A. Le. Mat.
Life Boat & Raft.

No. 14,365. Patented Mar. 4, 1856.

Fig: 1.

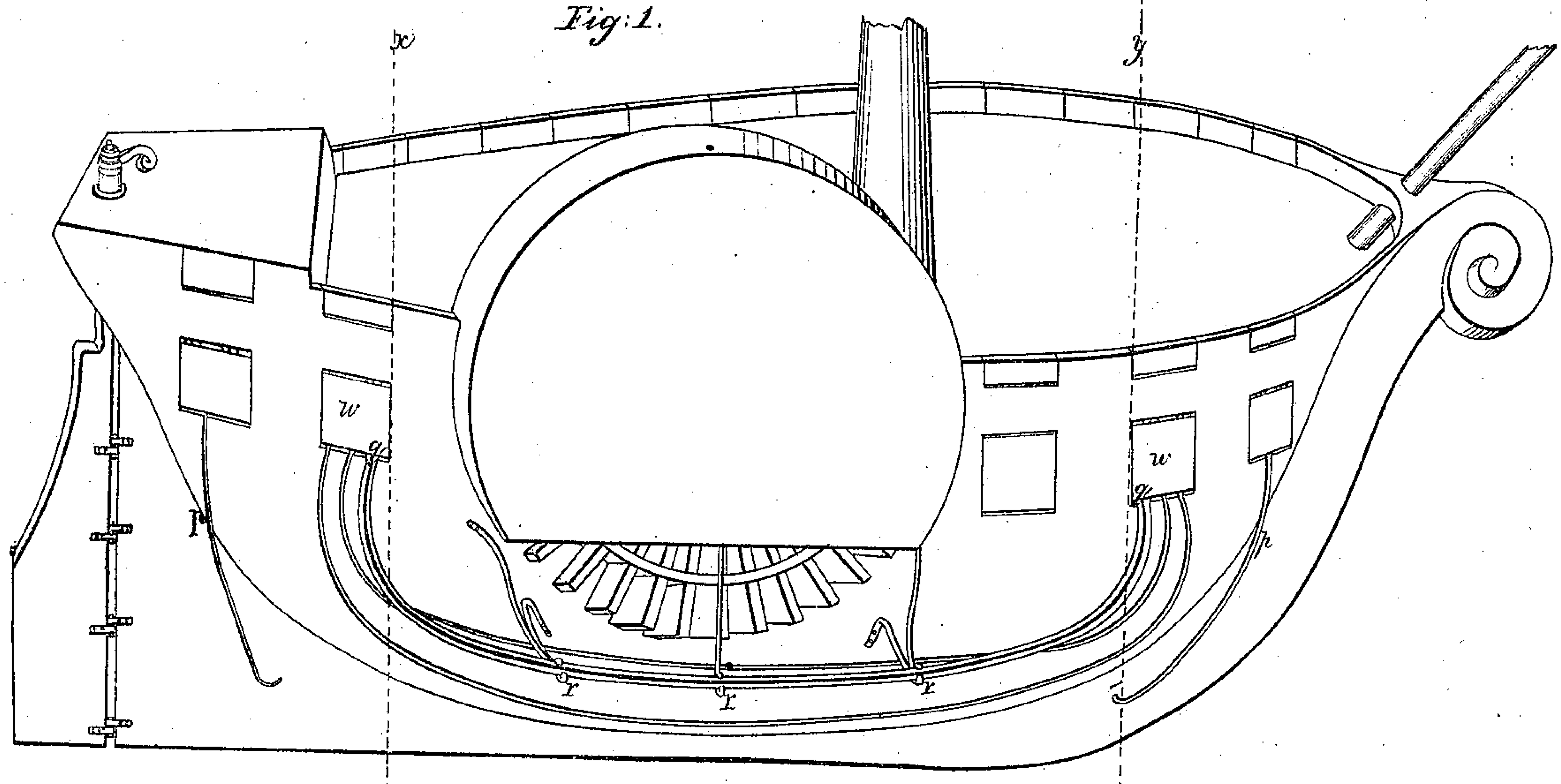


Fig: 2.

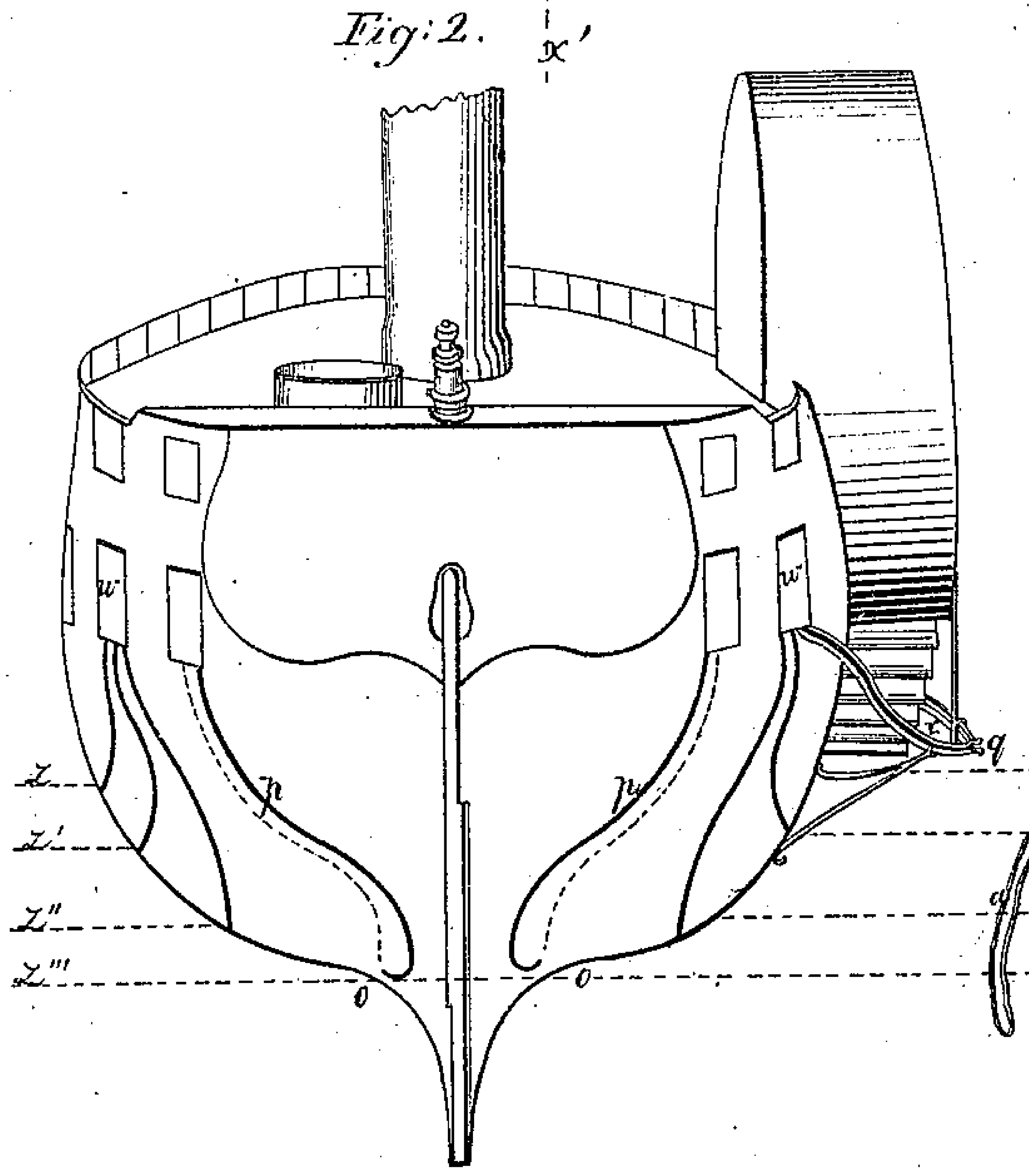


Fig: 3.

Perpendicular cross section thro: the axle

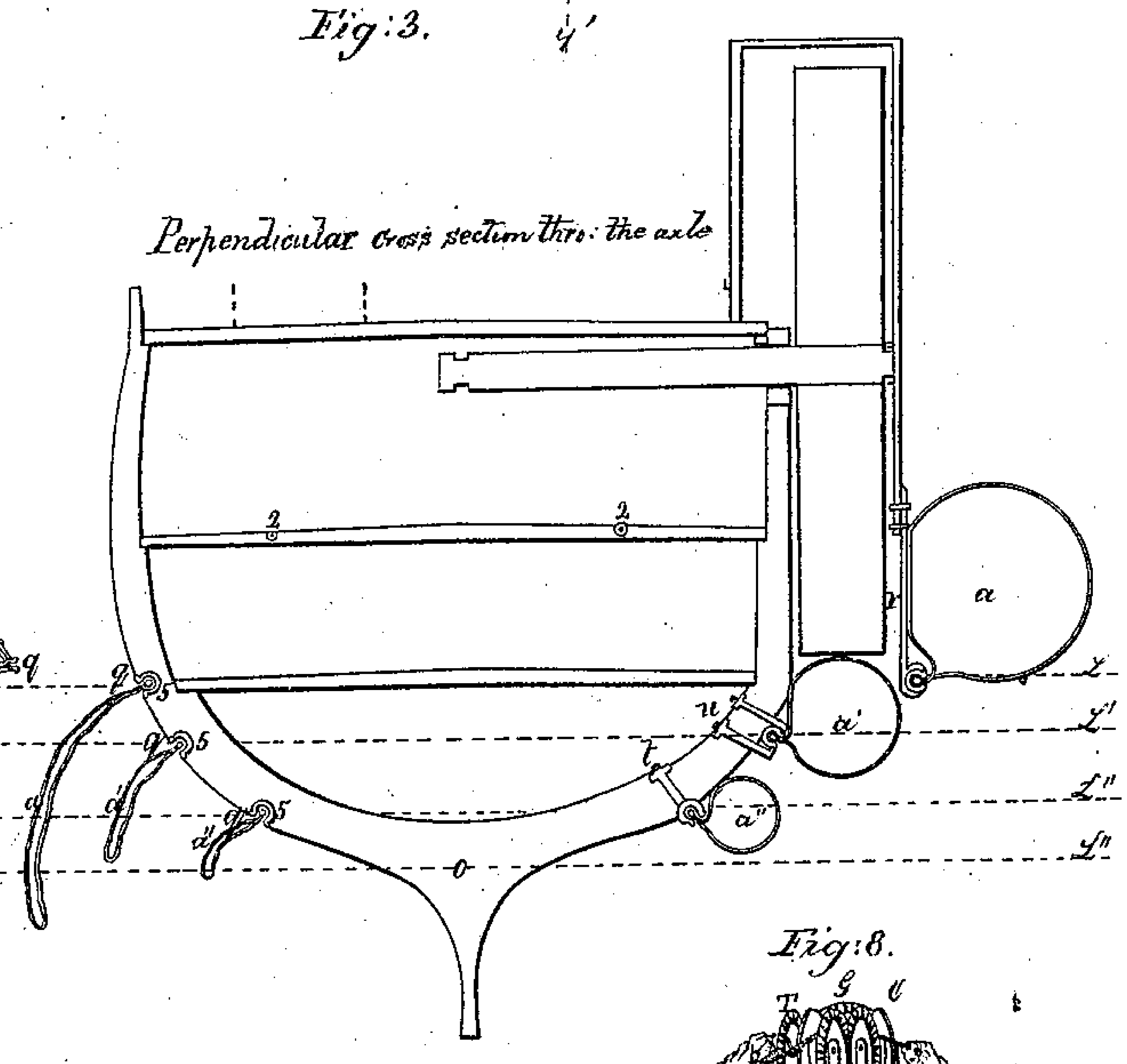
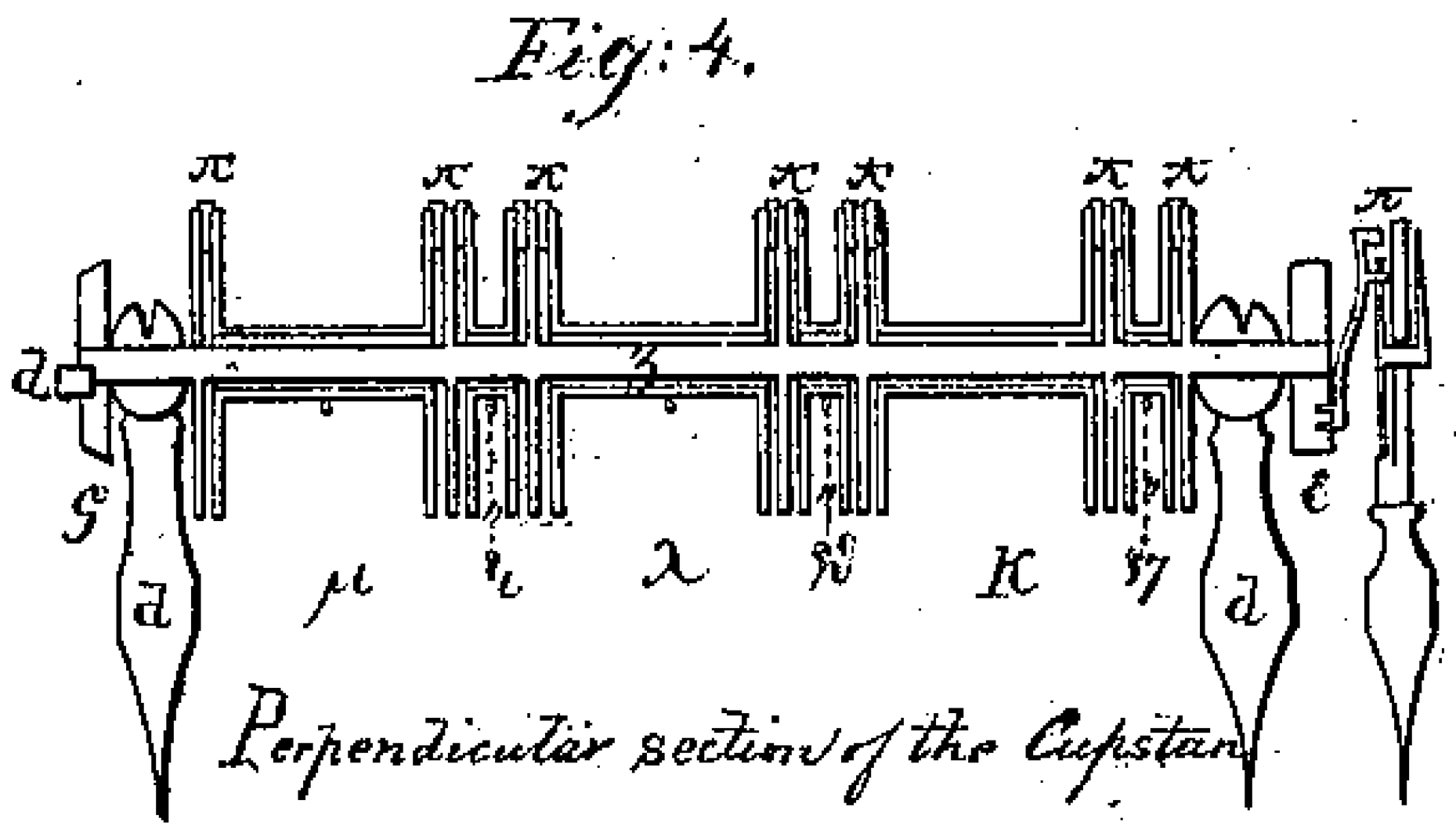


Fig: 4.



Perpendicular section of the Cupstan

Fig: 5.

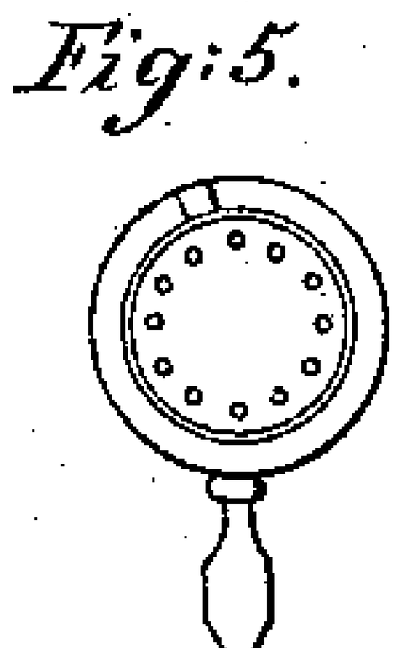


Fig: 6.

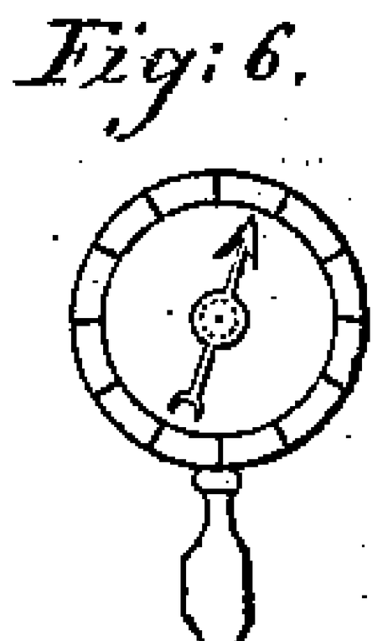
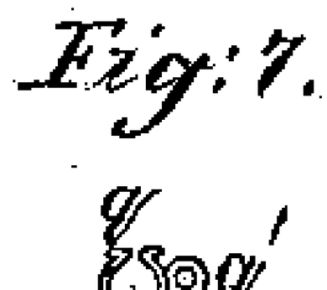


Fig: 7.



Cross Section

Fig: 8.

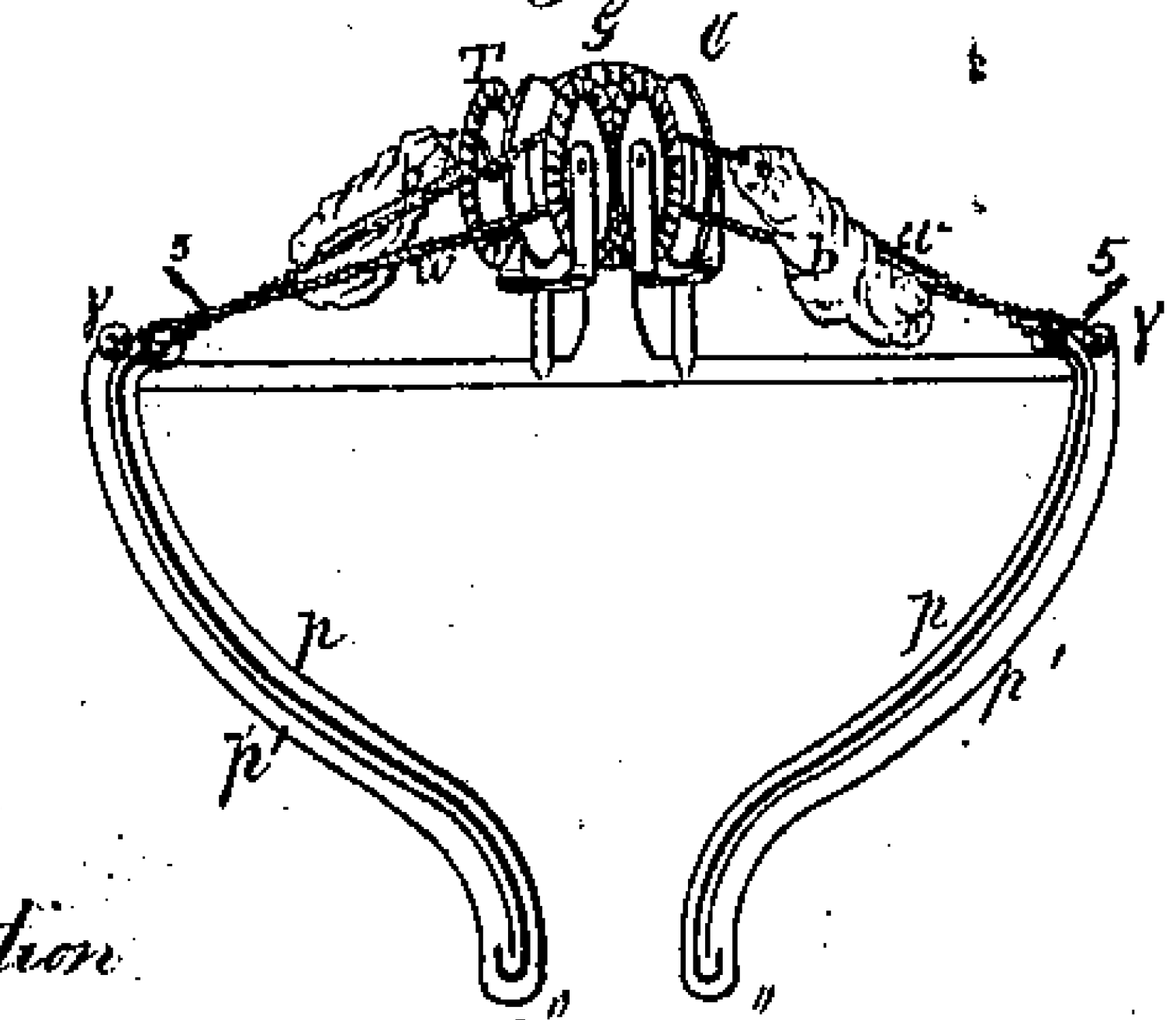


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Fig: 9.

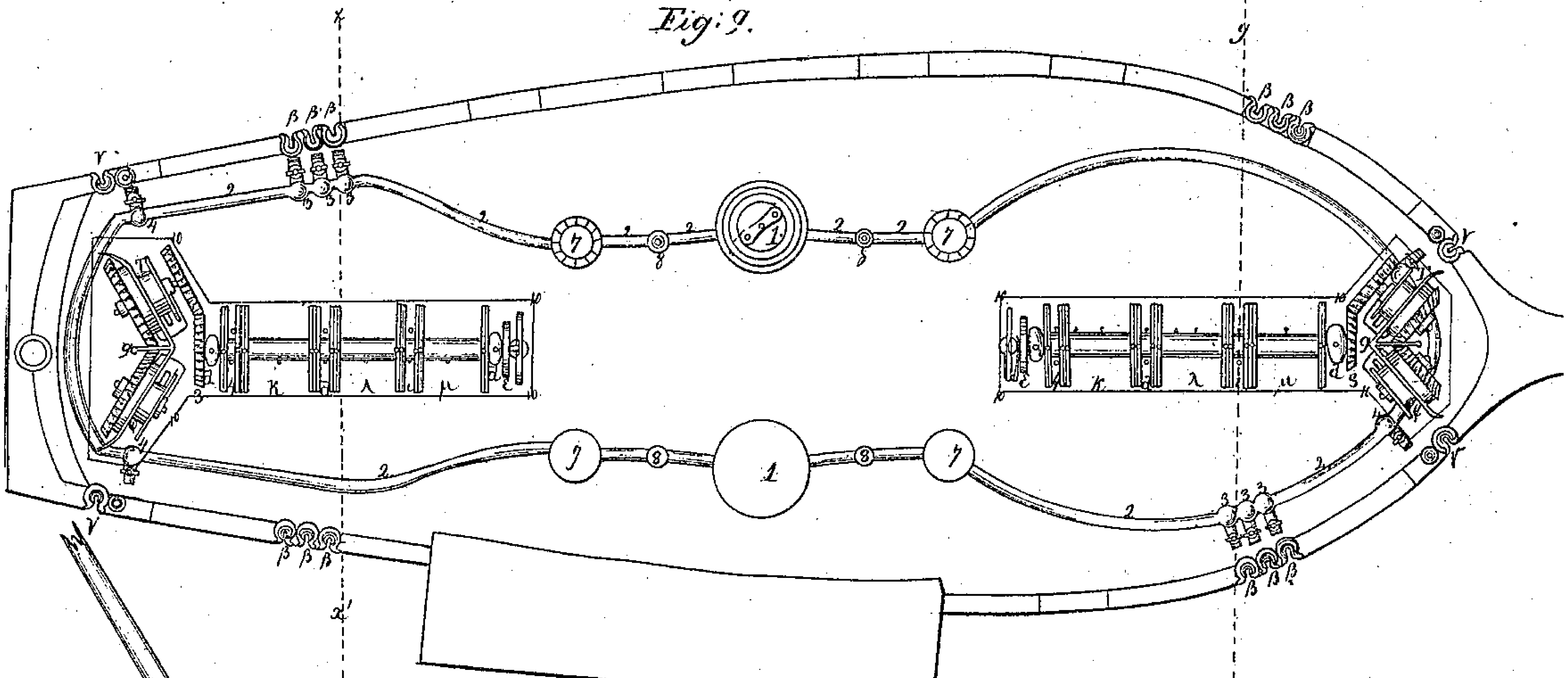

Fig: 10.

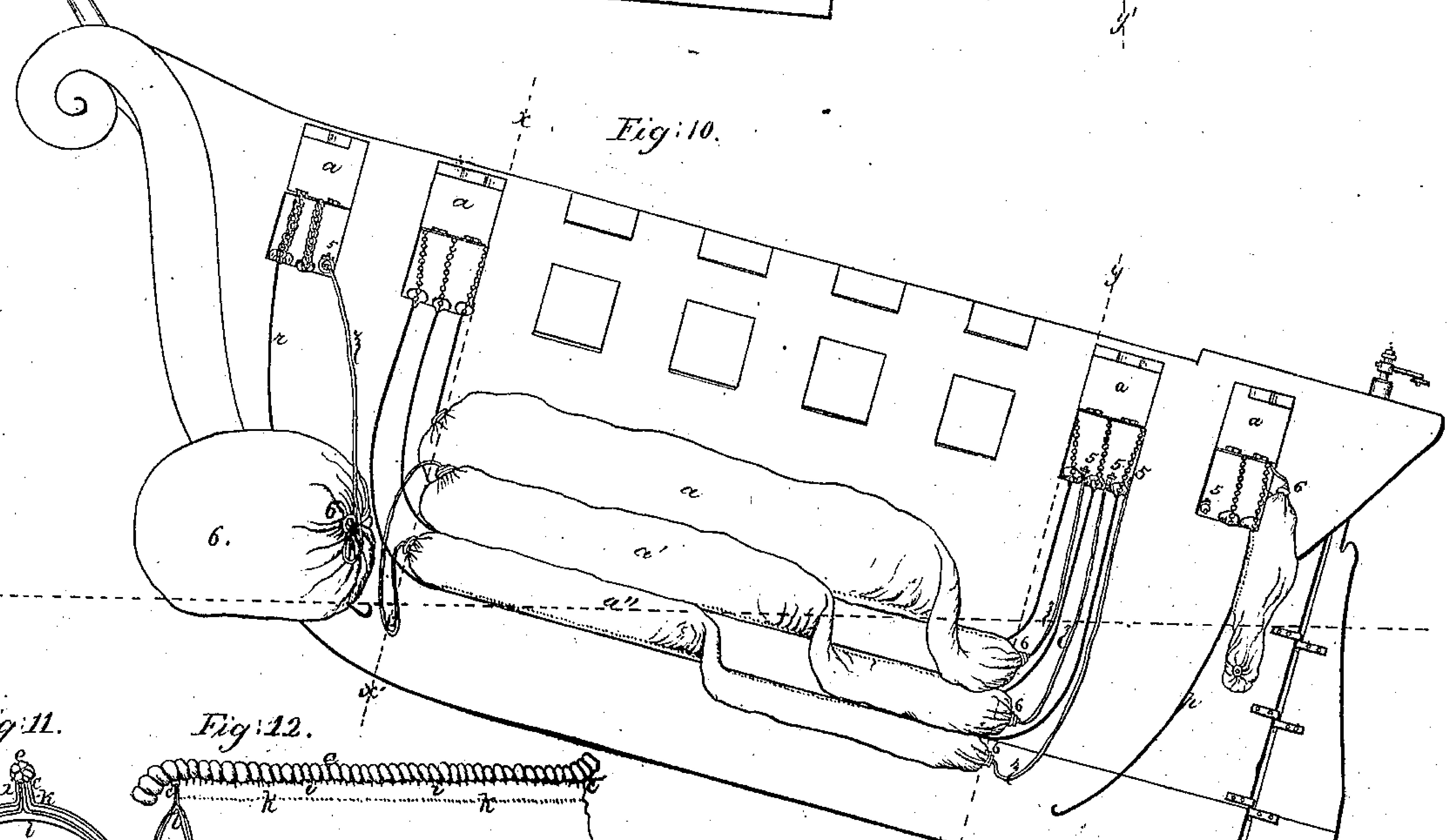

Fig: 11.

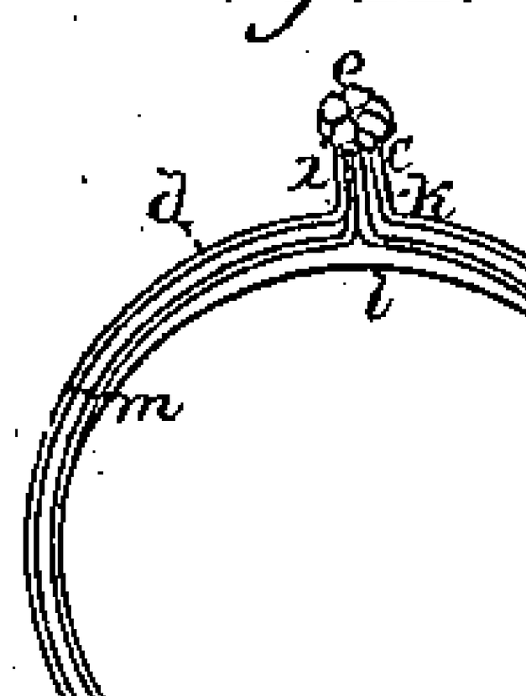

Fig: 12.

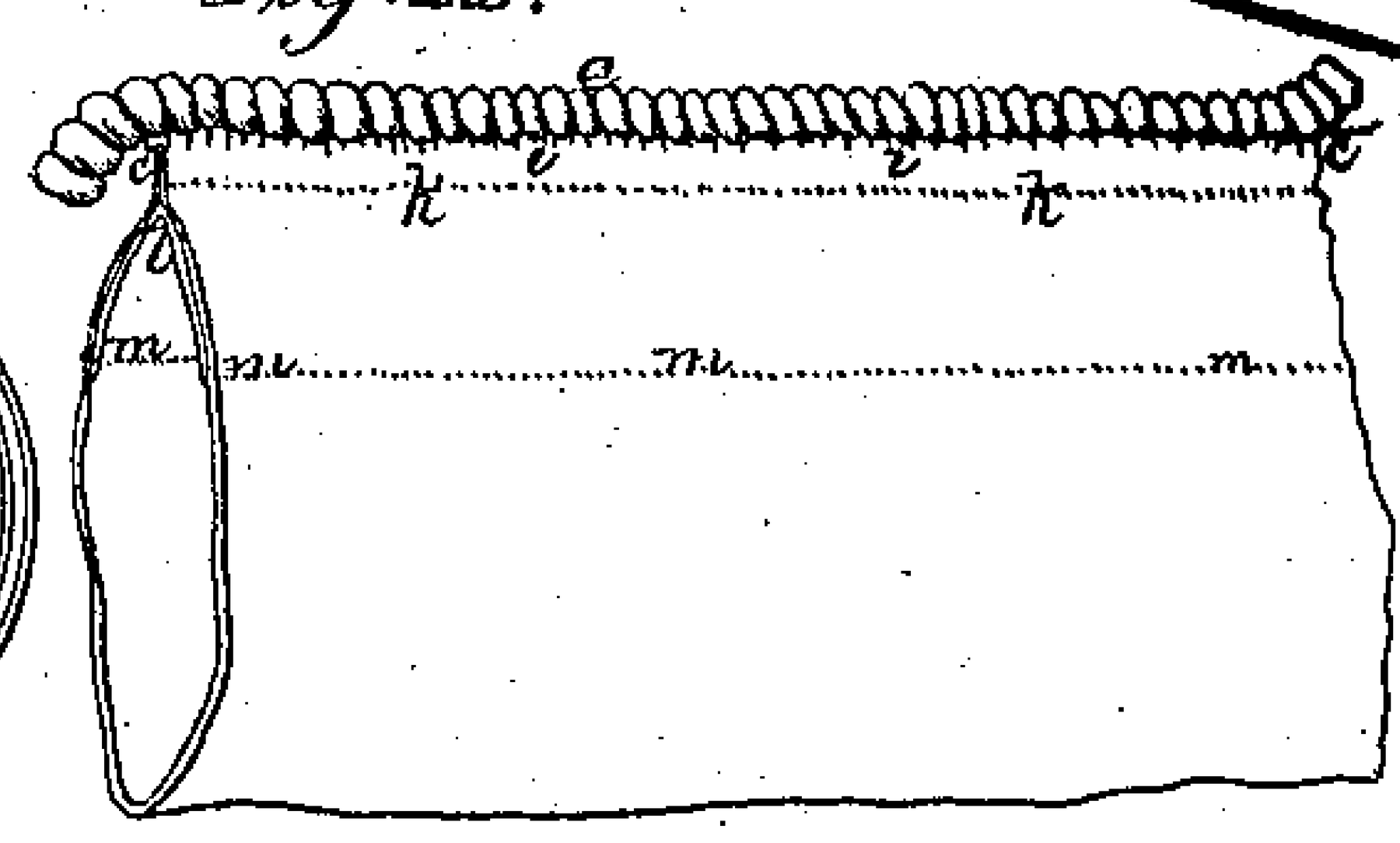

Fig: 13.

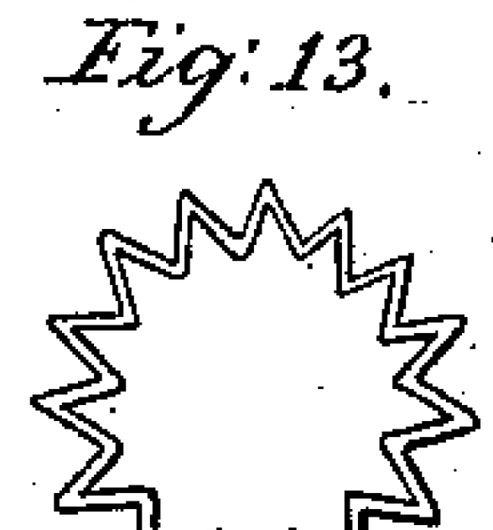

Fig: 14.

Fig: 15.

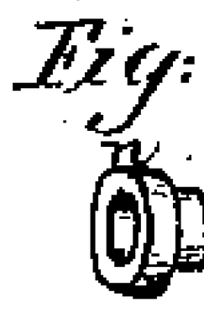

Fig: 16.

Fig: 17.

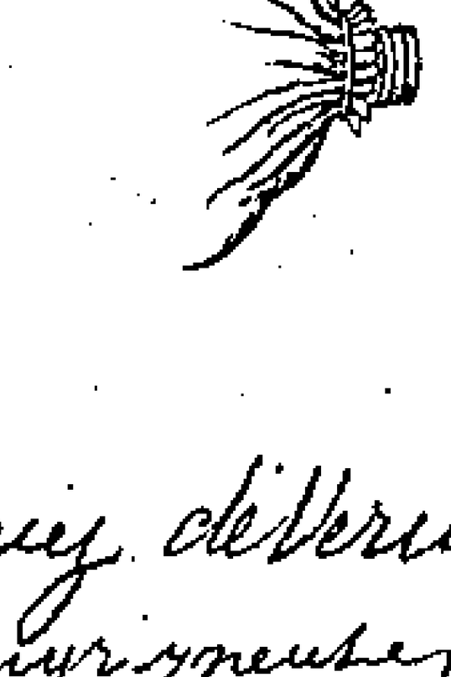

Fig: 18.

Fig: 19.

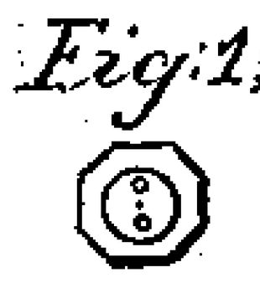

Fig: 20.

Fig: 21.

Fig: 22

Fig: 23.

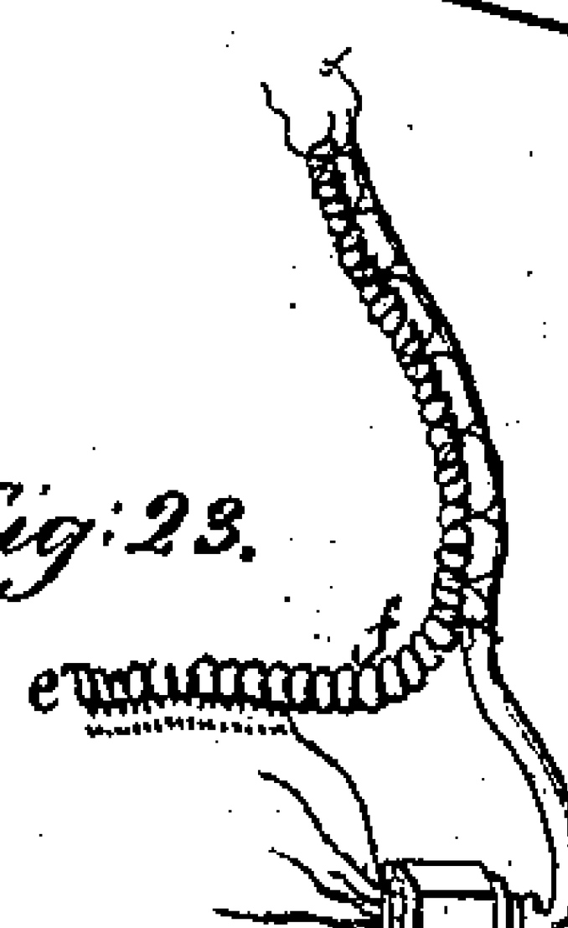

Fig: 24.

Fig: 25.

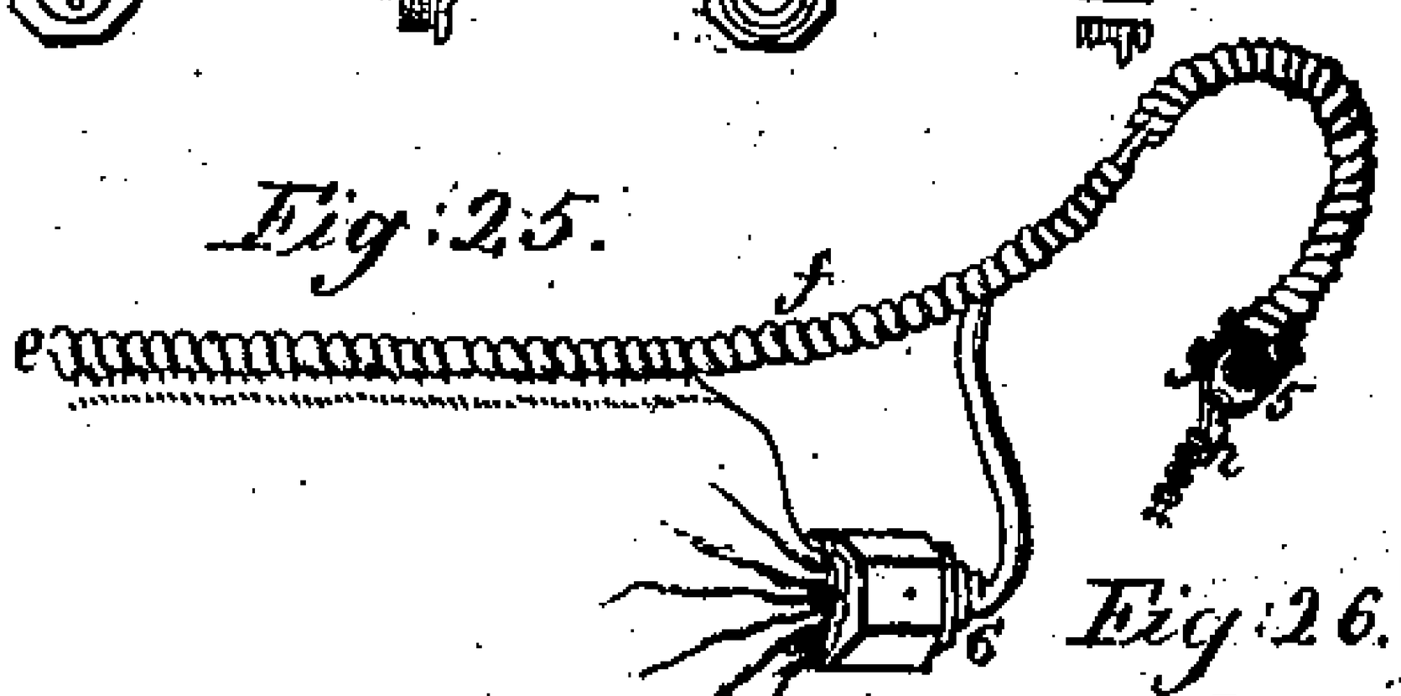

Fig: 26.

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ALEXR. LE MAT, OF NEW ORLEANS, LOUISIANA.

MEANS FOR INCREASING THE BUOYANCY OF SHIPS AND OTHER VESSELS.

Specification of Letters Patent No. 14,365, dated March 4, 1856.

To all whom it may concern:

Be it known that I, ALEXANDER LE MAT, of the city of New Orleans and State of Louisiana, have invented a new and Improved Apparatus for Buoying Up or Floating Vessels of Every Description by Displacement; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings and to the letters of reference marked thereon.

In order to show the modifications necessary in vessels propelled by steam each illustration of a vessel represents a wheel-house on its starboard.

Figure 1 is a perspective of a vessel furnished with my apparatus taken from the side. Fig. 2 is a similar view taken from behind. Fig. 3 is a perpendicular cross section of the same vessel through and in the line of the axle-tree. Fig. 4 is a perpendicular section of the capstan intended to carry the floats and chains of my apparatus. Fig. 5 is a back and Fig. 6 a front view of the indicator, intended to record the action of the capstan. Fig. 7 is a cross section and Fig. 8 a perspective view of the upright tubular rails of my apparatus. Fig. 9 is a bird's eye view of the deck containing my apparatus. Fig. 10 is a side view of a vessel with my apparatus in operation. Figs. 11, 12, 13, 14, 15, 16 and 17 illustrate the mode of constructing my floats. Figs. 18, 19, 20, 21, 22, 23, 24, 25, the several fixtures thereof, and Fig. 26, disks for holding the chains in place and for closing the mouths of the rails.

Similar letters in the different figures refer to identical parts of the apparatus.

The nature of my invention consists, in such adaptation of the principle of buoying up heavy bodies in a liquid by displacement, as to regulate and to control thereby the buoyancy of vessels of every description, in all emergencies, instantaneously and to any degree desirable, not only without incumbrance to the vessel but rather in such a manner as to add materially and effectually to its strength;—all this independent of the size, construction, shape, propelling power, or destination of a vessel, and by means of a system of floats, chains, guiding-rails, capstans, and force pumps constructed, arranged and operated substantially as follows.

Although as stated above and as it will appear from this description my apparatus is applicable to any vessel, I select here for the purpose of unity in description a two-decker and a man of war; this size and destination admitting of the use of my apparatus to its fullest extent.

My floats are of a twofold shape viz: elongated as illustrated (*a*, *a'*, *a''*) Fig. 3, and Fig. 10, and spheroidal as shown in (*b*) Fig. 8 and Fig. 10. There are three pairs of the long floats, all of equal length, proportionate to the length of the hull, so as to reach from line (*x*, *x'*) to line (*y*, *y'*) Figs. 1, 9 and 10, and each pair of a different width. The spheroidal floats are four in number and each of them of a capacity somewhat less than the capacity of one long float of the narrowest pair. The total sum of the capacity of all the 10 floats is so calculated that the volume of water displaced by all of them shall be equal to the volume of water to be displaced by the vessel at its regular line of flotation.

The material selected for the construction of the floats must unite the conditions of strength, pliability and impermeability to water, the latter condition to be completed by a coating with any of the known watertight varnishes, cements or compositions. The material is lapped over itself twice, until the edges thereof meet at (*c*) Figs. 11 and 12, and between the two layers thus formed a layer (*d*) Fig. 11, of watertight composition is interposed and cemented permanently. The tube thus formed is then firmly attached to a rope (*e*) Figs. 11 and 12, all along the meeting line (*c*) Fig. 11, aforesaid, with exception of a part of said line on both of its ends (*f*) Figs. 23 and 25, equal to half the diameter of the tube. The rope (*c*) is at both ends provided with loops (*g*) for the introduction of hooks (*h*), Fig. 17, serving to connect the floats with the chains hereinafter described. A seam (*i*) Figs. 11 and 12 is next provided close to the rope (*c*) by sewing the four layers of canvas with the two intervening layers of watertight composition firmly together all along the line (*k*) Figs. 11 and 12, and the said seam is then rendered less pliable and as smooth as possible by impregnating it with varnish or drying oil. This accomplished a slip (*l*) Figs. 11 and 12 of the canvas is cemented all along the inside of the float in such a way as to overlap the seam line (*i*) Figs. 11 and 12,

and the edges (m) of said slips are firmly sewn to the sides of the tube. Both ends of the tube are then carefully folded to form a star as represented (Fig. 13), these folds being drawn together as shown in Fig. 14 around and close to the shoulder (n) of the metallic box Fig. 15, they are fixed firmly but not permanently to said shoulder, and the cap Figs. 16 and 18, of the box, is screwed on and upon them so as to effect an air-tight joint. To each cap Figs. 16 and 18, there is a double set of air-tight fixtures Figs. 19 and 20, 21 and 22, the latter of which constitute the butt ends of the hose Figs. 8, 10, 23, and 25, to be screwed on to the floats when about or ready to be inflated, while the first Figs. 19 and 20 serves to close the floats airtight at either of their ends.

There being no interruption of continuity in the texture of the material of which the float is constructed, it will stand a very good inward pressure exercised by its inflation. To the outward pressure it offers the same resistance. The single threads of the texture lie at right angles to the same (i) and rope (c) upon which as hereinafter explained the buoyant force is intended to bear. This whole force whatever be its amount will therefore be equally subdivided on every thread constituting the material of the float, or in other words, the whole float will have a resisting force equal to the resisting force of a cable made of as many threads as there are transverse threads in the material constituting the float along its attachment to the rope, the resisting force of the cable due to its twist deducted. The quantities of these resistances being calculable as well as the amount of the resistance of the utmost displacement aforesaid to be accomplished by all the floats taken together;—the floats previous to being placed in their respective positions, are inflated by means of a force pump to the pressure of as many atmospheres as the calculation instituted requires. The degree arrived at on the manometer by such test is carefully noted, in order never to be transgressed in their further employment for effective service.

It has been said above, that the folds of the floats drawn together around the shoulders of the box Fig. 15 have to be attached thereto firmly but not permanently. This is intended to provide the means of a periodical inspection of the inside of the floats. One or both of the boxes Figs. 17, 23, 25, being detached the inspector preceded by a hoop and with a lantern in hand may enter the float and examine it all through with all necessary care and attention. Each float can thus be kept constantly in good repair and its efficiency be relied upon for every emergency.

Parallel with the line of flotation of the vessel in full charge and at a distance of about half the diameter of the widest pair of the long floats underneath said line of flotation a line (z, z) Figs. 2 and 3 is marked on both sides of the hull—also two other lines (z', z' and z'' z'') parallel to and between said line and the keel (o) so distanced from each other, as to make the horizontal planes, in which they and the keel lie, equidistant or nearly so from each other. These three lines extending from the lines (x, x') of the stern to the lines (y, y') of the prow, on both sides of the vessel indicate the position of three pairs of tubular rails by means of which the longitudinal floats are applied to perform their object. Two other pairs of similar rails (p, p,) descending at the stern, and at the prow in the directions as represented Figs. 1, 2, 8 and 10 to the very keel of the vessel are provided for the reception of the four spheroidal floats. All these rails are of tubular form, of a diameter admitting of an easy passage of the float ropes, and provided throughout their whole length with a slit (q) Figs. 7, 23 wide enough to admit of an easy passage of the float seams, so that the floats being introduced into said rails as represented Figs. 3 and 10, may be passed through them forward and backward longitudinally but can by no means be taken or torn out of them through the slit. Thus the floats being inflated the force resulting from the displacement effected, instead of tearing them out of the rails, acts on said rails as if it were on hinges or handles, to lift up the vessel to which they are attached. This latter attachment may be effected in several ways; (s s) Fig. 3 shows the attachment of the rails to the sides of a sailing vessel, or screw steamer built anew after my plan. The metallic tube is introduced in an excavation prepared for the purpose in the woodwork, the metal close to the slit is reversed to form two lips, serving the double purpose of increasing the strength of the fixture by the wood entering in the recesses formed, and of insuring a smooth passage for the float-seams; (t), Fig. 3, shows the attachment of the same rails to an old vessel by rivets, and (u) Fig. 3 by clamps; (r) Figs. 1, 2, 3, shows the same fixture to a side wheel steamer. In order to avoid any interference with the working of the wheels, the rails must be here supported, partially by the wheel-house and partially by standards of a strength, proportionate to the force they are intended to resist, and of such respective lengths as to admit of a curvature of the rails offering the least resistance possible to the progress of the vessel.

In casting iron vessels, the rails may be cast at once with the plates of which the

sides of the vessel are to be composed. As above stated various other devices of attachment of the rails may be adopted, but the essential features thereof are: firmness to a degree of bearing the bulk of the whole vessel without danger of being torn away, and an insertion into the sides of the vessel, such as not to present in its outside appearance any thing more but its slit to the gaze of the beholder. With old built ships and with steamers working with side wheels the latter condition must be approximated as far as possible. This insertion has for its object to do away with the heretofore unavoidable friction connected with floating apparatus, and to hide the existence of such apparatus on board, as the slits at a distance will appear but as dark lines painted on the sides of the vessel. The longitudinal rails ascend at both ends by a gentle curve in a nearly perpendicular direction toward the gunholes (w) Figs. 1, 2 and 10, where by another gentle curve, they as well as the stern and prow rails, are reversed toward the deck so as to present their mouths (which are gently widened and recurved as shown in Fig. 8,) close to, or rather in the deck floor, and so as to permit to protect said mouths against shot and detection by dropping the gun hole trap doors (α) Fig. 10 down and upon them. Thus as shown in the bird's eye view Fig. 9 the longitudinal rails open on the deck at the points (B, B, B,), and the upright rails at the points (γ).

It hardly needs observation, that the metal to be selected for the construction of the rails must effectually resist the friction and the chemical action of the sea-water to which it is to be exposed. As to the lodgment of sea animals and weeds within the rails this if not prevented, by the selection of the metal can be easily helped. The chains passed through the rails without the floats will clear them effectually from any foreign matter.

The means to introduce the floats into the rails and to keep the same therein in any position as long as required are the capsterns Figs. 4, 8 and 9. Both being of absolutely the same construction, the corresponding parts of them are referred to by the same letters, and whatever is said with regard to one of them, applies equally to the other. The standard (δ) or any equivalent frame, support a shaft (ζ) to be revolved by any force at command, by means of the power wheel (θ). A clockwork in Figs. 4 and 5 shows on a dial Fig. 6, the number of revolutions the shaft (ζ) is at any time caused to perform, and the dials are so disposed, that the officer in command can from one and the same point observe the indications of both.

On the shaft there are disposed 3 pairs of rollers for the reception of as many chains and floats,—in the order as marked by letters (γ, δ, ι,) for the chains and by letters ($\varkappa$, λ, υ,) for the floats. To each of the chain rollers there belongs and is attached a chain of a length corresponding with a line drawn from the periphery of said rollers to a hook underneath from thence to the mouth (β) of the respective rail, and from thence through said rail to the other end of the same, where the chains terminate with hooks or rings and disks, Fig. 26, provided with slots by means of which the chains when passed through the rails are retained in their position and the mouths of the rails protected against the entrance of pebbles, dirt, or any foreign body apt to obstruct the tubular passages within them.

To each of the flat rollers there belongs and are attached chains or cords of a length to reach the respective points of intersection of the lines x x' and y, y' with the longitudinal rails a, a', and a'', where said chains meet and are connected as shown, Fig. 17, (h, g,) to the float rope e. In such case the inflation of the floats has to take place by hose, hanging loose as represented in (3) Fig. 10. To avoid the exposure of said hose to injury from rocks, fishes, drift, &c., the hose may be tied to the cords as represented in Fig. 23, and run through the rails and be protected by them. Or instead of those parts of the chains or cords extending from the points β, to h, g, tubular cords may be substituted as represented in Fig. 25, to subserve both the purposes of chains or ropes to carry the floats and of hose to inflate the same. Whatever, however be used chains, cord or tubular rope the longitudinal float is connected to it at one end and being connected at the other end to the corresponding chain of a chain roller, there is an uninterrupted connection between the two capstans, and hence their arrangement is not symmetrical, but such that to every chain roller at the stern answers a float roller on the prow.

All the rollers are provided with a pin or equivalent to receive the loop of their respective chains or cords and all the float rollers are of a size to contain the largest of the longitudinal floats, if wound around them, thus providing the facility to use either of the floats in either of the rails. It is thus apparent, that an uninterrupted connection between rollers (γ and μ), ($\varkappa$ and ι), (δ and λ) of the two capstans may be established at pleasure and also dissolved at pleasure, by means of the float chains or ropes of the floats, and of the long chains. All said rollers are fixed upon their shafts in such a way that each of them separately, or any number of them or all together can be set in or out of gear with the shaft. I

exemplify this device by disks interposed between the rollers and fixed permanently to the shaft. In each of said disks plays a plug (π) Fig. 4 which being screwed down connects the adjoining roller with the disk, thus setting the same in gear, while on being unscrewed the connection is dissolved and the rollers set out of gear. Each shaft carries on its outer end a gear wheel (g) Figs. 2, 8 and 9, which by a plug (ς) or by any other mechanical contrivance may be set in or out of gear with the shaft; this gear wheel plays into a gear connected with the roller (T) Figs. 8 and 9 and placed at an angle of about 45 degrees to a line in the prolongation of the shaft (z) and so fixed upon an independent standard as to face with its periphery the mouths (γ) Figs. 8 and 9, of one of the upright rails (p). Said roller (T) communicates its motion to an other roller φ disposed symmetrically on the other side of the shaft and facing the mouths of the opposite upright rail by means of a gear and permanently fixed to these rollers. The motion of the two rollers is thus reversed by the simplest of mechanical means, owing solely to their angular position with reference to the shaft (z).

The office of each of the rollers (T and ψ) is to carry an endless chain or as represented in (ψ) Fig. 8, a tubular cord of the length of the tubular rail (p) connected with a chain so as to constitute an endless belt down through the upright rails (p) and up back through the tubes (p') connected with or forming part of the upright rails as shown by section in Fig. 7. These tubes open at the top by mouths (g') closely to and at a level with the mouths of rails (g) and are at the bottom so connected with the rails as to present a gentle curve (g''), admitting of an easy and unincumbered traveling of the endless chains. To these belts the spheroidal floats (b, b) are attached along their seams, and while fixed ready for service assume the position on the upper periphery of rollers (T, ψ) or close by as shown in (Fig. 8). For the sake of exemplification I represent this whole machinery disposed on the lower gun-deck, and it hardly needs the observation, that this disposition may be changed to suit circumstances provided the functions, the apparatus is devised for, be not arrested by the modification.

In a separate application I intend to describe and to claim a peculiar disposition of the capstans the distinctive feature of which is, a perpendicular instead of the horizontal position of the main axle-trees (Z, Z,), which affords a better appropriation of space, and less angular lines for the traveling of the chains, ropes and floats from the rollers to the rails.

In either of the points (1) Fig. 9, or in any other convenient place, one or two force pumps are provided capable to exercise the sum total of pressure, all the floats taken together are calculated to resist. If the vessel be propelled by steam power, the pumps are best placed so as to admit of the use of the engine to work them. The recipient of said pump or pumps branches off into the pipes (2, 2, 2,) which in any convenient way but always under the floor (in order to be beyond reach of harm) are conducted toward and close by the mouths of the rails (β, β, β) and (γ γ). Said pipes opposite each of these mouths are furnished with stopcocks and faucets (3, 3, 3 and 4, 4) to which fit and may be attached airtight by means of the usual gas fixtures, one of the butt ends of the hose (5) Figs. 8, 10, and 25, the other end of the latter to be appended to the floats as represented in (6) Figs. 10, 23 and 25.

Between the respective series of faucets and the recipient (1) Fig. 9, each branch of the pipe (2) is provided with a manometer (7) to guide the officer in command as to the proper degree of the pressure he has to apply to determine a given displacement, by a proportional inflation. At any point between the manometer (7) and the recipient (1) whistles (8) are connected with both branches of pipe (2) provided with stop-cocks by means of which in combination with the stop-cocks (3, 3, 3, and 4, 4,) both, the air forced into the floats as well as the air escaping from the latter may be used by the officer in command for sounding any description of signals he may find desirable.

The vents or gun-holes in the sides of the ship right over the points of entry of the longitudinal rails must be of a size proportionate to admit of the passage of three floats at the same time. The vents over the mouths of the upright rails may be smaller as each of them has to give passage to one float only. For the protection of these latter floats, the rollers (T and φ) Fig. 9, revolve within guards (9) preventing a collision between the gearing and the floats.

The spaces provided for the described connecting arrangements between the pipes (2) and the floats are somewhat excavated in the deck, so as to admit of their closing by means of a trap door or otherwise all the time the apparatus is out of operation. This arrangement is adapted both for the purpose of keeping clear the circulation on board, and also for the security of the apparatus against carelessness, malice or attack from without. For the same purposes the capstans with all their appendages are inclosed in a sort of cabin or capstan-house, (10, 10, 10) kept under lock and key, constantly, but when the apparatus is required to be in motion.

In order to keep the communication open, the chains of the chain rollers may be passed

around hooks (11, 11, 11,) or altogether detached from the rollers and fastened to the deck floor, while the capstan-house is closed. This boxing or housing up of the apparatus is essential in reference to the floats, the smallest rupture of which even made with a penknife would destroy their efficiency. But, besides, it affords the means to hide the whole apparatus from the inspection of idle or treacherous curiosity, which especially with man of war may be of paramount importance, as anybody uninformed of the existence of the apparatus may for any time stay on board of such vessel without a dream of its existence if there was no emergency for its display.

To explain the operation of the apparatus it is assumed that the capstan-houses and trap doors are closed, all stop-cocks in the pipes closed, the chains unhooked, the longitudinal floats wound around the rollers, the spheroidal floats on the top of the rollers, and all the rollers and wheels of the capstans out of gear. The officer in command takes a stand the most convenient to embrace at one glance the whole operation, for instance at the point (1). He opens the stopcock (8) a stroke of the force pump causes the whistle to sound an alarm. The gangways are cleared and every man hastens to his post, at a second signal of the whistle the trap-doors are lifted, the capstan-house doors opened, the long chains attached to rollers (α, θ, ι), the short chains hooked to rings (g), Fig. 17; the disks Fig. 26, removed, the hose screwed on to the floats and power held ready to be applied to one of the power wheels (e) of either capstan. A third signal tells which of the rollers or gear wheels has to be set in gear. Let the extreme case be assumed, that all the floats have to be put in requisition at once, then upon the signal given all the plugs (π, π, π, and σ) are screwed down and one of the shafts (ζ) set in motion. There being no interruption of continuity between chains and floats as above stated, the motion of one shaft communicates equal motion to the other shaft, the consequence of which is, that in the ratio, as the long chains wind around their respective rollers (γ, θ, ι,) and leave the rails (q, q, q,) the floats (a, a', a'',) unwind from their rollers ($\varkappa$, χ, μ,) and following in the track of the chains, travel with their ropes into the rails, and with their seams between the lips of the slit, while their bodies hang out outward of the vessel until they arrive at their required position, that is, until they come to fill out the rails from lines (x, x',) of the stern to lines (y, y',) of the prow. The moment the floats arrive at this position can be ascertained by the officer in command from the simple observation of dials Fig. 6 as it could be ascertained by previous trial how many turns of the shaft (z) are necessary to bring each of the floats in position. As the lower floats require more revolutions than the upper ones, the signals are now given for setting out of gear the rollers one after the other. Meanwhile in consequence of the contemporary revolution of the gear wheel (g), the spheroidal floats have descended down the upright rails on their respective endless belts, and as soon as the index on the dial Fig. 6, shows that said floats have descended as deep as required the signal is given to set out of gear the gear wheel (g), and the return of the spheroidal float is prevented by clamping or otherwise securing the endless belt in an immovable position. How far the spheroidal floats have descended can be ascertained on the dial Fig. 6, as this dial marks each revolution of the axle tree (z), and consequently each revolution of the rollers (T, Φ,) which in their turn determine the progress of the endless belts and of the spheroidal floats attached to the same. The next signal now given orders the attachment of hose to the other ends of the floats, the attachment of the same hose, and if two pumps be used, the attachment of the hose previously mentioned, by their other butt ends, to the faucets (3, 3, 3, and 4, 4,) of pipes (2, 2,) when the corresponding stop cocks being opened and the force pump or pumps being set in action, the floats are inflated to any degree required and which may now be ascertained on the manometers (7, 7,) in accordance with the previously instituted calculation as mentioned above. The stop-cocks (4, 4, and 3, 3, 3,) are then closed and if the floats are to be employed for any length of time the trap-doors, and capstan-houses may be closed to restore free communication. The occasion for using the floats having passed, one of the stop-cocks connecting the lowest floats with the force-pump may be opened to sound the signal on the whistle. The first operation now will be to disconnect the hose from the faucets (3, 3, 3, and 4, 4,) and the air confined in the floats is immediately expelled by the vessel sinking to its regular floating line, and the shafts (z, z,) being caused to revolve in a direction opposite to that as described above, the opposite effect takes place viz, the floats are withdrawn from the rails, and wound up again upon their respective rollers, while the chains are unwound from their rollers to enter the rails, and to assume their original position.

It may here be observed that the spheroidal floats need not be disinflated at once, but only the clamp, or other contrivance retaining their chain in position may be removed. Their own buoyancy will not only bring them up with their chains but by revolving the respective gearing (T, Φ, g,) will materially assist the force employed

upon the shafts (z, z). It is therefore in time to permit the escape of air from these floats, only at their arrival at the ordinary line of flotation of the vessel.

The operation described for all the floats strictly applies to the operation of any number of them, or even the operation of any single float whichsoever, the machinery, as explained being so contrived, as to work each float independent of or in connection with all the others. It may only be observed in this respect, that whenever it should be necessary or useful to inflate a superposed float after the disinflation of a lower float, time and power may be saved by connecting such floats, through their hose, (as represented in (12) Fig. 10), when the air will be expelled from the lower and forced into the upper float, simply by the weight of the vessel.

The advantages of my floating apparatus, are the following, viz: It does not involve any or but a very small additional friction of the sides of the vessel against the water, as the only part of the apparatus placed on said sides is connected to them in such way as to present no asperities or projections. It can be adapted to all vessels without changing their shape or construction. Far from impairing or lessening their strength it rather serves to increase it, as my rails adapted to a vessel in whatever way, work like as many hoops to bind its sides only firmer together. It is applicable to any floating craft. But a modification of the size of all the floats, and of the number of the longitudinal floats is required to adapt it to the smallest fisher-boat, or to any other ship, up to a huge three-decker; to rudder, sail as well as steam-propelled vessels, to man of war, merchantman and flat-boats on the rivers. It is in the latter application especially that the constructions of flat-boats, present facilities for modifications which although obvious may be mentioned here with a few words. The rails may be attached to the edge of, or under the flat-deck and the longitudinal floats instead of being wound upon rollers may be stored away under the flat deck, folded up in the manner as textile fabrics are held ready for immersion in bleaching or dyeing liquors. The apparatus being carried on the vessel itself and not on separate boats, is available at every time and in every emergency. The place taken up on the deck by the apparatus, is made up by the saving of space otherwise necessary for life-boats and other similar apparatus, which on vessels furnished with my apparatus may be safely dispensed with.

My apparatus admitting of almost absolute dissimilation is besides being a means of safety at the same time, a formidable weapon. A vessel furnished with my apparatus may pursue the smallest craft upon shallow waters or if in retreat, instead of alighting ordnance ammunition or other valuables, simply put on its longitudinal floats to increase its velocity, or passing bars defy the pursuing foe, unable to go farther, because of the want of a similar apparatus. Man of war furnished with my apparatus, would safely enter waters accessible heretofore only to boats of small draft and thus be enabled to attack and destroy fortifications unapproachable heretofore for marine forces. Man of war of the first order built in waters far distant from the open sea, could be rigged, armed, manned and equipped completely, on the spot and by means of my apparatus be transported upon shallow waters to the open sea in full, battle array, to meet at once the enemy infesting the shore. Finally man of war having on board my apparatus can stand the fiercest attack much longer than any other ship. Torn to pieces by the enemy's shot, unmasted, unrigged and almost wrecked, nay, even set on fire they may submerge for a moment to extinguish the fire or to frustrate an overwhelming attack, to float up again in the next moment, and to decide the day by sustaining the position to the last.

Not minor are the advantages of my apparatus for the peaceful conquests of commerce, places may be visited by vessels furnished with my apparatus heretofore inaccessible to larger ships because of rocks, bars, banks, shallow waters, and so forth, and which now may be crossed with impunity supported by my floats. In the open sea, the heaviest gale may be safely resisted by spreading out the uppermost longitudinal floats, the capsizing of vessels prevented by infloating the floats on the side of the ship under water.

Damages encountered to the hulk of the ship may be repaired in the open sea, or in ports otherwise unfitted for such operations, by raising either side of the ship or its stern or prow above water by means of a corresponding float and without outside assistance. In this connection it is observed that the raising of the stern or prow by the spherical floats may be assisted and rendered steadier by the longitudinal floats. For this purpose said floats are only partially inflated. If then, say the spheroidal floats of the prow be sunk down, to the lowest point and inflated, the vessel will assume a position as represented in Fig. (10). The air in the longitudinal floats will be expelled from the stern and forced toward the prow, thus supporting the vessel in the desired position, as if on pilots of a regular wharf. This application is particularly valuable for the purpose of painting, paying, calking or coppering the hull. The loading and unloading of merchandise in order to clear such to; or charge from ports, having but shallow

waters, is dispensed with by the aid of my apparatus. Wrecking is rendered less formidable, and even fire on board may be conquered by opening a vent to the water and subsequently repairing the hole, the application of my float, giving access to every part of the ship in the way above indicated. Finally the exploration of countries heretofore inaccessible will present no difficulty as rivers may be ascended heretofore unavoidable because of local obstructions of navigation.

To resume these advantages as far as they relate to commerce, to a practical expression it may be said that my apparatus represents a portable marine insurance. The premium has to be paid continually every year. This expenditure of capital would exceed many times the cost of my apparatus completed in the most perfect form.

The advantages relating to safety of human life, to the progress in navigation, to the defenses of the country and to civilization at large are incalculable.

Having thus fully set forth the nature of my invention as well as the construction and operation of my apparatus I wish distinctly to be understood, that I do not confine myself to the precise gearing, clock-work, pipe-fixtures, hose, and disposition of space with regard to manometers, pipe-conducts, force-pumps and whistle, as all these particulars as described have been selected by me only for the sake of exemplification, and may be changed on general mechanical principles without affecting the merits of my apparatus;—and I also find it proper to observe that I do not claim the proportions of my apparatus as illustrated, as the due proportions with reference to the size of the vessel I selected for exemplification;—evident as it may be, that said proportions are rather excessive and adapted in the illustration only for the purpose of facilitating the description.

What therefore I claim as new and desire to secure by Letters Patent is:

The horizontal and upright tubular rails or tubes constructed, furnished and operated substantially as described and for the purposes essentially as specified.

A. LE MAT.

Witnesses:
JOHN S. HOLLINGSHEAD,
E. G. HANDY.