Sheet 1. 3 Sheets.

H. K. Wagner.

Floating Dock.

No. 4,842. Patented Nov. 10, 1846.

Fig. 1.

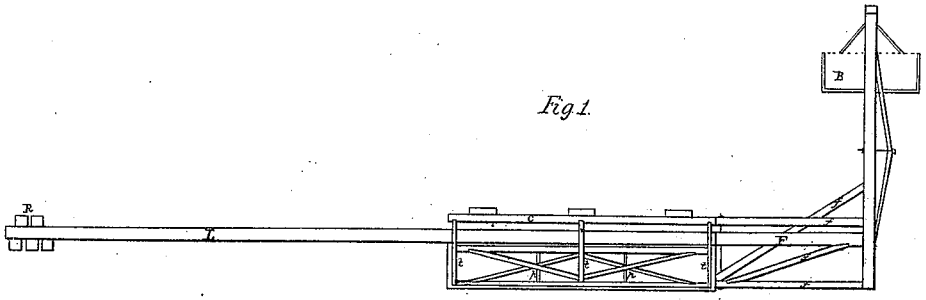


Fig. 2.

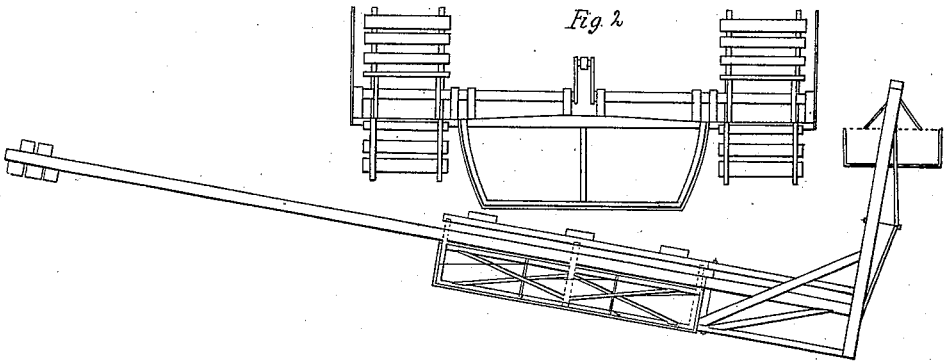


Fig. 3.

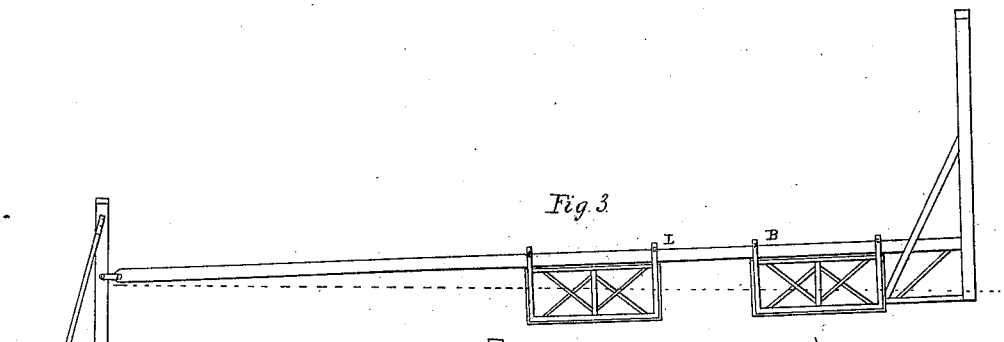
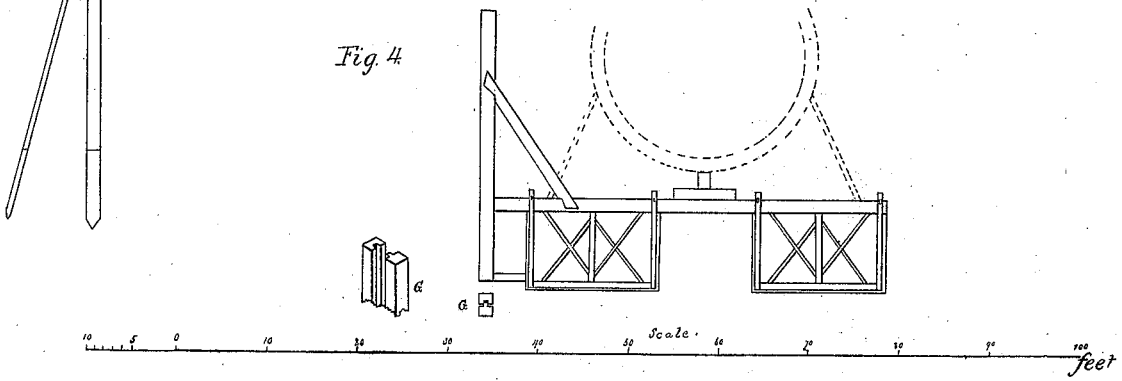


Fig. 4.



H. K. Wagner.
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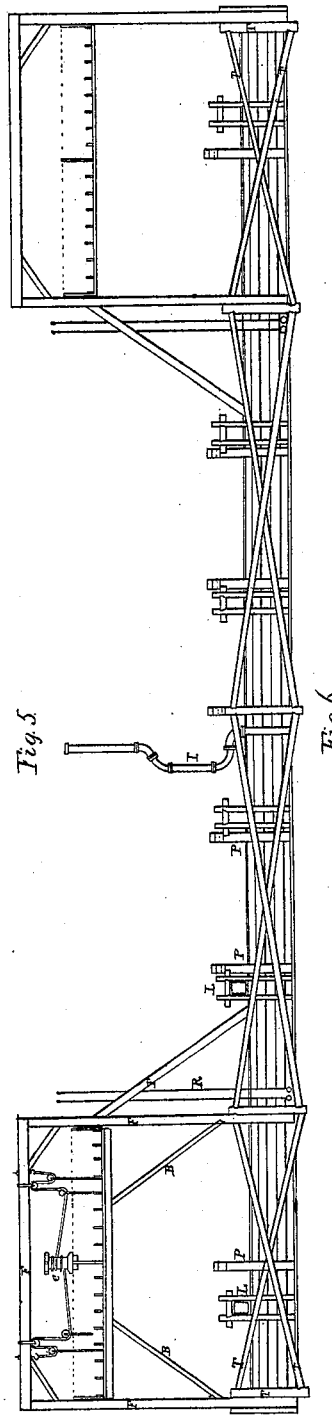

Fig. 5

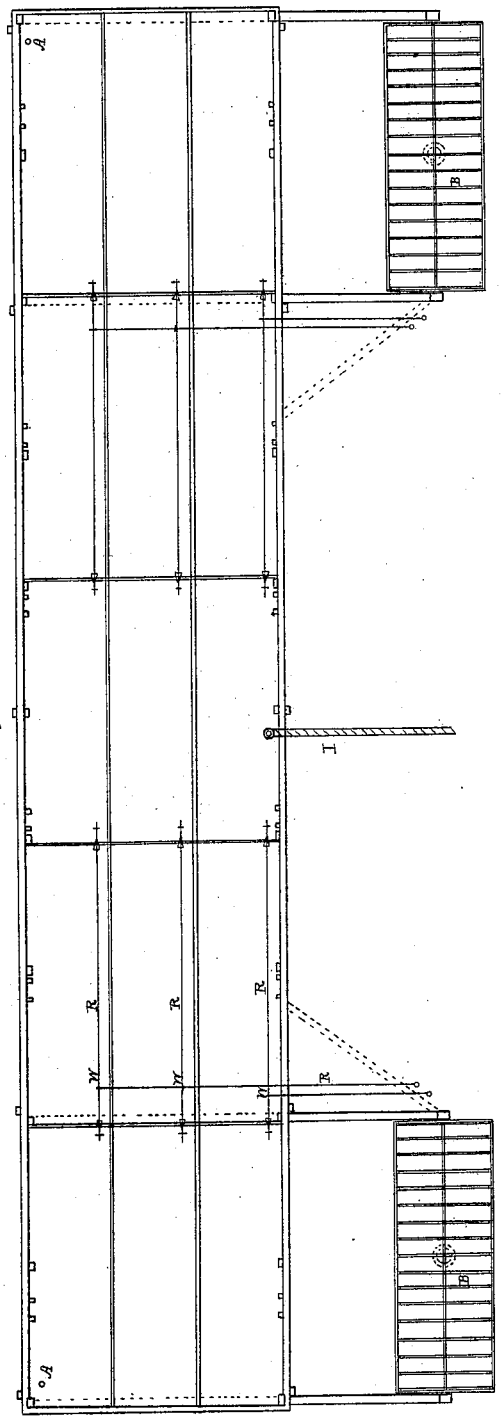

Fig. 6

Sheet 3. 3 Sheets.

H. K. Wagner.
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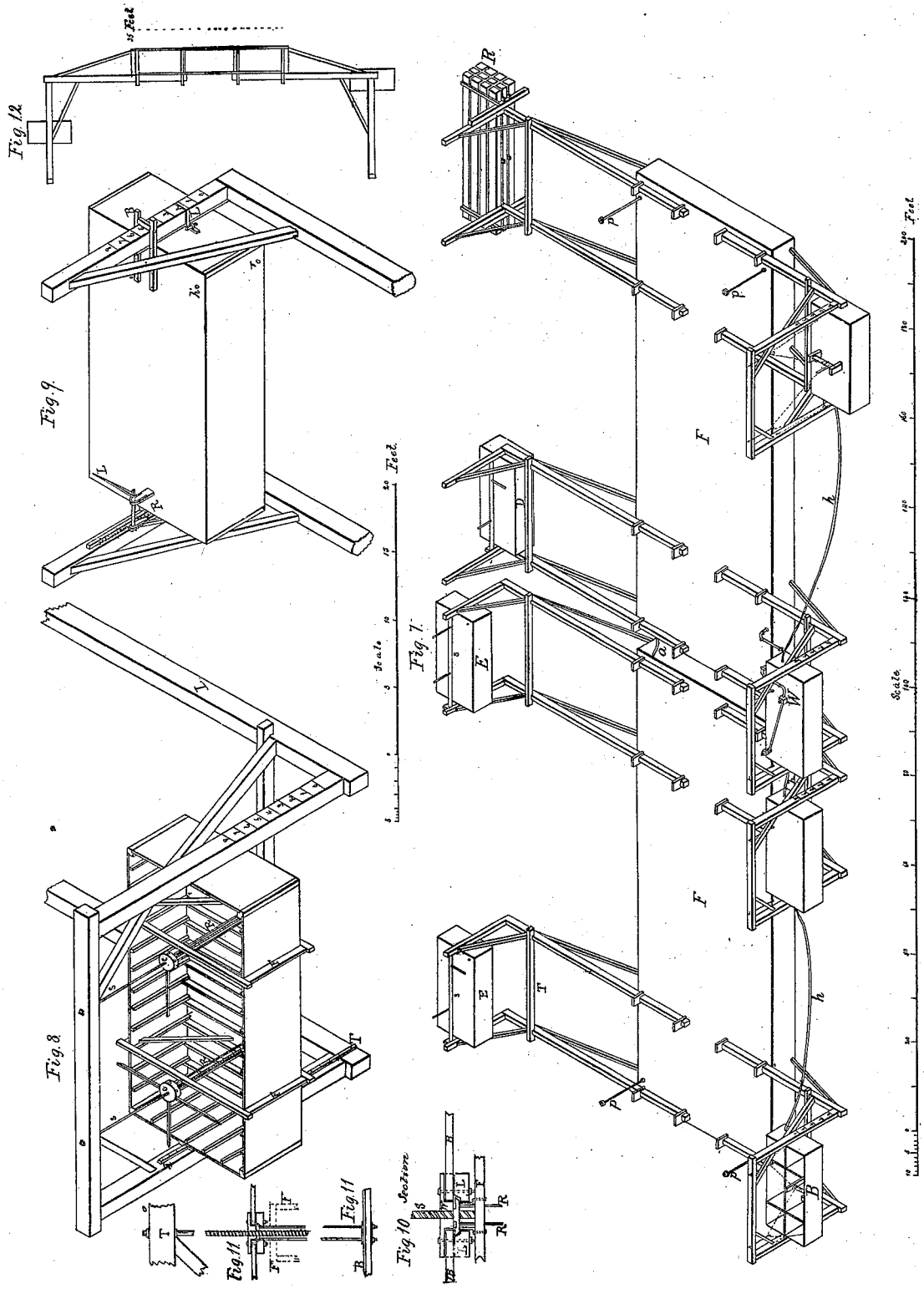
No. 4,842. Patented Nov. 10, 1840.



UNITED STATES PATENT OFFICE.

HUGH K. WAGNER, OF ST. LOUIS, MISSOURI.

DRY-DOCK.

Specification of Letters Patent No. 4,842, dated November 10, 1846.

To all whom it may concern:

Be it known that I, HUGH K. WAGNER, of the city and county of St. Louis and State of Missouri, have invented a new and useful Improvement on Floating Dry-Docks; and I do hereby declare that the following is a full and exact description of the same, reference being had to the annexed drawings, making a part of this specification, in which—

Figure 1 is a transverse section of a dock, the deck of which is flush with the surface of the water. L is a lever for preventing the vibration or tilting of the dock as it sinks, or rises, and is the most substantial part of my invention. It is attached at one end to a small raft of logs (R) floating on the water; the other end passes through mortises in the posts *t*, *t*, *t*, or through bits, as shown in Fig. 5. *p*, *p*, are longitudinal partitions running the whole length of the float. F, *f*, *f*, *f*, are timbers framed into and connected by irons with the posts which support B, the ballast float. C is a piece of timber laid upon and fastened to the tops of the posts or bits, *t*, *t*, *t*, and having short blocks fastened to the top of it, forms the cradle to receive a steamboat upon. *b*, *b*, are beams framed into the posts *t*, *t*, *t*, and with the braces connected therewith form a truss-frame for stiffening the dock or float transversely.

Fig. 2, is the same as Fig. 1, except that it is sunk by filling the ballast float B full of water, and has a steamboat drawn upon it to be raised, a section of which is shown. The shaded part of this figure shows the water in the dock after it has been partially pumped out.

Fig. 3 is another form consisting of two floats laid side by side, the lever is attached, at the outer end, to a post driven in the ground. The water is supposed to be pumped out, in which case it is necessary to detach the lever from the post, otherwise the lever would be liable to injury at the point L, or the bits at the point B. In this form it possesses the means of repair within itself, and in this respect has an advantage over the form shown in Fig. 1.

Fig. 4 is the same as Fig. 3, except that it is adapted to raising ships, and has the lever turned in an upright instead of a horizontal position. The lever in this case is to be tongued by spiking to its side a piece of oak, three by six inches, which is to play in a groove formed by two other similar pieces, spiked to a post driven in the ground, or attached to a wharf or other body that will hold it firmly in a perpendicular position. These tongues and grooves are shown at G, G.

Fig. 5 is a longitudinal section corresponding with Figs. 1 and 2. F, F, F, is a frame for supporting a ballast float, which is raised up by the capstan C, and supported by the loose braces B which are suffered to fall out when the ballast float is to be lowered. T, T, are posts and braces forming a truss-frame running the entire length of the float and spiked on the outside of both sides of it. L, L, are bits with levers in them, P, P, P, are posts connected with the transverse truss-frames, mentioned in section 1 of this specification. R are iron rods or handles for opening and shutting the valves to the orifices through which the water passes from one compartment of the float to the other. I is a copper pipe with swivel joints, to the upper end of which the pump is to be screwed.

Fig. 6 is the plan corresponding with the last described figure. B, B, are the ballast floats. R, R, R, iron rods for opening and shutting the valves mentioned in the last section. I is a leather or gumelastic pipe distended by a spiral spring, to the end of which pipe the pump is to be screwed. P, P, are longitudinal and transverse partitions for preventing the agitation of the water while the dock is rising or sinking. A, A, are apertures in the deck to which pipes are to be screwed to let the air pass out and into the dock.

Fig. 7 is an isometrical projection of a dock composed of two floats, F, F, lying longitudinally in a line with each other, and about five feet apart. They are disconnected with each other except by a pipe (*a*) and a similar one on the other side of the dock for letting the air pass freely through both floats from one end of the dock to the other. *p*, *p*, are pipes of leather or hemp distended by spiral springs, for letting the air pass out and into the dock. *h*, *h*, are hose, for maintaining an equilibrium of water in the ballast floats to which they are attached. B is a ballast float without a deck and divided by partitions within to prevent the agitation of the water. R is a raft of logs which may serve instead of the ballast floats, to steady the end of the lever, and

from which the end of the lever may be forced down or up, as occasion requires. E, E, are empty ballast floats, raised up by the shafts S, which have an iron pinion at each end, gearing into racks bolted to the posts, and held in its position by ratchet wheels or pawls. D is a ballast float resting on the water. The levers may be forced down by the rack work and the shafts S, but if the operation raises the floats up as at E, it will be necessary to put in sufficient water to sink the levers to the depth required. These floats are filled in the same manner as those on the other side of the dock, namely, by the pump which is subsequently to pump out the dock. A hose leads from the pump to the floats and also from one float to the others. The levers and the mortised posts through which they pass, the braces which support and stiffen the levers; the frames which support the ballast floats, and the windlasses by which they are raised up, are deemed sufficiently obvious upon inspection of the figure. T is a piece of timber notched out and fastened to the levers to hold them from spreading as the ballast float is raised up. W is an iron box about eighteen inches square, resting upon the deck of a ballast float. It receives in its side a pipe which can be moved in any direction by means of its goose necks and swivel joints, and which passes through the deck to the bottom of one of the floats. The opposite side of the box receives a pipe in all respects similar to the one described, and connected with the other float. The pump is screwed to the tube at the top of the box and when set in motion draws the water simultaneously and equally from the two floats. There are two valves in this box by which the water may be stopped in either pipe, at pleasure, and as occasion requires. By using two pumps the box can be dispensed with.

Fig. 8 shows the exterior and interior construction of a ballast float. C is a capstan head or nut with bars in it, the revolution of which around the screw S raises the ballast float up or forces it down as occasion requires. F, F, are frames put around the ballast float, to keep it from spreading when filled with water. R, R, are iron rods passing through the bottom of the ballast float and the frame F, under which there is a nut and screw. The upper end of the same rods pass through the lower part of the capstan head, and is secured there likewise by nuts and screws as more clearly shown in Fig. 10. The Figs. 0, 1, 2, 3, &c., on the near post indicate the depth of the water over the cradle prepared for a steamboat. L is a portion of a lever.

Fig. 9 is a ballast float with a deck on it. R is a rack and pinion for forcing the lever up or down as occasion requires. Motion is given to the pinion by the lever L, an eye in the end of which fits on to an iron shaft, to the other end of which the pinion is attached. B is a set of bits, and L a link for holding the post in a perpendicular position, while the ballast float is rising or the levers are forced down; h is a hole for filling it with water, and r a hole for letting it run out.

Fig. 10 is a section of the capstan C, Fig. 8; S is the screw passing through the center of the cap N, which forms the nut; the shaded port of the figure is bolted to the frame F; the lower pieces L, L, form the lower half of the capstan head and on the outer surface have the appearance of a cylinder divided by a perpendicular plane through its center. The shaded part is connected with the ballast float by the rods R, and hooks on to the lower half of the capstan head L, L. The said lower half is bolted to the nut or upper half N; the upper and lower halves being forced around by the bars B, the shaded part and the float suspended to it, will move up or down according to the direction in which the bars are moved. The dotted lines in this figure show the bolts by which the several parts are connected.

Fig. 11 is an elevation of the last described figure, showing the manner in which it is secured to bottom piece B under the ballast float and to the top T of the frame which supports said float. The dotted lines F show the frame to which the shaded part of the head is bolted in the last figure.

Fig. 12 is a transverse section, and is the same as Fig. 7, except that in this figure the levers are of equal length on both sides of the dock. All of the ballast floats in this figure are intended to be raised up and then filled with water. The transverse truss-frames are here omitted. The figure is deemed too obvious to need further description.

I now proceed to describe the construction of this dock. The sides are formed of pieces of oak as long as they can be had and about twelve inches square, strongly bolted together with square bolts. The ends are formed in the same manner. When the dock is intended for steamboats of six hundred tons and under I construct it of two floats as in Fig. 7, each about one hundred feet long and thirty-five feet broad, and five feet deep, all from out to out, at the angles where the sides and ends meet they are both to be halved out, and bolted or spiked to a post about nine inches square placed in each of said angles. Truss-frames, composed of two beams, one at bottom and one at top, each about four by eight inches, framed into a post at each end of about five by twelve inches, (these posts may run up a sufficient height above the deck to form a

cradle to receive steamboats upon,) a post in the center which must be made of two pieces of about five by six or seven inches, notched out so as to receive at its edge half the thickness of the beams, and then spiked together with the beams above mentioned between them, and the four braces, as shown in Figs. 1 and 2, are to be placed transversely, throughout the length of the dock, at about twelve feet apart.

A piece three by eight inches is to be fastened to the posts just mentioned at top and bottom, at the center of the float, and to run longitudinally the whole length of the float. The beams for supporting the deck and the bottom are to be laid into scores cut in this piece to such a depth, as that the upper edge of the deck beam, and the lower edge of the bottom beam, will be flush with the transverse timbers mentioned in the twelfth section, and also with the top and bottom of the sides of the floats, into which scores are to be made to receive them.

The bottom and deck plank will be about two inches thick. The longitudinal partitions of which there will be two, and the transverse partitions of which there will be two, in each float, are also to be about two inches thick; the transverse partitions will be nailed to those two truss-frames which most nearly divide the length of the float into three equal divisions, and the longitudinal ones will be nailed to studs, two of which will be spiked to each transverse one. There will be a man-hole in the deck over each one of the compartments thus formed, large enough for a person to enter when repairs become necessary. When the dock is in use these holes are to be kept closed tight. The partitions are to be calked and made perfectly tight, except a small aperture at the top for the circulation of air, and a hole at the bottom, three inches in diameter or thereabout for the passage of the water from one compartment to the others.

Plugs of a conical form are fixed to these holes for stopping them as occasion requires. These plugs are to be held in the holes by a spiral spring attached to the small end of the plug by a wire and are to be drawn out of the same by a wire attached to the large end or base, and running to the top of the frame which supports the nearest ballast float. These wires are to be arranged in the manner and on the principle of bell wires. The act of drawing a plug from its hole will be the same as that of ringing a bell, except that when pulled, the wire is to be held out, by attaching a ring at its end to a hook driven in the post of the frame aforesaid. The wires will be so arranged as that one wire will draw two or more plugs when practicable, as occasion requires. Iron rods about half an inch in diameter may be used instead of these wires, as shown in the plan, Fig. 6, at R. The plugs are to be fixed to the ends of the rods; the rods are to be run about eighteen inches through the hole, and to move in a ferrule or eye placed about one foot from the partition, and exactly opposite the center of the hole. The rod is to be cut in two, at a point nearly opposite the most central of the ballast float frames, and attached to a wheel; (W. Fig. 6), the shortest portion of the rod thus cut is to be attached to the bottom of the wheel, and the longest portion thereof to the top of the wheel. The wheel stands in a perpendicular position with its side parallel to the side of the float. An iron shaft about one inch and a quarter in diameter forming the axle of the wheel, passes from the wheel through a ferrule in the side of the float to a point about three feet less distant from the side of the float, than the post which supports the ballast float. It there forms an elbow, and passes perpendicularly upward till its top reaches a convenient position for being handled from the deck of the ballast float. When the plugs are to be drawn out of the holes, the upright shaft, or rod, is to be moved from the ballast float in a direction parallel to the side of the dock; and in a contrary direction when they are to be pushed into the holes. But I prefer the wires to be rods.

In the longitudinal section Fig. 5 the truss-frame is shown on the outside of the float; but for the convenience of calking it would be as well on the inside, using the posts of the transverse truss-frames, for the longitudinal ones, and keeping the braces of the latter entirely within the deck and the bottom of the float. When put inside of the float, there will be four of these braces between every two of the transverse truss-frames;—two on each side of the float, crossing each other in the form of an X.

The levers are to be made of oak timber of about twelve by eighteen inches and of a length proportioned to the weight and draft of the vessels to be raised. When the dock is constructed in the form shown in Fig. 12, wherein the levers are of equal length on both sides, I make them to project over and outside of the float about twenty feet. They are to be supported at the outer end by braces, six inches square, running from the end of the lever, where it is made to fit in a mortise to the side of the float about a foot above the bottom, where it also fits in a mortise about two inches deep. Close to the sides of the latter mortise are two eyes, between which the brace exactly fits, and having a hole in it, coinciding with the eyes, a bolt is run through which secures it to the side of the float. The upper end may be secured to the lever in a similar manner. That portion and end of the lever,

which rests upon the float passes through bits, as shown in Fig. 5, or through posts of about six by eighteen inches, mortised to receive them. A shoulder about fifteen inches from the end, is to be cut, so as to form a tenon to fit snugly in the mortise of the post nearest the center of the float, and a key driven through the lever outside of said post, to prevent the lever from drawing out, as the ballast float and the water within it, press down upon the other end of it.

The frames for supporting and suspending the ballast floats, are made of two posts of about twelve by sixteen inches, and a cross piece or bearer of the same size, resting and framed upon their tops. The posts are framed into, and stand upon the ends of the levers. They are supported in a perpendicular position by standing braces connecting each post with its appropriate lever, and two hanging braces in the angles formed by the meeting of the posts and bearer. The several parts of these frames may be held together in the same manner as mentioned in section 18, for securing the braces to the sides of the float and to the ends of the levers. The frames are to be framed so that they may be easily taken apart when required to be used on another dock. All of the foregoing work is to be constructed of oak timber.

The ballast floats are made of sound and clear white pine, one and a half inches thick, nailed to bottom and top beams of about two by six inches, and to side timbers or studs of about two by three and a half inches, all of oak, framed or nailed together at the angles. Frames as shown at F, Fig. 8, may be put around the outside to keep them from spreading. The construction dimensions, and manner of raising the floats with screws, may be seen by inspection of Fig. 8, and section 7 of this specification. The ballast float there mentioned, intended for the two float dock, Fig. 7, is twenty feet long, ten feet wide and five feet deep. The ballast float may also be raised up by capstans, windlasses, or by racks and pinions, and are to be held up by strong ratchet wheels or by pawls, which fall into notches made in the posts. When the ballast floats are forced down in to the water the action of the ratchet wheels, or the pawls must be reversed.

Although Figs. 1, 2 and 3 are used to illustrate the principle of this improvement, the lever is not intended to be used in that manner in practice. When one end is connected with a post, as in Fig. 3, it is to move up and down in a slot made in the post, and held from slipping out or in, by a shoulder on the side next the dock, and a key on the other. An upright piece is to be fastened to the end of it, to which a rack is bolted. A pinion gearing into the rack is fastened to the post by the motion of which the rack, and the lever with it, are forced up or down and held in any position by a ratchet wheel and click, which are to be constructed so as that their action may be reversed at pleasure. When a raft of logs is used to steady the lever, it will be necessary to attach a post to it, as at R, Fig. 7, grooved to receive a tongue on the upright piece attached to the lever (as G, G, Fig. 4); the tongue is held from coming out of the groove by an iron band put around both the upright piece and the post, sufficiently loose to allow the tongue to play. The rack and pinion are then to be applied as above. (See R, Fig. 9.)

Pipes about three inches in diameter made of hemp or leather, distended by a spiral spring, are to be screwed into the orifices in the deck of each float as near the four outer corners of the dock as may be, as shown at *p* Fig. 7, for the passage of the air out of and into the dock. Similar pipes are to be used to connect one float with the other; as *a*, Fig. 7. When one end of the dock is higher than the other and nearly filled with water, the air will pass out at the higher end while the water will prevent it from passing out at the lower end. These pipes must be elastic, or have a goose-neck and swivel joint at the bottom, so as that when the wheel of a steamboat comes in contact with them, they will give, until it passes over, when a cork or copper float at the top will bring them to an upright position.

A copper pipe about five inches in diameter is to be fixed between the deck and the bottom of each float, to supply the pump. Another pipe will be screwed to it at the deck, with goose necks and swivel joints so arranged as that it may be bent or moved in any required direction. A pipe thus formed will lead to a box made of metal, eighteen inches square, placed on one of the ballast floats near the center of the dock. A tube is to be screwed into the top of the box, and the pump to the tube. The pump will be as large as the two five inch pipes can supply, and worked by a steam engine, placed on the same ballast float, with the pipes and box. The box must contain two valves for stopping the water in either of said pipes at pleasure. These pipes may be made of leather distended by a spiral spring, and provided with goose necks and swiveled joints where necessary, (see *w*, Fig. 7), so that when the ballast float on which they rest, sinks or descends, the pipes may not be strained.

I now proceed to describe the operation or manner of using this dock. When a steamboat or other vessel is to be taken on, a hole three inches in diameter in each end of each float is to be opened, by moving a

sliding valve attached to a handle reaching up to the top of the nearest ballast float. The dock will then sink until the deck reaches the water. The pipe leading to the pump is to be screwed on at the deck to the piece below it. The air pipes are to be screwed on at the deck. The ballast floats are to be raised up as high as necessary. The pump is then set in motion to fill the ballast floats with water, which is equally distributed by means of the hose uniting them. The ballast floats being filled, the dock sinks until the ballast floats reach the water. The holes by which the ballast floats entered the dock, are to be stopped by the handles that opened them. The steamboat is drawn over the dock and placed so that a plane passing longitudinally through her center will coincide as nearly as may be with a like plane passing through the center of the dock. Her center of gravity is next made to rest as nearly as may be over the center of the space between the two floats (when two floats are used, as Fig. 7). The water is then to be let out of the ballast floats by drawing plugs from their sides. The dock will then rise until the cradle strikes the bottom of the steamboat.

The Figs. 1, 2, 3, &c. on the posts are to be examined, in order to see if the dock lies horizontally; if it does not the ballast float next the lower part, after stopping the plug hole in its side is to be forced down into the water by the capstans or by the racks and pinions till it is brought to a level position. The pump is again set in motion. As the dock rises, the ballast floats must continue to be forced down into the water, to steady it and preserve its equilibrium. The higher it rises the greater will be its tendency to tilt or vibrate; if one part of the dock appears to rise faster than another the holes in that part must be stopped by slacking up the wires and letting the springs draw in the plugs. The pump continuing to act will draw the water from the lower parts of the dock until an equilibrium is established, which may be maintained by paying a little attention to the levers. When the deck of the dock reaches the surface of the water the tendency to vibrate will cease. The pumping is to be continued until the deck is brought about eight inches above the water. The holes in all the internal partitions, are then to be stopped by slackening up the wires and allowing the springs to draw in the plugs. The pump and air pipes may be unscrewed and put out of the way, or removed to another dock, to be used there. The levers can be drawn out, and together with the other apparatus can be removed to another dock. The dock, with the steamboat upon it, can be brought close along shore, or removed to any convenient place for effecting repairs.

Heretofore floating dry docks have been made with six or more floats lying transversely under the vessel to be raised, with trunks or frames standing upright at their ends, forming together, sides or walls to the dock, with spaces or windows between. Each one of these upright trunks contains a pump, a pump well, two or three valves and a ballast well. In a dock of seven floats there are consequently fourteen pumps and pump wells, with their accompanying pipes and valves leading thereto. The trunks are permanently fixed to the ends of the floats, so that they cannot be removed when they are not required. One set of these trunks and apparatus connected therewith, can serve only for one dock. The trunks are a considerable obstruction to light and air; they are a considerable sinking force or burden for the dock to support; and a dock thus constructed presents an area to the action of the current or of floating ice nearly double of that presented by the lever dock. It moreover does not possess the capacity of being towed with facility from place to place, when a vessel is on it, a capacity which the lever dock possesses to a great degree. Others have been constructed of one float, contiguous to, or surrounded on two or three sides with a wharf or other bodies fixed permanently to the ground. Screws or other means connected with such permanent bodies and with the float, are used to force down the float when it is filled with water, and to prevent it from vibrating or tilting as it rises up.

When a light body, as a plank, is forced in a horizontal position under the water and the sinking force removed, its tendency is to rise endwise or edgewise. If, therefore, a flat vessel, as one of the floats hereinbefore described, should be sunk to a certain distance under the surface of the water, and a vessel placed upon it, when the sinking force was removed, it would immediately seek the surface of the water in any other than a horizontal position, and would be liable to throw the vessel off onto her side. This tilting tendency I call the vibration; and it is to prevent this by a simple means, and at a small expense, that I propose to use the movable levers; in consequence of which, I call this the lever dock.

The advantages resulting from the use of these levers, are: (1) The upright trunks, and the numerous pipes, valves, and pumps connected therewith in a dock composed of seven floats, are dispensed with. (2) The levers sinking apparatus and pump will serve for several docks. (3) Every obstruction to light and air is removed. (4) The dock is relieved from the sinking force or weight of the sinking and pumping apparatus. (5) It presents the smallest possible area to the action of the current; and

is easily towed from place to place. (6) It requires no wharf or other fixed body to steady it.

I claim—

The movable levers, in combination with the dry dock, as the most important and substantial part of my invention and improvement, and disclaim all other parts of the dock hereinbefore mentioned.

HUGH K. WAGNER.

Witnesses:
P. W. JOHNSTONE,
JAMES M. DONMAN.