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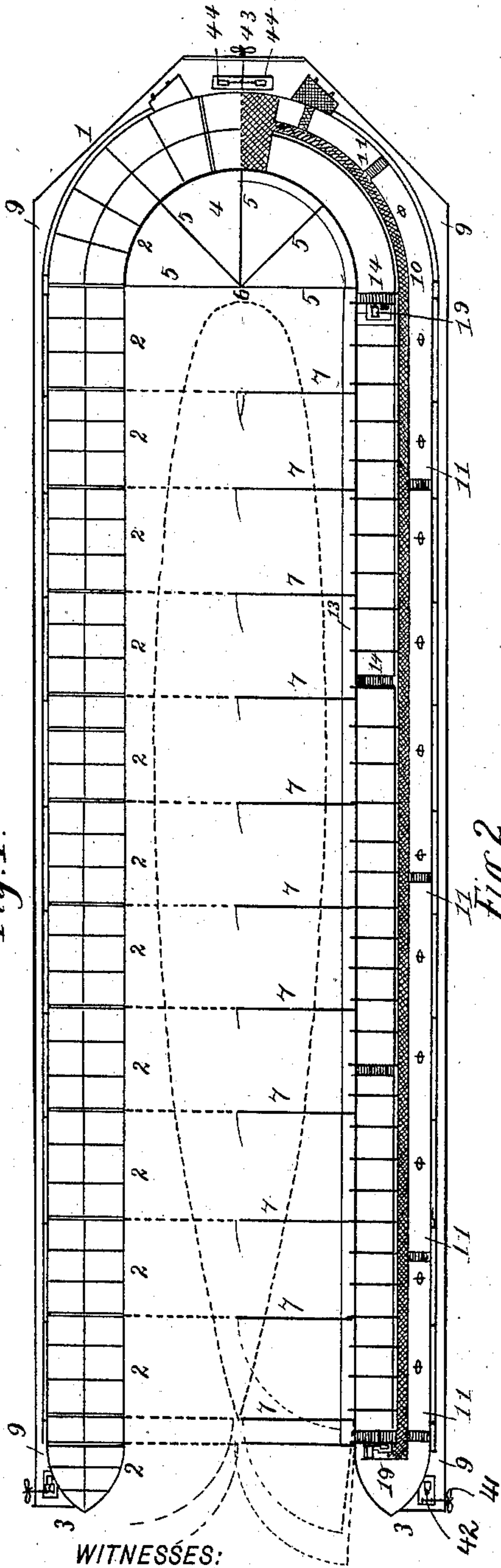
7 Sheets—Sheet 1.

M. GUASTAVINO.
FLOATING OR SUBMERGEABLE DOCK.

No. 590,147.

Patented Sept. 14, 1897.

Fig. 1.



WITNESSES:

C. Bedgwick
E. M. Hopkins.

Fig. 2.

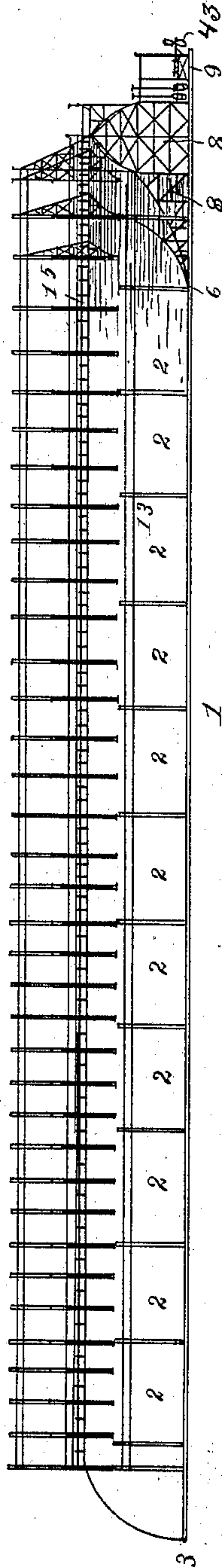
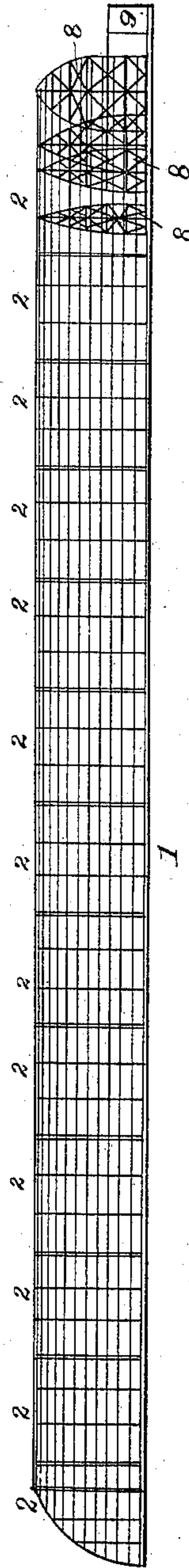


Fig. 3.



INVENTOR

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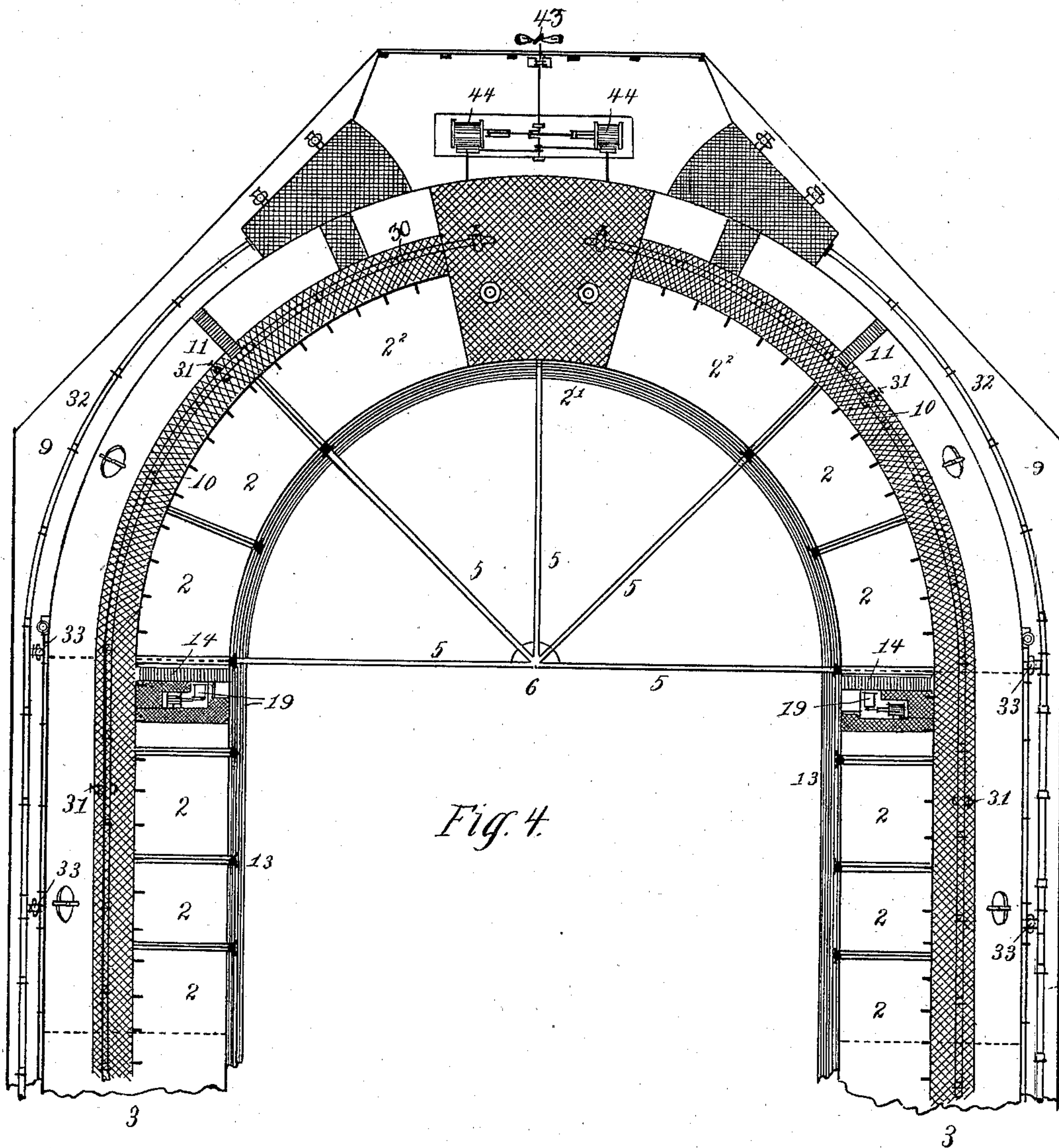


Fig. 4.

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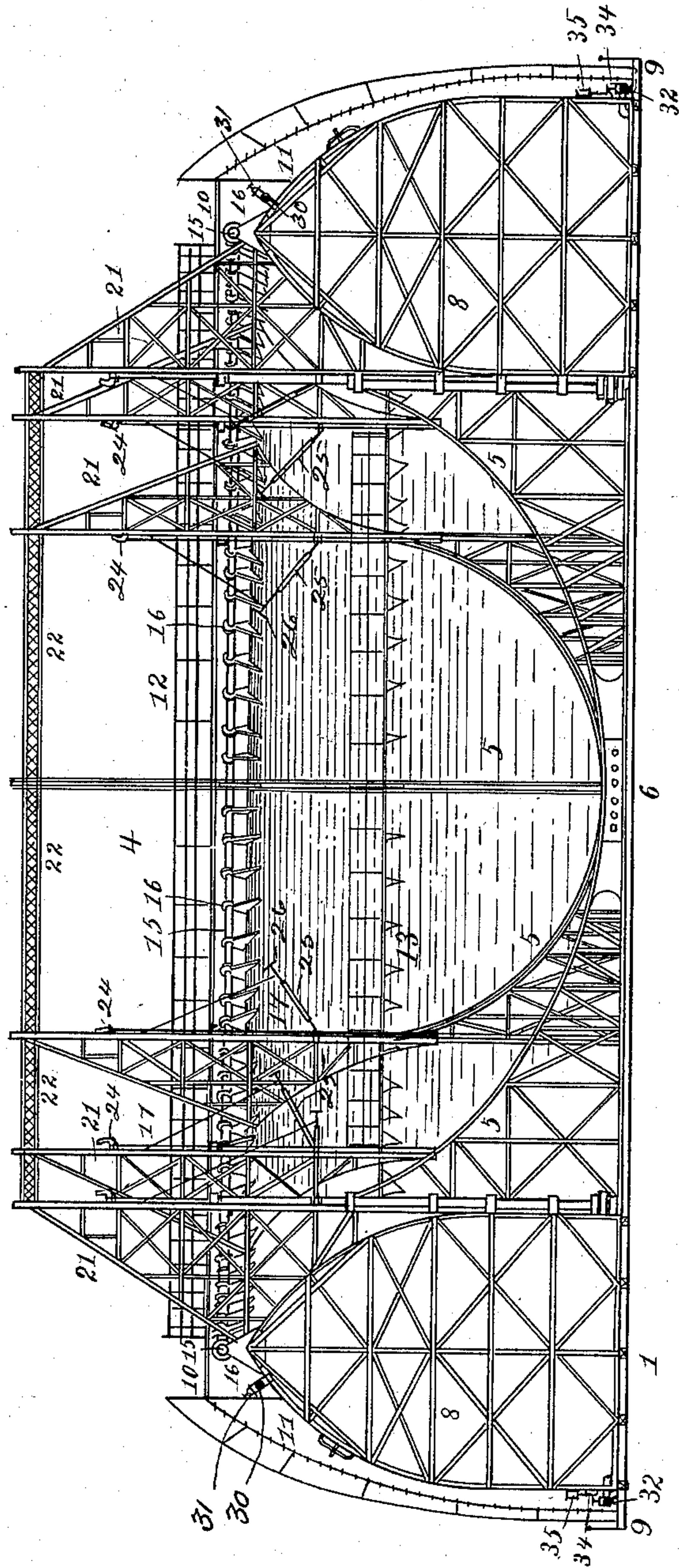
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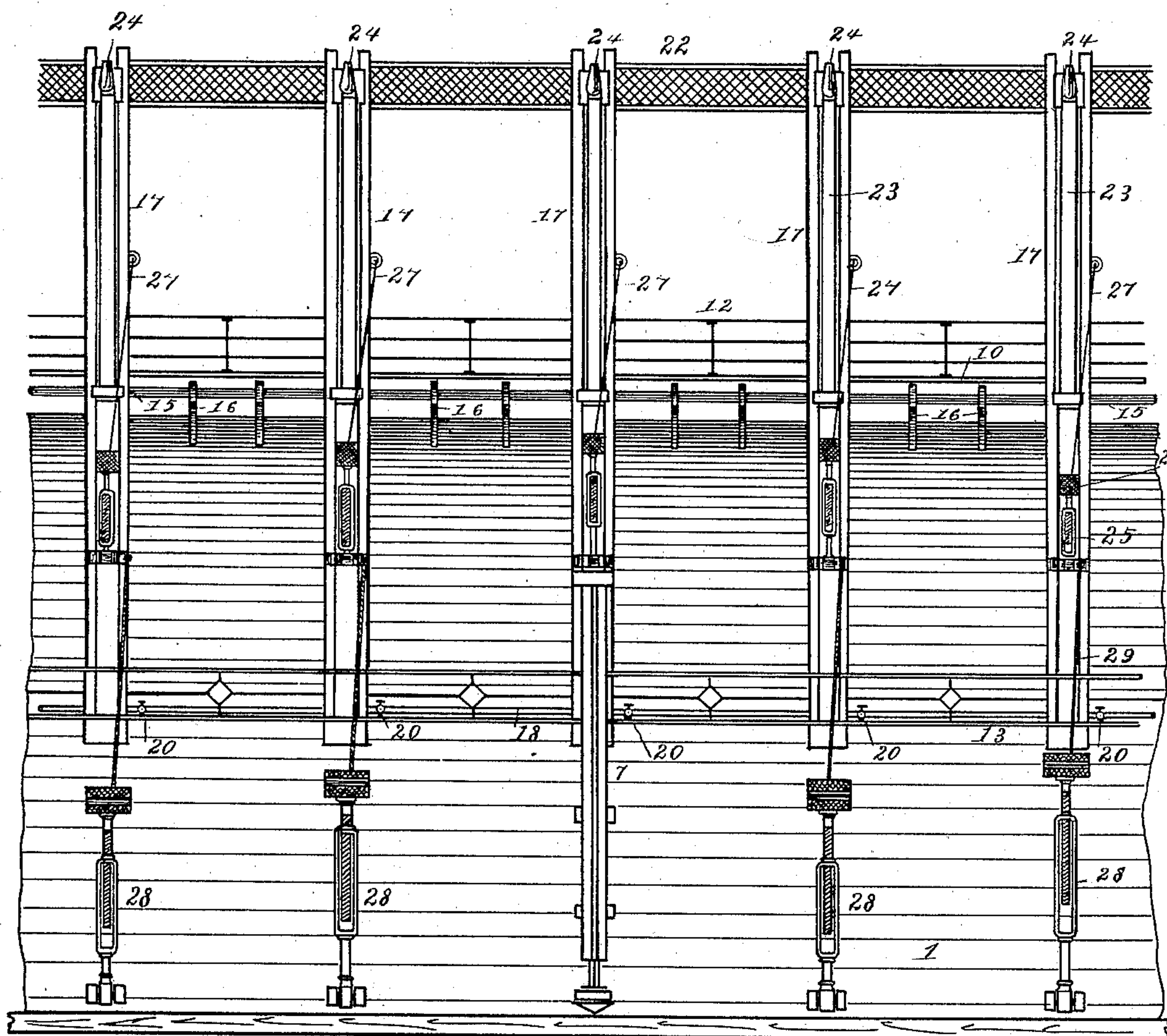
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Fig. 6.



WITNESSES:

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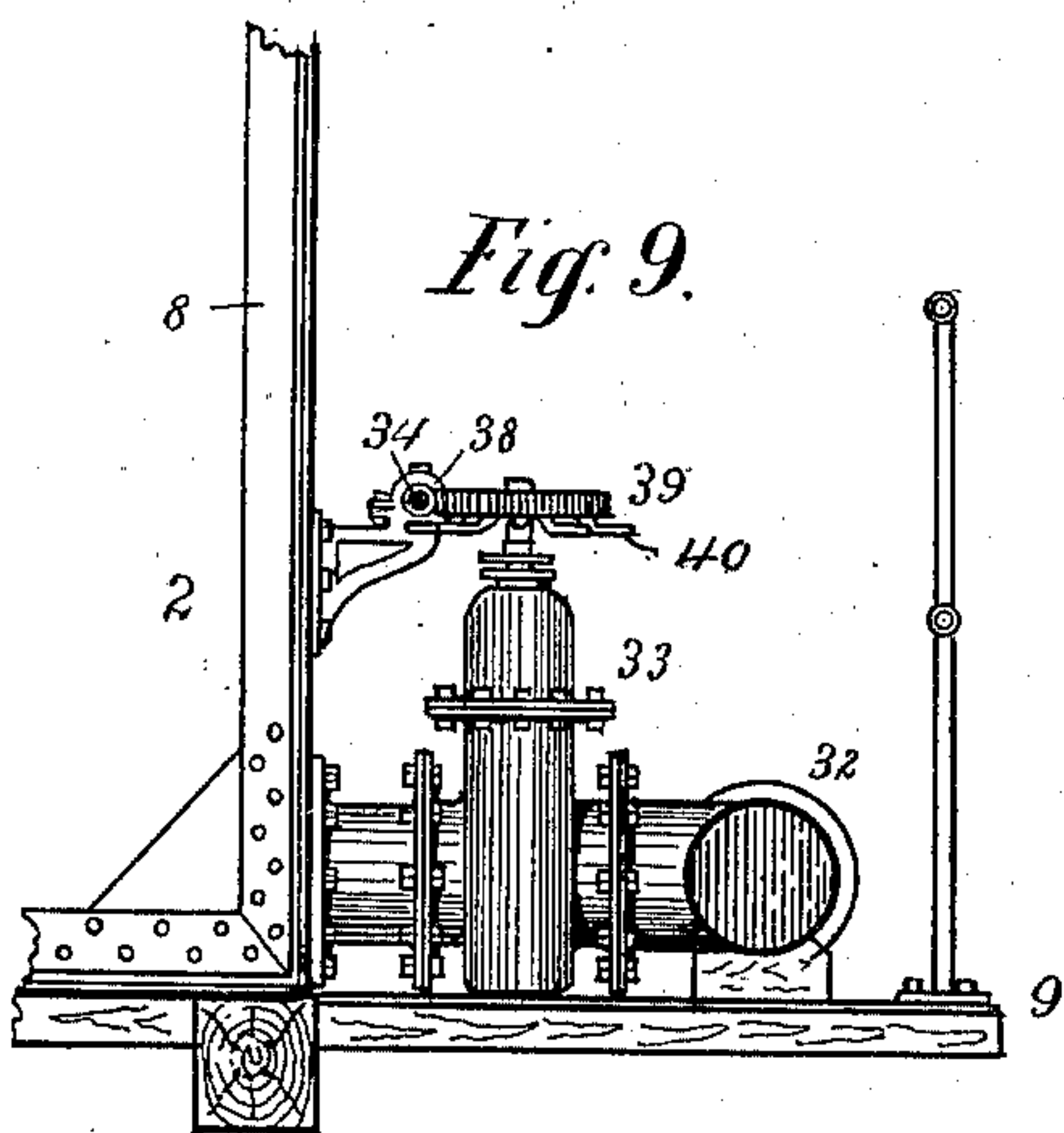
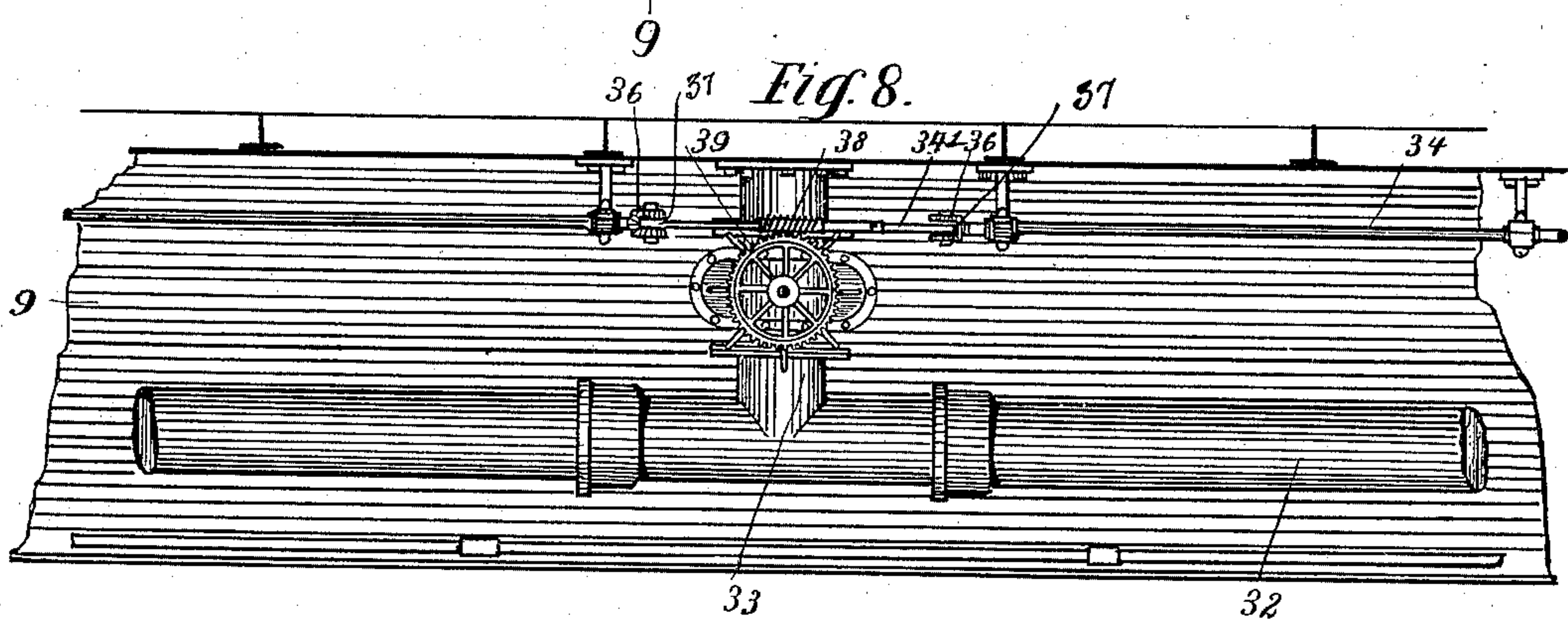
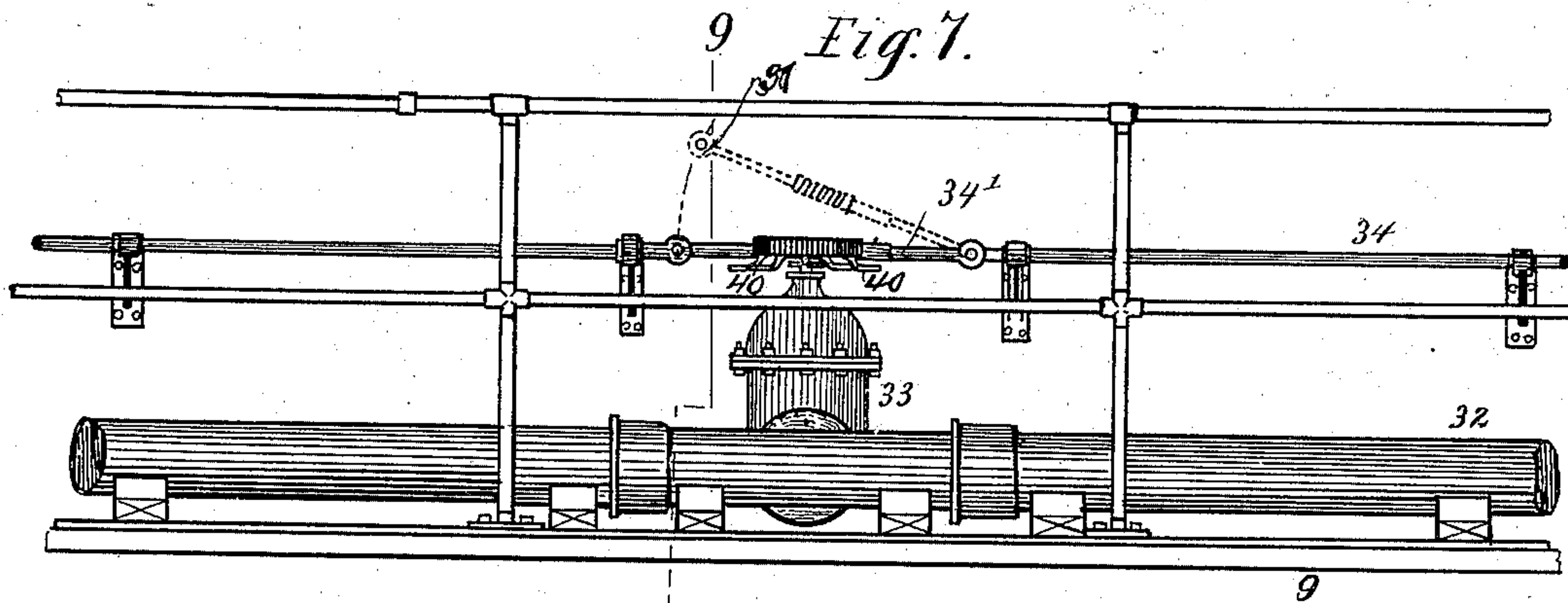
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Fig. 10.

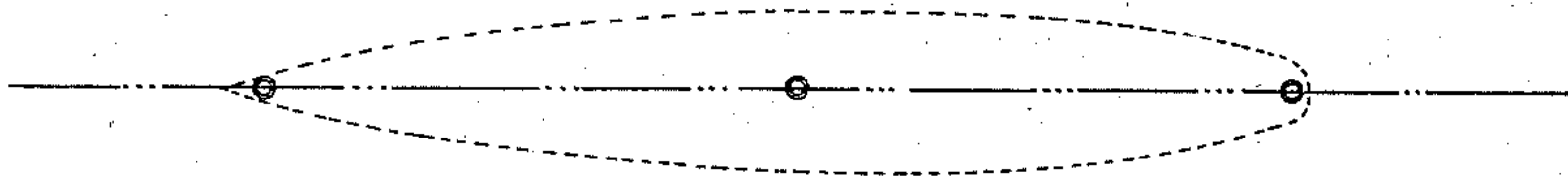
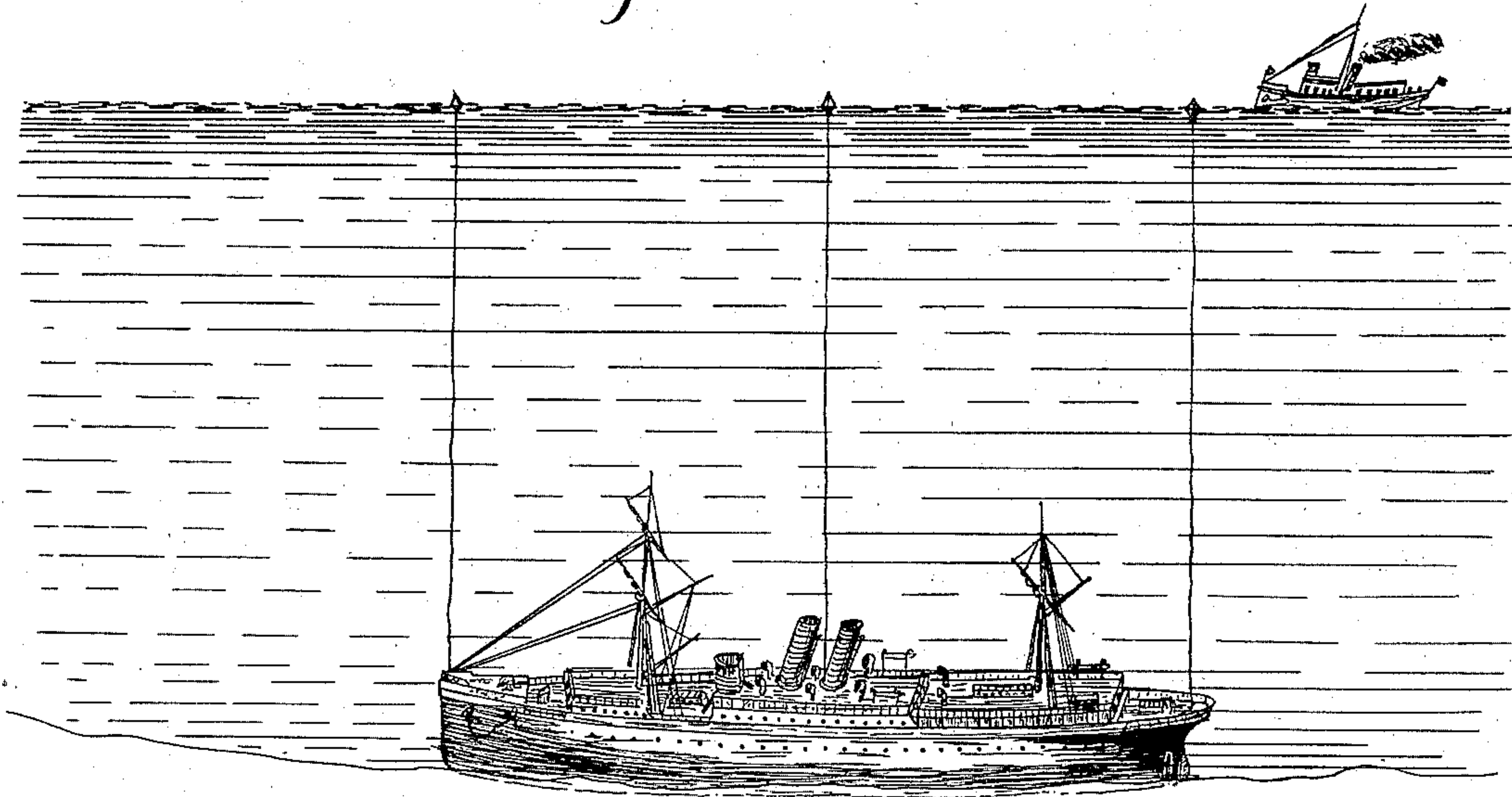


Fig. 11.

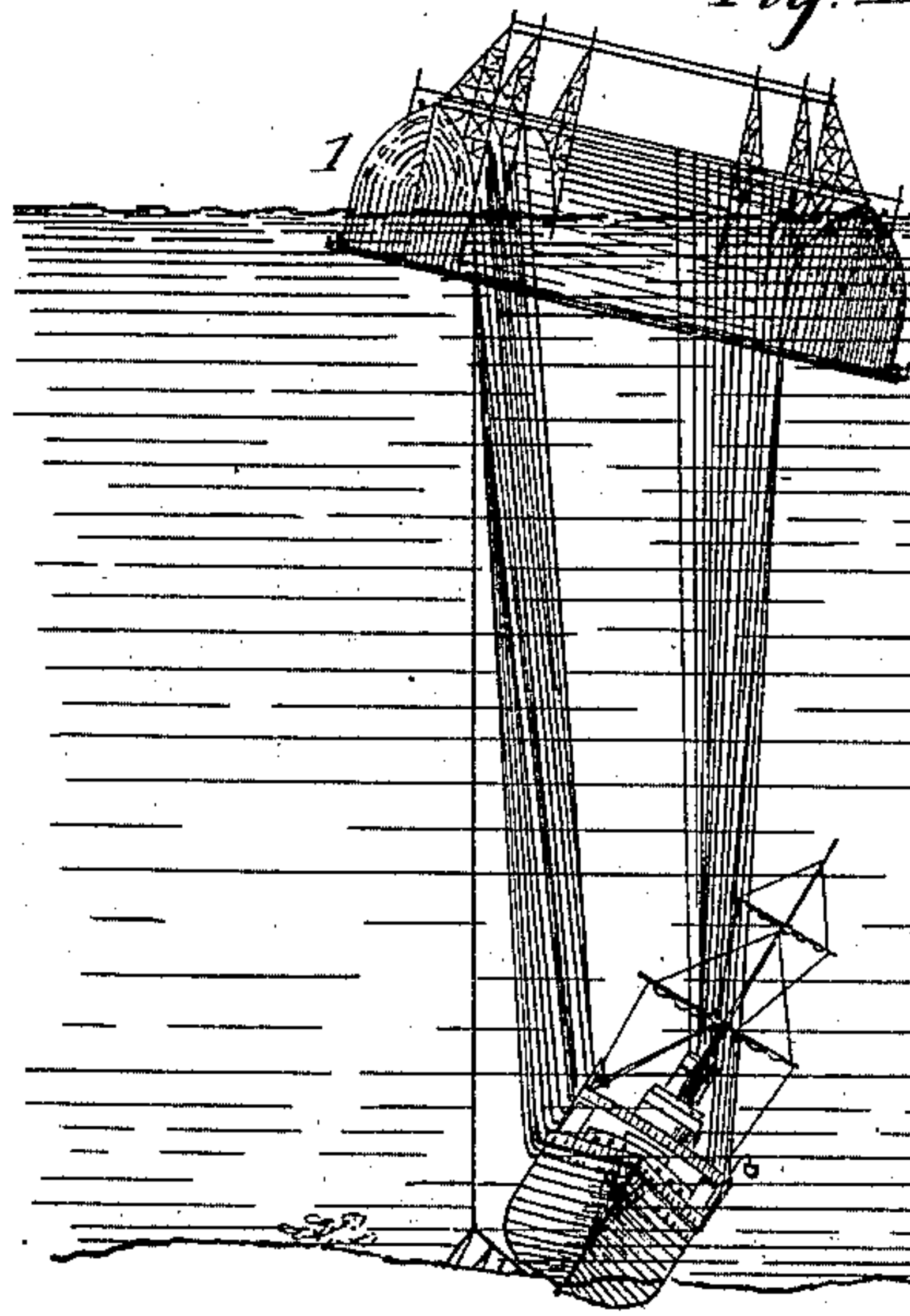
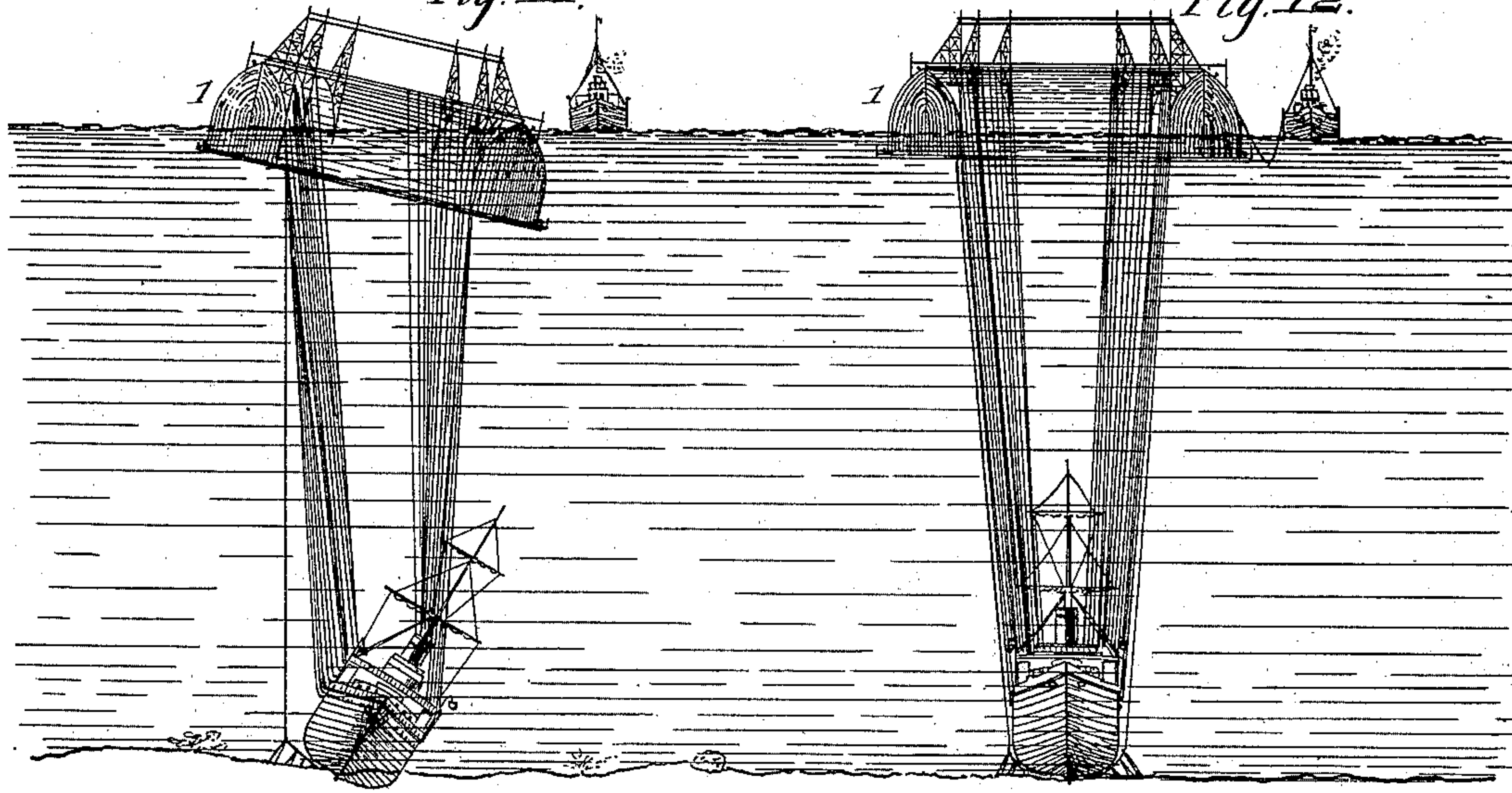


Fig. 12.



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Fig. 13.

Fig. 14.

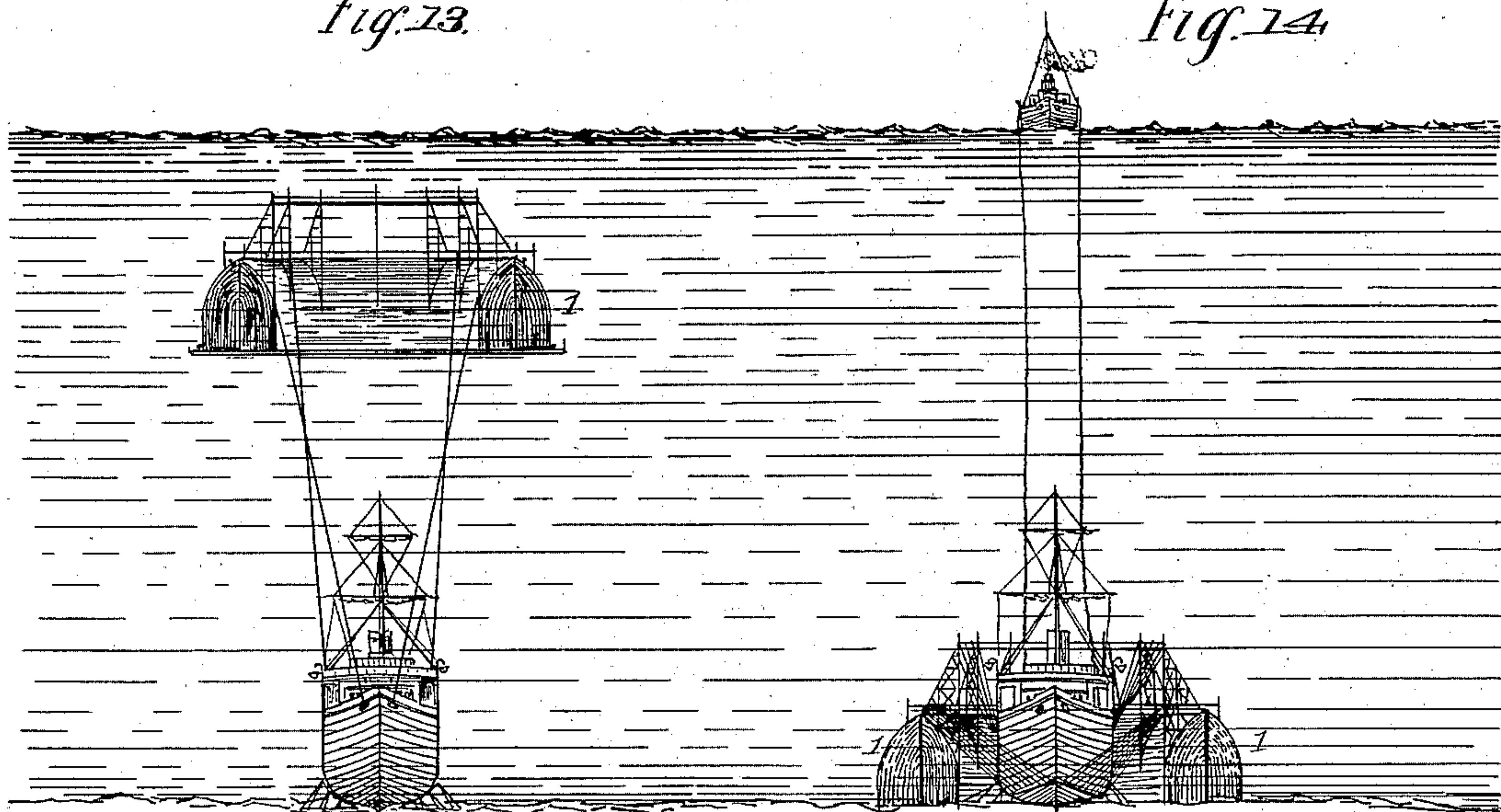
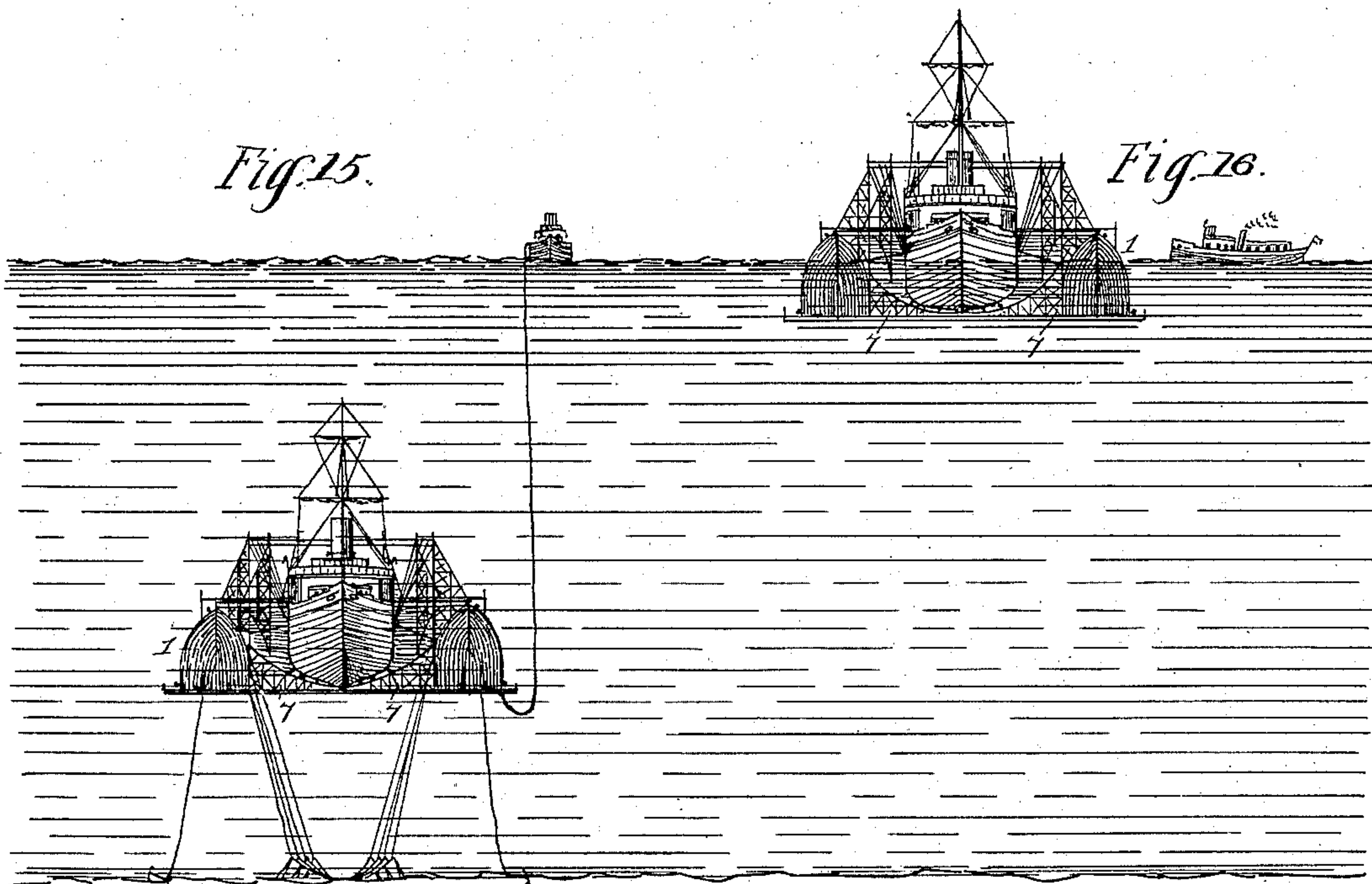


Fig. 15.

Fig. 16.



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UNITED STATES PATENT OFFICE.

MANUEL GUASTAVINO, OF NEW YORK, N. Y.

FLOATING OR SUBMERGEABLE DOCK.

SPECIFICATION forming part of Letters Patent No. 590,147, dated September 14, 1897.

Application filed August 4, 1894. Serial No. 519,616. (No model.)

To all whom it may concern:

Be it known that I, MANUEL GUASTAVINO, of New York city, in the county and State of New York, have invented a new and Improved
5 Floating or Submergeable Dock, of which the following is a specification, reference being had to the annexed drawings, forming a part thereof, in which—

Figure 1 is a plan view of my improved
10 dock, with a portion of the upper deck removed. Fig. 2 is a side elevation. Fig. 3 is a side sectional elevation of the main body of the dock, with the outside shell removed to show internal construction. Fig. 4 is an
15 enlarged plan view of the closed end of the dock. Fig. 5 is an enlarged rear elevation of the dock. Fig. 6 is an enlarged side elevation of a portion of the dock. Fig. 7 is a side elevation of a portion of the water-pipe
20 and valve, showing mechanism for operating the valve. Fig. 8 is a plan view of the same, Fig. 9 is a vertical transverse section taken on line 9 9 in Fig. 7. Fig. 10 illustrates a method of indicating the position of a sunken
25 vessel. Fig. 11 shows the dock partly submerged in an inclined position, with attachments to the sunken vessel. Fig. 12 shows the dock and vessel straightened up, the dock being in position for submergence. Fig.
30 13 shows the dock in its descent. Fig. 14 shows the dock resting on the sea-bottom and inclosing the sunken vessel. Fig. 15 shows the dock while ascending and carrying the sunken vessel, and Fig. 16 shows the dock
35 supporting the vessel at the surface of the water.

Similar figures of reference indicate corresponding parts in all the views.

Ships as they are built at present are of
40 such great size that when one of them sinks it is generally abandoned as a total loss on account of the lack of adequate apparatus for raising it. The appliances at present in use are of weak construction, insufficient
45 size, and not well adapted to the work to be done.

The object of my invention is to construct a floating and submergeable dock of sufficient capacity to accommodate the largest vessels,
50 and with efficient machinery and apparatus for righting a vessel if resting in an inclined position, and for raising it to the surface and there supporting it while it is being discharged or overhauled and repaired..

My object is also to provide a dock which 55 may not only be used for the salvage of vessels, but also for repairing vessels which are afloat.

My invention consists in a U-shaped dock, formed of a series of water-tight compart- 60 ments of approximately parabolic cross-section, with the base or wider portion downward, a series of valves for the introduction of air into the compartments, a series of valves for the eduction of water from the 65 compartments, and a series of hydraulic lifts for handling the vessel to be raised.

It also consists in adjustable struts for supporting the vessel in an upright position in the dock; also, in the combination with the 70 dock of screw-propellers operated by engines driven by compressed air.

The invention further consists in various details of construction whereby the handling of sunken vessels is reduced to simple and 75 positive operations with a minimum of expense and risk, all as will be hereinafter more fully described.

The body or main portion 1 of the dock is composed of air and water tight sections 2, of 80 approximately parabolic cross-section, with the apex uppermost and the broad base downward. The sections 2, which are rigidly secured together, form the two parallel sides 3 3 of the dock, and also the semicircular end 4, 85 the end sections being modified to permit of this construction. The dock is thus made practically U-shaped, and the extremities of the arms thereof are made pointed or angular, like a bow of a boat inverted. 90

The sections 2 of the semicircular end 4 are connected by brackets 5, radiating from the center 6, from which the curves of the end sections are described. These brackets are 95 securely fastened together at their meeting ends. The brackets 5 are formed of T and angle bars of iron or steel riveted together, forming a latticed structure of great strength and rigidity, having curved upper edges, as shown. To the sections 2, at the inner sur- 100 faces of the sides of the dock, are pivotally-connected brackets 7, similar in form and construction to the brackets 5. These brackets may be swung outwardly from opposite sides of the dock and connected in pairs at their 105 adjacent ends at the center line of the dock, as indicated by dotted and full lines in Fig. 1.

The sections 2 each consist of frames 8, made

of T and angle bars, arranged to afford great strength and rigidity, and, with a covering of sheet metal secured to and enveloping the frames, form an air and water tight chamber.

5 Around the outer portion of the base of the body of the dock is arranged a platform 9, which supports the water pipes and valves, also the engines used for operating the valves. The said platform is provided with a railing,
10 for the safety and guidance of the divers. The platform 9 communicates with a platform 10, extending throughout the length of the three sides and around the semicircular end, by means of ladders 11. The platform 10 is
15 guarded by a railing 12. On the inner side of the dock, at a distance from the top equal to about one-third of the height of the dock-sections, is secured a platform 13, which communicates with the platform 10 by ladders 14.
20 Above the apex of the sections 2 is supported a heavy bar 15 by standards 16, secured to the top of the sections. To the inner sides of the sections 2 are attached hydraulic lifts 17, which are connected by a pipe 18 with a
25 hydraulic accumulator or with pumps. Each hydraulic lift is provided with a valve 20, by means of which its movements may be regulated. The hydraulic lifts are supported by rigid iron frames 21, secured to the sections
30 2, and connected at their upper ends by beams 22. The pistons 23 of the hydraulic pumps are guided by ways on the frames 21, and the upper ends of the said pistons carry massive hooks 24, for receiving the chains or cables
35 to be attached to the vessel. To the frames 21 are pivotally secured struts 25, each of which is made adjustable as to its length by a turnbuckle, and is provided at its free end with a shoe 26 for engaging the side of the
40 vessel, and ropes 27 are attached to the struts for raising and lowering them as occasion may require.

To the lower portion of the sides of the dock are attached struts 28, like those already
45 described, which are suspended and operated by ropes 29. The central stern-section 2' is used as a reservoir for compressed air, and pipes 30, leading from the said section, communicate with the several sections 2 through
50 valves 31. The sections 2', lying on opposite sides of the central stern-section, are used as hydraulic accumulators for operating the hydraulic lifts, these sections being connected by pipes 32 through valves 33 with
55 the sections 2.

A shaft 34 extends along each side of the dock parallel with the pipes 32 and is connected with an engine 35. The said shaft is made in sections. A short section 34', arranged opposite each valve 33, is connected
60 with the longer sections between the valves by double eyes 36 on the ends of the longer sections and single eyes 37 on the ends of the shorter section, bolts being inserted in the
65 double and single eyes at each end of the short section to hold the said short section in place. On the short shaft-section 34' is

mounted a worm 38, which is capable of sliding on the shaft but can not turn thereon. The worm 38 engages a worm-wheel 39 on
70 the stem of the valve, so that when the shaft 34 is revolved by the engine 35 all the valves connected in the manner described will be either opened or closed according to the direction of the rotation of the engine. The
75 valve 33 may be of the ordinary gate-valve type provided with a gate or valve operated by the turning of a swivel-screw stem.

When it is desired to cut out one or more of the sections so that it may be filled or
80 emptied or maintained in any desired condition independent of the others, the short section 34' of the shaft 34 is disconnected at one end and swung outwardly, as shown in
85 Fig. 7, when the worm is moved along on the shaft, so that when the shaft is replaced the worm will not engage the worm-wheel. The worm-wheel is provided with radial handles 40, which permit of operating the valve by
90 hand.

The dock is provided at the open end on opposite sides with propeller-screws 41 41, operated by compressed-air engines 42 42, and the closed end of the dock is provided
95 with a propeller-screw 43 driven by compressed-air engines 44 44. The compressed-air engines and the various valves of the dock are controlled by divers.

The dock is accompanied by a powerful tug furnished with efficient air-compressors
100 and with apparatus for divers. The air-compressing apparatus is connected with the air-reservoir of the dock by means of hose preferably made of leather, and the dock is
105 provided with an air-discharge pipe (preferably rubber hose) leading to the surface to avoid the necessity of discharging air against the pressure of the water.

I will proceed to give a description of the maneuvering of my improved dock. When
110 a ship is sunk to a depth of one hundred and fifty feet or less, the first consideration is to determine its position. If it presents no trace on the surface of the water, divers are sent
115 down with the necessary orders for placing at the stern, center, and upon the bowsprit a cable to which is attached a buoy of the smallest practicable size. These buoys will each
120 be painted a different color. The divers will ascertain the character of the sea-bottom, the position of the vessel, and other necessary details. Ships in sinking generally settle on one
125 side, and in such cases the procedure should be as follows: The dock, which is on the surface, should be placed directly over the spot where the ship rests on the bottom. Cables
130 are sent down from the dock and attached to the sides of the ship from bow to stern, those on the lower side being tight, while those upon the upper side are slack. The upper ends of these cables are attached to the bar 15. During this operation the sections of the dock on the side corresponding to the side of the ship which is embedded will be allowed to slowly

fill with water, which will make the dock sink on that side, when the cables are tightened on that side. The sections are then emptied by forcing air into them through the pipes 30, the water being discharged through the pipes 32, the valves 33 at this time being open. The buoyancy of the side of the apparatus restored it resumes its horizontal position and by drawing on the cables rights the ship.

When the ship is righted, supports are placed beneath the hull to sustain it in its righted position. At this point all the cables are detached with the exception of four, two at the bow and two at the stern. These cables are connected with the winding-engines 19. When this is done, the sections of the dock are filled with water, thus producing a total immersion of the dock. This is aided and hastened by winding the cables by means of the motors 19. The cables serve to guide the dock in its descent. When the dock rests on the sea-bottom and incloses the vessel, a new arrangement of cables is made by attaching cables to the hull of the vessel and connecting them with the hooks 24 of the hydraulic lifts, when by means of the said lifts the vessel is raised a short distance, and cables are passed under the hull and attached to the bar 15, as shown in Fig. 14, and the brackets 7 are swung underneath the vessel and fastened together, as shown in Fig. 15. In case the sea-bottom is composed of sand or rock this operation may be performed while the dock is in suspension and without the necessity of bringing it into contact with the bottom by substituting air for water in one or more of the sections. By completely emptying the sections of water by forcing in air the buoyancy of the dock will be increased to such an extent as to enable it to lift the vessel to the surface, as shown in Fig. 16, after which its cargo may be discharged or the vessel with its load may be towed to a place where it may be repaired without removing it from the dock. The position of the vessel may be varied, as required, by filling part or all of the sections of the dock either partly or entirely with water.

In case the vessel is sunk by running on the rocks and one end is wedged between rocks while the other end hangs free the dock is advanced to the right point by means of its propeller-screw. The cables are then attached to the sides of the ship and to the hooks 24 of the hydraulic lifts, and the lifts can now exert sufficient lifting power to remove the vessel from the rocks. Where the vessel has run aground in the sand or on a bank on its side, the dock advances open end first toward the stern of the vessel and incloses the sides of the vessel, when the hydraulic lifts are brought into use, thus lifting the vessel, when the dock with the vessel may be floated into deep water. These maneuvers will have to be modified to meet different cases, but it is believed that the im-

proved dock will be effective in the salvage of many vessels which are now abandoned as lost.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A floating or submergeable dock, formed of tank-sections secured together and arranged to form a U-shaped structure having a clear open space between the arms thereof capable of receiving an entire vessel, the said arms extending parallel with each other along the sides of the vessel throughout its length, substantially as specified.

2. In a floating and submergeable dock, the combination of a U-shaped float formed of a series of water and air tight tank-sections, and a series of hydraulic lifts attached to the inner side of the U-shaped float and provided with devices for engaging the vessel contained by the U-shaped float, substantially as specified.

3. A floating and submergeable dock, formed of two series of air-tight tank-sections arranged parallel with each other, and an end series of tanks connecting the parallel series, one or more of the end series comprising a compressed-air reservoir for operating engines, substantially as specified.

4. The combination, with a dock formed of a series of tank-sections and adapted to float on the surface or be submerged, of air-operated propeller-screws placed at the stern and sides of the dock, for propelling the dock longitudinally or laterally, substantially as specified.

5. In a floating and submergeable dock, the combination with the tank-sections, of valves connected with the sections, pipes leading from the hydraulic accumulators and communicating with the valves, and mechanism for operating the valves simultaneously, substantially as specified.

6. The combination with the tank-sections, of valves connected with the sections and provided with valve-spindles having worm-wheels, shafts provided with movable worms engaging the worm-wheels, a motor for operating the shafts, and pipes leading from the valves to the hydraulic accumulators, substantially as specified.

7. A floating and submergeable dock, formed of air-tight tank-sections of approximately parabolic cross-section having the apex of the sections uppermost, secured to each other, forming a U-shaped rigid structure substantially as specified.

8. The combination, with a floating and submergeable dock, of a bar extending along the top thereof, parallel with and above the center line of the tank-sections for receiving the mooring-cables, substantially as specified.

MANUEL GUASTAVINO.

Witnesses:

C. SEDGWICK,
F. W. HANAFORD.