

(No Model.)

2 Sheets—Sheet 1.

R. S. GILLESPIE.
AIR LOCK FOR CAISSONS, &c.

No. 573,405.

Patented Dec. 15, 1896.

Fig. 1.

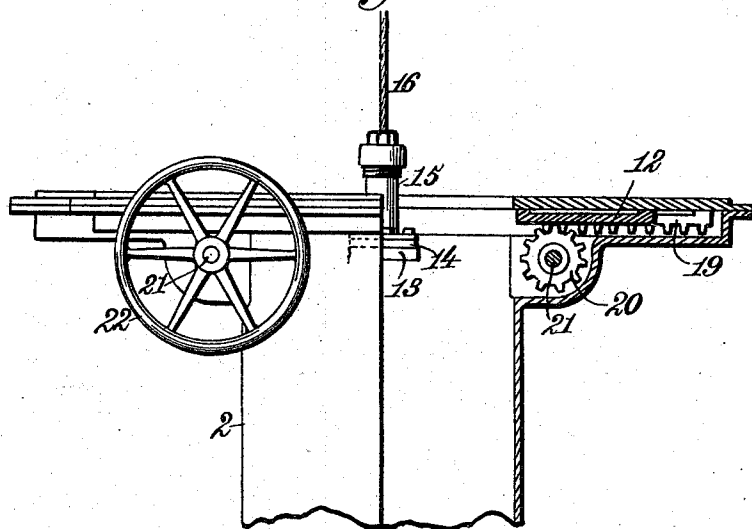
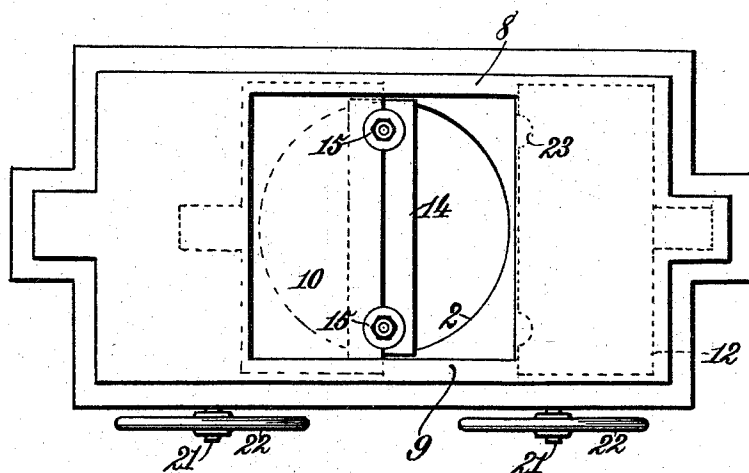


Fig. 2.



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Fig. 3.

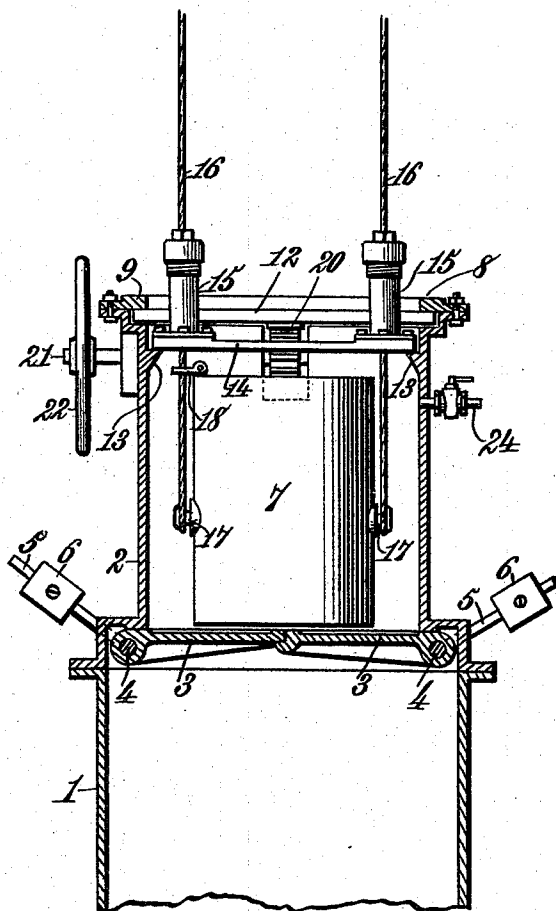
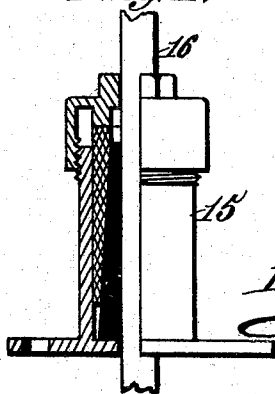


Fig. 4.



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UNITED STATES PATENT OFFICE.

RICHARD S. GILLESPIE, OF NEW YORK, N. Y.

AIR-LOCK FOR CAISSONS, &c.

SPECIFICATION forming part of Letters Patent No. 573,405, dated December 15, 1896.

Application filed July 20, 1896. Serial No. 599,934. (No model.)

To all whom it may concern:

Be it known that I, RICHARD S. GILLESPIE, 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 Air-Locks for Caissons, &c., of which the following is a specification.

This invention relates to air-locks for caissons and tunneling purposes wherein the casing of the air-lock is provided at its upper and lower end portions with doors or valves adapted to be opened and closed, so that a bucket can be raised into the air-lock casing while the upper valves are closed and the lower doors or valves then be closed to prevent the escape of compressed air when the upper doors or valves are opened to remove the bucket from the air-lock.

The chief object of the present invention is to provide new and improved means whereby the depth of the air-lock can be materially diminished, the tilting or tipping of the bucket while being raised or lowered is prevented, and the packing-boxes through which the hoisting-cables pass do not require to be manually operated when the bucket is lowered into the air-lock.

The object of my invention is accomplished in the manner and by the means hereinafter described and claimed, reference being made to the accompanying drawings, in which—

Figure 1 is a detail sectional side elevation of the top portion of my improved air-lock designed for caissons and tunneling apparatus. Fig. 2 is a top plan view of the same, showing one of the upper doors or valves closed and the other opened. Fig. 3 is a central vertical sectional view showing the air-lock mounted on the top portion of a caisson, and Fig. 4 is a sectional side elevation of one of the stuffing-boxes through which one of the hoisting-cables is passed to connect with the bucket.

In order to enable those skilled in the art to make and use my invention, I will now describe the same in detail, referring to the drawings, wherein—

The numeral 1 indicates a cylinder or structure, which may be a caisson, for constructing subaqueous or other foundations and the like, or which may be part of an apparatus designed for tunneling purposes. In

such caisson or apparatus the work is executed by the workmen in the presence of compressed air, and therefore an air-lock is employed, as is well known. According to my invention this air-lock comprises a casing 2, preferably in the form of a cylinder, but susceptible of being made of any form or shape in cross-section which is suitable for the purpose in hand. The air-lock casing is provided at its lower end with opening and closing doors or valves 3, mounted on rock-shafts 4, to which are attached arms or levers 5, having counterweights 6, in such manner that when the arms or levers and counterweights are at one side of the axes of the rock-shafts the doors or valves 3 will be held in their closed position, as in Fig. 3, and when the arms or levers and counterweights are shifted to the opposite side of the axes of the rock-shafts the doors or valves will be swung to and held in their open position for the passage of the bucket 7, which is employed either to raise material from the caisson or to lower material thereinto for executing the work in hand, whatever it may be, such, for example, as constructing subaqueous foundations or tunneling.

The upper end of the air-lock casing is provided at opposite sides with overhanging guide-flanges 8 and 9, arranged parallel to each other, and under which the ends of the upper doors or valves 10 and 12 engage, so that while these doors or valves can slide horizontally to their open or closed positions they are held down squarely upon the top portion of the air-lock casing 2. This casing is provided internally, near its upper end, with inwardly-projecting shoulders 13, upon which the ends of a cross-bar 14 are adapted to seat, as shown in Fig. 3. The shoulders are located a sufficient distance below the plane of the sliding doors 10 and 12 to enable the cross-bar 14 to lie between the shoulders and the doors or valves when the latter are closed. The opposite end portions of the cross-bar are provided with attached upright or vertical stuffing-boxes 15, through which the bucket-hoisting cables 16 extend. The lower ends of the two cables 16 engage with diametrically opposite studs or pins 17, secured to the bucket 7 at points about central between the upper and lower ends of the

bucket. The top edge of the bucket is provided with a suitable eye or other device 18, which engages one of the cables at some distance above the point where the lower end of the latter connects with a stud 17, whereby the bucket is maintained in a perpendicular position. The connection of the two cables with diametrically opposite points of the bucket and the provision of the eye or other device 18 to connect the top portion of the bucket with one of the cables effectually prevents the bucket from tilting or tipping as it is raised or lowered. Furthermore, by connecting the two cables with the bucket in the manner described I entirely avoid the use of a bail pivoted to the top portion of the bucket in the usual manner, and which extends to a greater or less extent above the bucket when the latter is raised or lowered, which it is desirable to avoid in that the bail occupies considerable space in the air-lock and renders it necessary to make the latter of such height that it will accommodate the bail when the latter is perpendicular. The omission of the bail and the connection of the cables to the bucket, according to my invention, enables me to materially diminish the height of the air-lock casing, and consequently to reduce the loss of compressed air when the bucket occupies the air-lock and the upper doors or valves are opened for the purpose of removing or unloading the bucket. This is desirable and important in that the compression of air in caissons and tunneling apparatus having air-locks is very expensive, and it is desirable to avoid the loss of compressed air as much as possible.

The cables are ordinarily composed of wire rope, but they may be of any material suitable for the purpose in hand, and they are susceptible of sliding through the stuffing-boxes 15 when the cross-bar 14 rests upon the inwardly-projecting shoulders 13 of the air-lock casing.

The stuffing-boxes may be of any desired construction, but preferably they are of the usual construction illustrated in detail in Fig. 4, wherein provision is made for tightening a packing upon the cables whenever occasion demands.

The horizontally-sliding doors 10 and 12 are designed to be operated through the medium of any suitable mechanism; but, as shown in the drawings, these doors are provided on their sides with racks 19, engaging pinions 20, mounted on shafts 21, which are provided at one end with hand-wheels 22, whereby the shafts may be rotated in either direction to slide the doors back and forth.

The inner edges of the doors, which lie contiguous when closed, are constructed with semicircular recesses 23, adapted to fit the stuffing-boxes and make an air-tight connection therewith when the doors are closed.

When the bucket 7 is raised out of the air-lock casing during the time the upper sliding doors are open, the cross-bar 14 is carried

with the bucket, and subsequently, when the bucket is lowered into the air-lock casing, the ends of the cross-bar will come against and be supported by the inwardly-projecting shoulders 13, thereby stopping the descent of the cross-bar and stuffing-boxes, while the cables will slide through the stuffing-boxes if the bucket continues to descend. By this means I entirely avoid manual manipulation of the stuffing-boxes, as is necessary where they are mounted on the cables and require to be moved down against the top portion of the air-lock when the bucket is lowered into the air-lock casing.

In the operation of my invention, assuming that the bucket is to be introduced into the air-lock casing from the exterior thereof, the lower doors or valves 3 are closed and the upper ones are opened, the bucket is lowered into the air-lock casing, and the cross-bar 14 comes to rest against the shoulders 13. The upper sliding doors 10 and 12 are then slid to their closed positions, and subsequently the lower doors 3 are opened and the bucket is lowered into the caisson or other apparatus. When the bucket is to be raised from the caisson or other apparatus into the air-lock for any purpose whatever, the lower doors 3 are opened, and after the bucket is raised into the air-lock casing the lower doors 3 are closed and the upper doors 10 and 12 are opened, so that the bucket can be raised out of the air-lock casing, if desired. When the upper doors or valves are closed, the air-pressure existing in the air-lock tends to raise or press these doors or valves upwardly; but this is resisted by the overhanging guide-flanges 8 and 9.

It is preferable to make the exterior of the stuffing-boxes tapering and to construct the edges of the semicircular recesses 23 to fit the tapering surfaces of the stuffing-boxes; but as I do not limit myself to this specific construction I do not deem it necessary to illustrate the same in the drawings.

The air-lock casing will, in practice, be provided with an air-pressure-equalizing pipe, as at 24, to connect with the casing 1, as usual in that class of apparatus.

It will be obvious that by diminishing the amount of bucket-space in the air-lock casing, in the manner described and shown, the quantity of compressed air in the casing when the latter is occupied by the bucket is correspondingly reduced, and therefore when the air-lock is opened there is less compressed air lost than where the bucket is provided with a bail, as usual, as in the latter construction the capacity of the air-lock casing requires to be such that it will accommodate the bail when it stands perpendicular.

As regards the lower doors or valves 3, I do not wish to be understood as confining myself to any particular construction nor to any particular means for opening and closing the same. I may use rock-shafts 4, having attached arms or levers 5, provided with counter-

weights 6, or I may use any other suitable means for operating these doors or valves, and instead of two lower doors or valves I may use a single one.

5 Having thus described my invention, what I claim is—

1. The combination with an air-lock casing having upper and lower doors or valves, of a cross-bar provided with stuffing-boxes, and
10 means for supporting the cross-bar when lowered into the casing, substantially as described.

2. The combination with an air-lock casing having internal shoulders or supports and upper and lower doors or valves arranged respectively above and below said shoulders or supports, of a cross-bar provided at its end portions with stuffing-boxes and adapted to seat upon and be supported by said shoulders or supports, and bucket-hoisting cables
20 extending through said stuffing-boxes adapted to be connected with a bucket, substantially as described.

3. The combination with an air-lock casing having upper and lower doors or valves and a bucket adapted to occupy the space between the upper and lower doors, of bucket-hoisting cables having their lower ends connected with opposite sides of the bucket at points
30 between the upper and lower ends thereof, and means for engaging one of the cables with the upper portion of the bucket to prevent tilting of the latter, substantially as described.

4. The combination with an air-lock casing having upper and lower doors or valves and a bucket adapted to occupy the space between said doors or valves, of a cross-bar provided with stuffing-boxes, a bucket having studs or
40 pins at its opposite sides at points between its upper and lower ends, and cables extend-

ing through said stuffing-boxes and connected with the studs or pins of the bucket, substantially as described.

5. The combination with an air-lock casing having internal shoulders or supports and upper and lower doors or valves arranged respectively above and below said shoulders or supports, of a cross-bar provided with stuffing-boxes, a bucket having studs or pins at
50 its sides, and cables extending through the stuffing-boxes and connected with the studs or pins of the bucket, substantially as described.

6. The combination with an air-lock casing having internal supports or shoulders, lower doors or valves, and upper horizontally-sliding doors or valves located above said shoulders or supports of the casing, of a cross-bar adapted to rest upon the shoulders or supports and provided with attached stuffing-boxes, a bucket adapted to occupy the air-lock casing, and cables extending through said stuffing-boxes and connected with the bucket, substantially as described. 65

7. The combination with an air-lock casing, of upper doors or valves having recesses in their contiguous edge portions, a cross-bar having stuffing-boxes adapted to lie in said recesses when the doors or valves are closed, 70 a bucket adapted to occupy the air-lock casing, and cables extending through the stuffing-boxes and connected with the bucket, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses. 75

RICHARD S. GILLESPIE.

Witnesses:

ALBERT H. NORRIS,
THOS. A. GREEN.