth of

the sail. The middle yard crosses each mast at about half the height of the mast.

Near the foot of each mast are placed two horizontal rings or staples 5, one a little above the other. The eyes of these staples are in line with each other vertically. There are provided two L-irons 6, of round iron, to be used at the foot of the masts, the vertical arm of each iron passing up closely through the two staples.

The sail-yards 2 have staples or rings 7 at the points where they are crossed by the masts. These staples are placed over and adapted to slide on the masts, so that the upper sail-yard can be drawn up and the lower sail-yard drawn down from the middle yard to spread the sail in a vertical or nearly vertical plane.

At each of the four points where the sail-yards cross the masts a rope or halyard 8 is connected with the sail-yard by means of stays 10^b, runs to a pulley 9 above it or below it, as the case may be, and thence along the inclined spar to the main hull, where they can be operated and secured. There are thus four halyards, two of which are used for spreading and two for furling the sail. The two halyards on the upper sail-yard draw that yard up and by intermediate ropes and pulleys draw the lower sail-yard down, thus spreading the sail on the masts. The other two halyards draw the lower yard up and the upper yard down.

The upper and lower yards may be connected by ropes 8^a passing over pulleys near the top of the mast, as in Fig. 10, whereby the weight of the two yards will about balance each other, making the spreading and furling of the sail easier.

From the ends of the masts to the middle yard there are diagonal stays 10, which hold the masts firmly at right angles to said yard. From each end of each mast there are two such diagonal stays 10^a, one on each side of the mast. Between the upper ends of the masts there is a cross-stay 11, and between the lower ends of the mast there is a stay 11^a, called the "lower" cross-stay. Stays 11 and 11^a may be connected by a cross-stay 12^a, this stay being fastened to the middle yard, where it crosses it, Fig. 1, or not connected, as in Fig. 3.

The stays are generally of wire rope, and on each or any stay there may be a turn-buckle or screw 12 for conveniently stretching the stay tight, as, in order that the parts stand fairly in their positions, the stays must be continually tight.

The stays 10^a may extend diagonally from mast to mast in straight lines, crossing at the center of the sail and there secured to the middle yard, as in Fig. 3, or said stays may be lengthened and extend to the free end of an arm 13, projecting on the front side of the sail and secured to the middle yard, Figs. 1 and 12. The latter arrangement better resists the tendency of yard 3 to bend, and strengthens the vertical masts.

Below and bearing up each of the two masts there is a small hull 14. Each mast is stepped on the hull beneath it by means of the L-iron 6 at its foot. The horizontal arms of the L-iron lie across the deck of the hull at right angles to the length and at the middle of the hull. The ends of the horizontal arms rest in sockets or staples 15, one at each edge of their hull. Each hull may thus tip up and down vertically with the horizontal arms of its L-iron as an axis, and each hull may turn around horizontally with the vertical arm of the L-iron as an axis. There may be a collar or deep washer 5^a on the vertical arm of each L underneath the lower ring 5 of the mast to keep the foot of the mast a little above the horizontal arms of the L-iron.

Hulls 14 are alike and each is of sufficient size to float about twice the portion of the weight of the whole apparatus that rests on it when the sail is furled. They are given a shape adapting them for speed and also giving them considerable sidewise resistance. Their sides 16 are vertical and incline or curve similarly from the middle of the hull toward each end. Each end of the hull is a vertical edge. The bottoms 17 and decks 18 are parallel planes. Any vertical section of these hulls will be a rectangle, the central cross-section preferably being a square, Fig. 4. They are closed air-tight.

Besides the two hulls 14 there is a third hull 19, called the "main" hull, which lies at some distance to one side of the plane of the sail. While this hull is called the "main" hull, it is not necessarily much, if any, larger than hull 14, but in practice has been made about the same width, but longer. This main hull is separated from and connected with the middle of the sail by a sloping spar 20, the length of which is preferably equal to about three-fourths the length of the sail. The spar 20 extends from about the middle of the sail away from it in a downwardly-inclined direction nearly to the surface of the water—that is, to a point nearly just above the center of the deck of the main hull.

The end of spar 20 at the sail has fastened to it a round vertical pin 21, which protrudes below the end of the spar, and at the middle of the middle yard (the center of the sail) is

fixed a horizontal staple 22, into which pin 21 enters, the spar being thus pivotally connected with the sail at its center, and this pivotal connection is a feature of my invention.

It will be seen that the sail when in use occupies a plane transverse to the pivoted spar at or approximately at right angles to the plane of the spar and is not in or approximately in a plane with the spar.

The main hull is of size sufficient to float somewhat more than the weight of the crew and of that portion of the weight of the apparatus which commonly rests on it.

Such freight as it is found the apparatus will conveniently carry will probably be best carried in or on the main hull, which is similar in shape and construction to the other hulls, but is provided with a large keel 22', preferably a little shorter than the hull. The main hull and keel give the amount of sidewise resistance needed in addition to that of hulls 14.

At its lower end the spar is connected with the main hull by means of a L-iron 23, connected with the hull as irons 6 are with their hulls. The spar 20 is connected with its L-iron by two horizontal staples or rings 20', secured at the end of the spar, one above the other with the eyes in line, and the vertical arm of the L-iron passes therethrough. As the spar does not rise vertically but obliquely from the water, its base should be thick, so that the staples can stand some distance apart to give the necessary purchase on the vertical arm or pivot. The main hull can be turned horizontally with respect to the spar, the vertical arm of the L-iron turning in the staples. The pivotal connection between the main hull and the spar is one important feature of my improvement. The vertical arm of the L-iron rises some distance above the upper ring or staple at the base of the spar for further connections. Fixed on the pivot just above the upper ring is a nut 24, Fig. 6, to prevent the spar slipping up.

A yard 25, called the "end" yard, about half as long as the sail, is placed horizontally nearly through a point a little above the center of the main hull, with its middle cross-section resting against the pivot on the side of the pivot away from the sail, as in Figs. 1 and 2, or on the side toward the sail, as in Fig. 6. The end yard crosses the pivot just above the end of the inclined spar, and there are horizontal staples or rings 26, secured to the end yard one above the other, with their eyes in line with each other vertically and at right angles to the length of the end yard. The pivot passes up through these eyes 26 and the end yard is thus kept at right angles to the pivot, but can turn horizontally around it.

In order that the end yard may be kept more strongly at right angles to the pivot, one of the rings 26 may be placed on the pivot some distance below the end yard, Fig. 6, and solid diagonal connections 27 therewith may be made from points on the end yard, one on

each side of the pivot. This lower ring may be placed below the lower ring of the spar 20, the mast then lying between the rings of the end yard. These connections must be so arranged that the end yard can be turned horizontally, so as to make an angle of forty-five degrees or less with the spar 20. There should be a nut or equivalent on the pivot above upper ring 26, so that it may not slip up. There should be a collar 28 on the pivot just above where it joins with its horizontal arms in order to keep up the rings and so to keep the connections with the pivot sufficiently above and free of these arms and their bearings.

The end yard is parallel to the middle yard 3, and from each end of the end yard extend three stays—one, 29, to a convenient point near the top of the vertical mast on that side of spar 20, and one, 30, to where the middle yard crosses that vertical mast, and one, 31, to a convenient point near the foot of the same vertical mast. The stays from one end of the end yard are equal in length and parallel to the corresponding stays from the other end. These stays are taut and keep the end yard permanently parallel with the sail.

The two hulls below the sail are kept about parallel with each other by taut stays 32.

From each of those ends of the small hulls which lie toward the main hull when the hulls are at some angle with the sail there extends a rope 33 to a pulley 34, fixed at about the center of the lower cross-stay. These ropes and any similar ropes may go from thence through convenient blocks to and along the spar to the main hull, to be secured and worked from there. There is also fastened solidly near the middle of the deck of one of the small hulls a bar 35, about half as long as the hull, projecting horizontally about at right angles to the length of the hull and from the side toward the other small hull, and from the free end of this bar a rope 36 extends through a pulley 37, fixed about the middle of the lower cross-stay and to the main hull. By these three ropes 33 33 36 the small hulls may be turned from the main hull to make any angle with the sail required and be so secured. The pivotal connection of the small hulls to the masts and sail is another feature of this invention.

In Figs. 17 and 18 the hulls beneath the sail are each provided with transversely and upwardly extending bars 35^a at the middle cross-section of the hull. Parallel stays 32' extend from the ends of these bars instead of from the ends of the boats, as stays 32, above described. A rope 33^a extends from the end of one bar 35^a through a pulley at or near the middle of the lower cross-stay, then to the end of bar 35^a on the other hull diagonally opposite the first bar, thence back and through a pulley at or near the middle of the lower cross-stay, then to the spar, and along it to the main hull. Rope 33^b is similarly arranged from the opposite bars 35^a. Line 33^c extends from the inner end of the small hull

at the left to the outer end of the other hull, passing through a pulley near the center of the lower cross-stay, then through a pulley 70 at the outer end of the second hull to a pulley near the center of the lower cross-stay, and thence to the main hull, being guided in the same way as ropes 33^a 33^b. These three ropes 33^a 33^b 33^c are all that are required to control 75 the angle of the small hulls with the sail. In changing the tack the small hulls would be shifted, as indicated by arrows 33^d.

The deck of the main hull at about the center has a platform 38, extending a little beyond each side of the hull to give standing-room.

It is necessary that the main hull may be turned horizontally on the pivot 23 to take any desired angle with the end yard 25 and that it may be secured. For this purpose 85 ropes 39 run through pulleys 40 at each end of the end yard. One rope running from each end of the end yard must be secured to a point of the hull, as 40^a, or to a point of something rigidly connected with the hull that lies sufficiently aside from the end yard to give convenient leverage. When by some turning of the hull the point 40^a gets so near to the end yard that the leverage is not great enough 95 for the ropes to easily turn to keep the hull firmly at its angle with the end yard when fastened, then some other point of the hull or solid with the hull, as bar 41 having now gained a position of commanding leverage, 100 must be found, and either the same ropes must be transferred and fastened to the outer end of said bar or another pair of ropes from similar pulleys must be fastened at this new point. It will be convenient to choose these 105 points of connection on that part of the hull or of some connection solid with it lying at the time on the side of the end yard away from the sail. The two ends of the hull may at different times serve for these points, and 110 the two ends of a horizontal cross-bar 41, fastened solidly across the deck near the middle of the boat, may be used to furnish the two other points of leverage. One of the points thus available—viz., the two ends of the hull 115 and the two ends of the cross-bar—will always have a position of commanding leverage. In order to secure the hull at certain angles, it may be an advantage to fasten ropes both to one end of the cross-bar and to one 120 end of the hull. But one rope 39 is shown. The ropes run from the pulleys at the ends of the end yard to some convenient point for working and securing them near the pivot. Another method of commanding the angle of 125 the large hull with the end yard is to have a single nearly horizontal bar 43, Fig. 11, one end of which bar is against the pivot, with a throat 43' to keep it from slipping aside from the pivot. This throat firmly grasps the pivot 130 at some convenient point near the deck—say at the base of the pivot just above where it joins the horizontal arms. The other end of this bar has the ropes from the ends of the

end yard fastened to it and rests firmly a little way from the pivot in any one of several vertical notches 44, placed where it is convenient about the edge of the platform 38. The bar has thus a solid hold on the boat for any moderate horizontal pressure. When the turning of the boat brings the end of the bar to a poor position of leverage, the bar is pulled from the notch it has occupied and is swung around far enough to be pressed down into another notch which will give better leverage. There may be three or more such notches at each edge of the platform. Each notched board or body may have hinges connecting it with the platform, Fig. 11, so that it may be turned down flat on the platform when not in use. These notches should cause the bar to incline up a little to keep its free end well off the water.

Near the pivot, Figs. 1 and 2, is placed a horizontal roller or windlass 45. Each end of the roller has a journal in a bracket rising from the spar 20. Outside the bracket that lies nearer the pivot is a hand-wheel. Any suitable means may be used for holding the wheel and roller in any position to which they are turned. Rope 46 is fastened where one of the vertical masts crosses the middle yard, and it extends through a block or pulley 47, fastened on the angle-mast below the roller. Then it extends several times around the roller to another block 46^a, below on the spar, and thence it extends, at 46', to the other vertical mast when it crosses the middle mast.

Turning the roller will move the main hull in one direction or the other across the face of the sail. Instead of one continuous rope to the roller there may be two ropes, each one having one end fastened to the roller itself, one rope toward each end of the roller and each rope turned a number of times around the roller, the ropes going around in opposite directions and the other ends of these two ropes going through the blocks 46^a 47 and to the vertical masts, or a rope from each vertical mast may end at some convenient distance short of the roller, and then the ends of the ropes from the roller, as just described, after they pass through the blocks below on the spar, may run each one through a pulley fastened at the end of one of the ropes from the vertical masts, thence returning to the spar, where the locks are near to the roller, and being there secured. Thus the rope around the roller would have less tendency to get tangled and also the turning of the roller would have less resistance, taking its effect more slowly. Some check should be placed on the rope or ropes, so that only such length of rope can pass over the roller as will allow the main hull to be drawn around toward the sail as far as may be done without endangering the stability of the apparatus.

When sailing, all three hulls are fixed at about the same angle with the sail, and therefore are about parallel with one another. This

is indicated in the diagram Fig. 16, where the parts shown are numbered to correspond with the other figures. The arrow indicates the direction of the wind. It will be found most convenient to sail with the sail so exposed that the wind reaches it from that side on which the main hull lies, one side of the sail being thus continually the windward side.

While in Fig. 1 the apparatus is sailing before the wind, the hulls being at right angles to the plane of the sail, in Fig. 16 the hulls are turned obliquely and the wind strikes the sail obliquely. When the wind strikes the sail on that side toward the main hull, resistance of the small hulls should be continually a force nearly through a perpendicular dropped from the center of the sail where the angle-mast is connected. The main hull swings from the center of the sail without changing its angle with the sail, because it is fastened at its angle with the end yard and the end yard keeps parallel with the sail because of the connections described. When the main hull swings thus, its resistance should be a force about through the perpendicular dropped from the center of the sail, which is the point from which it swings. The total resistance of the hulls is therefore a force about through the perpendicular line dropped from the center of the sail. The resistance of the sail to the wind is a force about at the center of the sail. The resistance of the sail to the wind and of the hulls to the water are therefore horizontally about through one perpendicular line, and there should be little to turn the apparatus horizontally, and it should keep almost a direct course.

When all the hulls are parallel to one another and at some angle with the plane of the sail and the apparatus is sailing, the main hull if left free to swing or move horizontally—i. e., if the hand-wheel on the roller 45 is not checked—will tend to keep a position about opposite to the center of the sail—that is to say, the main hull thus free will not swing so as to approach the plane of the sail to any appreciable extent, and for this reason the apparatus will have great stability without such extra provisions of ballast as are commonly required in yachts. The sail will remain practically vertical in any moderate wind, and the speed of the apparatus should be great. In order to correct such tendency of the apparatus to turn horizontally as would be found if the main hull were left free to swing, the main hull is drawn and held a little to one side or the other of the position it would have if free. This is readily effected by turning the hand-wheel on the roller. Thus the resistance of the main hull is caused to pass aside from the perpendicular dropped from the center of the sail. The hand-wheel may be turned just enough to correct the lack of steadiness in the course of the apparatus, or it may be turned more than would be necessary for that purpose or turned in the opposite way and the apparatus thus

caused to turn, as desired. The apparatus is in this way steered without a rudder and will turn toward that edge of the sail that is in the direction toward which the main hull has been drawn.

When it is desired to change from port tack to starboard tack, or vice versa, the sail is swung around, bringing the leeward edge to windward, but keeping the wind still on the same side of it. This is effected by forcing the main hull aside from its natural position toward the edge of the sail toward which the apparatus is to turn, and all the hulls are turned to have the same angle with the sail toward the edge of the sail from which they have been pointing.

If desired, the apparatus can sometimes be steered by placing the hulls 14 and hull 19 at different angle with the sail. The end yard 25 may be given greater firmness by stays from its ends to the outer end of a bar 25^a, Fig. 15, having bearings on the pivot and projecting backward.

Evidently the utility of the pivotal connection between the main hull and spar 20 is not dependent on having the sail supported by the small hulls, nor on the pivotal connection between the sail and the angle-mast; nor is the utility of the pivotal connection between the sail and spar 20 dependent entirely on the pivotal connection between the spar 20 and main hull, although there are advantages in having both connections.

While it is much preferred to support the sail in a vertical plane and by means of hulls beneath it, it is within my invention to support the sail in a plane inclined from the vertical, as in Fig. 19, this sail preferably being rectangular and having side and middle yards 2 3 and having one or more masts or rods 4' at right angles to the yards. To the center of the middle yard the inclined spar 20 is pivotally connected. Said mast is connected to the hull 19' at its middle by the vertical pivot 23^a and is supported at the proper angle of inclination by resting against a ring 23^b, supported from the sides of the boat. The boat or hull can be turned horizontally with respect to the mast, as desired, and then secured by ropes 23^c. The sail is normally when in use held at right angles to the mast by ropes 23^d, extending from yards 2 near each corner of the sail; but this angle can be changed at will by adjusting said ropes.

23^c is ballast to counterbalance the weight of the sail. With this arrangement of sail one increment of the wind force on the sail is upward, so that the boat will not careen unduly in a high wind.

Any suitable means may be used to hold the sail of Fig. 19 on the pin 21 when unsupported by the wind.

Having described my invention, what I claim is—

1. The combination, in a sailing apparatus, of a hull, an inclined spar, a pivotal connec-

tion between said spar and the hull, a sail at the outer end of said spar and transverse thereto, and means for fixing the sail and spar at desired angles with the hub.

2. The combination of a hull, an inclined spar 20, a pivot connecting the hull and spar, a sail at the outer end of the spar, and means distinct from said hull and spar for supporting said sail.

3. The combination of a hull, an inclined spar, a pivotal connection between the hull and spar, near the center of the hull, and a sail at the outer end of the spar and transverse thereto.

4. The combination of a hull, an inclined spar, a pivotal connection between the hull and spar, a sail at the outer end of the spar and transverse thereto, and means for spreading and furling said sail from said hull.

5. The combination of a hull, an inclined spar, a sail transverse to the spar, secured to the spar at its outer end, and ropes and pulleys for spreading and furling the sail from the hull.

6. The combination of a hull, an inclined spar, a sail, at the outer end of the spar, middle and side yards for the sail, ropes extending to the hull for pulling the side yards from the middle yard to spread the sail, and ropes also extending to the hull for pulling the side yards to the middle yard to furl the sail.

7. The combination of a hull, an inclined spar, a sail at the outer end of the spar, middle and side yards for the sail, ropes extending to the hull for pulling the side yards from the middle yard to spread the sail, and ropes also extending to the hull for pulling the side yards to the middle, and ropes from one side yard over suitable pulleys to the other side yard, whereby one side yard is caused to counterbalance the other side yard.

8. The combination of a hull, an inclined spar, a sail at the outer end of the spar, middle and side yards for the sail, the former being fixed and the latter movable from and toward it, ropes extending to the hull for spreading and furling the sail, and ropes passing over pulleys and between the side yards, whereby the moving of one side yard will move the other also but in opposite direction.

9. The combination of a hull, an inclined spar, a sail at the outer end of the spar, a pivotal connection between the sail and spar, and means operated at the hull for shifting the angle between the sail and spar.

10. The combination of a hull, an inclined spar having a pivotal connection with the hull, a sail adapted to be stretched in or nearly in a vertical plane, and connected to the outer end of the spar.

11. The combination of a hull, a sail, a spar connected at one end to said hull and at the other end pivotally connected at the center of the sail, whereby when the sail is spread in the wind the spar assumes a position in a vertical plane at right angles to the length of

the sail, means for changing the angle between the sail and spar, and means for securing the spar and its hull in the new position, whereby the course of the apparatus is changed.

12. The combination of a hull, an inclined spar having a pivotal connection with the hull, a sail adapted to be stretched in or nearly in a vertical plane, a pivot at the outer end of the spar connecting the spar and sail, and means operated from the hull for shifting the angle between the sail and the spar and holding the sail and spar at the angle to which they are set.

13. The combination of a main hull, an inclined spar, a vertical or nearly vertical sail connected to the outer end of the spar, and hulls, distinct from the main hull, below and supporting said sail.

14. The combination of a single rectangular sail continually supported when spread in or nearly in a vertical plane, hulls below the sail, masts at the centers of said hulls supporting the sail, a main hull at a distance to one side of the plane of the sail, a spar one end of which is pivoted to the sail at its center and the other end of which is pivotally connected to the main hull, and means for turning any of the hulls to, and securing them at, any desired angle to the plane of the sail.

15. The combination of a rectangular sail having secured thereto horizontal yards along the middle, top, and bottom of the sail, and a plurality of hulls below the sail for supporting it.

16. The combination of a rectangular sail having secured thereto horizontal yards along the middle, top, and bottom of the sail, a plurality of hulls below the sail, a vertical mast from each hull below the sail, said masts being secured to the middle yard where they cross, and the side yards having eyes adapted to slide on the masts.

17. The combination of a main hull, a spar secured thereto, a sail connected to the outer end of said spar, horizontal sail-yards secured along the top, bottom and middle of the sail, a hull below the sail on each side of its center, a mast on each hull below the sail, the middle yard being connected to the masts where they cross, and the side yards having eyes adapted to slide on the masts, and ropes and pulleys for moving the side yards at will and securing them.

18. The combination of a main hull, a spar, a sail at the outer end of the spar, horizontal yards along the edges and middle of the sail, hulls below the sail, masts rising from said hulls, the middle yard being connected to the masts where they cross, the side yards having eyes adapted to slide on the masts, ropes extending from the side yards over pulleys to the main hull for pulling the side yards away from the middle yard, and similar ropes for returning said yards whereby the sail is spread and furled.

19. The combination of a main hull, a spar, a sail at the outer end of said spar, hulls below the sail, masts, \perp -irons secured in bearings across the decks at right angles to their length, the vertical arms of said irons entering suitable eyes on the masts.

20. The combination of a main hull, a \perp -iron secured in bearings across the deck at or near the middle thereof, a spar pivoted on the vertical member of said \perp -iron, a sail at the outer end of the spar, and hulls below the sail for supporting it.

21. The combination of a hull, a spar, a sail at the outer end of the spar, hulls below the sail, \perp -irons secured in bearings across the decks of the hulls below the sail, masts supported by said \perp -irons and supporting the sail, and on which the sail can be spread.

22. The combination, of a sail, a plurality of hulls below and supporting said sail, a mast rising from the centers of each of said hulls on which said sail can be spread, said sail always extending across both said hulls at their centers, said hulls below the sail being movable to vary the horizontal angle which they make with the plane of the sail, stays holding said masts parallel, and stays holding said hulls parallel.

23. The combination of a rectangular sail, horizontal side and middle sail-yards to which the sail is connected, a plurality of hulls below the sail, masts rising from said hulls and supporting the sail and yards, stays between said masts, and stays between said masts and the middle yard holding the masts parallel, said sail always extending over all said hulls.

24. The combination of a main hull, a spar, a pivot therefor on the main hull, a sail at the outer end of the spar, horizontal sail-yards, an end yard over the deck of the main hull parallel with the sail and sail-yards and secured to the pivot, hulls below the sail, masts rising therefrom, and stays between the sail-yards or the masts and the end yard holding the sail and end yard parallel.

25. The combination of a main hull, a spar, a pivot on said hull for said spar, a sail at the outer end of the spar, sail-yards, hulls below the sail, vertical masts rising therefrom and supporting the sail, an end yard above the deck of the main hull, stays holding the sail and yard continually parallel, ropes extending from a point of leverage on the main hull to pulleys at the end of the end yard for moving the hull to any angle with the end yard and there securing it.

26. The combination of a hull, a spar, a pivot on the hull for said spar, a sail at the outer end of the spar, an end yard above the deck of the hull, one or more bars projecting sidewise from the deck and firmly fixed thereto so as to stand horizontal pull, and ropes from said bar through pulleys at the ends of the end yard for shifting the hull to a different angle with the end yard.

27. The combination of a hull, a mast, a sail,

a vertical pivot at the bottom of the mast and near the middle of the hull, a sidewise-extending bar fixed to said hull and forming a point of attachment for turning the hull horizontally on said pivot.

28. The combination of a hull, a mast, a sail, a vertical pivot near the middle of the hull and at the bottom of the mast, a sidewise-extending bar fixed to said hull and forming a point of attachment for turning the hull horizontally on said pivot, said bar being adjustable horizontally to different angles with the hull.

29. The combination of a hull, a vertical pivot near the middle thereof, a sidewise-extending bar fixed to said hull and forming a point of attachment for turning the hull horizontally on said pivot, a rope attached to said bar for partially turning the hull, and a rope attached to an end of said hull also for further turning it.

30. The combination of a hull having a central pivot, notched boards or bodies arranged beside the pivot, a bar for turning the hull on said pivot one end of which has a bearing against the pivot the other end of which projects beyond the hull the bar being adapted to enter one or another of the notches thereby securing the bar to the hull at a desired angle.

31. The combination of a hull having a deck, hinged notched boards near the edges of the deck, and a bar 43 held in either of said notches.

32. The combination of a hull closed air-tight, a vertical pivot rising at the middle of the hull, a spar 20 secured to the pivot and a sail secured to the spar at its outer end.

33. The combination of a hull, a vertical pivot rising from the hull, a spar 20 secured to the pivot, a sail secured to the spar at its outer end, hulls closed air-tight below the sail, and masts rising from the hulls below the sail and supporting the sail.

34. The combination of a main hull closed air-tight, a spar 20, a sail at the outer end of the spar, and hulls closed air-tight below the sail and supporting it.

35. The combination with a sail, of a plurality of hulls closed air-tight below the sail and supporting it said sail always extending over all said hulls.

36. The combination with a sail, of a plurality of hulls closed air-tight below the sail and supporting it, said sail always extending over all said hulls, and means for holding the

hulls at any desired horizontal angle with the sail.

37. The combination of a hull rectangular in cross-section, the sides being vertical and inclining similarly from the center to each end, a spar pivotally connected to said hull, and a sail, as set forth.

38. The combination of a main hull closed air-tight, rectangular in cross-section, a vertical pivot rising at the middle of the deck of the hull, a spar 20, a vertical sail pivotally connected to the spar at its outer end, hulls below the sail closed air-tight and rectangular in cross-section, and masts rising from the hulls below the sail and supporting it.

39. The combination of a main hull, a spar 20, a vertical pin fixed to the outer end of the spar, a sail having side yards and a middle yard, a vertical eye or socket fixed to the middle of the middle yard and receiving said vertical pin.

40. The combinations of hulls 14 and 19, spar 20 and masts 4, a sail adapted to be spread on masts 4, horizontal middle and side yards for the sail, an end yard 25 above hull 19, stays 29, 30, 31 between the ends of the end yard and the sail at or near where the sail-yards cross masts 4, and ropes from the sail where the middle yard crosses masts 4 to hull 19.

41. The combination of a hull, an inclined spar pivotally connected at one end to the hull, a sail at the other end of the spar, means for securing the hull at a desired angle with the sail, means for changing the angle between the spar and sail, and means for maintaining the same angle between the sail and hull.

42. The combination of a vertical or nearly vertical sail, hulls inclining similarly from the middle to each end below and supporting the sail, a main hull, and a spar 20 between the main hull and the sail.

43. The combination of a vertical or nearly vertical sail, hulls inclining similarly from the middle to each end below and supporting the sail, a main hull also inclining similarly from the middle to each end, and a spar 20 from the main hull to the sail.

Signed this 21st day of September, 1897.

CHARLES TWINING.

Witnesses:

W. G. CATTARACH,
PHILIP POPHAM.