July 4, 1933. C. L. POWELL 1,916,684

AIR LOCK FOR PNEUMATIC CAISSONS

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FIG. 1.

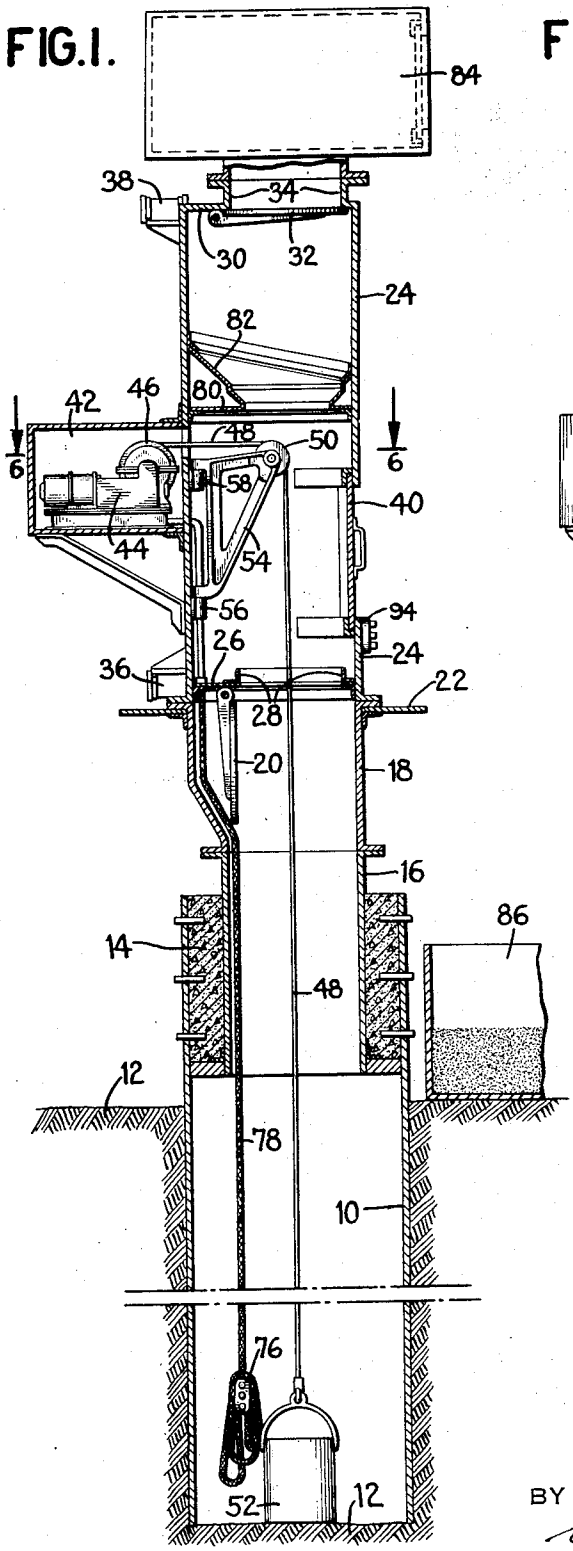
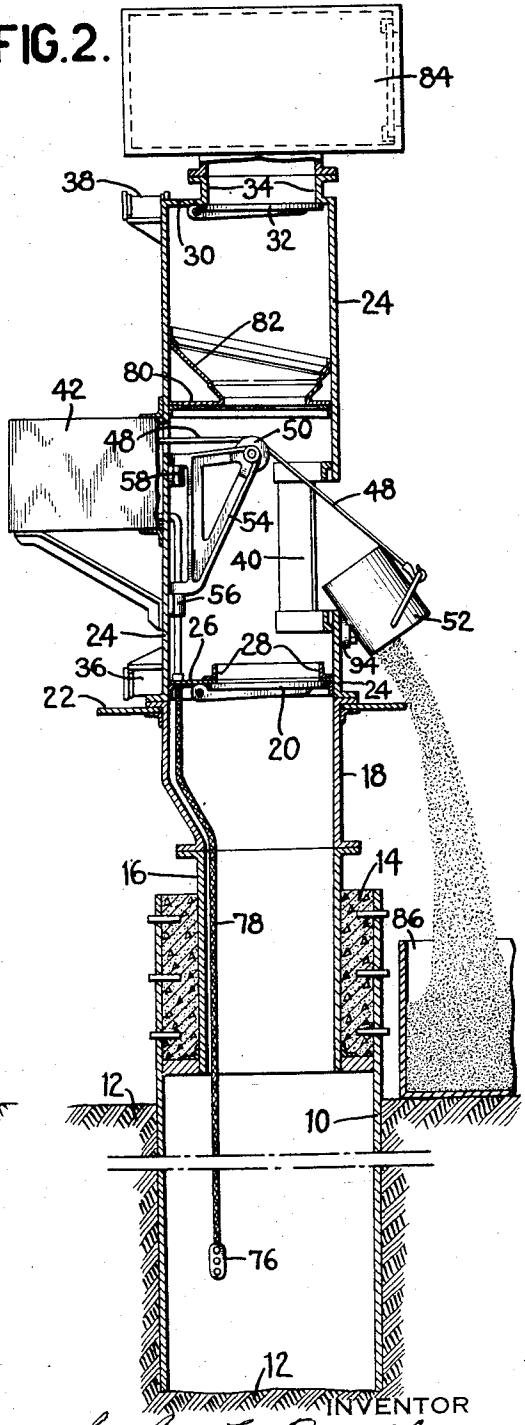


FIG. 2.



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FIG.3.

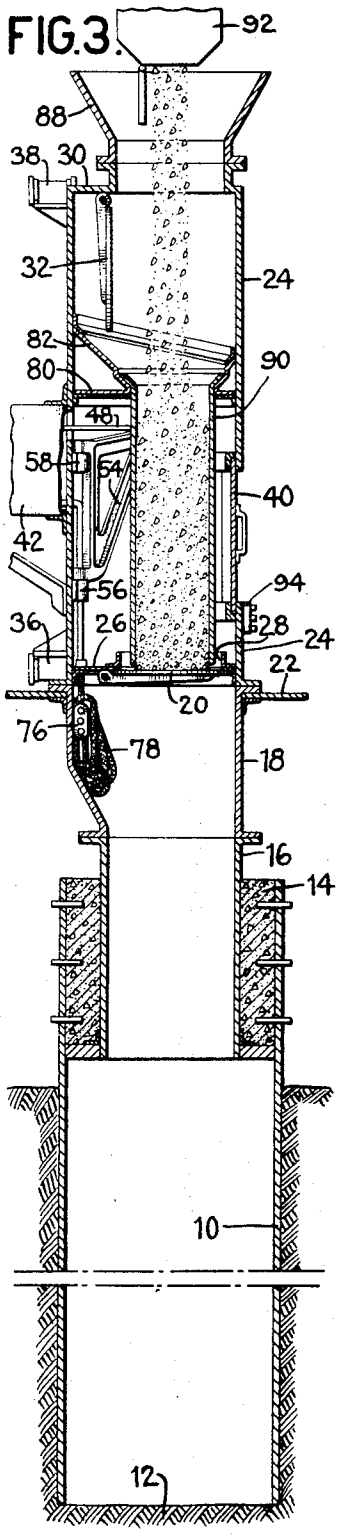


FIG.4.

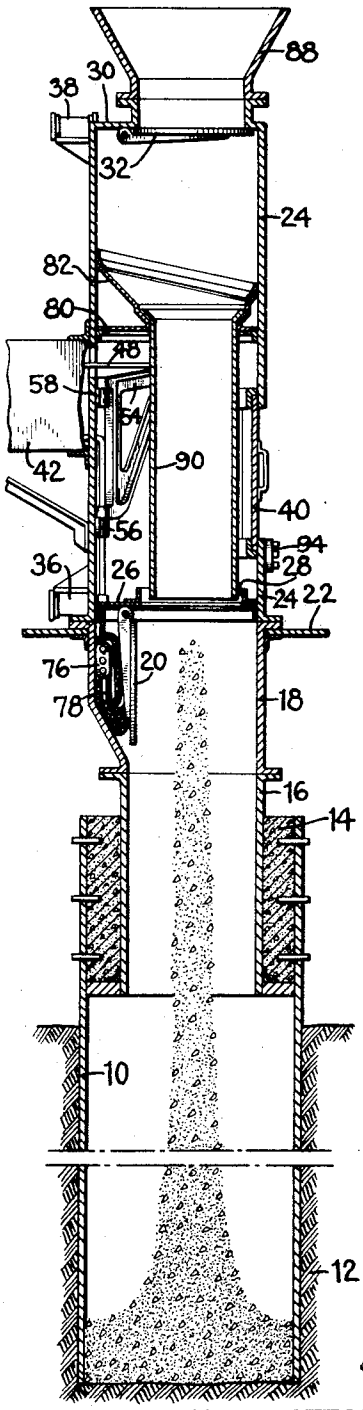
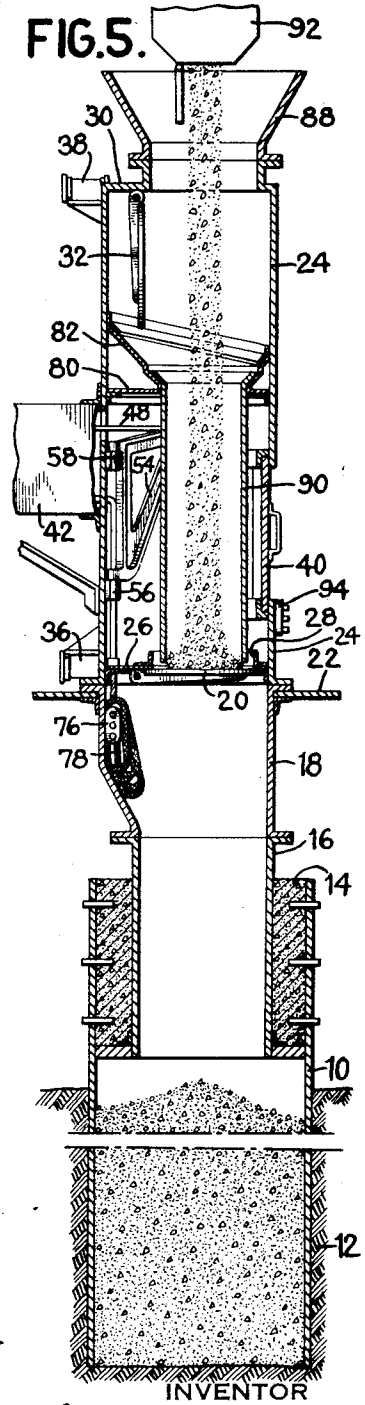


FIG.5.



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FIG.6.

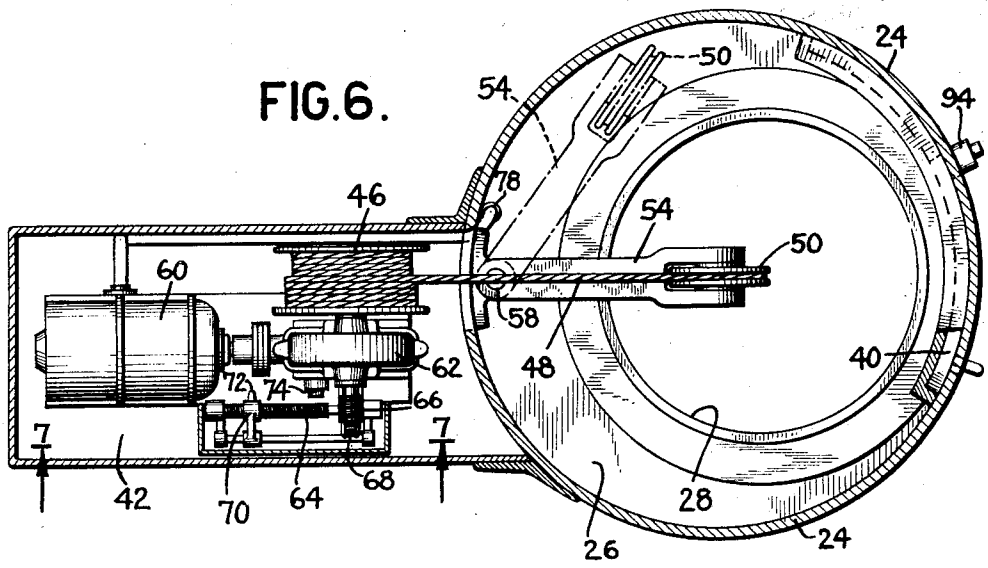
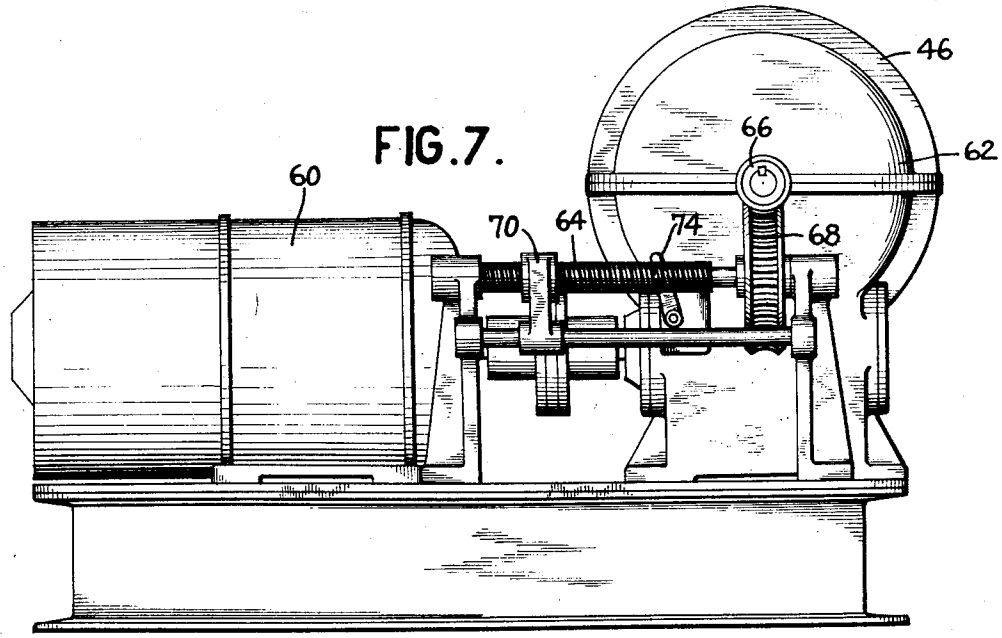


FIG.7.



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UNITED STATES PATENT OFFICE

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AIR LOCK FOR PNEUMATIC CAISSONS

Application filed October 3, 1931. Serial No. 566,597.

This invention pertains to an improved air lock for use on a pneumatic caisson.

There are two kinds of air locks in common use, known as the "side door" and "top door" locks, respectively.

The top door type is used generally for large work where a derrick or crane is available for handling the muck bucket.

The side door type is customary for small jobs where there is no crane, since a very small hoist can be used.

Both the above types of lock have serious drawbacks in service. An engineer is required to operate the hoist or crane, which is a serious item in the cost of operation, especially when the three-shift plan is in use. The sand hog who fills the muck bucket must signal for the raising or lowering of the bucket by tapping on the side of the caisson. The lock tender on the outside of the lock receives the signals and transmits them to the engineer. This procedure usually slows up operations and may be dangerous if the signals are not relayed prompty or if they are misunderstood. Another drawback is the leakage of air through the stuffing box around the hoisting cable.

In addition to the above, there are other disadvantages which apply particularly to the side door lock after the excavation has been finished and the concrete lock is put in place to supply concrete to the excavation. During that operation a man must stand inside the lock to operate the bottom door of the concrete lock. That is a dangerous situation since the lower air lock door is always open at that time and after the concrete has been placed in the concrete lock and the pressure equalized, the lower door of the concrete lock bangs open and the man in the lock is liable to be hurt if he is not very careful. The fact that the man operating the door works under air pressure adds greatly to the expense of operation since the rate of pay of air workers is higher than that of men outside the caisson.

When the concrete lock is in place there is no power means for raising or lowering a man for inspection of the concrete, even the ladder being removed before concreting is begun.

The principal object of the air lock herein disclosed is to overcome the above objections.

Further and other objects and advantages will be apparent from the specification and claims, and from the accompanying drawings which illustrate what is now considered the preferred embodiment of the invention.

Fig. 1 shows the improved airlock in operative position while the excavating operation is going on, the bucket being at the bottom of the hole.

Fig. 2 is a view somewhat similar to Fig. 1 but with the bucket in dumping position.

Figs. 3, 4 and 5 show three stages of the concreting operation.

Fig. 6 is an enlarged sectional view on line 6—6 of Fig. 1.

Fig. 7 is a view on line 7—7 of Fig. 6.

Referring to Figs. 1 and 2, 10 is the caisson being sunk into the ground 12. Sealed into the upper end of the caisson by concrete bulkhead 14 or otherwise is the lower tubular section 16 of the air lock. Fitted on top of section 16 is another section 18, enlarged at its upper end to accommodate the lower air lock door 20 when it is open as in Fig. 1. Supported by section 18 is an operator's platform 22.

Secured above section 18 is the chamber 24, having a lower head 26 upon which is hinged the door 20 adapted to open or close opening 28, and having an upper head 30 carrying a door 32 adapted to open or close opening 34. Doors 20 and 32 are controlled by air cylinders 36, 38 respectively. A sliding door 40 may be opened by hand to provide a side exit from the chamber to the atmosphere.

Mounted in a compartment 42 at one side of chamber 24 and communicating therewith so as to be in effect within the chamber so far as air conditions are concerned, is a hoisting device 44 having a drum 46 upon which may be wound a cable 48 extending over sheave 50 to support bucket 52 in the caisson. Sheave 50 is supported for rotation on

a bracket 54 hinged at 56 and 58 on the wall of chamber 24 so that the bracket may be swung out of the road during the concreting operation.

The hoisting drum 46 may be operated by air, water, electricity or in any other desired manner. It is shown (Figs. 6 and 7) as being electrically driven by means of motor 60 through the instrumentality of a worm and gear in housing 62. A screw 64 driven in synchronism with the drum by means of worm 66 and gear 68 actuates a nut 70 having a finger 72 adapted to actuate a knock-out lever 74 to stop the drum at a predetermined point when the muck bucket is opposite door 40. A switch 76 hanging at the bottom of the caisson on cable 78 enables the man at the bottom of the caisson to raise or lower the bucket at will; or to hold it at any desired point by simply stopping the motor (the worm drive being irreversible).

Above the hoisting device, across chamber 24 is a partition 80 which supports a hopper 82 for use in the concreting operation, as will appear.

A "man lock" 84 may be placed on top of the air lock above door 32, if desired. This will permit "decompressing" a sand hog without interfering with the mucking or excavating operation.

With the above structure in mind the mucking operation will be readily understood. When the sand hog has filled the bucket he pushes the proper button in switch 76 to start the motor to hoist the bucket. Finger 72 actuates lever 74 to stop the bucket opposite door 40, whereupon the outside man closes door 20, draws the bucket out of door 40 sufficiently to dump it into truck 86. The outside man, by means of auxiliary motor control switch 94 in parallel with switch 76 can control the bucket during the dumping operation. After the bucket is dumped it is replaced in the air lock hanging on cable 48, door 40 is closed, door 20 is opened, and the bucket is again lowered to the bottom of the caisson under control of the sand hog, and the operation is repeated. The air pressure in air lock and caisson is controlled in well known manner by apparatus not shown.

After the excavation is completed and the caisson lowered to proper depth, the air lock is used as described below in performing the concreting operation.

Bucket 52 is removed, bracket 54 is swung to one side as indicated in dotted lines in Fig. 6, cable 78 and switch 76 are hung out of the way behind door 20, man lock 84 is replaced by a hopper 88, and chute 90 is inserted to hang from hopper 82 with its lower end in opening 28. Then with door 20 closed and door 32 open, plastic concrete is dumped from bucket 92 through hopper 88 to fill chute 90 (Fig. 3). Door 32 is then closed and door 20 opened to permit the contents of chute 90 to fall into the caisson. Then door 20 is closed and door 32 opened and the operation is repeated until the caisson is filled.

If it be desired to inspect the concrete in the caisson at any time, chute 90 is removed, bracket 54 is swung to hoisting position, bucket 52 is hung on cable 48 and the inspector may be lowered and raised by means of switch 94, or by switch 76 which he can reach through opening 28 and which he can carry with him down into the caisson.

It is to be understood that the invention is not limited to the specific embodiment herein illustrated and described, but may be used in other ways without departure from its spirit as defined by the following claims.

1. An air lock having a bucket hoisting device therein and adapted to be placed on top of a caisson, in combination with manually operable means in the caisson for controlling said hoisting device.

2. An air lock having a bucket hoisting device therein and adapted to be placed on top of a caisson, in combination with means manually operable at the bottom of said caisson, regardless of the depth thereof, for controlling said hoisting device.

3. An air lock having a motor driven bucket hoisting device therein and adapted to be placed on top of a caisson, in combination with a control switch suspended in said caisson whereby the operator at the bottom of the caisson may control said hoisting device.

4. An air lock adapted to be placed on top of a caisson and having a chamber with a lower door, in combination with a hoisting device entirely in said chamber, a cable controlled by said device, a bucket on said cable, said hoisting device being adapted to raise or lower said bucket from or into the caisson through said lower door of said chamber and manually operable means in the caisson for controlling said hoisting device.

5. An air lock adapted to be placed on top of a caisson and having a chamber with a lower door, in combination with a hoisting device in said chamber, a cable controlled by said device, and means in the caisson below said door for controlling the operation of said hoisting device.

6. The invention set forth in claim 4 in which a side door is provided in said chamber through which said bucket may be dumped if desired.

7. An air lock adapted to be placed on top of a caisson and having a chamber with a lower door, in combination with a hoisting device entirely in said chamber, a cable controlled by said device, and a bucket on said cable, a sheave for said cable, and means for supporting said sheave in said chamber to guide said cable and bucket through said lower door, said supporting means being adjustable in position whereby said sheave and

cable may be moved out of alignment with said lower door.

8. An air lock adapted to be placed on top of a caisson and having a chamber with upper and lower doors, a concrete chute supported in said chamber with its lower end close above the closed position of said lower door, in combination with means for filling said chute with concrete through said upper door while said lower door is closed, said chute being adapted to discharge its contents into the caisson when said lower door is opened.

In testimony whereof I hereto affix my signature.

CHARLES L. POWELL.