No. 607,966.

Patented July 26, 1898.

W. H. STRICKLER.

WATER ELEVATOR.

(No Model.)

(Application filed Mar. 4, 1898.)

2 Sheets—Sheet 1.

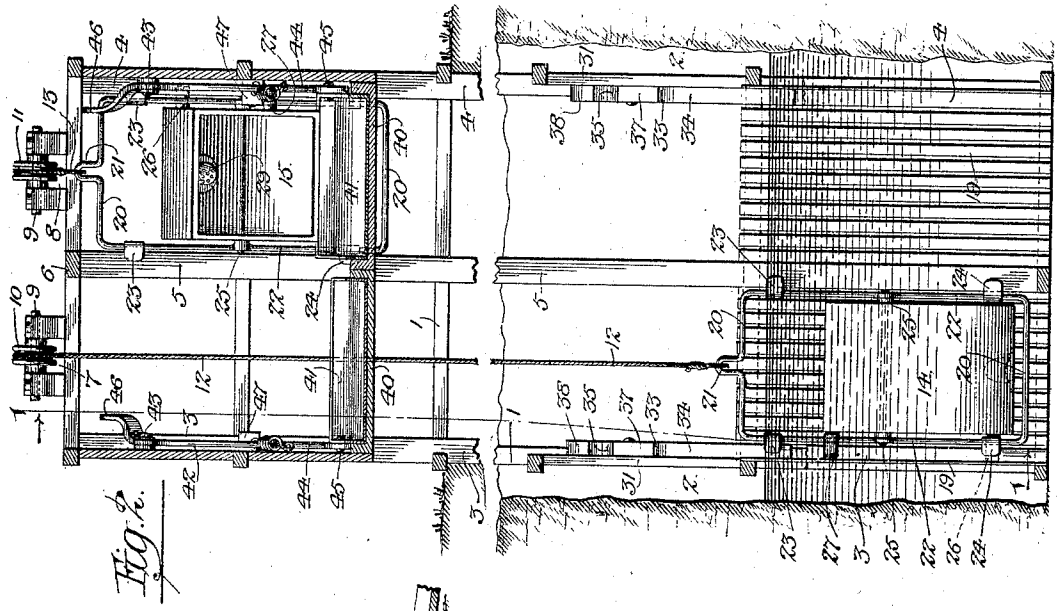


Fig. 2.

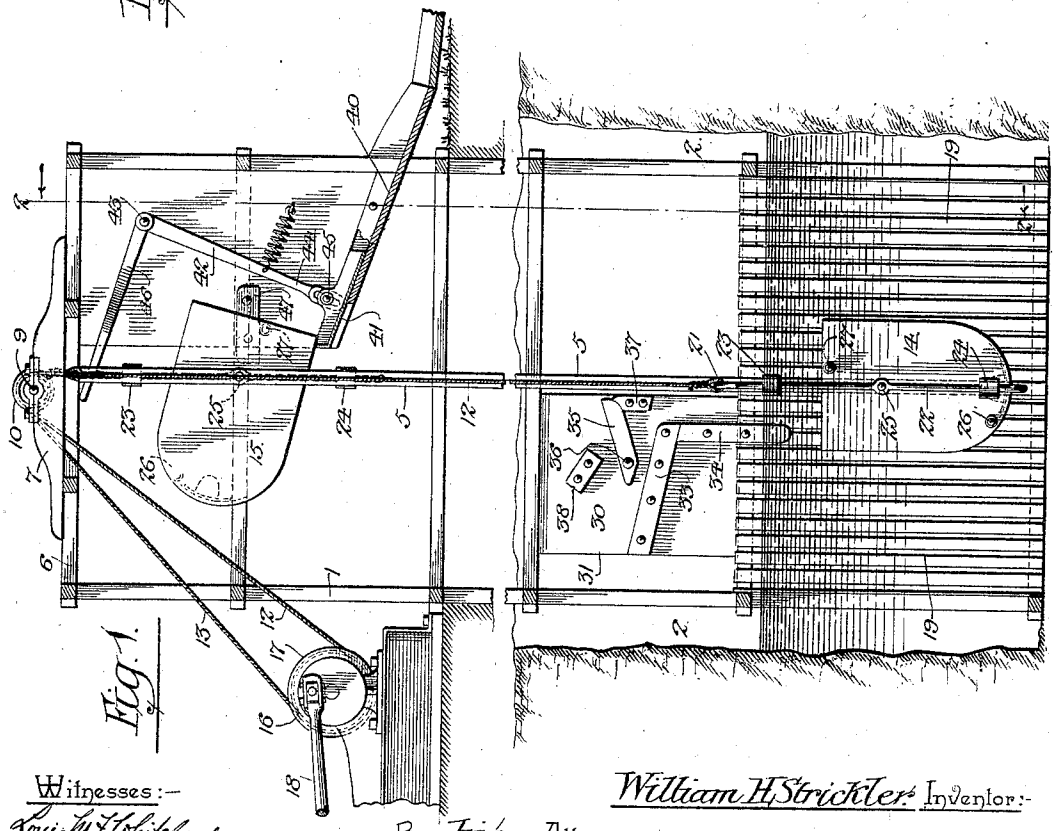


Fig. 1.

Witnesses:—
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H. C. Beecher

William H. Strickler Inventor:—
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2 Sheets—Sheet 2.

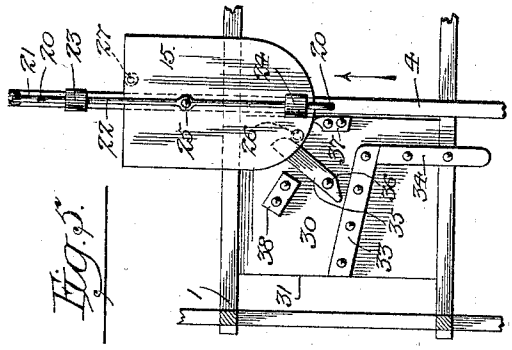


Fig. 5.

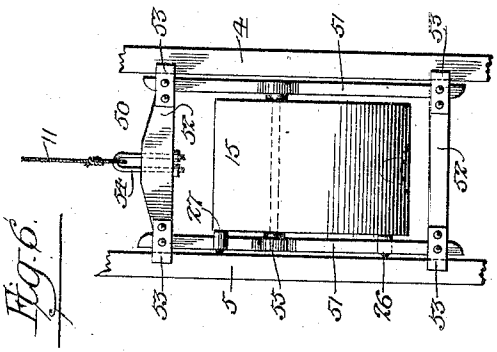


Fig. 6.

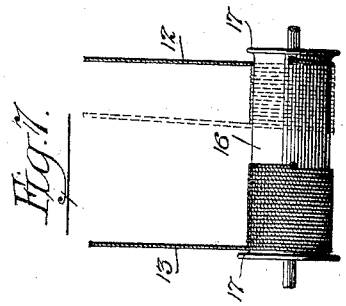


Fig. 7.

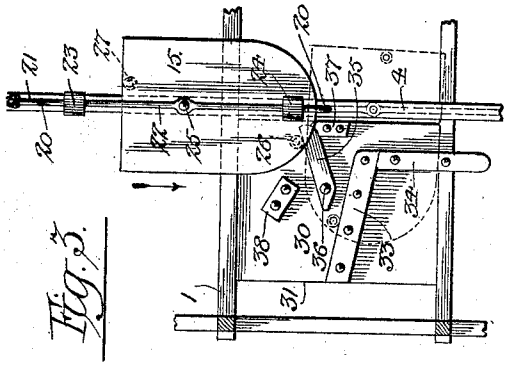


Fig. 3.

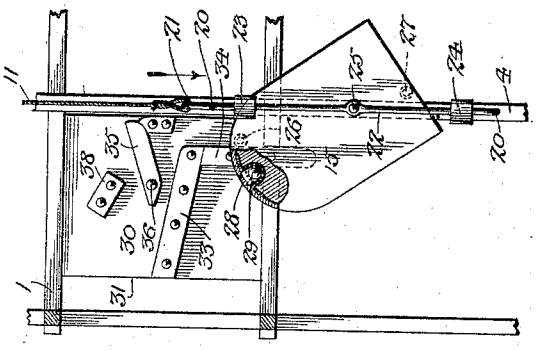


Fig. 4.

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UNITED STATES PATENT OFFICE.

WILLIAM H. STRICKLER, OF JEANNETTE, PENNSYLVANIA.

WATER-ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 607,966, dated July 26, 1898.

Application filed March 4, 1898. Serial No. 672,582. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. STRICKLER, a citizen of the United States, residing at Jeannette, in the county of Westmoreland and State of Pennsylvania, have invented a new and useful Water-Elevator, of which the following is a specification.

My invention relates to improvements in means for elevating water from the deep shafts of mines; and the primary object that I have in view is to provide a simple apparatus by which water may be raised rapidly and economically from the bottom of a mine as compared with the cost of installing and operating a pumping plant.

A further object that I have in view is to provide an improved mine-elevator in which buckets of large capacity may be inverted before they are immersed in the water to insure rapid immersion and obviate floating on the water of the buckets, and provision is also made for the ready escape of air from the buckets as they are inverted.

A further object of the invention is to provide simple means by which the buckets are automatically tilted and emptied of their contents at the limits of their upward travels, and the contents of the buckets are prevented from spilling back into the mine-shaft by the provision of means which are automatically thrown into operative relation to the buckets as they are tilted and in like manner retracted from the paths of the buckets when they assume their upright positions preliminary to descending in the mine-shaft.

With these ends in view my invention consists in the novel combination of elements and in the construction and arrangement of parts, which will be hereinafter fully described and claimed.

To enable others to understand my invention, I have illustrated the preferred embodiment thereof in the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a vertical sectional elevation illustrating my apparatus and showing the framework of said apparatus and the mine-shaft broken away horizontally, the plane of section being indicated by the irregular dotted line 1 1 of Fig. 2, looking in the direction indicated by the arrows. Fig. 2 is a vertical sectional elevation on a plane at right angles to Fig. 1 and indicated by the dotted line 2 2 of Fig. 1, looking in the direction indicated by the arrows. Fig. 3 is a detail view in elevation, partly in section, illustrating the position of the bucket with relation to the inverting trip mechanism at the time when the detent of said bucket engages with a part of the trip prior to the inversion of the bucket. Fig. 4 is a view somewhat similar to Fig. 3, but illustrating the bucket in its inverted position, in which it enters the water at the foot of the mine-shaft. Fig. 5 is an elevation illustrating the pivoted latch in the act of yielding to permit the bucket to freely pass the trip mechanism when the bucket is raised with its load in the mine-shaft. Fig. 6 is an elevation of a modified construction of the means for supporting the tiltable bucket; and Fig. 7 is a detail elevation of the hoisting-drum, illustrating by full and dotted lines the coiling of the hoisting-cables for the two buckets employed in my apparatus.

Like numerals of reference denote like and corresponding parts in each of the several figures of the drawings.

1 designates the upright frame, which is erected vertically within the mine-shaft, (indicated in a general way at 2.) This upright frame is provided with a plurality of vertical guides, of which the side guides 3 4 are adjacent to the respective sides of the mine-shaft, while the central guide 5 is equidistant between and parallel to the side guides 3 4, said series of guides accommodating the oppositely and vertically movable pair of buckets presently described. The upper ends of the vertical guides are joined by the cap rails or frames 6, and on said cap rails or frame are mounted the bearings 7 8, one bearing being between the guides 3 5 and the other between the guides 4 5 of the vertical frame 1. In these bearings are journaled the short idler-shafts 9, which carry the pulleys 10 11, and over the pulley 10 passes the hoisting-cable 12, while the pulley 11 accommodates the other hoisting-cable 13.

To the hoisting-cable 12 is connected the bucket 14, which is fitted to slide on and between the vertical guides 3 5 of the frame. The other bucket of the pair of buckets used in my apparatus is indicated at 15, attached

to one end of the hoisting-cable 13, and said bucket 15 is fitted to slide freely against and between the guides 4 5, whereby the two buckets are movable vertically within a common frame without hindrance from each other. The hoisting-cables 12 13 for the independent oppositely-movable buckets are coiled in a reverse direction on a common hoisting-drum 16. (See Figs. 1 and 7.) This hoisting-drum has its trunnions or shaft journaled in suitable bearings on a bed secured adjacent to my water-elevating apparatus, and said drum is flanged or headed at its ends, as at 17, to prevent the hoisting-cable from winding off the ends of the drum or either of them. The cable 12 for the bucket 14 is attached at one end to a part of the drum to be coiled in one direction thereon; but the other cable 13 for the bucket 15 is attached to another part of the drum to be coiled thereon in a reverse direction to the cable 12, whereby as the drum is rotated one cable will be coiled on the drum to raise its bucket from the mine-shaft and at the same time the other cable will be uncoiled from the drum to lower its bucket in said mine-shaft, thus simultaneously actuating the pair of buckets to move in opposite directions. The hoisting-drum may be driven by suitable connections, as at 18 in Fig. 1, with a power-engine; but as the engine and the means for driving the drum form no part of the present invention I have not deemed it necessary to more fully illustrate or describe the actuating mechanism for the hoisting-drum.

At the foot of the mine-shaft I provide a suitable cage 19, consisting of suitable piling or timbers placed vertically within or around the lower part of the vertical frame 1 and suitably secured thereto at intervals sufficient to permit of the free ingress of water within the cage. The cage extends up to or above the water-level and it prevents loose debris from accumulating in the water confined within the cage, thereby overcoming accumulation of the debris to interfere with the proper operation of the elevating-buckets.

Each bucket is pivotally hung within a carrier which is slidably engaged with two of the vertical guides of the vertical frame, thus holding the carrier for the bucket in proper vertical position while permitting the bucket to have a tilting movement within its carrier, which tilting movement is desirable, because the bucket, according to my invention, is inverted previous to its immersion in the water at the foot of the mine-shaft and is tilted for the purpose of emptying its contents when the bucket reaches the limit of its upward travel.

In the preferred embodiment of the invention the carrier for each bucket consists of a bail 20, adapted to engage with two of the vertical guides and constructed for the attachment of the hoisting-cable. Each bail 20 is bent or otherwise wrought to provide at its upper end the eye or loop 21, to which one extremity of the hoisting-cable is attached, and the side bars 22 of this bail are each provided with a pair of lugs or clips 23 24. Each bail thus has four pairs of lugs or clips, two pairs of which are on each side bar of the bail, and the upper pairs of clips are in substantially the same horizontal plane, while the lower pairs on the two side bars are also in the same horizontal plane. The clips of the bail for the bucket 14 loosely engage with the vertical guides 3 5 of the vertical frame, but the clips of the other bail, which carries the bucket 15, slidably engage with the guides 4 5 of said vertical frame, the adjacent pairs of clips of the two bucket-bails, which engage with the central guide 5, being disposed to travel past each other when in contact with said guide without hindrance one from the other, and thus insure the proper vertical movement in opposite directions of the two buckets. Each bucket is hung or suspended within its bail by suitable trunnions or pivots 25, which are connected with the bucket above the horizontal axis thereof, and said trunnions are arranged to permit a tilting movement in a vertical plane of the bucket within its bail, while normally the bucket hangs in its proper vertical position by gravity. Each bucket carries two detents 26 27, which are disposed on opposite sides of the vertical axis of the bucket, one detent being provided near the lower or bottom part of the bucket for engagement with the trip mechanism to insure the inversion of the bucket in its downward travel, while the other detent 27 is attached to the bucket near its upper open end to engage with a fixed stop at the upper end of the frame 1, for the purpose of tilting the bucket and emptying the contents thereof when said bucket reaches the limit of its upward travel. The form of the detents is not material; but in the drawings I have shown the detents as consisting of fixed pins having loose antifriction-rolls.

According to my invention the buckets are automatically and positively inverted as they approach the limit of their downward travel for the purpose of causing the buckets to quickly become immersed in the water and overcoming any tendency of the buckets to float on the surface thereof, and as the buckets when inverted contain a volume of atmospheric air it is important in order to insure quick or instantaneous immersion thereof that provision be made for the escape of the air on inversion of the bucket. To this end I provide each bucket with a vent-port 28 in its bottom, and over this port is arranged a suitable cage, within which is confined a valve 29, preferably a ball-valve, adapted to seat itself over the port when the bucket is in its upright position and cut off the escape of water from the bucket on the upward movement of the latter; but when the bucket is inverted this valve leaves its seat and exposes the port 28, thus allowing of the free escape of air from the bucket.

Near the bottom or foot of the mine-shaft I provide a trip device 30 for each of the vertically-movable buckets, and each trip device is in the path of its bucket, so as to insure engagement of the bucket with said trip when it descends for the purpose of inverting the bucket before it strikes the water. Each trip device has a movable element adapted to yield or give to the bucket in its upward travel, thus allowing the bucket and its load to ascend without hindrance from the trip mechanism. In the preferred embodiment of my trip mechanism, as shown by the drawings, I employ a support 31, which is fixed in a suitable framing of the main frame 1 at a point elevated above the water-level and the cage 19 a suitable distance for engagement with and tilting of the bucket before it enters the cage and water. On the face of this support 31 is fixed an irregular guide-track 32, which consists of a horizontally-inclined member 33 and a vertical member 34, which depends from one extremity of the horizontally-inclined member and is preferably extended to a point below the upper open end of the cage 19 and into the water. In connection with this irregular guide-track I employ a pivoted guide-latch 35, which is arranged in a horizontally-inclined position above the inclined member 33 of said guide-track and is inclined in a downward direction toward the same. This pivoted latch is hung at its heel, as at 36, on the support 31 at a point above the upper face of the member 33 of said guide-track for the purpose of leaving sufficient space between the heel of said latch and said guide-track member 33 for the passage of the detent 26 on the bucket. The latch projects forwardly beyond the vertical working edge of the vertical member 34 of the guide-track, thus disposing the free end of the latch in the path of the detent 26 of the bucket, and said end of the latch rests upon and is sustained by a pivoted stop-lug 37, which is rigidly fastened to the support 31 below said latch and sustains the latter against downward movement when the weight of the bucket is imposed upon the latch by the detent 26 riding thereon in the act of tilting the bucket on its downward travel. This latch is thus arranged and held to engage with the detent 26 of the bucket and to form a track along which the detent will ride until it clears the heel of said latch and drops onto the inclined member 33 of the guide-track, and said latch is adapted on the upward movement of the bucket to yield to the passage of the bucket-detent 26, the inward and upward movement of the latch being limited by an arresting-lug 38, which is fixed to the support 31 in the path of the latch and at a suitable distance from the stop-lug 37 to permit said latch to yield sufficiently for the bucket-detent 26 to clear the latch in the upward travel of the bucket.

As the bucket approaches the limit of its upward travel it is tilted to discharge its contents into a chute 40, which is fixed in an inclined position in the framing 1 to lead outwardly therefrom. This fixed chute 40 has its receiving edge out of the path of the bucket, and to it is fitted a slidable chute-section 41, which is actuated automatically to be interposed beneath the tilted bucket and the fixed chute and to be retracted out of the path of the bucket when it assumes its upright position. The sliding chute-section is actuated by a bell-crank lever 42, which is hung or fulcrumed, as at 43, to a part of the frame 1, and the depending arm 44 of said lever is loosely or slidably connected, as at 45, to the sliding chute-section 41. The other arm 46 of said lever 42 overhangs the bucket-bail so as to lie in the path of the latter, and with said lever 42 is connected a suitable retractor that operates normally to hold the sliding chute-section out of the path of the bucket and to maintain the arm 46 of the lever in the path of the bucket-bail. This retractor may consist of a weight or a spring; but in Fig. 1 I have shown said retractor as consisting of a coiled spring suitably attached to the frame and one arm of the lever.

47 designates a stop which is attached to the upper part of the frame 1 to lie in the path of the detent 27 at the upper open end of the bucket. This stop 47 is fixed above the chute a suitable distance for the bucket to be tilted and to discharge its contents to the sliding chute-section.

In the modified construction of the means for carrying the bucket illustrated by Fig. 6 I employ a rectangular frame 50, which consists of the side bars 51 and the cross-bars 52. The cross-bars are provided at their ends with the guides 53, adapted to slidably engage with the vertical guides of the frame in the mine-shaft, and the upper cross-bar has a U-shaped staple or an eyebolt 54, to which the hoisting-cable is attached. In this form of the invention the bucket is eccentrically hung within the slidable frame on a cross-shaft 55, passing loosely through the bucket and suitably attached to the side bars of the frame.

It will be understood that each bucket is adapted to discharge to a two-part chute 40 41 and that the buckets are tilted independently by separate stops 47, fixed above said chutes, as represented by Fig. 2.

The operation may be described as follows: When the hoisting-drum is driven in one direction, one cable is uncoiled to permit its bucket to descend and the other cable is coiled to raise its bucket and the load. As each bucket nears the limit of its downward travel in the mine-shaft its detent 26 rides upon the latch 35, thus tilting the bucket on its pivotal connection with its bail. The continued downward movement of the bucket causes the detent to drop onto the inclined member 33 of the guide-track and to ride downwardly thereon to insure the complete inversion of the bucket, and as the bucket continues to descend and as it enters the water its detent 26 rides against the guide-track member 34.

The bucket is thus maintained in its inverted position until fully immersed in the water, and when the detent clears the lower extremity of the vertical guide-track member the weight of the bucket, which is hung eccentrically in its bail, causes it to assume an upright position within the bail. The bucket is thus filled automatically, being inverted to readily enter the water and its vent-valve opening for the escape of air. The weight of the bucket and its load causes the bucket to hang vertically within its bail, and on the upward travel of the bucket its detent 26 rides against the pivoted latch 35, which yields sufficiently for the bucket to continue its ascent without being affected by the trip mechanism. As the bucket reaches the limit of its upward movement its detent 27 strikes against the stop-lug 47 to tilt the bucket; but as the bucket is tilted the bail 20 thereof actuates the bell-crank lever to throw the sliding chute-section 41 beneath the tilted bucket, thus discharging the contents of the bucket into the chutes 40 41.

My water-elevating apparatus may have its buckets and the working parts thereof constructed of wood or metal; but as metal is subject to corrosion by contact with the water I prefer to make as many parts as possible of wood, although the materials may be varied at pleasure.

I am aware that changes in the form and proportion of parts and in the details of construction may be made by a skilled mechanic without departing from the spirit or sacrificing the advantages of the invention, and I therefore reserve the right to make such modifications as fall within the scope of the invention.

It is evident that the levers 42 at the upper end of the chute may be duplicated, so as to provide a pair of levers for the sliding section of each chute, the levers of each pair being mounted and connected in the manner hereinbefore described. As such duplication is obvious to a skilled mechanic, I have not deemed it essential to illustrate the same.

Having thus described the invention, what I claim is—

1. In a water-elevating apparatus, the combination with a vertically-movable bucket and means for hoisting the same, of a trip mechanism in the path of the bucket on its downward movement for positively inverting said bucket and having a movable member adapted to yield or give in the upward movement of the bucket, substantially as described.

2. In a water-elevating apparatus, the combination of oppositely-traveling buckets arranged in pairs within a suitable frame, hoisting-cables therefor coiled in opposite directions on a single actuating-drum, and independent trip devices interposed in the path of the buckets near the limits of their downward travel and adapted to operatively engage with said buckets to invert the latter prior to their immersion in the water, substantially as described.

3. In a water-elevating apparatus, the combination with a vertical guide, of a frame or bail slidably fitted thereto, a tiltable bucket eccentrically hung within said frame and carrying a suitable detent, and a trip mechanism in the path of the bucket-detent and comprising an irregular guide-track, a pivoted latch and means for sustaining said latch against the weight of the bucket on the downward travel thereof, substantially as described.

4. In a water-elevating apparatus, the combination with a suitable guideway, of a slidable frame or bail fitted to said guideway, a bucket hung in said bail or frame, a fixed irregular track at one side of the path of the bucket-detent, a yieldable latch having its heel pivoted or hung adjacent to one part of the irregular guideway and arranged to leave a throat or passage between its heel and said guideway, and a stop-lug in a vertical plane at one side of the irregular guideway and supporting the free end of the latch against the weight of the bucket on the descent of the latter, said stop-lug being out of the path of the bucket-detent and the latch adapted to yield on the upward travel of the bucket, substantially as described.

5. In a water-elevating apparatus, the combination with a vertically-movable bucket and means in the path thereof for tilting said bucket as it reaches the limit of its upward travel, of a two-part chute having its sliding section arranged to fit beneath the bucket when the latter is tilted, and an operating-lever connected with the sliding chute-section and lying in the path of a part of the bucket, substantially as described.

6. In a water-elevating apparatus, the combination with a guideway, of a slidable bail or frame fitted thereto, a bucket hung in said bail or frame and provided with a detent in its upper end, a fixed chute having a sliding section, a stop fixed above said chute and in the path of the bucket-detent, and a bell-crank lever having one end connected with the sliding chute-section and its other end interposed in the path of the bucket bail or frame, substantially as described.

7. In a water-elevating apparatus, the combination of a vertical frame having the side guides and a central guide, independent bucket-carrying bails engaging with the central guide and also engaging individually with the side guides, the buckets hung eccentrically within the respective bails and provided with detents disposed on opposite sides of the vertical axis of said bucket, independent trip mechanisms supported on the frame near the lower limits of travel of said bails and buckets and each trip mechanism having a movable member disposed in the path of one of the bucket-detents, independent chutes having slidable sections, fixed stops above said chutes

and in the paths of the upper detents on the buckets, the actuating-levers connected with the sliding chute-sections and lying in the paths of the bucket-bails, and a hoisting-drum having cables connected with the bucket-bails, substantially as described.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

WILLIAM H. STRICKLER.

Witnesses:
JOHN TAYLOR,
U. J. SHEETS.