

No. 685,056.

Patented Oct. 22, 1901.

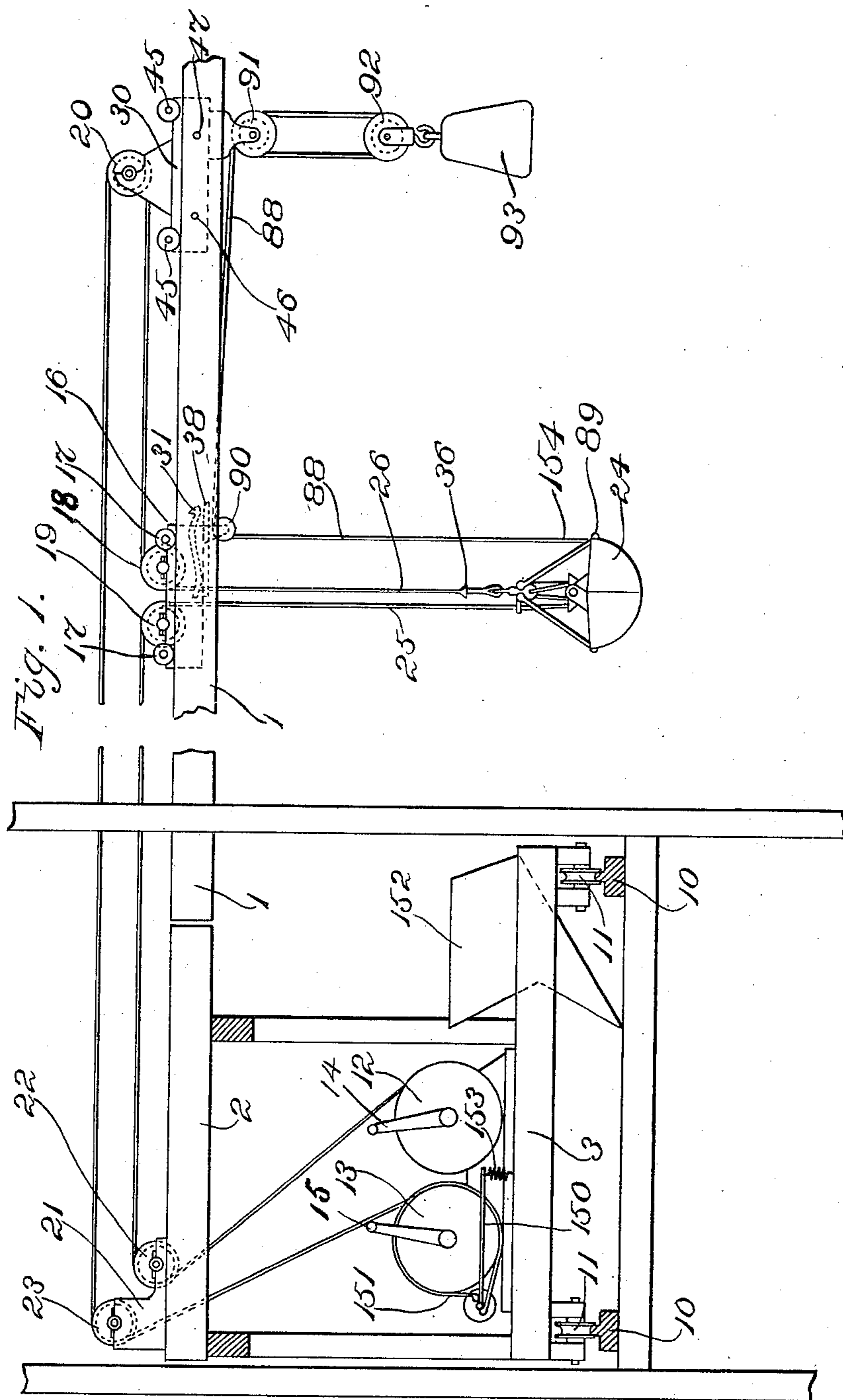
A. E. NORRIS.

HOISTING AND CONVEYING APPARATUS.

(Application filed May 12, 1898. Renewed May 6, 1901.)

(No Model.)

2 Sheets—Sheet 1.



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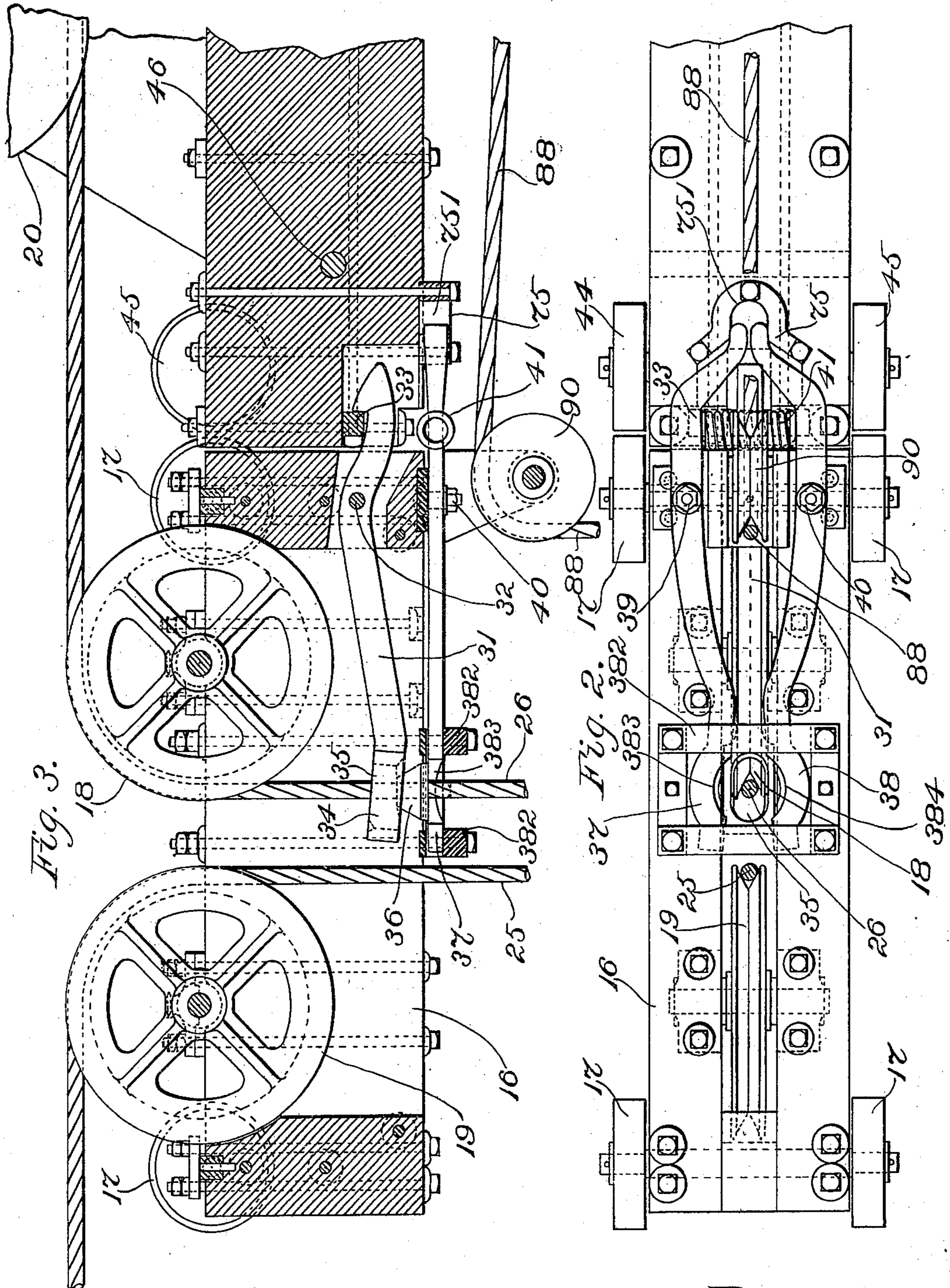
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(No Model.)

2 Sheets—Sheet 2.



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UNITED STATES PATENT OFFICE.

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HOISTING AND CONVEYING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 685,056, dated October 22, 1901.

Application filed May 12, 1898. Renewed May 6, 1901. Serial No. 59,024. (No model.)

To all whom it may concern:

Be it known that I, ALMON E. NORRIS, a citizen of the United States, residing at Cambridge, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Hoisting and Conveying Apparatus, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention has relation to apparatus such as is employed in various connections for the purpose of loading or hoisting coal, sand, earth, or other material in mechanical shovels or buckets and transporting or conveying the same in the said shovels or buckets to a desired or convenient point of deposit.

Certain features of my invention are fitted for use in general in the aforesaid connections; but the invention in its entirety has been designed and perfected more especially with reference to the utilization of the improved apparatus in handling coal.

Subsequent to being transported and unloaded and until it is reloaded and distributed coal usually is stored in a coal-house which is divided into bays—that is, into sections or compartments formed by boarding up lines of timbering that run from front to rear in the building. In some cases over each of these bays is suspended a track extending the length of the bay. When one of these tracks is in use, there is mounted upon the same a trolley, from which latter is hung a mechanical shovel. The shovel is arranged to take its load at any desired point in the bay, to travel forward, to discharge into a hopper or pocket, and to return empty for a fresh load. The mechanism for effecting these operations consists in general in ropes for suspending and manipulating the shovel and moving the trolley, which ropes lead to an engine having drums which receive the same. When it is desired to operate in connection with a different bay, a shift of the trolley and shovel from one bay to the other is made, the said parts being transferred from the track of the first bay to that in the new location. In other cases a single track is employed for the support of the trolley, and

when a change from one bay to another is desired to be effected the track itself is shifted by a lateral movement of the same.

Certain portions of my invention are fitted for use equally well with either of the foregoing forms of apparatus or even where a single fixed track is employed and the trolley is not shifted from the same, as in the unloading of a coal-carrying vessel. My invention in its entirety, however, has reference more especially to a form of coal-handling apparatus employing a series of fixed tracks in connection with a suitable arrangement of bays and having adjacent the said series two or more rails forming a track or way extending transversely past the ends of the fixed tracks and having mounted thereon a traveling car usually carrying the engine which operates the ropes by which the shovel and trolley are actuated, the said car being adapted to be arrested in proper position adjacent any desired one of the bays and carrying a short section of track adapted to form a continuation of any one of the said fixed tracks and onto which the trolley may be moved for the purpose of facilitating the transport thereof from one fixed track to another.

The invention will be described first with reference to the accompanying drawings, in which I have illustrated the best embodiment thereof which I have yet contrived, after which the various improved combinations in which the invention more especially resides will be specified in the claims at the close of this specification.

In the drawings, Figure 1 is a side elevation of an apparatus embodying my invention. Fig. 2 is a view from beneath of the trolley and connected parts. Fig. 3 is a vertical longitudinal section of the same along a line at mid-width of Fig. 2.

1 designates one form of one of the fixed tracks of a series of fixed tracks, such as has been referred to hereinbefore as employed above the series of bays of a coal-house.

2 designates a section of track which is located at the end of track 1 in line therewith and is made movable by being mounted upon the car 3.

10 10 designate the rails of a track, extending transversely or at right angles with relation to the fixed track 1, the said rails receiving the wheels 11 11 of car 3. By movement
 5 of the car 3 along the rails 10 10 the movable section of track 2 may be placed in line with any one of the fixed tracks 1. Upon the car 3 is mounted an engine, of which the drawings show only the two drums 12 13, the two le-
 10 vers 14 15 for throwing the said drums into and out of engagement with the rotating gears of the engine, and the brake-arm 150 for operating a brake 151, of usual construction, applied to the drum 13. The connections of
 15 these parts and the remaining parts of the engine are not shown or detailed, because they are well known and do not contribute to the operation of my invention otherwise than by furnishing the power by which the drums are
 20 actuated.

152 is a hopper of usual character, which may be mounted on car 3, if desired, and through which the coal emptied from the mechanical shovel is discharged into cars, wag-
 25 ons, or other receptacles beneath.

The trolley is composed of a frame 16, mounted on wheels 17, which rest on the fixed track 1. Upon the trolley are journaled two sheaves 18 19. Outwardly beyond the trolley and fixed
 30 with relation to the track 1—as, for instance, in the manner hereinafter more particularly described—is a sheave 20.

In the present description the words “inward” and “outward” will be used to design-
 35 nate the position of various parts with respect to the trolley and will be understood to be equally applicable to other constructions as well as to the specific construction in connection with which my invention is shown.
 40 By “outward” is meant the direction in which the trolley proceeds for the purpose of taking a load. By “inward” is meant the direction in which the trolley proceeds to discharge a load.

Fixed upon a frame 21 on the inner end of
 45 the track 2 are the sheaves 22 23.

24 is a mechanical shovel or bucket of any preferred type—for example, such as is presented in United States Letters Patent No. 394,297. The opening and closing rope 25
 50 passes from the shovel upward over the sheave 19 on the trolley and thence inward over the sheave 22 and to and around the drum 12. The holding-rope 26 passes from the shovel upward over the sheave 18 on the
 55 trolley, thence outward to the sheave 20, thence inward to the sheave 23, and to and around the drum 13. It will be understood that the sheaves 20, 22, and 23 are introduced simply for the purpose of changing the direc-
 60 tion of the ropes to enable them to reach the drums of the engine in the particular position in which the engine here is shown as placed. All that is essential to my invention is that the initial directions of the two ropes
 65 from the trolley should be opposite—that is to say, one inward and one outward—and their

subsequent directions may be changed as most convenient or necessary with any other position or arrangement of the operating-engine. When the shovel lies open in the coal, the
 70 pull on the opening and closing rope in closing the shovel tends to cause the trolley to run inward, the holding-rope being at that moment slack. To prevent such inward motion, I provide trolley-latching devices in the
 75 form of engaging members, one of these members being located on or in connection with the trolley and the other being located at a point fixed with relation to the track 1. By preference I locate the latter member on a frame
 80 30, which frame also by preference serves as the support of the sheave 20. When, therefore, the empty shovel in its outward travel arrives at the frame 30, the engaging mem-
 85 bers on the frame and trolley interlock, and the trolley is thereafter solidly held during the operation of loading. After the shovel has been loaded it is hoisted clear of the coal by pulling or drawing upon both ropes, and
 90 when hoisted to the desired height or level it is necessary that the latching devices or engaging members should be disengaged, so that the trolley and shovel may travel inward. This disengagement is effected auto-
 95 matically by a tripping member actuated upon the proper elevation of the shovel, and therefore attached to the shovel or the hoisting-rope, preferably the latter, at such a point that when the shovel has been hoisted fully
 100 the tripping member will strike one of the engaging members, which engaging member is extended into its path, and thereby will cause the disengagement of the trolley from the frame 30. The particular forms of engaging
 105 and tripping members that in practice I have found the most reliable are shown in Figs. 2 and 3.

31 is a gravity-latch, which is pivoted at 32 to the trolley 16, with its head projecting horizontally outward from the trolley.
 110

33 is a pin affixed to the frame 30 in the path of the latch. The tail 34 of the latch projects into the path of the holding-rope 26, the rope running loosely through a hole 35 in
 115 the said tail.

36 is a bobbin on the rope 26, placed below the said tail and constructed of too large a diameter to pass through the hole 35. When the trolley 16 in its outward travel reaches the frame 30, the latch 31 engages automati-
 120 cally with the pin 33 and locks the trolley in its outermost position. When the shovel is being hoisted by both ropes after having taken its load, the bobbin 36 on the holding-rope 26 at the proper time strikes and lifts the tail
 125 of the latch, thereby disengaging the latch from the pin and leaving the trolley free to be drawn inward to discharge its load; but the shovel must be supported at the proper level during its inward or horizontal travel.
 130 To accomplish this through the drums 12 and 13 and their respective ropes would be im-

practicable, for as the trolley travels inward if one rope be permitted to pay out more rapidly than the other rope is being drawn in the trolley, which always responds to inequalities in pull or tension upon its two oppositely-extended ropes, would immediately race toward the rope exerting the most pull or tension to find a position where the pull or tension upon both ropes balances, and this racing of the trolley would operate to lower the shovel. To guard against this and to provide for a positive suspension of the shovel from the trolley during its inward and outward traverse, regardless of the equal or unequal pull or draft upon the ropes, and also to relieve the ropes between the shovel and the drums 12 13 from the weight of the loaded shovel and the wear and tear that would result therefrom, I arrange a second set of engaging members, placing them respectively in connection with the trolley and the shovel, so that when the said members are in engagement with each other the shovel will be securely suspended from the trolley, and its suspension will not depend upon the thrown-in or thrown-out condition of either drum 12 or 13—that is, so that it will not be necessary to maintain a tension on either rope in order to keep the loaded shovel suspended. I further arrange a releasing member fixed with relation to the track so that when the trolley is at its outermost position the engaging members aforesaid will become disengaged by contact of one or both of them with the releasing member, the shovel thereby being permitted to be lowered into the coal. The particular forms of engaging and releasing members that in practice I have found the most reliable are shown in Figs. 2 and 3.

37 38 are the jaws of a lock and are pivoted at 39 40 upon the trolley-frame. The outer ends of the jaws project beyond the trolley, and their inner ends project into the path of the holding-rope 26 and rest on the horizontal supporting-frame 382. The said inner ends are formed with registering concavities 383 384, adapted to surround the rope 26, but not to grip it, even when the said ends are closed into contact with each other.

41 is a spring applied to the jaws 37 38 and which tends to keep the outer ends thereof separated and the inner long ends thereof closed. The said lock constitutes that one of the engaging members which is connected with the trolley. The engaging member that is connected with the shovel is constituted by the bobbin 36 upon the holding-rope 26. The bobbin 36 therefore is made to serve both as one of the engaging members now being described and as the tripping member in the latch mechanism hereinabove described; but such double function is a minor feature, contributing to convenience and simplicity, and the said functions might be assigned to separate or different portions of the mechanism. The above-mentioned registering concavities 383 384 in the inner ends of the jaws 37 38 are

made of such a size that, while permitting the free passage of the holding-rope 26, they do not in their closed position permit the passage of the bobbin 36. The bobbin, however, is made cone-shaped, with the point of the cone upward, and it is therefore capable of passing through the jaws of the lock by forcing those jaws apart; but it is incapable of passing again downward through the jaws while they are closed. When, therefore, with the bobbin above the closed lock the holding-rope is slacked, the bobbin is lowered upon the lock and practically the entire weight of the elevated shovel during its inward and outward traverse is taken by the lock. Not only are the jaws of the lock adapted to open and close, but the two jaws as an entirety are adapted to turn freely while closed in a horizontal plane, and thereby to follow the rope in case the latter sways during the manipulation of the shovel, whereby wear of the rope and strain of other parts is largely relieved. The releasing member above referred to is a double inclined plane 75, attached to the frame 30. When the trolley in its outward travel reaches the said frame, the free ends or tails of the jaws of the lock impinge upon the converging sloping faces of the wedge and are pressed together thereby, this motion opening the lock and allowing the bobbin 36 to pass down through it in the lowering of the shovel. When the trolley, pulled by the holding-rope, reaches the end of its outward or return travel, the pull of the holding-rope having lifted the weight of the shovel largely from the lock, the opening of the locking-jaws does not let the bobbin through with a jerk or jump, but allows it to be lowered easily when the holding-rope is overhauled to drop the shovel. This desirable effect is obtained in part by the slope of the releasing member and the arrangement of the members of the lock with their long ends utilized as jaws and their short ends as tailpieces. So long as any considerable portion of the weight of the shovel is sustained by the lock the frictional contact of the bobbin on the jaws and of the latter on the supporting-frame 382 will prevent the tailpieces from being forced together readily by the wedge and will in consequence automatically prevent opening of the lock. Not until the strain of the holding-rope has become sufficient to relieve the jaws from substantially the entire weight of the shovel will the tailpieces be permitted to close together by action of the wedge, and thereby occasion the release of the bobbin.

The operation of my apparatus as here shown is as follows, viz: With the trolley at the outer end of its track and the shovel lowered and open preparatory to taking its load the operator first throws in the drum 12 and by drawing upon the opening and closing rope 25, controlled by said drum, closes the bucket, it taking up its load in the act of closing. The trolley during this time is locked by its latch, and thus is prevented

from being pulled inward by the draft upon the opening and closing rope in closing the shovel. The drum 13 is now also thrown in, and the pull upon the two ropes together acts to hoist the shovel. It is desirable that both ropes be drawn upon simultaneously in hoisting the shovel, because a pull upon either one alone would slacken the other, and with the trolley locked in its outermost position the moment the opening and closing rope is slackened the bucket will open and discharge its load. When the bucket, hoisted by its two ropes, reaches the desired elevation, the bobbin 36, having passed freely between the long arms or jaws of the locking device, strikes the tail 31 of the latch, lifts it, and thereby disengages the latch from its cooperating holding-pin 33, releasing the trolley. The operator now throws out the holding-drum, leaving its holding-rope free to pay out under the slight retarding action of the automatic brake 150, whereupon the continued pull upon the opening and closing rope causes the trolley to start inward. This inward starting movement of the trolley will operate, as before stated, to drop the shovel slightly; but by the time the descending bobbin is dropped to the level of the jaws of the lock the head of the latch has escaped forward far enough to prevent its reengagement with the pin or bar 33 and the tails of the lock have moved outward from the releasing device 75 and have closed about the holding-rope below the bobbin, so as to arrest the bobbin in its descent and leave the shovel suspended by its bobbin upon the locking device on the trolley. Inequality in pull or draft upon the two ropes will no longer have any effect upon the level of the shovel, as it will remain suspended by its bobbin upon the locking device until the latter is again opened. The continued pull upon the opening and closing rope now draws the trolley and its suspended shovel inward to a position over the hopper 152, when the opening and closing drum 12 is thrown out and its rope slackened to permit the shovel to open and discharge its load. During this inward pull upon the opening and closing rope the retarding action of the brake upon the holding-rope has been sufficient merely to keep the trolley from racing forward—that is, holding the trolley under such control that it moves forward only so fast as the pull upon the opening and closing rope draws it. It is clear that if the trolley were left free to jump forward under the pull of the opening and closing rope at a higher rate of speed than the rope itself was seeking to draw the trolley the latter would gain upon the rope, and thereby slacken it and permit accidental opening of the shovel. Having discharged the load from the shovel, the operator throws in the drum 13, and thereby through the holding-rope 26 draws the trolley and its suspended bucket outward again toward the end of its track. When the trolley reaches the

end of its travel, its latch engages the pin 33, thereby locking the trolley in its outermost position and substantially at the moment the short arms of the locking-jaws engage the converging walls of the releasing device and open the said jaws, thereby releasing the bobbin, so that the operator by now throwing out the drum 13 permits the holding-rope as well as the opening and closing rope, already free, to pay out and permit the shovel to descend for another load.

In my apparatus as shown the position of the trolley and the shovel suspended therefrom and the point at which said shovel shall be opened to discharge its contents may be quickly and accurately determined by the engineer in charge, for he has perfect and immediate control over the position of the trolley by reason of the two ropes leading in opposite directions, whereby the trolley when its shovel has been locked in elevated position may be positively drawn in one or the opposite direction by one or the other of the ropes. The trolley when being drawn by either rope needs only enough tension on the other rope to prevent the trolley racing faster than the movement of the rope that is drawing it, and this retarding tension is automatically supplied by the brake device described. It will be noticed that while both ropes are used in hoisting the bucket and the entire weight of the bucket and its contents is suspended by the two ropes during hoisting, yet when the bucket or shovel reaches the level where it becomes automatically locked to the trolley both ropes are thereafter relieved of all tension, draft, or pull excepting what little is necessary to move the bucket and its trolley in one or the other direction along the track, together with the slight retardation necessary to prevent racing of the trolley. In this way the life of the ropes is greatly prolonged. All these operations take place automatically, and the manipulation of the engine-drums is simply as described prior to the mention of any engaging, tripping, and releasing members.

It is to be particularly noted that no jar or wrench occurs upon the tripping of the latch, inasmuch as the strain on the trolley at that moment is outward as well as inward. The inward motion of the trolley is occasioned by freeing the holding-drum and the holding-rope, the latch being already in its raised or tripped condition. Hence there is no jerk or jar, and the entire operation produces the least possible wear and tear on the mechanism.

To still further minimize the wear and tear on the mechanism, I provide an improved means for preventing the shovel from twisting in its course. Such twisting is a serious objection, and its detrimental effects are so well recognized that various attempts have been made to prevent it. The primitive way of doing this was to have a man hold and manage a guy leading off at an angle from the shovel. The danger and inconvenience of

this method in the case of a rapidly-acting shovel and the difficulty of applying it to a shovel having a long horizontal travel have resulted in various mechanical means of controlling such obliquely-disposed guy. I depart from all these constructions in consequence of my discovery that no oblique guy whatever need be employed. The disadvantage of such a guy is especially felt where the shovel is being operated in a confined place or where the trestle-work gives no more room laterally than is needful for the passage of the shovel itself, and where, therefore, the addition of an oblique guy is very objectionable. I have discovered that if a guy is led vertically upward from one side of the shovel—that is to say, parallel with the ropes that suspend the shovel and entirely within the vertical space occupied by the shovel itself in ascending and descending—and if such guy is kept under moderate tension by means of a weight or the like the shovel will be successfully prevented from twisting in its course and the process of loading or unloading coal can be carried rapidly and smoothly forward. In the drawings is illustrated a vertical guy 88, attached, as by a bridle 154, to the shovel at 89 and thence running up to and over the sheave 90 upon the trolley and thence to and around the sheaves 91 92, of which the former is affixed to the frame 30, while the latter is free and carries the weight 93 depending from it. Such disposition of the sheaves, &c., has the object of providing for the proper transmission of the tension due to the weight 93 to the vertical run of the guy 88 in the varying positions of the trolley, and other arrangements of these parts might be substituted in other exigencies. The shovel cannot swing out of its normal position without taking with it the lower end of the guy 88, and as this would, in effect, exert a pull upon the guy it is resisted by the weight or other device employed to exert the tension upon the guy. Hence the action of the guy is to hold the shovel, particularly when elevated, or nearly so, constantly in its correct position.

In order to provide for transferring the frame 30 to different parts of the track, as for placing it farther inward or farther outward in order that the shovel may take its load from a point farther inward or farther outward or for taking the frame over upon the movable section 2 of track in order to transfer it to any other bay or portion of the coal-house, I arrange the said frame to travel upon the track either by sliding along or preferably by rolling upon the wheels 44 45, and I further arrange the said frame to be arrested and held at any desired point upon the track, as by the pins 46 47, passing through the track and frame.

It being desired to shift the shovel from the track 1 of one bay to the corresponding track of a different bay, all that is required is to remove the holding device or devices 46 47 of the frame 30 and to draw both the trolley

and the sheave-carrying frame 30 along the fixed track 1 onto the section of track 2, which is carried by the car 3. After this the said car 3 may be pushed transversely along the rails 10 10, so as to bring the section of track 2 into line with the fixed track of the bay in which operations are to be carried on. This having been effected, the sheave-carrying frame 30 and trolley will be moved onto the latter section of fixed track, the said frame 30 will be secured or held at the proper point along the said section of fixed track, and operations will be resumed. In making these shifts no disconnection of the ropes whatever is required to be effected, the trolley and sheave-carrying frame 30 simply being drawn onto the section of track 2 upon the car, then shifted transversely by the aid of the car, and then moved onto the fixed section of track of the bay where operations are being proceeded with.

What I claim is—

1. The combination of a track, a trolley running thereon, a shovel suspended from the trolley, a load-supporting lock on the trolley for supporting the shovel, a disengaging member for opening the lock when encountered by the latter, and a hoisting-rope leading from the shovel over the trolley and thence rearward for the purpose of elevating the shovel and hauling the trolley rearward, whereby at the moment when the lock is opened by the disengaging member the weight of the shovel is lifted from the lock and an easy release insured by the rearward pull on the hoisting-rope.

2. The combination of a track, a trolley running thereon a shovel suspended from the trolley, a load-supporting lock on the trolley for sustaining the shovel, and a disengaging member fixed with relation to the traverse of the trolley and having cam-surfaces to engage with the tailpieces of the jaws of the lock.

3. The combination of a track, a trolley running thereon, a mechanical shovel, ropes leading from the shovel over the trolley to suspend and manipulate the same, a guy leading from the shovel vertically to the trolley, and a weight connected to the said guy and serving to maintain a constant tension upon the same, substantially as described.

4. The combination of a fixed track, a shovel-trolley mounted on the said track, a sheave-carrying frame adapted to move along the track, means to fix the frame at any desired point along the track, a car movable laterally with relation to the said track, a section of track on the said car adapted to form a continuation of the fixed track and onto which the said trolley and frame may be moved, a mechanical shovel, and ropes leading from the shovel over the trolley to the car and passing in part around the sheave on the said frame, substantially as described.

5. The combination of a fixed track, a shovel-trolley mounted on the said track, a

sheave-carrying frame adapted to move along the track, means to fix the frame at any desired point along the track, a car movable laterally with relation to the said track, a section of track on the said car adapted to form a continuation of the fixed track and onto which the said trolley and frame may be moved, a mechanical shovel, ropes leading from the shovel over the trolley to the car and passing in part around the sheave on the said frame, and winding-drums mounted on the said car, substantially as described.

6. The combination in a hoisting and conveying apparatus of a track, a trolley thereon, a mechanical shovel, two ropes leading upwardly therefrom to said trolley and extended from the latter in opposite directions, one of said ropes serving as opening and closing rope when said shovel is otherwise supported, locking means to support said shovel from said trolley, and means to draw upon said ropes singly to move said shovel in opposite directions along its said track while so supported.

7. The combination in a hoisting and conveying apparatus of a track, a trolley thereon, a mechanical shovel, two ropes leading upwardly therefrom to said trolley and extended from said trolley in opposite directions, one of said ropes serving as opening and closing rope while said shovel is held supported by the other or holding rope, locking means cooperating with said holding-rope to support said shovel from said trolley, and means to draw upon said ropes singly to move said shovel in opposite directions along said track while so supported.

8. The combination in a hoisting and conveying apparatus of a track, a trolley thereon, a mechanical shovel, two ropes leading upwardly therefrom to said trolley and extended from said trolley in opposite directions, one of said ropes serving as opening and closing rope when said shovel is otherwise supported, locking means to support said shovel from said trolley, means to draw upon said ropes singly to move said shovel in opposite directions along its said track while so supported, a latch to restrain the travel of said shovel along said track and means operable by the hoisting of said shovel to release said latch.

9. The combination in a hoisting and conveying apparatus of a track, a trolley thereon, a mechanical shovel, two ropes leading upwardly from said shovel to said trolley and extended from the latter in opposite directions, one of said ropes serving as opening and closing rope while said shovel is otherwise supported, locking means to support said shovel from said trolley, means to draw upon said ropes singly to move said shovel in opposite directions along its said track while so supported, a latch to restrain the travel of said shovel and means on one of said ropes to disengage said latch.

10. The combination in a hoisting and conveying apparatus of a track, a trolley thereon,

a mechanical shovel, an opening and closing rope and a holding-rope leading upwardly from said shovel to said trolley and extended from said trolley in opposite directions, locking means on said trolley and cooperating with said holding-rope to support said shovel in elevated position, means to draw upon said ropes singly to move said shovel in opposite directions along said track while so supported, a latch device normally restraining travel of said bucket and its trolley, and means on said holding-rope to release said latch device.

11. The combination in a hoisting and conveying apparatus of a track, a trolley thereon, a mechanical shovel, an opening and closing rope and a holding-rope leading upwardly therefrom to said trolley and extended from said trolley in opposite directions, with means for manipulating said ropes, a latch device and also a locking device on said trolley and a single device on said holding-rope to cooperate with said locking device to support said shovel from said trolley and also to release said latch device.

12. The combination in a hoisting and conveying apparatus of a track, a trolley thereon, a mechanical shovel, two ropes leading upwardly therefrom to said trolley and extended from the latter in opposite directions, one of said ropes serving as opening and closing rope when said shovel is otherwise supported, locking means to support said shovel from said trolley, means to draw upon said ropes singly to move said shovel in opposite directions along its said track while so supported, and means operated by travel of said trolley upon its said track to release said locking device.

13. The combination in a hoisting and conveying apparatus of a track, a trolley thereon, a mechanical shovel, two ropes leading upwardly therefrom to said trolley and extended from the latter in opposite directions, one of said ropes serving as opening and closing rope when said shovel is otherwise supported, locking means to support said shovel from said trolley, means to draw upon said ropes singly to move said shovel in opposite directions along its said track while so supported, and means operable by the travel of said trolley upon its said track in one direction to render said locking device effective, and operable by movement of said trolley in an opposite direction to release said locking device.

14. The combination in a hoisting and conveying apparatus of a track, a trolley thereon, a mechanical shovel, two ropes leading upwardly therefrom to said trolley and extended from the latter in opposite directions, one of said ropes serving as opening and closing rope when said shovel is otherwise supported, locking means to support said shovel from said trolley, means to draw upon said ropes singly to move said shovel in opposite directions along its said track while so supported, and a guy-rope leading upwardly from said shovel and substantially parallel with said

two ropes, with means for maintaining said guy-rope under suitable tension.

15. The combination in a hoisting and conveying apparatus of a track, a trolley thereon, a mechanical shovel, an opening and closing rope and a holding-rope leading upwardly therefrom to said trolley and extended from said trolley in opposite directions, with means for manipulating said ropes, a latch device on said trolley to lock the latter against travel on its said track and a locking device also on said trolley and a single device on said holding-rope to cooperate with said locking device to support said shovel from said trolley and also to release said latch device, and a guy-rope leading upwardly from said shovel and substantially parallel with said two ropes, with means for maintaining said guy-ropes under suitable tension.

16. The combination in a hoisting and conveying apparatus of a track, a trolley thereon, a mechanical shovel, two ropes leading upwardly therefrom to said trolley and extended from said trolley in opposite directions, one of said ropes serving as opening and closing rope when said shovel is otherwise supported, locking means to support said shovel from said trolley, means to draw upon said ropes singly to move said shovel in opposite directions along its said track while so supported, a latch normally restraining the travel of said shovel along said track, means operable by the hoisting of said shovel to release said latch, and a guy-rope leading upwardly from said shovel and substantially parallel with said two ropes, with means for maintaining said guy-rope under suitable tension.

17. In an apparatus of the class described, a mechanical shovel, one or more ropes to hoist the same, and a guy-rope connected with

and leading upwardly from said shovel and substantially parallel with said hoisting rope or ropes, with means for maintaining said guy-rope under suitable tension.

18. In an apparatus of the class described, a mechanical shovel, one or more ropes to hoist the same, a traveling trolley over which said hoisting-ropes are passed, and a guy-rope leading upwardly from said shovel to said trolley and substantially parallel with said hoisting rope or ropes and means for maintaining said guy-rope under suitable tension.

19. In an apparatus of the class described, a traveling trolley with means positively to draw the same in one or the opposite direction, a mechanical shovel, two ropes leading upwardly therefrom to said trolley, thence in opposite directions, with means for manipulating said ropes, and a guy-rope also extending from the said shovel upwardly to said trolley and substantially parallel with said two ropes, and means fixed relative to said traveling trolley to maintain said guy-rope under suitable tension while permitting travel of said trolley with its shovel.

20. The combination in a hoisting and conveying apparatus of a track, a trolley thereon, a mechanical shovel, an opening and closing rope and a holding-rope leading upwardly from said shovel to said trolley, thence in opposite directions, means to manipulate said ropes to draw upon the same singly or in unison, and automatic braking means to operate as described.

In testimony whereof I affix my signature in presence of two witnesses.

ALMON E. NORRIS.

Witnesses:

ROBT. WALLACE,
LEPINE HALL RICE.