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FLOATING DRY DOCK.

APPLICATION FILED MAY 17, 1916. RENEWED JUNE 28, 1919.

1,333,580. Patented Mar. 9, 1920.

5 SHEETS—SHEET 1.

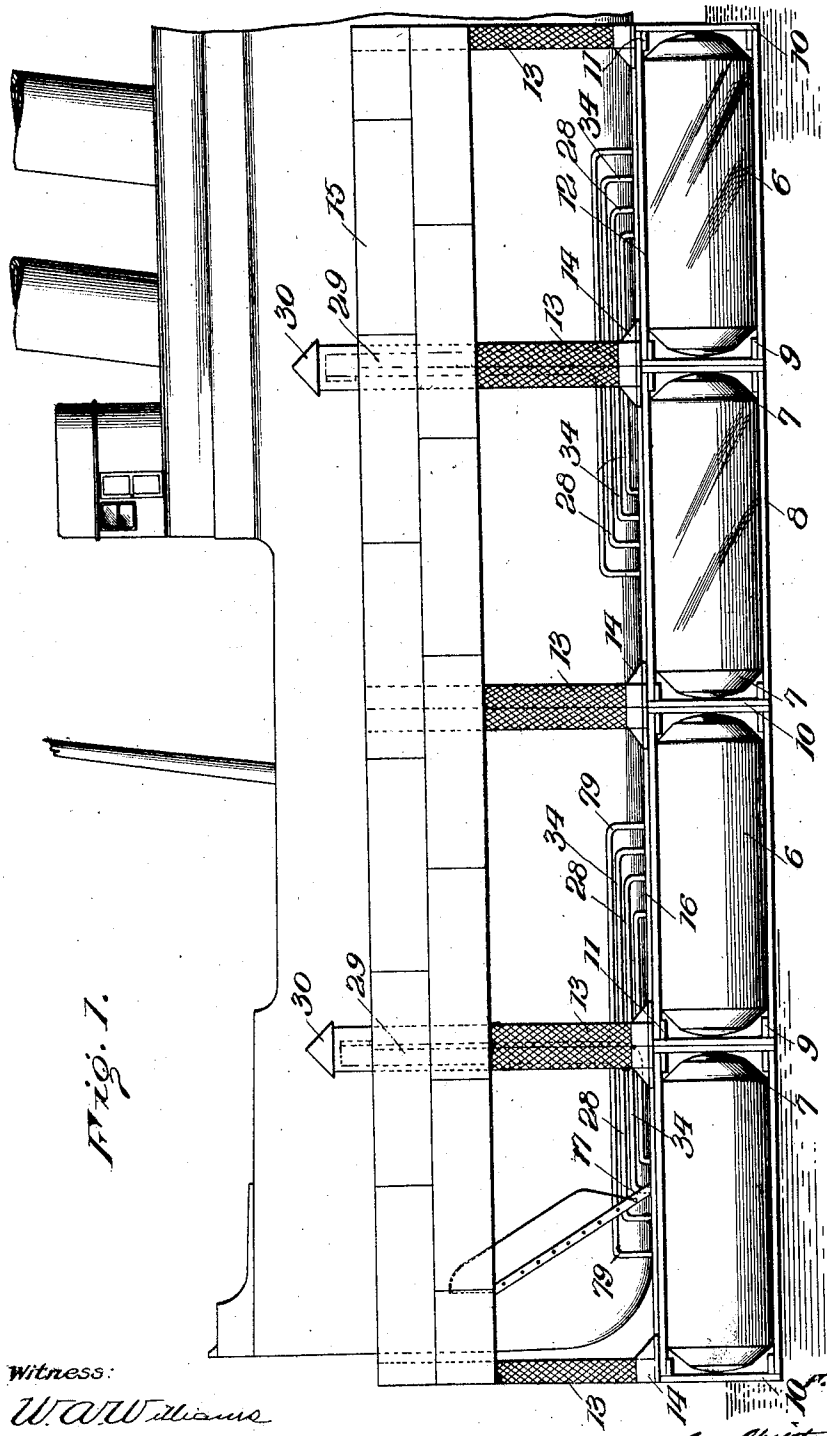


Fig. 1.

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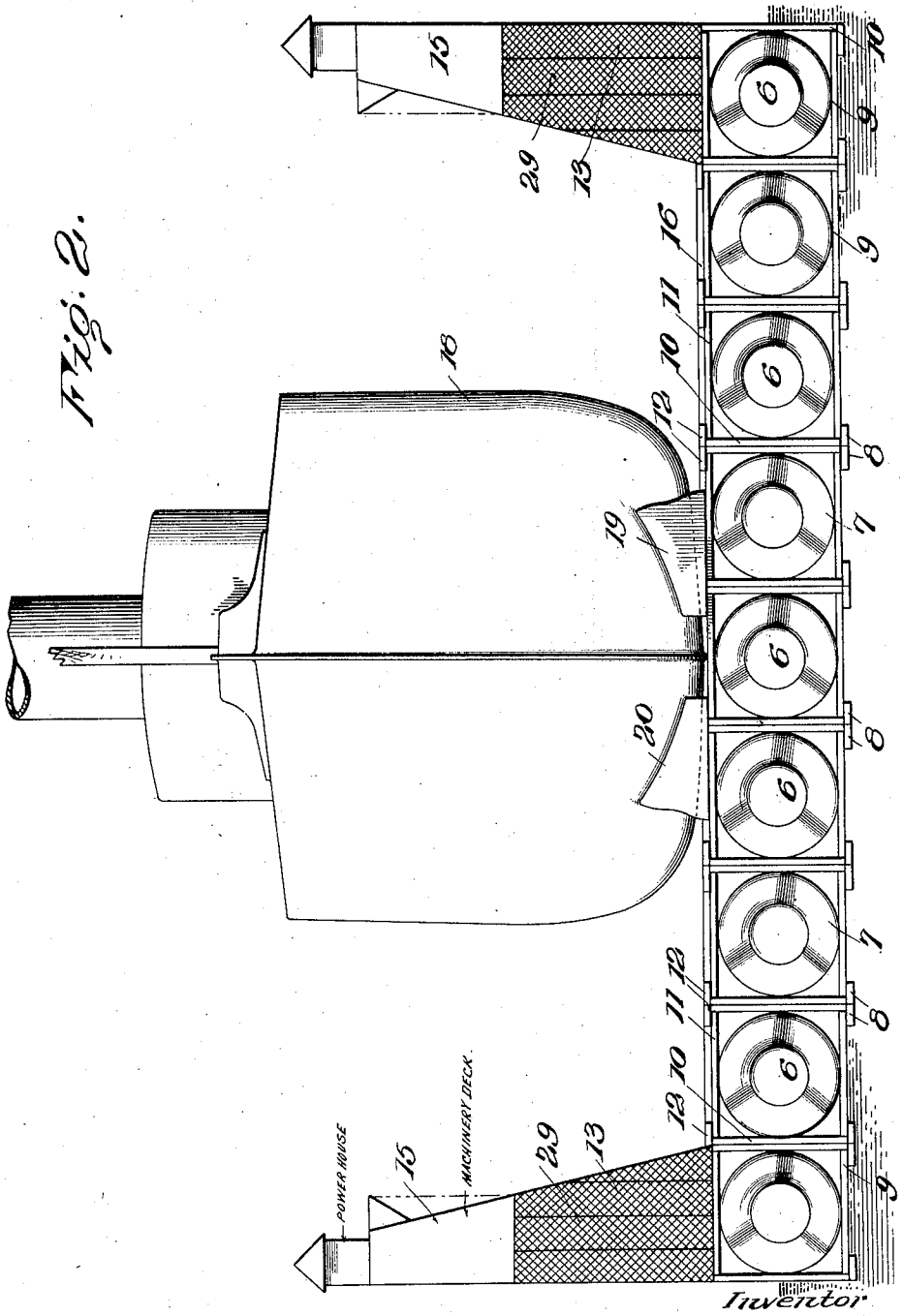
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5 SHEETS—SHEET 2.

Fig. 2.



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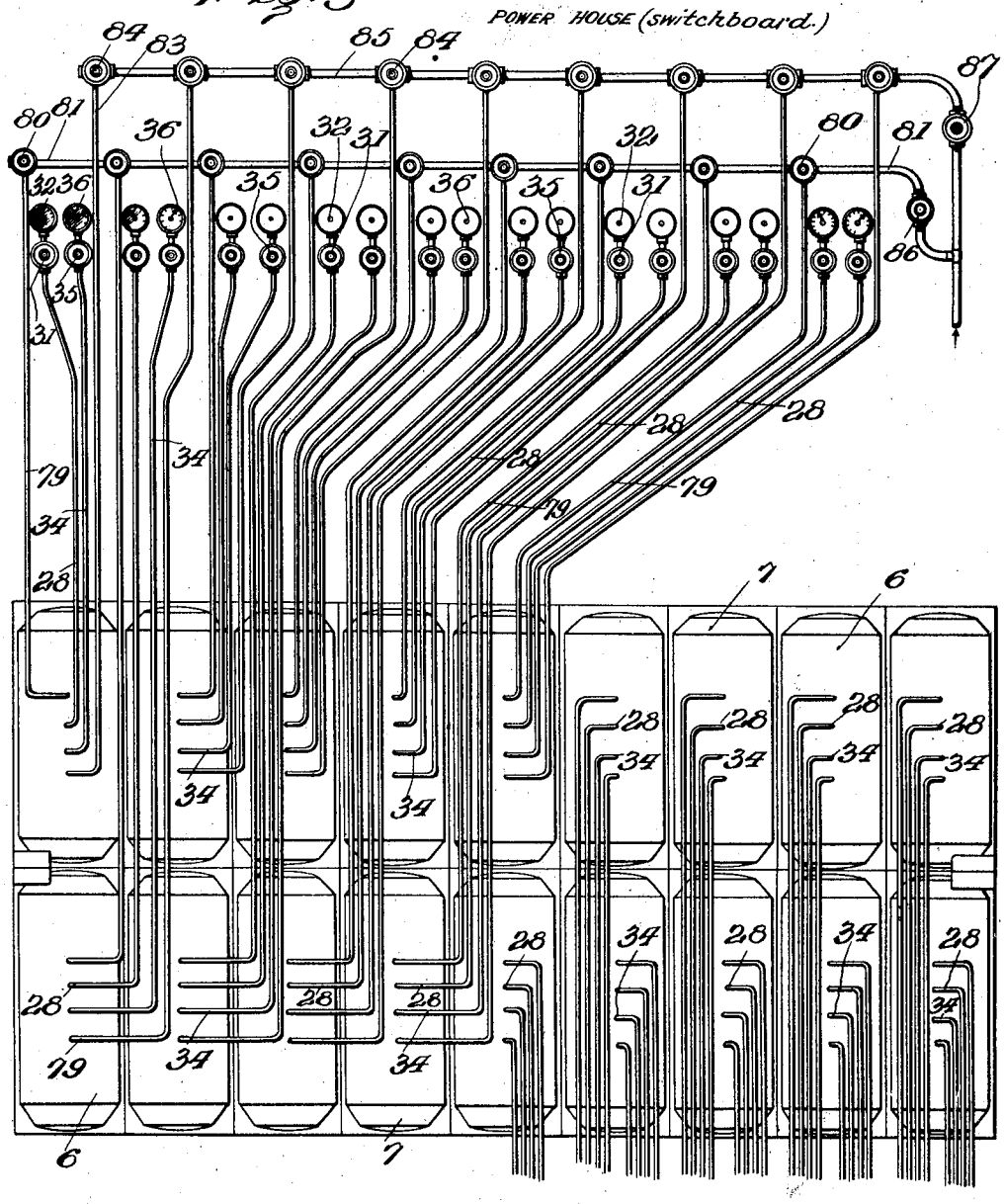
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5 SHEETS—SHEET 3.

Fig. 3



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5 SHEETS—SHEET 4.

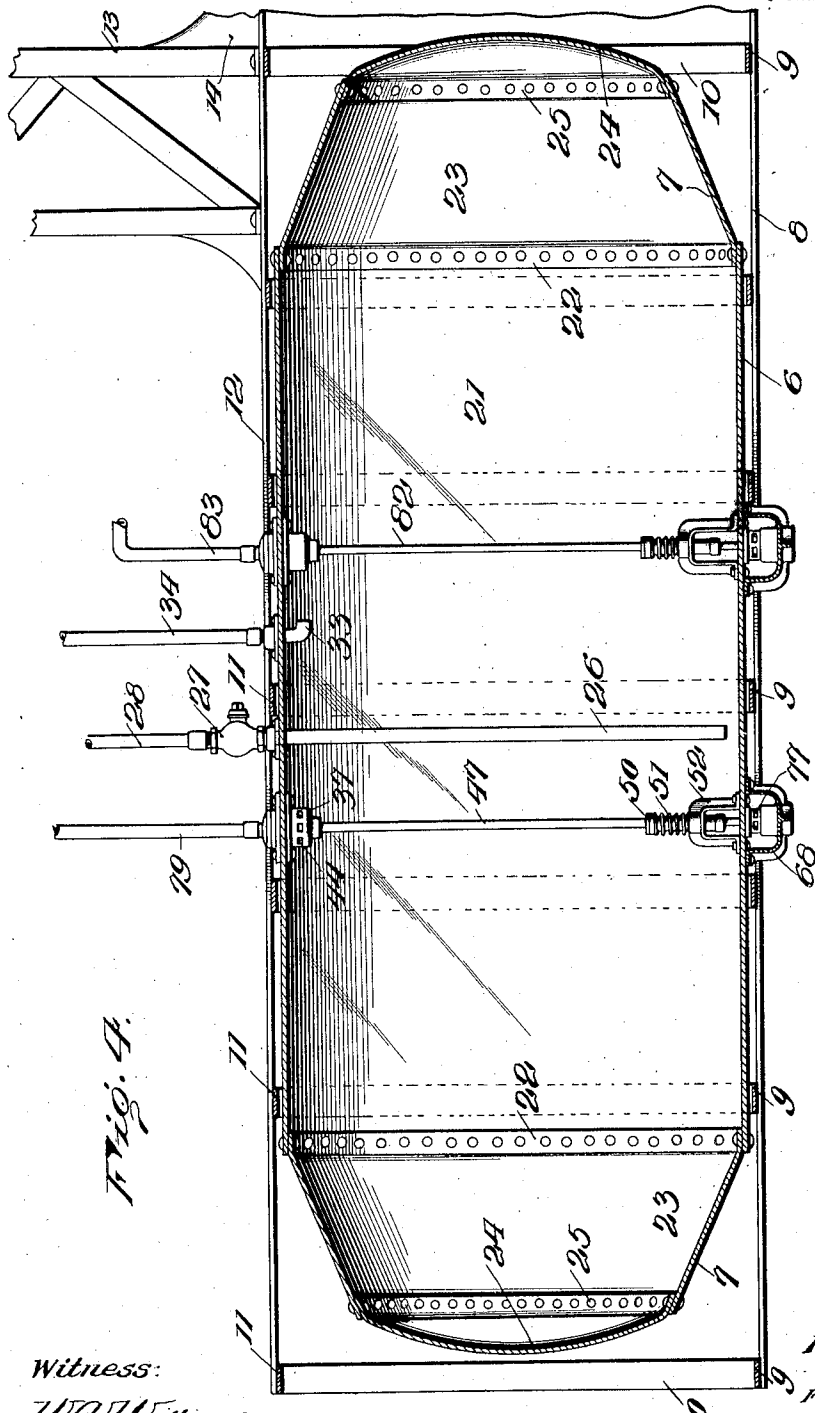


Fig. 4.

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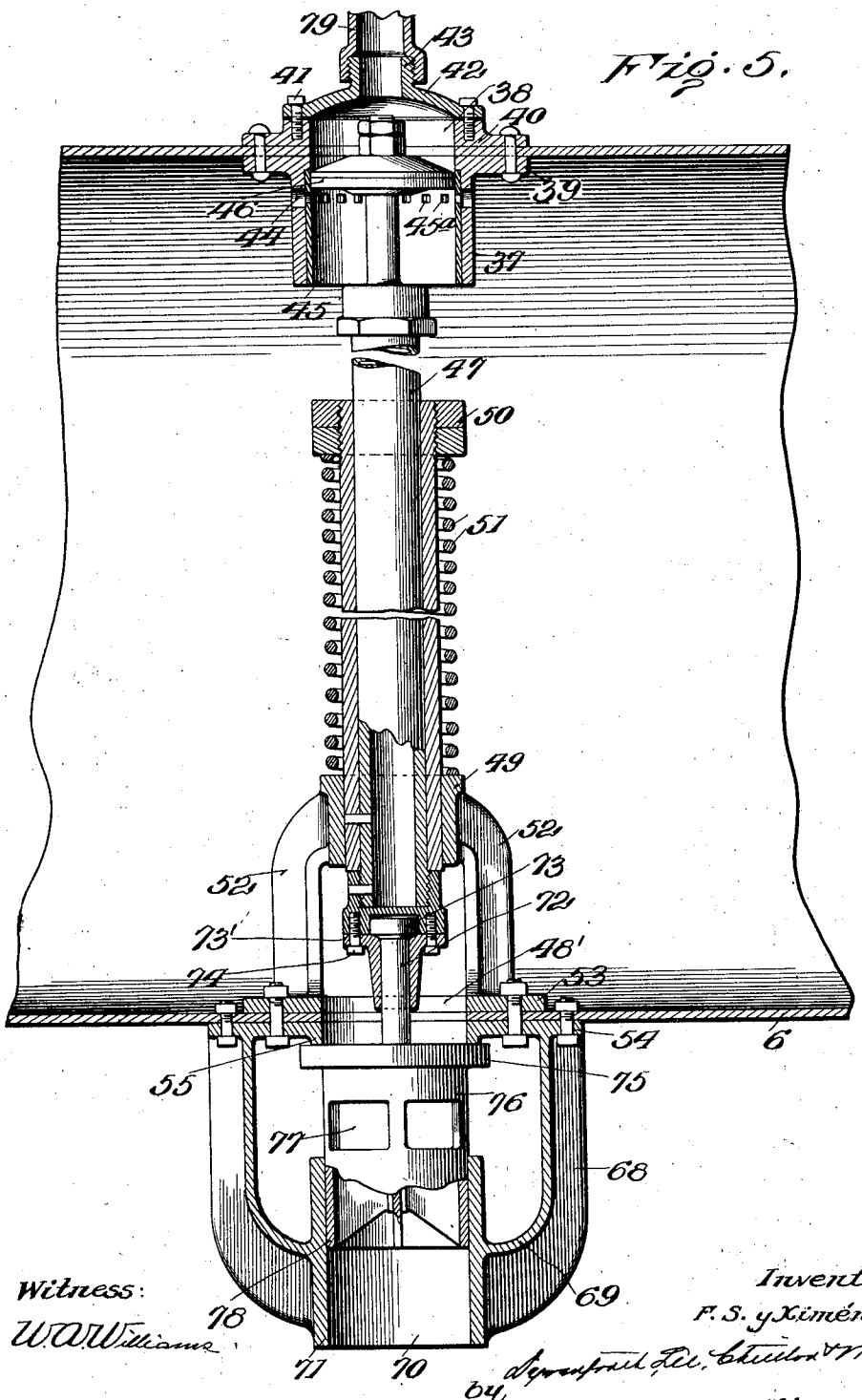
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1,333,580. Patented Mar. 9, 1920.

5 SHEETS—SHEET 5.

Fig. 5.



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UNITED STATES PATENT OFFICE.

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FLOATING DRY-DOCK.

1,333,580. Specification of Letters Patent. Patented Mar. 9, 1920.

Application filed May 17, 1916, Serial No. 98,051. Renewed June 28, 1919. Serial No. 307,444.

To all whom it may concern:

Be it known that I, FERNANDO STAUD y XIMÉNEZ, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented new and useful Improvements in Floating Dry-Docks, of which the following is a specification.

This invention relates to floating dry-docks and has for its primary object the construction of a dock of the character set forth which shall be comparatively inexpensive to build, efficient of operation and particularly adapted to the uses of such structures.

A further object of this invention is to provide a dock of the character set forth with means whereby the submerging and raising thereof may be accomplished in the most effective manner, preventing any side motion when submerging and securing at all times a stability for the dock and the vessel carried thereby.

A still further object of this invention is to construct a floating dry dock which can be readily transported to any desired location.

Another object of the construction described herein is the provision of a floating dry-dock with means for controlling the raising and submerging movements thereof in such a manner as to permit of control from specified points of the dock, to enable the employment of a minimum amount of operation to control the movement of the dock.

With the foregoing and other objects in view, as will from time to time appear hereinafter this invention consists in the peculiar arrangement and combination of the various coöperating elements of a floating drydock as described in the following specification and more particularly pointed out in the appended claims.

Referring to the accompanying drawings forming a portion of this specification, illustrating the preferred embodiments of the invention, and in which the same reference characters indicate the same parts wherever used,

Figure 1 is a partial side view of a dock constructed in accordance with my invention;

Fig. 2 is a front elevation;

Fig. 3 is a diagrammatic view of a portion of the pontoons and their control;

Fig. 4 is a longitudinal section through one of the pontoons and,

Fig. 5 is a section through one of the pontoon draining valves.

6 designates a hollow pontoon preferably cylindrical and tapered at 7—7. The base of the dry dock is formed by a plurality of longitudinally extending strips 8 spaced apart and connected by transverse strips 9 which support vertical members 10 carrying a second set of transverse strips 11 adapted to connect a second series of longitudinally extending strips 12, thus forming a plurality of rectangular skeleton frames each one of which is adapted to incase and support a plurality of the pontoons 6 placed end to end in parallel series across the entire base of the dock, leaving open spaces between the tapered ends 7—7 and also between the various longitudinal and transverse framework strips which carry the pontoons.

At either side of the base are skeleton towers 13 extending up from bases 14 carried by the base framework, the towers 13 supporting a machinery deck 15 which is reached from the main deck 16 by a stairway 17. This machinery deck, as will be seen, is of such a size as to accommodate a fully equipped machine shop, as well as the air compressors and pressure tanks for compressed air for use in operating the dock, as will be hereinafter described.

Due to the skeleton framing construction of the main deck 16 and the towers 13 the dock will, upon submerging, sink in a straight line without any of the side to side movement present in solid base docks, as the water will readily flow between the various pontoons 6 and the supporting framework—thus relieving the pressure against the dock bottom during the submerging movement.

Each of the pontoons 6 comprises a cen-

tral cylindrical portion 21 to which are riveted at 22—22 conical members 23 capped by members 24 riveted thereto at 25.

Near the center of the cylindrical portion 21 a pipe 26 depends through the top thereof and extends nearly to the bottom of the pontoon. The pipe 26 carries on its outer end a check valve 27 with which is connected one end of a pipe 28 which extends upwardly through a casing 29 within the skeleton tower 13, and terminates in the control house 30 where it is provided with a cut off valve 31 and a pressure gage 32.

Adjacent the pipe 26 is provided a vent 33 to which is attached one end of a pipe 34 extending through the casing 29 to the control house 30, where it is provided with a blow off valve 35 and a pressure gage 36. Adjacent to the pipe 26 the pontoon cylindrical section is equipped with an upper air-admitting and lower water-discharging valve device, illustrated in detail in Fig. 5. This device comprises a short cylinder 37 extending inside the pontoon at an opening 38 therein, which is provided with a flange 39 riveted to the pontoon shell, the rivets also passing through the flange of a collar 40 in order to fasten it to the outer surface of the pontoon shell about the opening 38, and on this collar is bolted, by means of bolts 41, a cap 42 provided with a central threaded nipple 43. At suitable intervals about the cylinder 37 near its upper end are provided relatively large ports 44, the interior of the cylinder 37 being provided with a bushing 45 containing a circumferential series of relatively small ports 45^a adapted to aline with the ports 44 and uniformly spaced apart. A piston 46 is adapted to work within the cylinder 37 and is provided with a stem 47 which extends nearly to the bottom of the cylindrical portion of the pontoon and alines with a water outlet opening 48 formed in the pontoon shell. On the piston rod 47 near its lower end there is provided a sleeve 49 confining between it and a collar 50 a spiral spring 51 adapted to normally hold the piston rod 47 and the piston 46 in raised position above the ports 44, 45, the sleeve 49 being provided with depending cage-forming legs 52 connected at their lower ends by means of a ring 53 bolted to the inner surface of the pontoon shell about the opening 48, these bolts passing through a ring 54 upon the outside of the pontoon shell, the said ring being provided with an annular valve seat 55. From the ring 54 extend legs 68 forming a bowl-shaped member 69 containing a central base opening 70 provided with a guide thimble 71.

A continuation 72 of the piston rod 47 is provided with a head 73 which is confined in a recess formed in the bottom of the rod 47 by a flanged sleeve 73′ bolted thereto at 74. This member 72 terminates at its lower end in a valve head 75 adapted to normally close upwardly against the seat 55 and provided with a depending cylindrical skirt 76 having radially disposed ports 77 and an extension 78 guidingly engaged within the thimble 70.

From the nipple 43 extends a pipe 79 which passes upwardly through the casing 29 to the control house 30, where said pipe is provided with a cut-off valve 80, connecting it with a compressed air supply pipe 81, which is supplied with compressed air from any suitable source.

Adjacent the vent 33 the pontoon is provided with a valve device represented as a whole by the numeral 82 and being in every detail of construction similar to the one from which the pipe 79 extends with the single exception that the cylinder 37 thereof is not provided with any ports 44, 45^a, so that no further description of this valve mechanism is necessary, it forming a water inlet and pressure equalizing valve, as hereinafter explained. From the valve 82 extends a pipe 83 which extends upwardly through the casing 29 to the control house 30, where it is provided with a cut-off valve 84 which connects it with a compressed air supplying pipe line 85 supplied by any suitable source of compressed air.

The construction as above described is the same for each pontoon, each control house receiving the piping from a certain set of pontoons, as diagrammatically indicated in Fig. 3, the pipe lines 81 and 85 being provided with cut-off valves 86 and 87 respectively, in order to entirely cut off the supply of compressed air to the plurality of valves 80 and 84.

The operation of the construction above described is as follows:—

When it is desired to submerge the base deck of a dock in order to receive the vessel, the operators in the control houses 30 open the valves 84 which permits air from the compressed air supply pipe 85 to flow into the various pipes 83 to the respective valves 82, whereupon action of the compressed air upon the piston 46 will cause the valve 75 to be forced from its seat 55 against the pressure of the water and permit water to flow upwardly and into the pontoon, through the opening 48′, the pipes 26 with their corresponding gages 32 serving to indicate in the control houses the pressure of the water within the pontoon. When the dock has been submerged to the desired level each valve 84 will be closed to prevent any further flow of compressed air, thus permitting the valve 82 to close under the pressure of the water, and the action of their springs 51, thus reseating each valve 75 against its seat 55 and preventing any further entrance of the water.

The dock is now in position to receive

a vessel. When it is desired to raise the dock the valves 80 are operated to permit compressed air from the supply pipe 81 to flow into the pipes 79, where the compressed air will act upon the piston 46 of the valve shown in detail in Fig. 5 and cause the piston to move downwardly within the casing 45, which permits the compressed air to flow into the pontoon through the apertures 45ª and 44, and at the same time unseats the valve 75 from its seat 55, as in the action described for the other valve 82. The pressure of the compressed air which is flowing into the pontoon through the openings 45ª and 44 will cause the water therein to be forced downwardly and outwardly through the opening 48, the pressure valve in the pipe 26 indicating the pressure within the pontoon. When the desired level of the dock has been reached the flow of air into the pontoon may be stopped by operating the valves 80, whereupon the dock will float at the desired level. The air vents 33 with their corresponding pipes 34 are controlled by means of valves 35 and are supplied with gages 36 in order to indicate the air pressure within the pontoon.

By the method of control above described the series of pontoons may be operated simultaneously and submerge or lift the dock to any desired level, the device indicating at all times the exact pressure of air and water within the pontoons, so that a proper raising and lowering of the dock may be effected. In will be further understood that upon the emptying action of the pontoon the water will also flow out through the valve device 82 in addition when the pressure overcomes the closing tendency of the spring 51, thereby expediting the evacuation.

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

1. In a floating dry dock, in combination, a main deck comprising a plurality of members spaced apart, separate pontoons carried in fixed position by said members in the spaces formed therebetween, valves at the top and bottom of said pontoons, a source of compressed air connected with the upper valves, and controlling means for opening the lower valves by means of compressed air to allow water to enter the pontoon or to open both the upper and lower valves to force the water out of the pontoons by means of the air pressure.

2. In a floating dry dock, in combination, a main deck comprising a plurality of members spaced apart to form a cratelike structure, a plurality of separate pontoons carried in fixed position by said structure, a machinery deck having a controlling means, a main source of compressed air controlled thereat, pipes leading therefrom to said pontoons, and valves associated with each pontoon whereby on actuating said controlling means one valve in each pontoon is opened to permit an inflow of water or if filled with water to admit compressed air to the pontoon through another valve to force the water out.

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