

No. 623,660.

Patented Apr. 25, 1899.

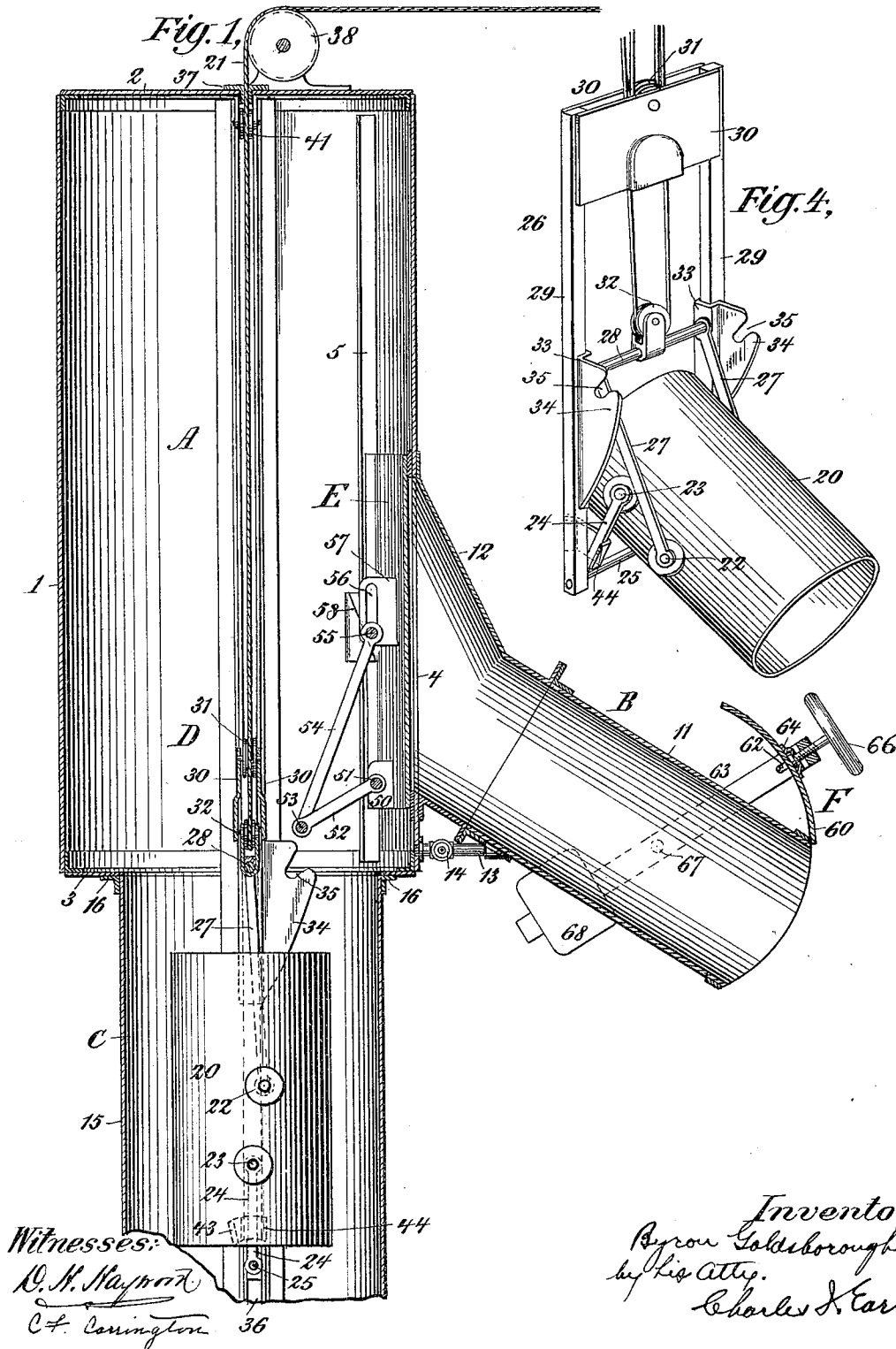
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(Application filed Mar. 26, 1898.)

(No Model.)

2 Sheets—Sheet 1.



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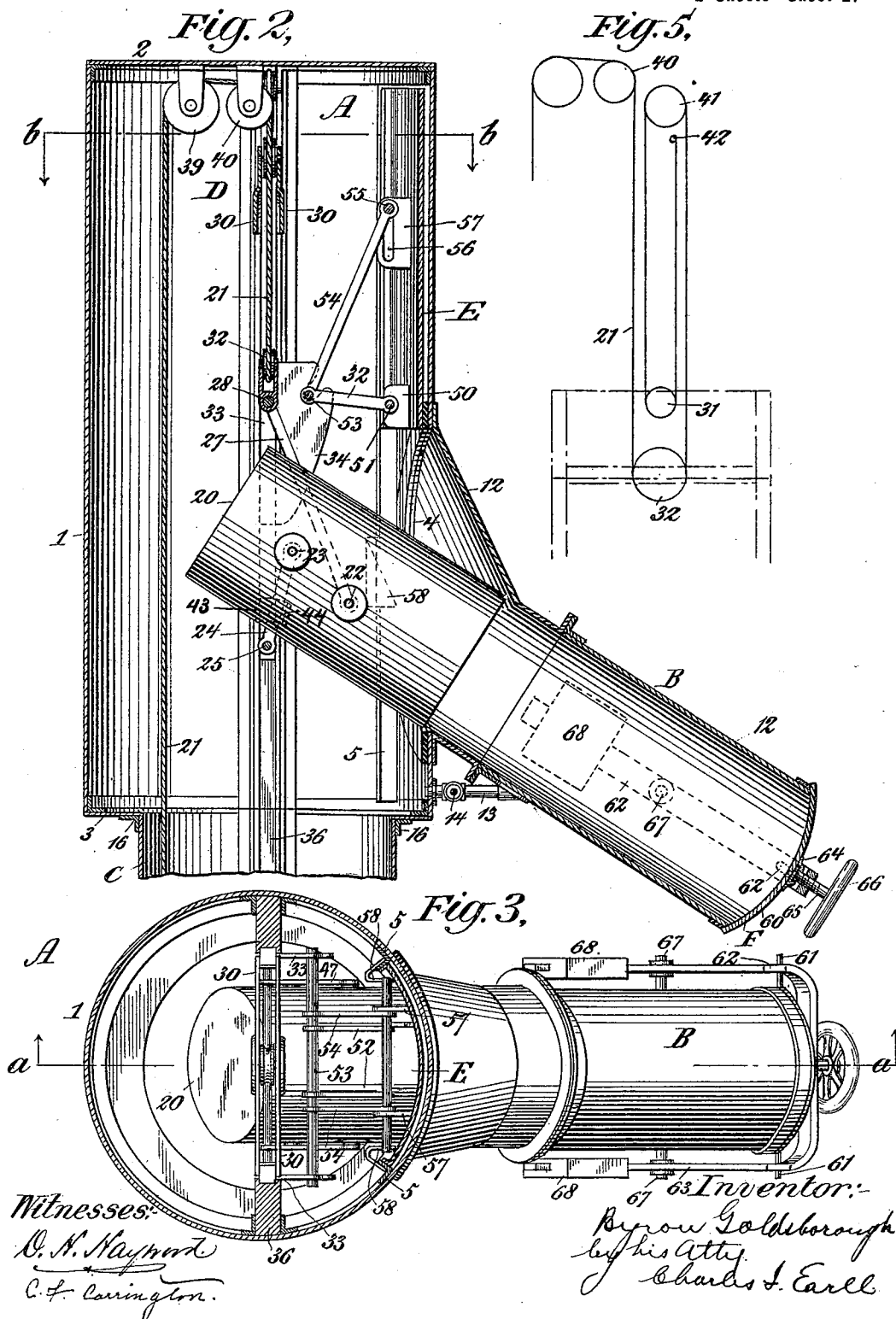
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UNITED STATES PATENT OFFICE.

BYRON GOLDSBOROUGH, OF NEW YORK, N. Y.

HOISTING AND AIR-LOCK APPARATUS FOR CAISSONS.

SPECIFICATION forming part of Letters Patent No. 623,660, dated April 25, 1899.

Application filed March 26, 1898. Serial No. 675,216. (No model.)

To all whom it may concern:

Be it known that I, BYRON GOLDSBOROUGH, a citizen of the United States of America, and a resident of the city, county, and State of New York, have invented certain new and useful Improvements in Hoisting and Air-Lock Apparatus for Caissons, of which the following is a specification.

My invention relates to hoisting and air-lock apparatus for caissons, the object being to produce an apparatus of this character reliable and effective in its construction and operation and one by means of which the material can be raised in the caisson-shaft and automatically dumped into the air-lock.

The object is, further, to produce an air-lock which can be automatically opened and closed to the shaft of the caisson and which can be conveniently opened and closed to the atmosphere and one which is adapted to receive material from the hoisting-bucket and to discharge it when its outer door is opened.

This invention consists in providing a novel hoisting apparatus whereby the bucket used to raise the material from the working chamber of a caisson into the caisson-shaft is automatically dumped when it reaches the proper point.

This invention consists, further, in providing a novel door for controlling communication between the air-lock and the caisson-shaft and novel means connected therewith whereby the door may be opened automatically to permit the air-lock to receive the contents of the bucket.

This invention consists, further, in arranging an air-lock so that it may receive the contents of the bucket, in a novel outer door for said air-lock, which may be conveniently opened and closed to discharge the material therefrom, and in the novel arrangement and construction of parts, to be more fully described hereinafter.

By means of this invention the material excavated in the caisson can be more expeditiously and safely taken therefrom than has been possible with caissons heretofore used, and fewer operators and attendants are required, and the upper section or head of the caisson-shaft, to which the air-lock is attached and which must be made removable with reference to the caisson-shaft, is especially adapt-

ed for convenient handling in this operation on account of its lightness and simplicity of construction.

In the drawings accompanying and forming a part of this specification, Figure 1 is a vertical section on line *a a*, Fig. 3, through the head and air-lock and the upper part of the shaft of a caisson embodying my improvements. Fig. 2 is a similar section showing the door controlling communication between the air-lock and the caisson-shaft opened and the bucket dumped. Fig. 3 is a plan and horizontal section taken on the line *b b*, Fig. 2. Fig. 4 is a detached view of the bucket and attachments used in connection therewith for hoisting and dumping the same and for automatically unlocking and opening the door. Fig. 5 is a diagrammatic view showing the preferred arrangement of the hoisting-cable and sheaves.

Similar characters of reference designate like parts in all of the figures.

This apparatus comprises in a general way an upper shaft-section or head, (designated generally by A,) an air-lock attached thereto, (designated generally by B,) the caisson-shaft proper, connecting the head A with the caisson, (designated generally by C,) the hoisting mechanism, (designated generally by D,) a door controlling communication between the lock B and the head A, with its locking mechanism, (designated in a general way by E,) and the door controlling communication between the lock B and the atmosphere, (designated generally by F.)

In the preferred form of my invention herein shown and described the head A of the caisson-shaft consists of a cylindrical shell 1, with a head 2 at its upper end and a flange 3 at its lower end, adapted to be secured to the end of the shaft C in any suitable manner. The head A is preferably somewhat larger in diameter than the shaft C.

The lock B is joined to the side of the head A at the opening 4 and is inclined at such an angle as to permit material to discharge from it by gravity when its outer door F is opened. In the preferred form it consists of a cylindrical shell 11, forming the main body of the lock, to which is joined the conical or hopper-shaped portion 12, which is adapted to be secured to the head A in the manner shown.

The lock B is provided with a pipe connection 13, having a valve 14 for admitting air into it from the head A to equalize the air-pressure when the door E is to be opened, as will be more fully explained hereinafter.

The shaft C consists of the shell 15, of ordinary construction, and is used to connect the head A with the main body of the caisson. As the caisson is sunk the head A is removed from time to time, and an additional section is added to the shaft C in a manner that is well understood by those skilled in the art. The ends of the sections of the shaft C are provided with flanges 16, adapted to be bolted to the flange 3 of the head.

The hoisting mechanism (designated in a general way by D) comprises a bucket 20 and a flexible cable 21, attached thereto in such a way that when the cable is operated to raise the bucket the lifting is done from two points by means of the two pairs of studs 22 22 and 23 23, one pair located above the other and preferably not in the same vertical line, so that when the motion of the upper studs is arrested and the operation of the cable continued the bucket will thereby be dumped. The studs 22 22 and 23 23 are secured to the bucket in any convenient manner. The studs 23 23, which are nearer the bottom of the bucket, are connected by the links 24 24 to the rod 25 in the lower end of the frame 26. The studs 22 22 are connected by the links 27 27 to the rod 28, the said rod 28 being vertically movable with reference to the rod 25 and the frame 26. The frame 26 comprises two vertical members 29 29, which are joined together at their lower ends by the rod 25 and at their upper ends by the two cross-pieces 30 30. Mounted between said cross-pieces 30 30 is the sheave 31, and mounted on the rod 28 is the sheave 32. The rod 28 terminates in and is secured to the slides 33 33, which are guided by the vertical members 29 29. The slides 33 33 are provided with projecting portions 34 34, having the notches 35 35, the purpose of which will fully appear hereinafter. The frame 26 is guided by the guides 36 36, extending the whole length of the caisson-shaft and head.

It is evident that a lifting effort applied to the sheave 31 will be transmitted through the frame 26 and links 24 24 to the studs 23 23, and a lifting effort applied to the sheave 32 will be transmitted through the links 27 27 to the studs 22 22.

The cable employed to hoist the bucket may be operated by any suitable form of hoisting engine or motor. If located outside of the caisson, the cable will pass through a stuffing-box 37 and over a sheave 38, as shown in Fig. 1, to the winding-drum of the hoisting-engine. As, however, there are some difficulties attending the use of the stuffing-box, I prefer, where it is practicable, to have the cable operated from within the caisson. In this case I pass the cable from the winding-drum over the sheaves 39 and 40, Fig. 2. The manner in

which the cable is rove is illustrated in Fig. 5. Passing over the sheave 40 (in case the hoisting-engine is located outside of the caisson passing through the stuffing-box 37) the cable is led over the sheave 32, up over a sheave 41, down and around the sheave 31, and up again to the top of the head, where it is fixed in any suitable manner to the upper end 2 of the head.

The door E is made to conform in shape to the cylindrical shell 1 of the head A and is guided at its sides by the guides 5 5. At the lower end of the door are two brackets 50 50, and carried in said brackets is the rod 51. Attached to the rod 51 are the links 52 52, carrying at their outer ends the rod 53. Attached also to the rod 53 are the links 54 54, the upper ends of which are attached to the rod 55. The rod 55 passes through the slots 56 in the brackets 57 57 secured to the door. The rod 53 is adapted to be engaged by the projecting portions 34 34 in the notches 35 35 of the slides 33 33. Secured to the fixed portion of the caisson-head, preferably the guides 5 5, are the wedge-shaped pieces 58 58, which are adapted to engage the rod 55 when the door is lowered and to force the door against its seat in air-tight communication therewith.

The outer door of the air-lock B comprises a curved lid 60, provided with projections 61 61 in the bail 63. The cap 64 is adapted to receive the enlarged head of the screw 65, said screw passing through the bail, so that as the screw is turned by the hand-wheel 66 the lid 60 is brought into or out of engagement with its seat on the end of the lock. The bail 63 is pivoted on the studs 67 67, and the bail, lid, and other parts of the door are balanced by the adjustable counterweights 68 68.

The operation of the apparatus is as follows: Assuming the parts in the position shown in Fig. 1, with the bucket full of material ready to be hoisted and dumped into the lock, the door F is first closed and screwed down upon its seat, and the valve 14 is opened in order to equalize the air-pressure on each side of the door E. The cable 21 is now wound upon the drum of the hoisting-engine, and the frame 26 and bucket are raised thereby. When the recess or notch 35 of the projection 34 engages the rod 53, the link 52 is caused to turn upon the rod 51 and the rod 55 is raised out of engagement with the wedge-shaped surfaces 58 58, thereby relieving the pressure between the door and its seat. The continued upward movement of the frame 26 and bucket raises the door until the opening 4 is fully uncovered and the door comes against a banking or stop in the head of the caisson. The movement of the slides 33 and rod 28 is thereby arrested, and the continued operation of the cable raises the frame 26 and dumps the bucket. As the bucket turns over and the rods 28 and 25 are brought nearer together the bucket is thrust forward until its end projects through the opening 4. In order to limit this forward movement of the bucket, I provide the stops

43 43 on the links 24 24, which come in contact with the side pieces 29 29, and in order to prevent the links 24 24 from swinging backward I provide the stops 44 44, also made integral with the links 24 24. On slackening the cable to lower the bucket the bucket will resume its upright position and the door will be closed. The upper portion of the notch 35 is made of such shape as to act as a cam to force the rod 55 in engagement with the wedge-shaped pieces 58, thereby tending to assist making the closure air-tight. After the door E has been closed and previous to opening the door F to discharge the material the valve 14 is closed.

Having thus described my invention, what I claim is—

1. In a hoisting and air-lock apparatus for caissons, the combination with the caisson-shaft, of an air-lock joined thereto, a door controlling communication between said caisson-shaft and said air-lock, vertical guides within said shaft, a frame adapted to slide in said guides, a bucket pivotally suspended in said frame, and means connected with said door and operated by said frame, for automatically opening and closing the door.

2. In a hoisting and air-lock apparatus for caissons, the combination with the caisson-shaft, of an air-lock joined thereto, vertical guides within said shaft, a frame adapted to slide in said guides, a bucket pivotally suspended in said frame, and means for hoisting said bucket and frame, and for tipping said bucket so as to discharge material into said air-lock.

3. In a hoisting and air-lock apparatus for caissons, the combination with the caisson-shaft, of an air-lock joined thereto having an outer and inner door, vertical guides within said shaft, a frame adapted to slide in said guides, a bucket carried by said frame and attached thereto by link connections, and means for engaging said connections whereby the inner door of the air-lock is opened and the bucket is tipped to discharge its contents into said air-lock.

4. In a hoisting and air-lock apparatus for caissons, the combination with the caisson-shaft, of an air-lock joined thereto, vertical guides within said shaft, a frame adapted to slide in said guides, a bucket provided with pivots on two horizontal axes, links connecting one of said axes with said frame, and links connecting the other of said axes with a member, or cross-head, sliding vertically in said frame, means for lifting said frame and said cross-head, and for arresting the vertical movement of said cross-head, and permitting the movement of the frame to continue.

5. In a hoisting and air-lock apparatus for caissons, the combination with the caisson-shaft, of an air-lock joined thereto, vertical guides within said shaft, a frame adapted to slide in said guides, a bucket provided with pivots on two horizontal axes, links connecting the pivots on the lower of said axes with

the lower end of said frame, links connecting the pivots on the upper of said axes with a rod vertically movable in said frame, sheaves connected with said frame and with said rod, and with the upper end of said caisson-shaft, and a cable operatively connected with said sheaves, and means for arresting the upward movement of said rod at the point where it is desired to dump the bucket, whereby the bucket and frame may be hoisted and whereby the bucket may be dumped.

6. In a hoisting and air-lock apparatus for caissons, the combination with the caisson-shaft and the hoisting apparatus therein, of an air-lock joined to the side of the caisson-shaft, a door controlling communication between the air-lock and the shaft, sliding vertically in guides attached to the caisson-shaft, means connected with said door and engaged by said hoisting mechanism for first relieving the pressure of the door upon its seat, and then raising the door.

7. In a door for controlling communication between a caisson-shaft and its air-lock, the combination with guideways attached to the caisson-shaft, of a wedge-shaped surface fixed to the caisson-shaft, and a member movably connected with the door and adapted to come in contact with said wedge-shaped surface to force the door upon its seat after it has been closed.

8. In a hoisting and air-lock apparatus for caissons, the combination with the caisson-shaft and the hoisting mechanism operating therein, of an air-lock joined to the head of said shaft, a vertically-slidable door controlling communication between said air-lock and said caisson-shaft, a member, as rod 55, having a limited vertical movement relative to said door, adapted, when the door is closed, to engage a fixed cam-surface for producing a pressure between the door and its seat.

9. In a hoisting and air-lock apparatus for caissons, the combination with the caisson-shaft, of a hoisting mechanism operating therein, an air-lock attached thereto having an outer door and an inner door adapted to slide vertically in guides attached to the inside of the head of the caisson-shaft, the lug 57 attached to the door and having the slot 56 therein, the rod 55 operating in said slot, the link 54 attached to the rod 55 and to the rod 53, the link 52 attached to the rod 53 and to the lug 50, the said lug 50 being attached to the door at its lower end, a wedge-shaped member 58 fixed to the head of the shaft and adapted to engage the rod 55, and the projecting plate 34 attached to the hoisting mechanism and adapted to engage the rod 53.

10. In a hoisting and air-lock apparatus for caissons, the combination with the caisson-shaft, of an air-lock joined to the upper section, or head, of said caisson-shaft, a vertically-sliding door controlling communication between the shaft and the air-lock, vertical guides in said head extending down into said shaft, a frame adapted to slide in said verti-

cal guides, a bucket to receive excavated material, links pivoted on a horizontal axis of said bucket and to the lower end of said frame, links pivoted to another horizontal axis of said bucket and to a rod adapted to slide vertically in said frame, slides attached to said rod and engaging the vertical members of said frame and provided with projecting portions which are adapted to engage said door, a cable operatively attached to said frame and to said cross-rod whereby the bucket is raised, the door is opened, and the bucket dumped into the air-lock, substantially as described.

11. In a caisson, the combination with the shaft-casing having a discharge-opening therein, a chute having an air-tight closure at its discharge end and connected to the casing at said opening, a door slidably mounted in the casing in air-tight connection with said opening, means for operating said door, and a pipe provided with a valve connecting the interior of said casing with the interior of said chute.

12. In an air-lock for receiving and discharging materials for caissons, the combination with a shell forming the body of the air-

lock, of a counterbalanced bail pivotally secured to said shell carrying a lid, and a screw for bringing said lid in air-tight engagement with the discharge end of said air-lock.

13. In a bucket-hoisting apparatus, the combination with a cable, of a bucket having two sets of studs, or pivots, one set located above the other, and means for operatively connecting said cable with the two sets of pivots so that when the movement of the upper set is arrested the continued operation of the cable will then dump the bucket.

14. In a bucket-hoisting apparatus for caissons, the combination with vertical guides and a frame adapted to slide therein, of a bucket provided with pivots on two parallel horizontal axes, links connecting the pivots of one axis with the frame, links connecting the pivots of the other axis with a member vertically slidable in said frame, means for operatively connecting a cable with said frame and said vertically-slidable member.

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Witnesses:

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