No. 691,069. Patented Jan. 14, 1902.

J. F. O'ROURKE.

AIR LOCK FOR CAISSONS.

(Application filed Dec. 30, 1896.)

(No Model.)

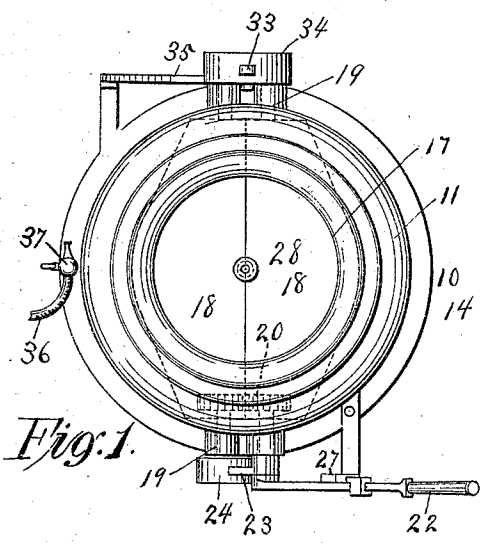

Fig. 1.

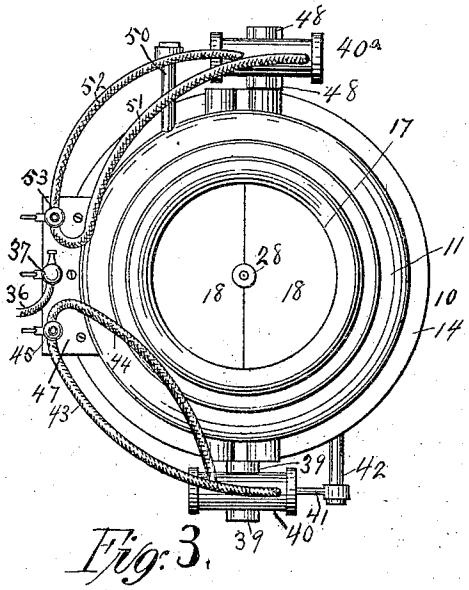

Fig. 3.

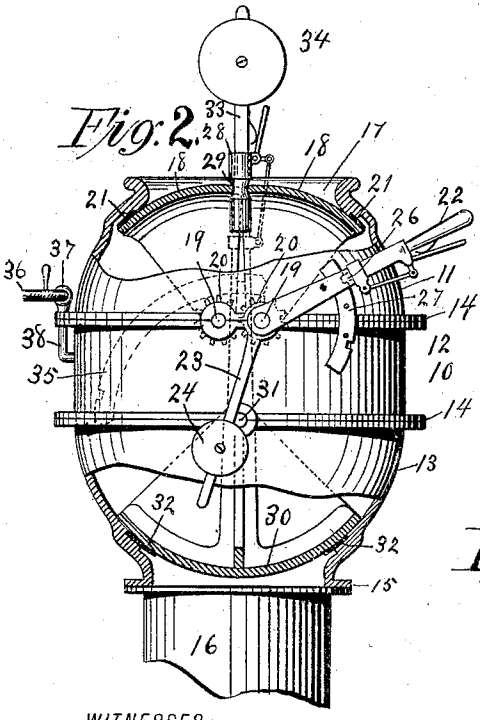

Fig. 2.

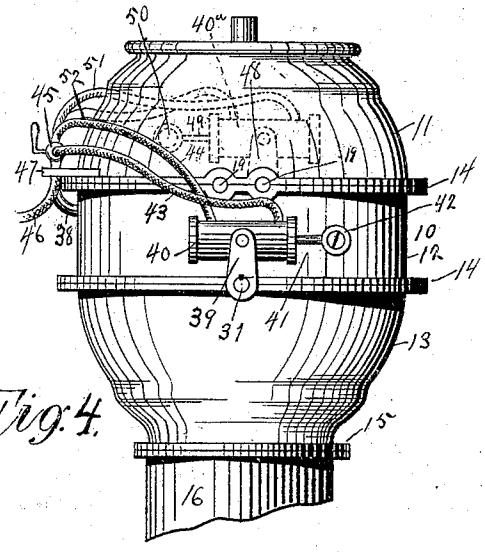

Fig. 4.

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AIR-LOCK FOR CAISSONS.

SPECIFICATION forming part of Letters Patent No. 691,069, dated January 14, 1902.

Application filed December 30, 1896. Serial No. 617,437. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. O'ROURKE, of New York, in the county and State of New York, have invented certain new and useful Improvements in Air-Locks for Caissons, of which the following is a full, clear, and exact description.

My invention relates to improvements in air-locks for caissons such as are used in sinking foundations, piers, bridgework, &c.; and the objects of my invention are to produce a comparatively cheap and very simple air-lock which can be conveniently applied to the ordinary air-shaft of a pneumatic caisson and to produce a system of gates and mechanism for working them adapted to be operated with great ease and constructed and arranged so as to be worked rapidly and permit the hoisting and lowering of the bucket with the least possible escape of air.

To these ends my invention consists of certain features of construction and combinations of parts, which will be hereinafter described and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar figures of reference indicate corresponding parts in all the views.

Figure 1 is a plan of the air-lock embodying my invention, showing manually-operated means for working the gates. Fig. 2 is a broken side elevation, partly in section, of the lock, showing the particular arrangement of the gates. Fig. 3 is a plan view of a modified form of the air-lock, showing means for working the gates by compressed air; and Fig. 4 is a side elevation of the air-lock as shown in Fig. 3.

The air-lock has a shell 10, which is preferably, though not necessarily, a casting, and for convenience it is made is three sections 11, 12, and 13, which are placed one upon the other and have meeting flanges 14 to enable the sections to be readily fastened together, the whole shell being when assembled of a generally spherical shape. The lower end of the shell is open, so as to permit the passage of the bucket into and out of the shaft 16 of the caisson, and the shaft and shell have at their junction meeting flanges 15 to provide for easy connection. The shell has at the top a mouth or opening 17 large enough for the passage of the hoisting-bucket, and this mouth or opening is closed by the oppositely-arranged swinging gates 18, which are shaped to conform to the shape of the shell and are journaled at their ends, as shown at 19, the journals being placed in the flanges 14, so that, if necessary, they can be easily reached by separating the sections 11 and 12 of the shell.

The journals 19 of the gates 18 are geared together, as shown at 20, so that the two gates will move in unison and oppositely, and the gates slide opposite an annular gasket 21, which encircles the mouth 17 of the shell, so as to produce a tight closure. One of the journals 19 is provided with a lever 22, by means of which the gates are operated, and the journal or shaft has also an arm 23, carrying a counterbalancing-weight 24 to enable the gates to be easily worked. The lever 22 has an ordinary spring-bolt 26 to engage a rack 27, which is supported on the shell 10, the spring-bolt being worked by the ordinary latch, and by means of the bolt and rack the lever may be locked, so as to hold the gates open or closed. This arrangement is not shown in great detail, because it is like the ordinary locking devices for fastening levers, and any usual affair of this kind can be used.

The meeting edges of the gates 18 are suitably packed, and in the center they are adapted to close tightly into the groove 29 of the stuffing-box 28, through which the hoisting-rope passes. This stuffing-box is held in place by the gates when they are closed, and when the gates are open the lower gate 30, hereinafter referred to, is closed, so that there can be no great displacement of the stuffing-box, and one of the operators can readily adjust it when the gates 18 close, so as to cause the groove 29 to register with the edges of the gates.

The lower opening of the shell is closed by the swinging gate 30, which, like the gates 18, is shaped to conform to the general surface of the shell and is hung at the ends, as shown at 31, the gate being suitably ribbed and braced to give it the necessary strength. This gate swings also over a gasket 32, which surrounds the lower opening of the shell in order that an air-tight closure may be effected, and the gate 30 and also the gates 18 should

have the outer surfaces planed, so as to make a nice fit.

The gate 30 is worked by a lever 33, which is secured to one of the pivot-shafts of the gate, and the lever carries a weight 34 to counterbalance the gate 30. The lever has the customary locking-bolt, like that shown on the lever 22, so as to engage the rack and lock the lever, and thereby the gate 30.

When the gate 30 is to be opened, air is admitted to the air-lock to equalize the pressure on both sides of the gate 30, and when the gates 18 are to be opened the gate 30 is closed and the air exhaused. To accomplish this, air is admitted through the pipe 36, cock 37, and pipe 38 and is exhausted through the cock 37, which is an ordinary two-way cock and needs no description.

In operating the air-lock the gate 30 is closed, the hoisting-bucket lowered into the air-lock, the gates 18 closed by means of the lever 22, the air admitted through the cock 37 to make the pressure in the air-lock equal to the air-pressure below the gate 30, and then the gate 30 is opened to permit the descent of the bucket. When the bucket is to be removed, the operation is reversed, the gate 30 being first opened until the bucket has passed it, after which the gate 30 is closed, being worked, as before referred to, by the lever 33. The air is exhausted from the shell 10, and the gates 18 then opened.

In Figs. 3 and 4 I have shown means for working the gates 18 and 30 by compressed air or steam and incidentally provided means for making the cylinders serve as counterbalances for the gates. As here shown, the lower gate 30 has one of its shafts 31 provided with cranks 39, between which is pivoted an ordinary cylinder 40, the weight of which counterbalances the gate 30. The piston-rod 41 of the cylinder is pivoted at its outer end, as shown at 42, and air is admitted to opposite ends of the cylinder through the pipes 43 and 44 by means of the cock 45, which is supplied by a pipe 46. The cylinder and piston-rod are not shown in detail, because it is the ordinary oscillating cylinder, and all that is claimed for it is its particular application to the gate for the purposes specified. When air is admitted to the left-hand end of the cylinder, the piston, of course, remains stationary and the cylinder is pushed to the left, thus moving the cranks 39 and opening the gate 30, and when air is admitted to the opposite end of the cylinder the opposite effect takes place and the gate is closed. The upper gates 18 are similarly worked, one of the journals 19 having cranks 48, between which is pivoted a cylinder 40^a, precisely like the cylinder 40, just referred to, and the piston-rod 49 of this cylinder is at its outer end pivoted to the shell, as shown at 50. Air is admitted to opposite ends of the cylinder through pipes 51 and 52 by means of the cock 53. This and the other cocks are supported on a plate 47 or equivalent support. The air in the shell 10 is exhausted or admitted in the manner already specified.

In operating the air-lock by means of the construction shown in Figs. 3 and 4, supposing the bucket to be in the shell ready for descent, the operator manipulates the cock 45 so as to admit air into the left-hand end of the cylinder 40, so as to open the gate 30, and the bucket is permitted to descend. It will be understood, of course, that before this is done air is admitted to the shell, so as to make the pressure on the two sides of the gate 30 equal. When the bucket is hoisted into the shell 10, the gate 30 is closed, the operator manipulating the cock 45 so as to admit air to the right-hand end of the cylinder 40. After this the operator turns the cock 37, so as to exhaust the air from the shell, and then turns the cock 53 so as to admit air to the right-hand end of the cylinder 40^a, thus opening the gates 18, which can be closed again by admitting air to the left-hand end of the cylinder 40^a.

It will be observed from the foregoing description that the air-lock is capable of very easy manipulation, either when operated manually or by means of air or steam admitted to the cylinders 40 and 40^a, that the arrangement of gates provides for holding the air in the shell 10, and that the construction is of such a simple and practical character as to be easily kept in repair and to be comparatively inexpensive. It will be further observed that the shape of the shell 10 can be departed from without affecting the principle of the invention, which lies in the arrangement of the gates and means for operating them.

I have described the shell of the air-lock provided with double doors at the top and a single door at the bottom; but it is perfectly obvious that this arrangement can be reversed and the single door placed at the top and the double doors at the bottom or single or double doors used at either end without in the least affecting the principle of the invention. It is equally obvious that the gates can be hung on the outside as well as on the inside of the shell without affecting the principle of the invention.

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

1. An air-lock for caissons, comprising a shell convex at top and bottom and provided with end openings, a single gate for closing the bottom opening, the gate corresponding in shape to the shape of the shell, a pair of oppositely-arranged swinging gates to close the top opening, said gates being geared together so as to move in unison, counterbalances for the upper and lower gates, mechanism for working the gates, and means for admitting air to and exhausting it from the shell, substantially as described.

2. The combination with the shell and the

swinging gate therein, of an oscillating cylinder serving as a counterbalance for the gate, a stationary support for the piston-rod of the cylinder, and means for admitting air or steam to the cylinder, substantially as described.

3. In an air-lock for caissons, the combination with the shell and the swinging gate therein, of the cranks on the pivot-shaft of the gate, a cylinder pivoted between the cranks, a stationary support forming a pivot of the piston-rod of the cylinder, and means for admitting air or steam to the cylinder, substantially as described.

4. An air-lock for caissons comprising a shell having an opening therein with a curved seat surrounding the same, gates to close said opening having curved surfaces to fit said curved seat and pivoted so that said gates shall move toward and from each other with their curved surfaces sliding against said seat, each of said gates having a journal extended through the wall of said shell, and gears applied to said journals outside of said shell and connected so that said gates shall open and close in unison.

5. An air-lock for caissons comprising a shell having openings at its upper and lower ends with a curved seat around each opening, two gates to close the upper opening having curved surfaces to fit the curved seat around the same and pivoted so that said gates shall move toward and from each other with their curved surfaces sliding against said seat said gates having a rope opening between them, and a single gate to close the lower opening, said single gate having a curved surface to fit the curved seat around the lower opening and pivoted so that it shall move to open or close said opening with its curved surface sliding against said seat.

6. An air-lock for caissons comprising a shell having openings at its upper and lower ends with a curved seat around each opening, two gates to close the upper opening having curved surfaces to fit the curved seat around the same and pivoted so that said gates shall move toward and from each other with their curved surfaces sliding against said seat, said gates having a rope opening between them, a single gate to close the lower opening, said single gate having a curved surface to fit the curved seat around the lower opening and pivoted so that it shall move to open or close said opening with its curved surface sliding against said seat, means to operate the upper gates and independent means to operate the lower gates.

7. An air-lock for caissons comprising a shell having an opening at its upper end with a seat curved about a center below it and having an opening at its lower end with a seat curved about a center above it, and gates to close said openings having curved surfaces to fit the curved seats and pivoted so that the curved surfaces thereof shall slide against said seats respectively.

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