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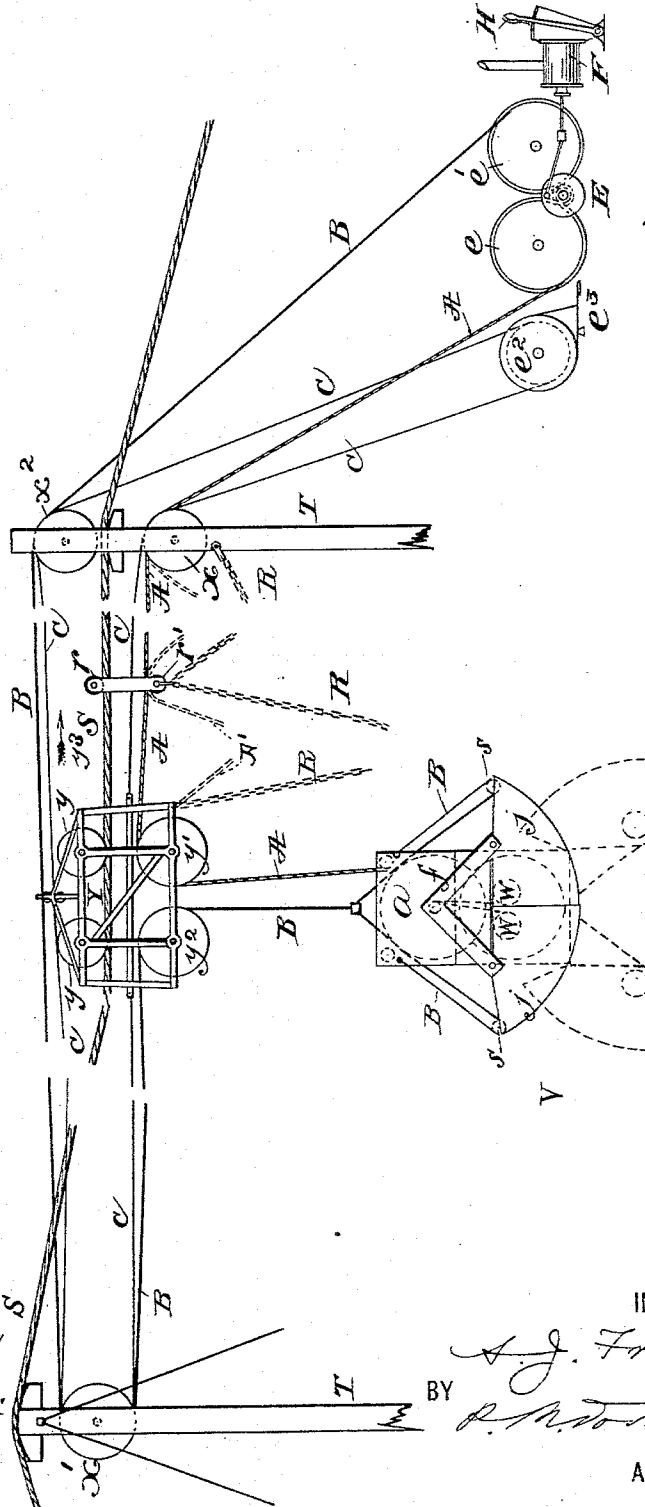
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A. J. FRITH.
LOADING AND CONVEYING APPARATUS.

No. 533,797.

Patented Feb. 5, 1895.

Fig. 1.



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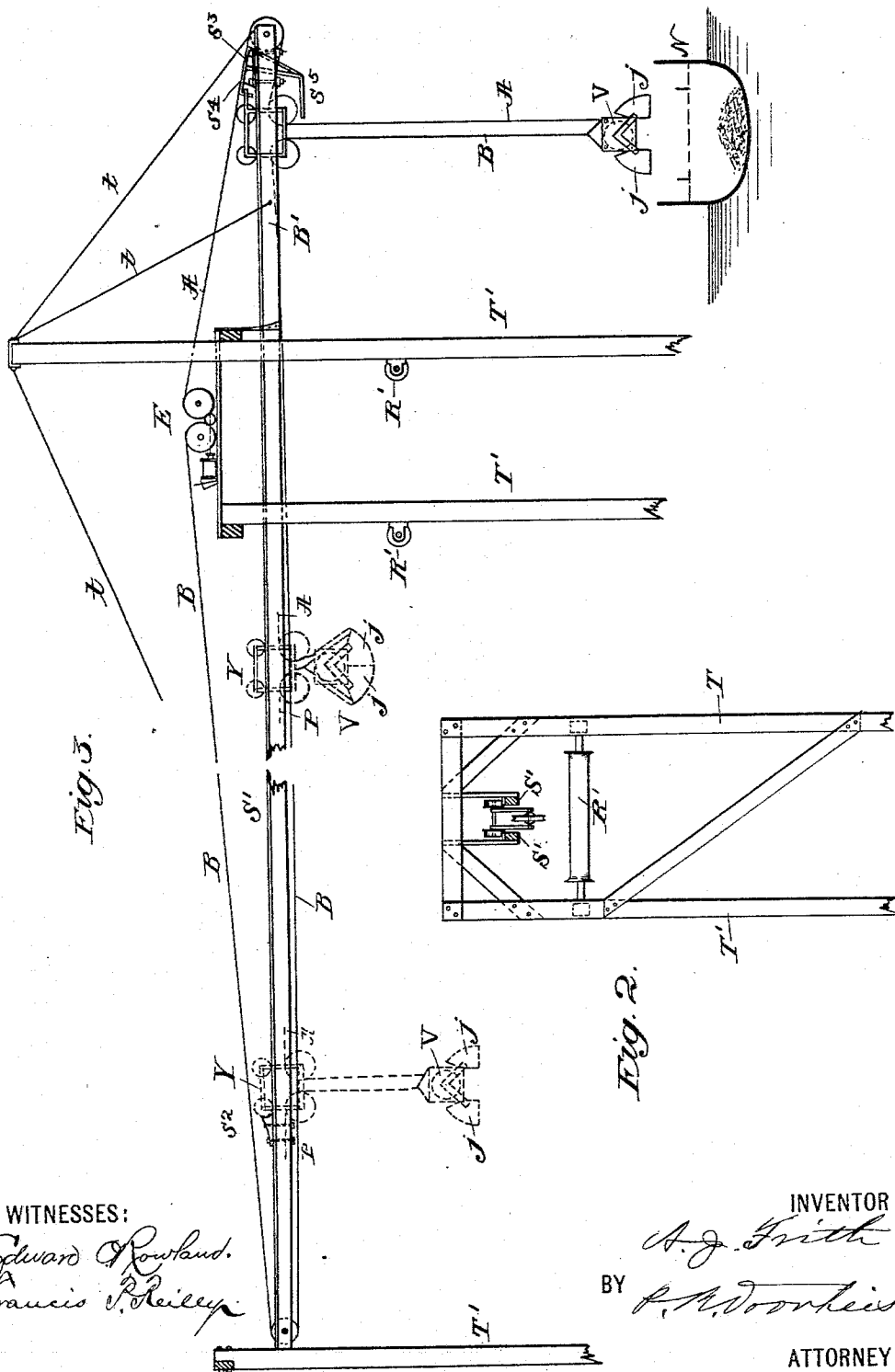
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4 Sheets—Sheet 3.

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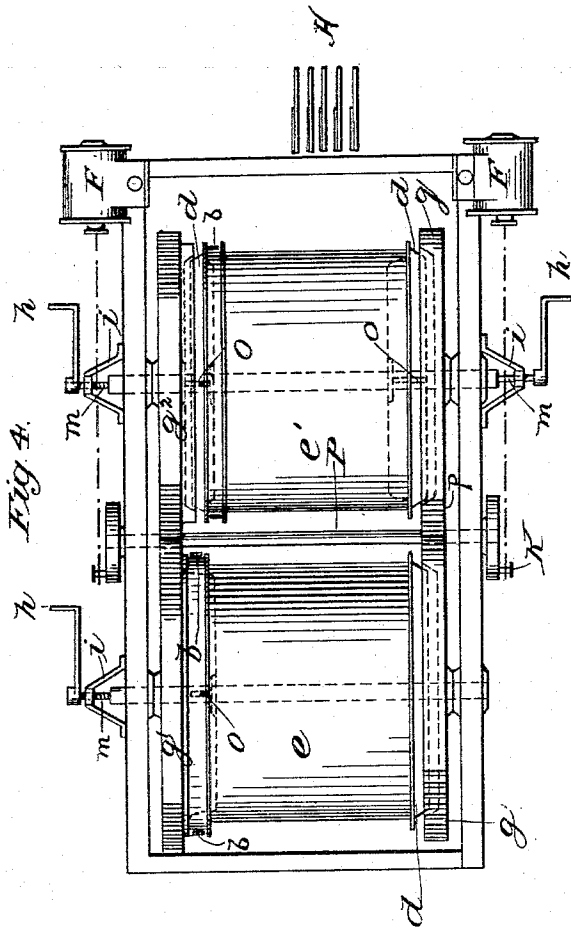


Fig. 4.

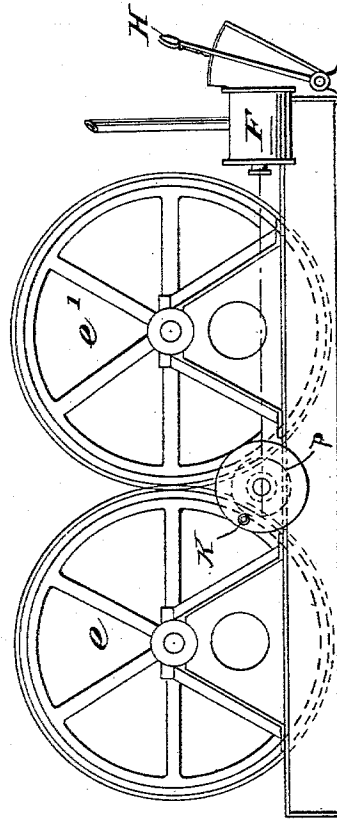


Fig. 5.

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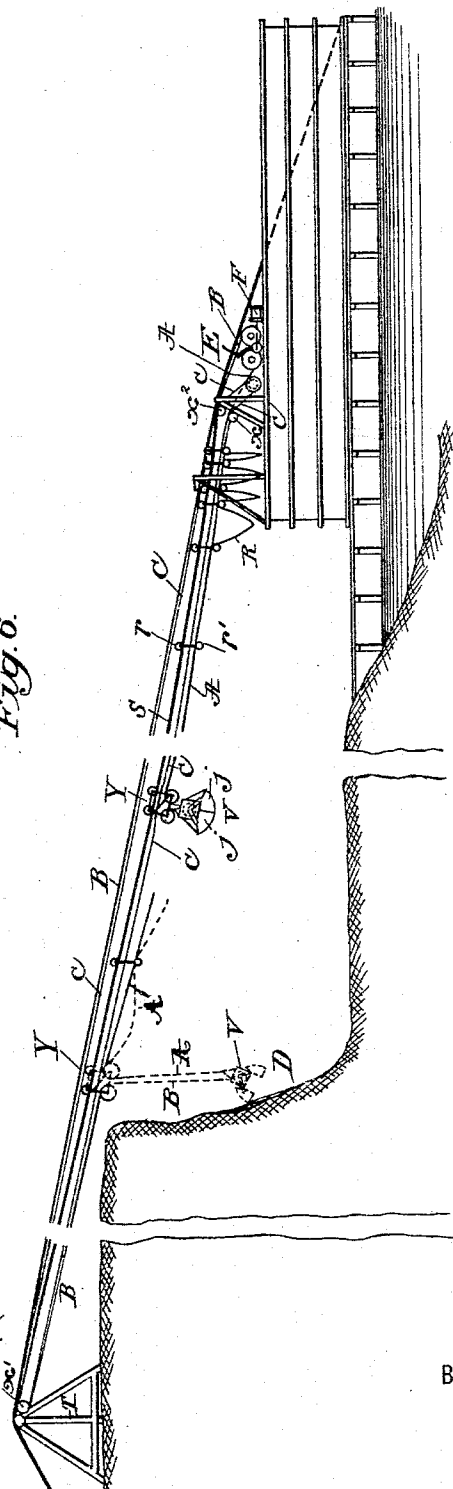
4 Sheets—Sheet 4.

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Fig. 6.



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LOADING AND CONVEYING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 533,797, dated February 5, 1895.

Application filed June 22, 1893. Serial No. 478,418. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR J. FRITH, of the city and county of New York, in the State of New York, have invented a new and useful Self-Loading, Hoisting, and Conveying Apparatus, which invention is fully set forth and illustrated in the following specification and accompanying drawings.

Apparatus has heretofore been used by which buckets of coal, sand, earth or other material are hoisted at one point to a trolley running on an elevated track or rope, conveyed along said track the desired distance and either automatically dumped or lowered at the desired point.

The object of this invention is to provide such elevated tramways with means by which an automatically filling bucket or dredge, after being loaded, may be elevated and conveyed to any desired distance where it may be lowered and discharged of its contents by simple winding mechanism operated by a single attendant.

The invention will first be described in detail and then particularly set forth in the claims.

In the accompanying drawings, Figure 1 shows in side-elevation a hoisting and conveying apparatus embodying my invention. Fig. 2 shows in end elevation a modification of the apparatus shown in Fig. 1. Fig. 3 is a side elevation of Fig. 2. Fig. 4 is an enlarged view in plan of a winding-engine such as may be employed to operate the apparatus. Fig. 5 is a side elevation of Fig. 4. Fig. 6 shows in side elevation, an outline of a completed plant embodying my invention, illustrating its method of performing its work, when applied to the removal of a bank of material such as sand or gravel, or even a coal pile.

In said figures the several parts are respectively indicated by reference letters as below described.

Referring first to Fig. 1, the letter S indicates a standing rope, or elevated track, supported by towers T, on which towers are carried double sheaves X, X', X². Upon the rope or track S runs a carriage or trolley Y consisting of a frame carrying running wheels y, y and large sheaves y', y².

The letter E indicates a hoisting engine, hereinafter more particularly described in

detail, having driven drums e, e'. An idler drum e², provided with a brake e³, may be secured to the framing or bed plate of said engine, if desired.

A bucket or shovel, V, is shown, having swinging jaws, j, j, pivoted to a frame f, which frame carries, on a shaft, a windlass a. The shovel or bucket V, is supported by ropes A and B. The rope A passes over the sheave y' on the trolley Y, over the sheave X, and around the hoisting drum e of the engine E to which the end of said rope is secured. The rope B passes over the sheave y² on the trolley, back over a sheave X', thence above the trolley Y, over a sheave X² to the hoisting drum e' of the engine E to which its end is secured. The rope A is wound around the windlass or winding-sheave a on the bucket or shovel V, its end being secured to said sheave, and when said rope is strained it winds up and closes the jaws j, j. When the weight is thrown upon the rope B attached to the outer ends of the jaws j, j, the bucket opens, rewinding the rope A upon the windlass a. To facilitate this opening the rope B is bifurcated and passes around sheaves s, s, secured to the jaws j, j, the ends of said rope being brought back and attached to some part of the frame f, thus doubling the purchase of said rope. Weights w, may also be attached to the jaws j as shown, which will facilitate the rewinding of the rope A upon the sheave a.

A chain R is secured to one of the towers T, and to the trolley Y, and is supported at intervals by running supports r, r, hung from the rope or track S. Said supports r, r, carry sheaves r', which act as supports for the rope A. An endless rope c, is attached to the trolley Y, passes over the supports r' and sheave X and several times around the drum e², then back and around sheaves X², X' to the other end of the trolley Y, to which it is secured. It is evident that, if the drum e² is rendered stationary by the brake e³, the continuous rope c will prevent the trolley Y, from traversing in either direction upon the rope S.

In Figs. 4 and 5 is shown a hoisting-engine suitable for operating this apparatus. The two drums e, e', are operated in common by gears g, g, and a pinion p, on the driving shaft P of the engine, which shaft is rotated,

by connecting rods, not shown, or other convenient connections from the cylinders F to the crank pins K. The hoisting drums are so mounted as to be thrown in or out of gear longitudinally on their shafts with gear-wheels g and g^2 by means of screw rods m , passing through nuts in guides i , and operated by the handles h , which rods are inserted in the ends of said shafts and bear against keys passing through slots in said shafts at the points o . Either drum may thus be driven separately or together, either in the same or opposite directions as may be desired, by being thrown into one or other of the gear-wheels g , g^2 . The gear g' is keyed to the drum shaft, while the fellow gear g^2 on the drum e' is loose on its shaft. The drum e' is arranged so as to be thrown in or out of gear with either end gear-wheel g , g^2 , but the drum e is arranged to be thrown either in or out of the gear g , which meshes into the pinion p , and not into the gear-wheel g' on the opposite side of its shaft. Said drums and their respective gears are coupled as shown in the drawings at the points d by cone-friction surfaces. A suitable brake-strap, or straps, b , may be used in any well known manner in connection with these drums. Suitable reversing levers and brake-bar handles are shown at H.

The operation of the apparatus constructed as above described is as follows:—The drum e^2 being prevented from rotating by the application of the brake e^3 and the trolley thus prevented from traversing in either direction by its attachment to the ends of the rope c , if the rope A is slackened the jaws of the shovel V will open and if said rope be tightened the shovel will close. If the brake e^3 and drum e^2 be free, the trolley Y is free to move in either direction and if hoisting be commenced with the rope A, the rope B will be slackened and the trolley Y will move in the direction y^3 , until the strains upon the ropes A and B are equalized. If hoisting by the rope B the several movements of the parts described will be reversed.

If, as in Fig. 6, the shovel be at a position D, and open, then, by hoisting on the rope A, the shovel will close and take its load. It will then rise, and, as the rope B is slackened, move toward the engine E. When the shovel reaches the height of the trolley Y, both drums e , e' , of the engine will be thrown into action and as they may be wound in opposite directions, the rope B will be paid out at the same rate as the rope A is wound in, and the trolley, with the shovel suspended close beneath it, will move toward the engine E until the point of dumping is reached. The brake e^3 is then applied to the drum e^2 to prevent further movement of the trolley. By slackening the rope A the shovel will open and drop its load; or by slackening both the ropes A and B, the shovel will descend, as far as desired, closed, and then by holding fast the rope B, the load can be dumped at the lower

level. The action just described could be reversed and material raised from a point near the engine E conveyed back over the line and dumped at the point D. If it be desired to raise the shovel, say at the point D, vertically, or nearly so, it will be evident that both the ropes A and B must be hoisted upon. Hence the engine used in this case should be capable of hoisting by both of the drums e , e' , at the same time, and, when the shovel has reached the trolley, be capable of hoisting on one drum e and pay out upon or by the other drum e' .

The supporting rope S may be replaced by any other elevated track.

In Fig. 3, the apparatus is shown as arranged with a projecting boom B' and track S'. Supporting frames T' are provided, from one of which suspension-rods or tie-rods t , t , support the track S', the engine E being placed above said track. In said Fig. 3, the endless rope c , drum e^2 , and brake e^3 , are replaced by stops s^2 , s^3 , located at desired points on the track S', to arrest the motion of the trolley Y. The stop s^2 may be provided with a catch s^4 arranged to be unlatched by the contact of the shovel V with some projecting part of it, such as s^5 .

The supporting sheaves, r' , r' , shown in Fig. 1 for supporting the rope A, are replaced in Figs. 2 and 3, by sheaves R', rigidly attached to the supports T'. Said supporting sheaves, in either case, are provided, not alone to prevent the rope A from sagging down, but also to divide the span of the hanging rope into shorter spans and thus reduce the tension in said rope due to the weight of the hanging rope. This reduction of tension facilitates the opening of the jaws of the bucket, in addition to the use of the sheaves s , s , and the weights w , w , to the extent of its diminution of the resistance of the weight of the rope A, in opposing the opening of the jaws, as said rope must necessarily be wound upon the sheave a by the opening of the jaws. This diminution of the tension of the rope A is made manifest by the sagging of only a short portion of the entire length of the same, indicated by the dotted lines A', Fig. 1.

When shovels such as herein described are hung by an opening rope, such rope tends to open and rewind the closing rope, but, as said closing rope is heavily geared against such movement, a relatively trifling resistance in a long line of closing rope is liable to prevent the shovel from opening, or cause serious difficulty in opening the same. The sheaves s , s , on the jaws of the shovel herein described, give the opening rope a double purchase to overcome this multiplied resistance in the closing rope, and, in conjunction with the supports R', r' , and weights w , facilitate the opening of the jaws of the shovel.

In Fig. 3, the bucket V is shown in connection with the loading or discharge of a boat N under one end of the tramway. For the sake of clearness of illustration said

bucket is also shown in dotted lines in two different positions on the tramway.

The advantages of my invention are simplicity of construction and certainty in operation. The ropes connecting the engine, trolley and shovel serve the purpose not only of running the trolley but of operating the bucket or shovel, raising, lowering, opening and closing it. All running-blocks or sheaves between the trolley and the shovel are dispensed with; thus permitting the shovel to be elevated close to the trolley and obviating back-pull on the opening rope which has heretofore seriously opposed the opening of the jaws of the shovel. The complete operation of loading and discharging at points either near or remote from each other, may be readily effected by a single attendant's manipulations of the winding engine.

All shovels of the class herein described, which are intended to remain closed with their loads, must have the opening and closing lines taut, for, if the closing line were to slacken, the shovel would open and drop its load. In devices heretofore used, when the hoist or transfer is long and the trolley held by moving lines, both the opening and closing ropes must be overhauled at an equal rate, and hence the mechanical difficulty has arisen of the necessity for having both of the hoisting drums of the engine vary exactly the same in diameter. Even if both drums wind with but a single layer of rope this is difficult where the hoisting distance is great, and if a double layer of rope, that is one layer winding over another be employed, the change from lower to upper layer must take place at the same instant—almost a mechanical impossibility—in order that the practical diameters of the drums shall not be made proportionally different. In addition to this difficulty the moving lines on the friction drum employed, must be manipulated, during the entire operation, at the same time as the hoisting drums.

In my device above described, it is not only unnecessary to use the line *c* when moving the trolley, but said line is intended to be free, leaving only the hoisting lines to be attended to by the operator, said line *c*, being merely a means to stop the trolley, not to move it. By having the trolley free and the hoisting lines, *A* and *B*, leading from the trolley in opposite directions, the necessity of equally overhauling said lines is avoided, for if one line, say the closing line, slackens, the balance in the trolley from the pull of the two lines in opposite directions is disturbed and the trolley instantly moves until the tension on the two lines is restored. This construction thus permits of the use of small hoisting drums with several layers of line in a long transfer and compensates or provides for any inequality in the diameters of the drums. It will also be observed that the strain in this device is only one-half the weight of the

shovel pulling in opposite directions on the trolley.

While I prefer to employ an engine such as shown in Figs. 4 and 5 to operate this apparatus, any other suitable winding machinery to perform similar functions may be substituted therefor, without departing from my invention.

I do not confine myself to any particular form of bucket or shovel, as, while I prefer to use a bucket such as shown in the drawings, any suitable form of bucket may be employed.

Having thus fully described my invention, I claim—

1. In a self-loading and conveying apparatus, the combination of a supporting tramway; a carriage or trolley running thereon; a winding engine; a bucket or shovel provided with opening and closing jaws; and opening and closing ropes connecting the trolley to the engine by leading from the trolley in opposite directions over sheaves on the trolley; each of said ropes having one end connected to the shovel and its other end to the winding-mechanism of the engine; whereby the shovel, by the action of said winding mechanism, may be raised to different elevations and the trolley moved in either direction, at any point of the bucket's elevation.

2. In a self-loading and conveying apparatus, the combination of a supporting tramway; a carriage or trolley running thereon; a winding engine; a bucket or shovel provided with opening and closing jaws; and opening and closing ropes connecting the trolley to the engine by leading from the trolley in opposite directions over sheaves on the trolley; each of said ropes having one end connected to the shovel and its other end to the winding mechanism of the engine, and said closing rope being intermediately supported at intervals by sheaves distributed on the line of the tramway; whereby the tendency of the weight of the closing rope to close the jaws of the shovel is diminished, and the shovel, by the action of said winding-mechanism, may be raised to different elevations and the trolley moved in either direction, at any point of the bucket's elevation.

3. In a self-loading and conveying apparatus, the combination of a supporting tramway; a carriage or trolley running thereon; a winding engine; a bucket or shovel provided with opening and closing jaws; and opening and closing ropes connecting the trolley to the engine by passing over sheaves on the trolley; each of said ropes having one end connected to the winding mechanism of the engine, the other end of the closing rope being connected to closing mechanism on the shovel and the other end of the opening rope being provided with a bifurcation passing around a sheave on each jaw of the shovel, the end of each bifurcation being secured to the frame or body of the shovel; for the purposes set forth.

4. In a self-loading and conveying apparatus, the combination of a supporting tramway; a carriage or trolley running thereon; a winding engine; a bucket or shovel provided with opening and closing jaws; and opening and closing ropes connecting the trolley to the engine by passing over sheaves on the trolley; said closing rope being intermediately supported at intervals by sheaves distributed on the line of the tramway and having one of its ends connected to the winding mechanism of the engine and its other end to closing mechanism on the shovel; and said opening rope having one of its ends connected to the winding mechanism of the engine and its other end provided with a bifurcation passing around a sheave on each jaw of the shovel, the end of each bifurcation being secured to the frame of the shovel; for the purposes set forth.

5. In a self-loading and conveying apparatus, the combination of a supporting tramway, a carriage or trolley running thereon, means substantially as described for arresting the travel of said trolley at will at any point, a bucket or shovel provided with opening and closing jaws, and a winding engine provided with two lines of operating ropes for opening and closing said jaws, each one of said ropes connecting the trolley to the engine and the shovel to the trolley, for the purposes set forth.

6. In a self-loading and conveying apparatus, the combination of a supporting tramway, a carriage or trolley running thereon, means substantially as described for arresting the travel of said trolley at will at any point, a bucket or shovel provided with opening and closing jaws, and a winding engine provided with two lines of operating ropes for opening and closing said jaws, each one of said ropes connecting the trolley to the engine and the shovel to the trolley and leading from the trolley in opposite directions, for the purposes set forth.

7. In a self-loading and conveying apparatus, the combination of a supporting tramway, a carriage or trolley running thereon, an idler drum provided with a brake, a rope coiled around said drum and having one end connected to each end of said trolley, a bucket or shovel provided with opening and closing jaws, and a winding engine provided with two lines of operating ropes for opening and closing said jaws, each one of said ropes connecting the trolley to the engine and the shovel to the trolley, for the purposes set forth.

8. In a self-loading and conveying apparatus, the combination of a supporting tramway, a carriage or trolley running thereon, an idler drum provided with a brake, a rope coiled around said drum and having one end connected to each end of said trolley, a bucket or shovel provided with opening and closing jaws, and a winding engine provided with

two lines of operating ropes for opening and closing said jaws, each one of said ropes connecting the trolley to the engine and the shovel to the trolley, and leading from the trolley in opposite directions, for the purposes set forth.

9. In a self-loading and conveying apparatus, the combination of a supporting tramway, a carriage or trolley running thereon, a bucket or shovel provided with opening and closing jaws, a closing rope connected to said jaws and supported at suitable intervals throughout its length, an idler drum provided with a brake, and a rope coiled around said drum and having one end connected to each end of said trolley, for the purposes set forth.

10. In a self-loading and conveying apparatus, the combination of a supporting tramway, a carriage or trolley running thereon; a winding engine; a bucket or shovel having opening and closing jaws each provided with a sheave, as *s*, *s*; a closing rope connected to said jaws; and a rope for opening said jaws, running on said sheaves so as to increase its opening pull upon said jaws; substantially as set forth.

11. In a self-loading and conveying apparatus, the combination of a supporting tramway; a carriage or trolley running thereon; a winding engine; a bucket or shovel having opening and closing jaws each provided with a sheave; a closing rope connected to said jaws; and a bifurcated opening rope passing around said sheaves and having its ends secured to the shovel; whereby the opening pull of said opening rope is increased; substantially as set forth.

12. In a self-loading and conveying apparatus, the combination of the following named elements: a supporting tramway; a carriage or trolley running thereon; a bucket or shovel having opening and closing jaws; a hoisting engine having two drums loosely mounted on shafts, having gears, as *g*, secured thereon in mesh with a driving pinion, as *p*, and provided with a gear, as *g'*, fast on its shaft, in mesh with a loose gear, as *g''*, said drums and gears *g* and *g''* being provided with suitable friction surfaces, as *d*, for respectively coupling the same; and opening and closing ropes connecting the trolley to the engine by leading from the trolley in opposite directions over sheaves on the trolley; each of said ropes having one end connected to the shovel and its other end to the winding mechanism of the engine; whereby, while the shovel is held closed at any desired point of elevation, the trolley may be moved positively in either direction by the winding drums, substantially as set forth.

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