948,781.

G. W. FREELAND.

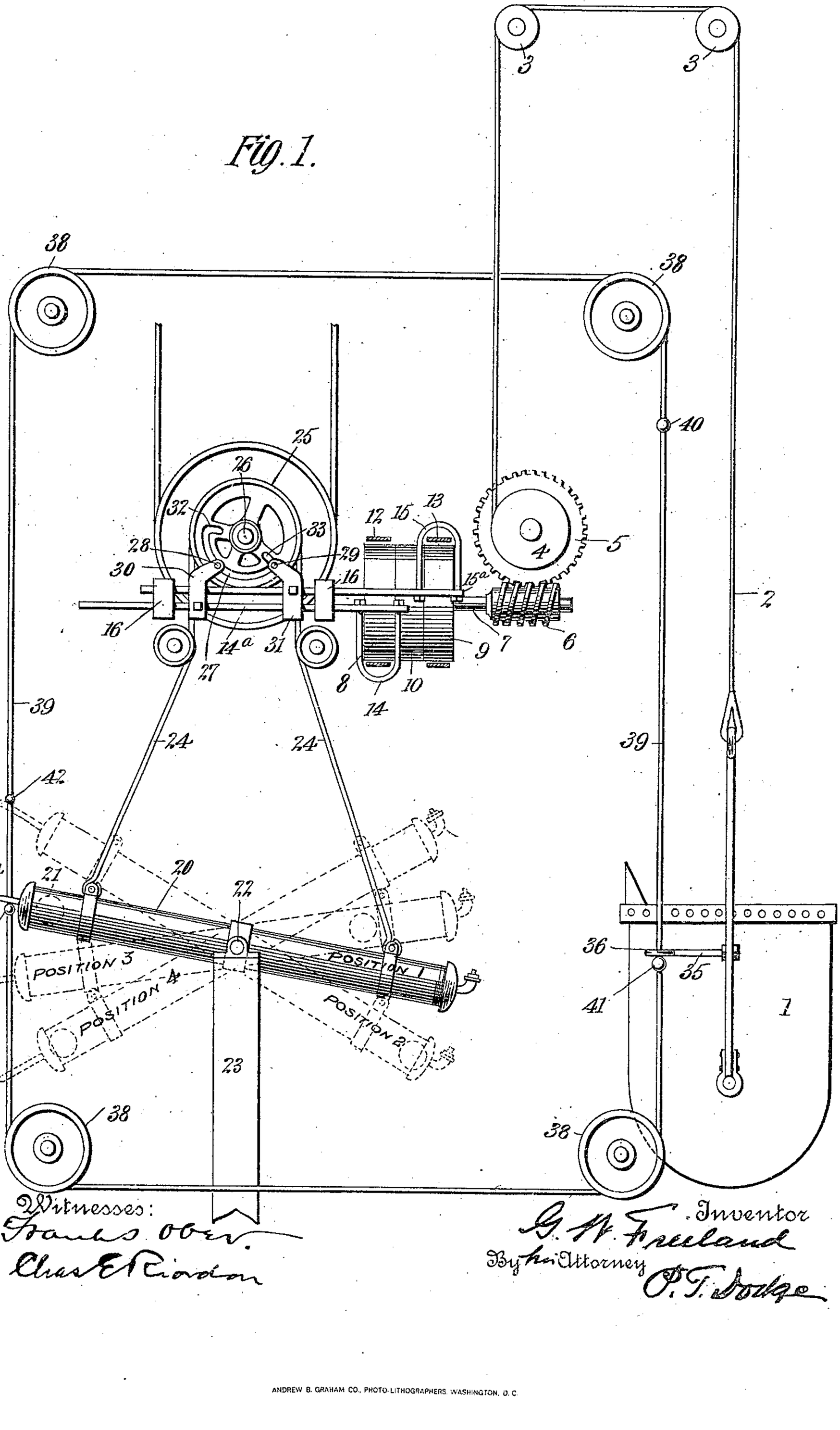
REVERSING MECHANISM.

APPLICATION FILED AUG. 31, 1908.

Patented Feb. 8, 1910.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
Frank Ober.
Chas. E. Riordon

Inventor
G. W. Freeland
By his Attorney
O. F. Dodge

948,781.

G. W. FREELAND.

REVERSING MECHANISM.

APPLICATION FILED AUG. 31, 1908.

Patented Feb. 8, 1910.

2 SHEETS—SHEET 2.

Fig. 2.

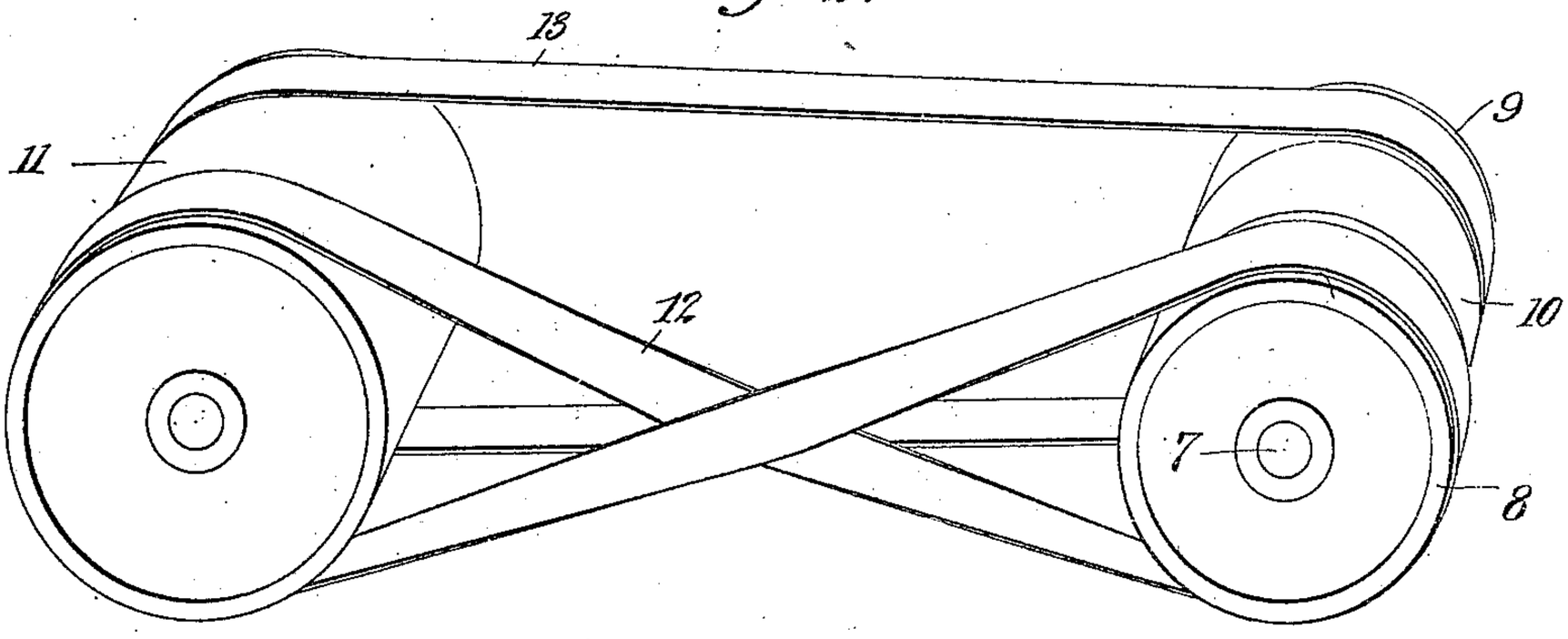


Fig. 3.

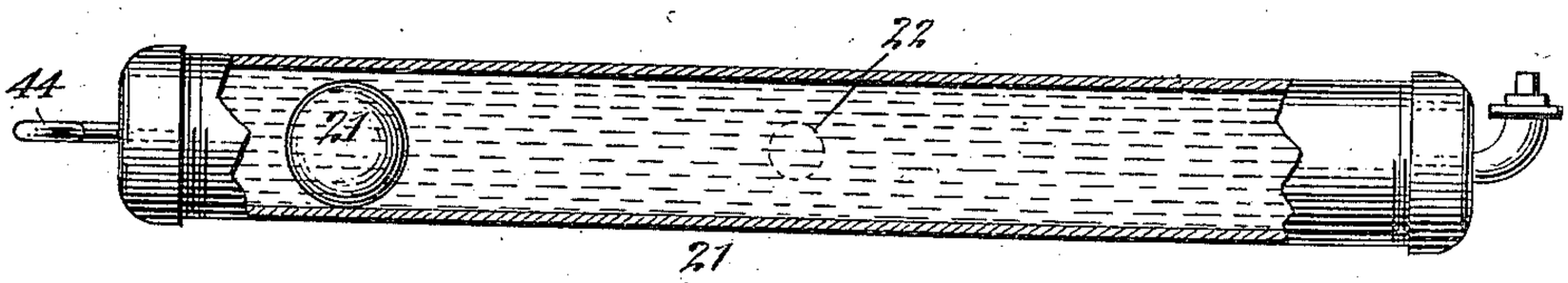


Fig. 4.

POSITION 4

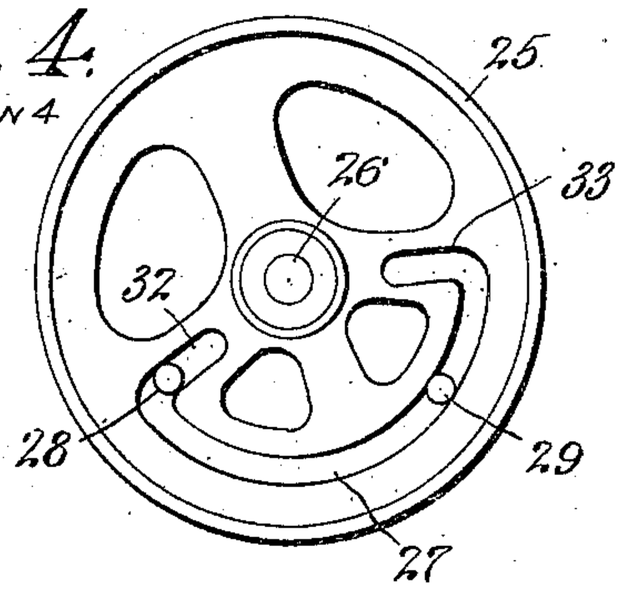


Fig. 5.

POSITION

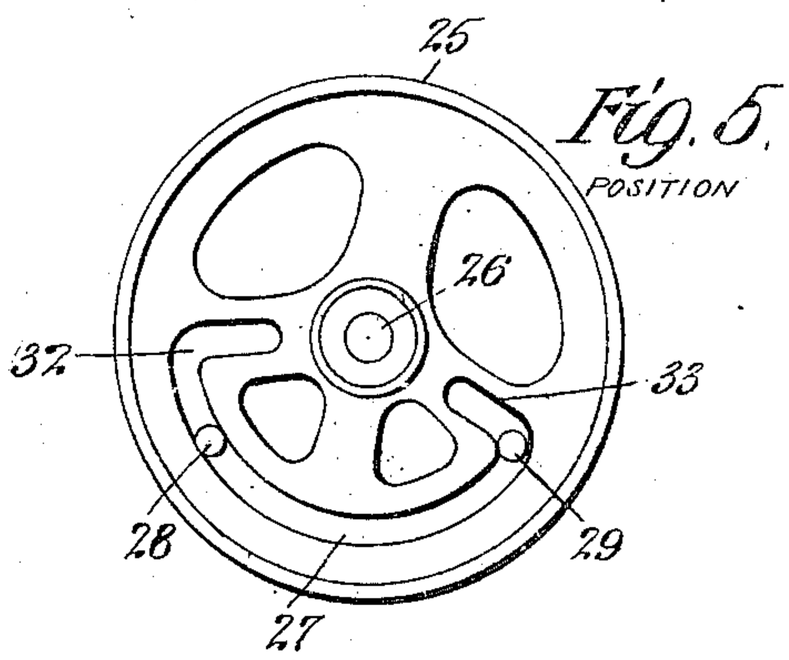
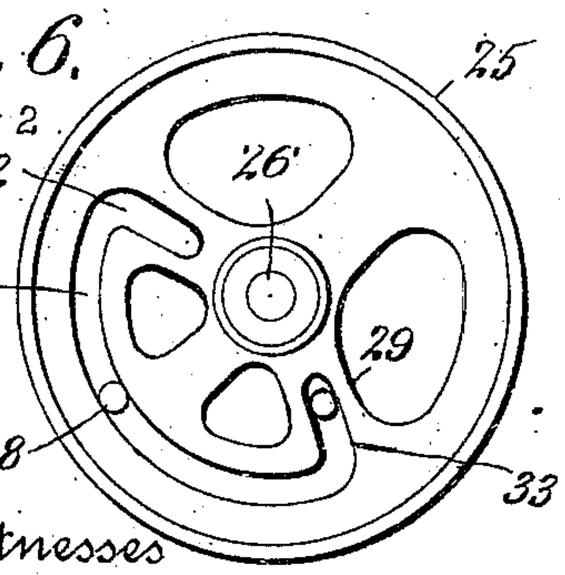


Fig. 6.

POSITION 2.



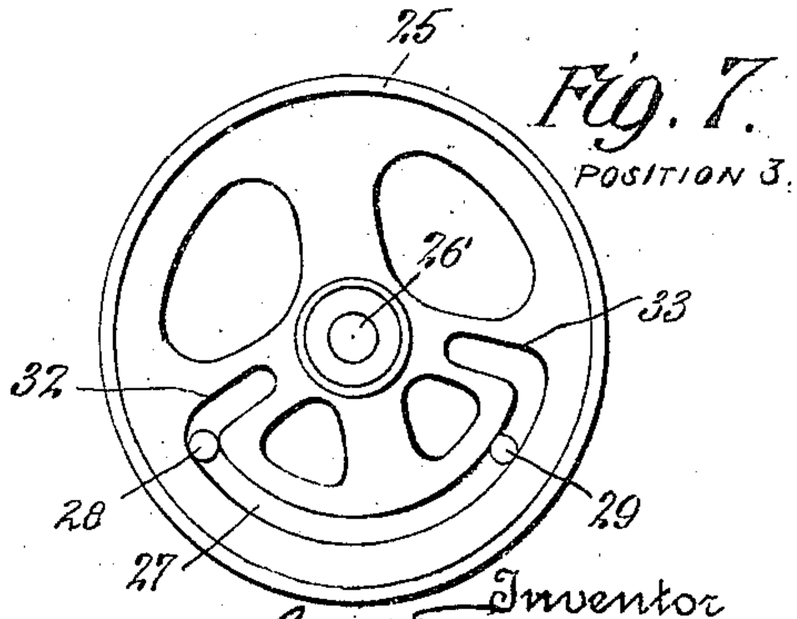
Witnesses

James. Oberlin

Chas E Riordan

Fig. 7.

POSITION 3.



Inventor

G. W. Freeland

By his Attorney

O. T. Bridge

UNITED STATES PATENT OFFICE.

GEORGE W. FREELAND, OF ROCK ISLAND, ILLINOIS, ASSIGNOR TO WILLIAMS, WHITE & COMPANY, A CORPORATION OF ILLINOIS.

REVERSING MECHANISM.

948,781. Specification of Letters Patent. Patented Feb. 8, 1910.

Application filed August 31, 1908. Serial No. 450,999.

To all whom it may concern:

Be it known that I, GEORGE W. FREELAND, of Rock Island, county of Rock Island, and State of Illinois, have invented a new and useful Improvement in Reversing Mechanism, of which the following is a specification.

This invention relates to reversing mechanisms designed more particularly for use in connection with hoisting machinery for the purpose of automatically arresting and reversing the movements of the parts at the completion of the upward and downward movements.

In a certain type of elevating mechanism for handling coal, the material is taken from a storage bin at one level, and raised and discharged into a distributing bin at a higher level, the elevating or conveying device being in the form of a vertically movable bucket, which on its descent receives its load from the storage bin, and on its ascent discharges it into the distributing bin. A mechanism operating in this manner is illustrated in an application for Letters Patent of the United States, filed by me on the 11th day of July, 1908, Serial No. 443,103, and it is to mechanisms of this character that my present invention is directed, although, as will be manifest to the skilled mechanic and as will appear later on, it may be used in connection with other apparatus, and elevating mechanisms of other types, and, in fact, for any purpose where it is desired to automatically arrest and reverse the movements of a reciprocating member at the ends of its travel.

My improved reversing mechanism is controlled and actuated by the movements of the hoisting or elevating bucket, as the latter reaches the upper and lower ends of its path of travel, the construction of the reversing mechanism being such that on the initiation of its action by the bucket, the hoisting mechanism will be stopped and the bucket will come to rest, whereupon the reversing mechanism continuing to act, will, of its own volition, start the hoisting mechanism again, but in the opposite direction, thereby causing the bucket to travel in a direction opposite to that in which it was traveling when it first initiated the stopping action, the reversing mechanism being formed and constructed, as will be more fully described later on, to produce a pause between the stopping and starting actions, during which pauses, the bucket will have ample time to receive its load when at the bottom and discharge the same when at the top.

In the accompanying drawings I have shown my improved reversing mechanism acting to shift from two loose pulleys to a fast pulley, two constantly rotating belts traveling, where they engage the pulleys, in opposite directions, the fast pulley being by this means driven alternately in opposite directions, and being operatively connected with a suitable hoisting drum, causing the latter to be correspondingly rotated, and thereby acting to alternately raise and lower the elevating bucket connected with the drum by means of a hoisting cable, this arrangement of parts peculiarly adapting it for the type of apparatus disclosed in my said application above referred to. Where, however, the reciprocating part to be controlled is of a different form and used for a different purpose, the specific means for giving motion to the same, and the specific devices controlling this motion and in turn operated by my improved reversing mechanism, may be modified to meet the changed conditions, the main feature of the invention being to stop the traveling device at the ends of its travel, permit the same to remain at rest for a short period of time, and then start the same in the opposite direction.

In the accompanying drawings:—Figure 1 is a side elevation of a hoisting bucket, its hoisting drum and my improved reversing mechanism. Fig. 2 is a perspective view showing the constantly operating driving mechanism and the two oppositely traveling belts actuated by the same. Fig. 3 is a longitudinal section through a detail of the reversing mechanism. Figs. 4, 5, 6 and 7 are views in the nature of diagrams, showing the different positions of the reversing cam to cause the parts to operate in the proper sequence.

Referring to the drawings:—1 represents a vertically movable hoisting or elevating bucket, suspended by a cable 2 passing over guide pulleys 3 and connected with a hoisting drum 4. In the present instance, the drum is provided with a worm-wheel 5, driven by a worm 6 on a horizontal shaft 7 mounted in suitable bearings and provided

with three pulleys,—two outer ones, 8 and 9, loose on the shaft, and an intermediate fast pulley, 10.

11 represents a driving pulley receiving its motion from any suitable source and rotating constantly in one direction.

12 and 13 represent two driving belts passing over the driving pulleys and over the two loose pulleys 8 and 9, respectively, the belt 12 being crossed so that the two loose pulleys are driven in opposite directions. These belts are adapted to be shifted from the loose to the fast pulley, in order that the latter may be driven in opposite directions so that the hoisting drum operated by the shaft 7 may be correspondingly rotated to raise and lower the elevating bucket. To shift the two belts to the fast pulley, two horizontally movable belt shifters 14 and 15, carried by their respective shipper bars 14ª and 15ª, are employed, belt shifter 14 engaging cross belt 12, and the other shifter engaging belt 13, which shipper bars are mounted to slide horizontally in suitable guide blocks 16. The direction of rotation of the driving pulley in its relation to the hoisting drum is such that when cross belt 12 is shifted to the fast pulley, the bucket will descend, and when belt 13 is shifted to the fast pulley, the bucket will ascend, the parts coming to rest when both belts are on the loose pulleys.

My improved reversing mechanism, now to be described, operates on the belt shifters in such a manner that when the bucket arrives at the upper end of its travel, belt 13 which had been driving the fast pulley, will be shifted back to its loose pulley 9, and the bucket will come to rest, remaining at rest a short period of time, controlled by the action of the reversing mechanism, whereupon the latter continuing its action will shift cross belt 12 to the fast pulley, which will cause the bucket to descend. When the bucket arrives at the bottom, the reversing mechanism shifts belt 12 back to its loose pulley, causing the bucket to stop, and after the lapse of a short period of rest, controlled by the reversing mechanism, the latter continuing to act, shifts belt 13 to the fast pulley, which will cause the bucket to ascend, the latter thus automatically reversing its motions up and down, and pausing for a while between each reversing action. These actions of the belt shifter are effected and controlled by means of a rocking member 20 in the form of a cylinder closed at both ends and filled with a liquid through which a rolling weight, or ball, 21, in the cylinder, is adapted to force its way slowly back and forth as either end of the cylinder is tipped upward, the purpose of which will be presently described, the cylinder being provided midway between its ends with trunnions 22 mounted in a suitable bearing on the upper end of a standard 23, this arrangement permitting the cylinder to rock in opposite directions to the different positions indicated by the dotted lines in Fig. 1. Near its opposite ends, the cylinder has connected with it the two ends of a rope or band 24, passing around a wheel 25 mounted loosely on a shaft 26 fixed in suitable bearings, the rocking of the cylinder thus oscillating the wheel on its axis. By these oscillating movements of the wheel, the belt shifters are operated in the manner before described, the wheel being formed for this purpose with a cam groove 27, in which extend pins or studs 28 and 29, projecting laterally from the upper ends of arms 30 and 31, respectively, the arm 30 being connected fixedly to shipper bar 14ª, and the arm 31 being connected fixedly to the other shipper bar. The cam slot extends nearly one-half way around the wheel, its ends 32 and 33 extending for some distance radially inward, and its intermediate portion extending in the arc of a circle described from the axis of the wheel, the shifting movements of the shipper bars being effected by the engagement of the pins 28 and 29 in the radial ends 32 and 33, respectively, of the groove, the said radial ends by the oscillating movements of the wheel embracing first one pin and then the other, and in this manner shifting the shipper bars back and forth, one of the pins extending in the intermediate portion of the slot, while the other is engaged and moved by the radial end, so that while one shipper bar is moved, the other remains at rest and is undisturbed.

The rocking of the pivoted cylinder to effect the oscillations of the cam wheel is effected primarily and automatically by the movements of the hoisting bucket at the moment when it arrives at the ends of its upward and downward movements, the bucket for this purpose being provided with a horizontal arm 35, formed with an eye 36 encircling an endless wire or cable 39, extending vertically along the path of movement of the bucket, the said cable passing around four guide pulleys 38, so disposed that it will extend vertically as at 39 adjacent to the outer end of the rocking cylinder, and may be shifted bodily around the guide pulleys. The arm 35 on the hoisting bucket is adapted as it arrives near the end of its upward movement to encounter a ball or projection 40 on the cable, and as it arrives near the end of its downward movement, to encounter a similar ball or projection 41 on the cable at this point, by which actions the cable will be shifted around its guide pulleys, which shifting movements will act through the medium of the upper and lower projections 42 and 43 on the vertical portion 39 of the cable, engaging an eye 44 on the end of the cylinder,

through which eye the cable passes, to rock the cylinder on its axis, the shifting of the cable by the descent of the bucket, tilting the end of the cylinder upward, and the shifting of the cable in the opposite direction by the ascent of the bucket, carrying the end of the cylinder downward. It is seen, therefore, that the cylinder is positively shifted on its trunnions by the action of the bucket on the cable, and that this positive movement of the cylinder acts through the medium of the oscillating cam-wheel to shift the belt which, for the time being, was driving the fast pulley, to the loose pulley, resulting in the stopping of the hoisting mechanism. In addition to this positive action of the cylinder by the bucket, there is an independent movement of the cylinder due to the action of the rolling weight or ball therein which, as one end of the cylinder is raised, runs down to the opposite end (but very slowly, owing to the resistance offered to its travel by the liquid) and over-balancing the cylinder causes its opposite end to rise higher, this motion due to the action of the rolling weight being a continuation of that started by the action of the cable, and resulting in a shifting of one of the belts from its loose pulley to the fast pulley, thereby starting the action of the hoisting drum and causing the bucket to ascend or descend according to the belt which was shifted. It is seen, therefore, that between the stopping and starting actions, there is a pause or period of rest which takes place while the rolling weight is traveling from the high to the low end of the cylinder, during which period of rest the bucket, either at the top or bottom, is given time to discharge or receive its load. In these operations, the action of the bucket on the shifting cable initiates the action of the reversing mechanism, by which initiating action the bucket is brought to rest, and the reversing mechanism continuing to act, under the influence of the rolling weight, the cylinder by its continued movement, and independently of the bucket, starts the mechanism again, but in the opposite direction.

The sequence of actions is as follows, reference being had particularly to Figs. 1, 4, 5, 6 and 7:—Assume that the bucket is at the lower end of its travel, as shown in Fig. 1. In arriving at this position its arm 35 had engaged projection 41 and shifted the cable down on that side and up on the other, and projection 43 had engaged the end of the cylinder which was in position #4, shown by dotted line in Fig. 1, and by this engagement had carried it upward to position #1, shown in full lines. Previous to these actions, cross belt 12 was on the fast pulley, causing the descent of the bucket, and the cam wheel was in the position shown in Fig. 4, with the pin of shipper bar 14^a in the radial end 32 of the cam slot ready to carry said bar to the left, while the pin of the other shipper bar was in the intermediate portion of the cam slot; hence, when the above described actions took place on the descent of the bucket, that is, when the cable 37 had shifted the cylinder up to position 1, shown in full lines, the cam wheel was oscillated some distance, causing cam slot end 32 to draw shipper bar 14^a to the left, the cam wheel moving from the position shown in Fig. 4 to that shown in Fig. 5, and causing cross belt 12 to be shifted from the fast to the loose pulley, thereby stopping the operation of the bucket. By this shifting of the cam wheel, the opposite radial end 33 of the slot therein was brought to the position shown in Fig. 1, ready to act on shipper bar pin 29. This position of the parts is shown in Fig. 1. Now, as the end of the cylinder is raised, as shown, the rolling weight will travel down slowly through the liquid to the opposite end, and this end will be further depressed, causing the end from which the weight just left to rise higher to the extreme position #2. In rising, the cam will be oscillated farther and in the same direction that it started, thereby shifting its position from that shown in Fig. 5 to that shown in Fig. 6, by which shifting the radial end 33 of the slot acting on shipper bar pin 29 will draw shipper bar 15^a to the left and shift belt 13 onto the fast pulley, which action will start the bucket upward. Pin 29 is now in the radial slot, so that the movement of the cam wheel in either direction will shift the pin. When the bucket arrives at the top, its arm 35 will engage projection 40 and will shift cable 37 up on this side and down on the other, causing projection 42 to engage and lower the end of the cylinder from the position 2 to position 3. This will oscillate the cam wheel in the opposite direction, causing the radial end 33 of the slot to shift pin 29 to the right and carrying belt 13 from the fast to the loose pulley, the bucket now coming to rest. In this action the cam will move from the position of Fig. 6 to the position of Fig. 7, bringing the opposite radial end 32 of the slot ready to engage pin 28. When the cylinder is moved down, as just described, to position 3, the end to which the ball had rolled is raised and the ball runs down to the opposite end, but very slowly, thereby further depressing this end and causing the cylinder to move to position 4. As it goes down at this end, it will oscillate the cam wheel farther, thus causing the latter to move from the position shown in Fig. 7 to that shown in Fig. 4, and shifting shipper bar pin 28 to the right, thereby shifting cross belt 12 to the fast pulley, which will lower the bucket to the position

shown in Fig. 1. This completes the cycle of operations, the bucket being automatically stopped at the top and bottom, and after a pause, being automatically started in the opposite direction, the periods of rest between the reversing operations permitting the bucket to receive its load when at the bottom, and discharge the same when at the top.

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

1. In combination with a continuously operating driving mechanism, a driven member operated thereby, a traveling element operated by the driven member, a controlling device initiated in its action by the traveling element and adapted to operate by successive movements and an intermediate pause, means controlled by the first movement of said device for arresting the motion of the traveling element, and means controlled by the second movement of the device for reversing the movement of the traveling element; whereby in the pauses between said successive movements the traveling element will come to rest between its opposite movements.

2. In combination with oppositely traveling belts, two loose pulleys and a fast pulley adapted to be driven by the belts, a driven member operated by the fast pulley, a traveling element operated by the driven member, a controlling mechanism initiated in its action by the traveling element and adapted to operate by successive movements and an intermediate pause, means controlled by the first movement of said device for shifting one belt from the fast pulley to one of the loose pulleys, and means controlled by the second movement of the device for shifting the other belt from the other loose pulley to the fast pulley.

3. In combination with a continuously operating driving mechanism, a driven member operated thereby, a traveling element operated by the driven member, a controlling mechanism comprising a rocking frame, a weight movable along the same, and means for retarding the movement of the weight, means controlled by the movement of the traveling element for tipping one end of the frame upwardly, whereby the weight will move slowly to its other end and will elevate the upper end of the frame still higher, means controlled by the first upward movement of the frame for causing the traveling element to come to rest, and means controlled by the second upward movement of the frame for reversing the movement of the traveling element.

4. In a mechanism of the type described, the combination of a shiftable cable adapted to be shifted in opposite directions, a rocking cylinder adapted to be tilted by the shifting of the cable, a weight moving along said cylinder back and forth, an oscillating cam wheel operated by the movements of the cylinder, belt shifting mechanisms operated by the cam wheel, belts operated by the shifting mechanism, and a shaft adapted to be driven by the belts.

5. The combination of reciprocating belt shifters, driving belts engaged thereby, a driven member adapted to be operated by the belts, a traveling element operated by the driven member, an oscillating member, connections between the same and belt shifters so formed that a partial movement of the oscillating member in one direction will shift one belt to stop the operation of the traveling element, and the continued movement of the oscillating member in the same direction will shift the other belt to start the operation of the traveling element in the opposite direction, a rocking member operatively connected with the oscillating member, means controlled by the movement of the traveling element for effecting a partial movement of the rocking member, and means operating independently of the traveling element for continuing the movement of the rocking member.

6. In combination with a driven member, a belt shifter controlling the operation of the same, an oscillating wheel operatively connected with the belt shifter, a rocking cylinder, a rope or band connected with the same and operating the wheel, and means controlled by the movements of the driven member for rocking the cylinder.

In testimony whereof I hereunto set my hand this eighteenth day of August, 1908, in the presence of two attesting witnesses.

GEORGE W. FREELAND.

Witnesses:

AL. B. LINDBURG,

HARRY AINSWORTH.