

O. JOHNSON, DEC'D.

N. JOHNSON, ADMINISTRATRIX.

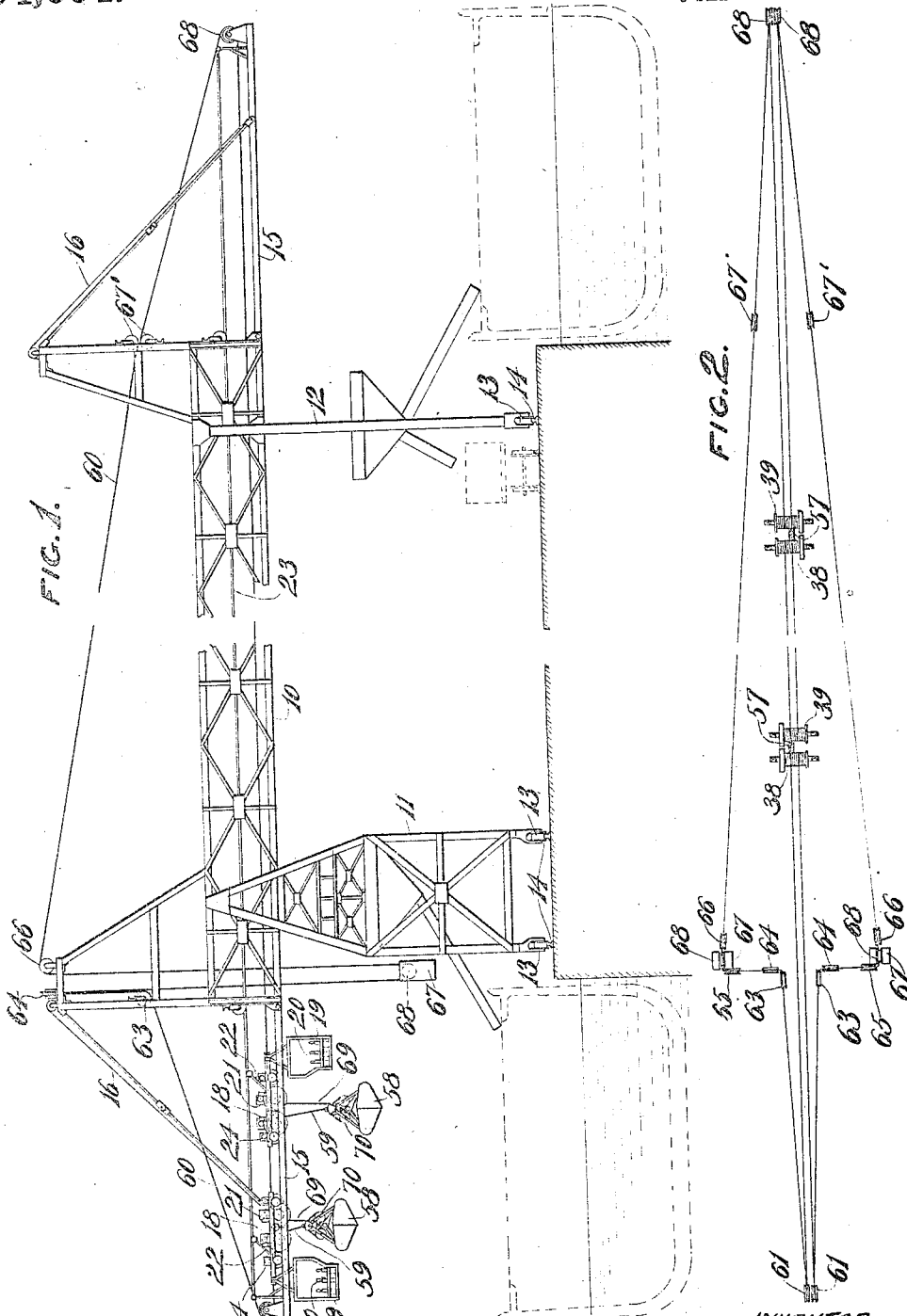
APPARATUS FOR ELEVATING, TRANSPORTING, AND DISCHARGING MATERIAL.

APPLICATION FILED JAN. 15, 1909.

Patented May 30, 1911.

3 SHEETS—SHEET 1.

994,004.



WITNESSES.

*W. E. Thayer*  
*Amos E. Schmitt*

*Nikoline Johnson, Administratrix,*  
*of Olet, Johnson, son, Dec'd.*  
*By Benedict, Morsell & Caldwell,*  
**ATTORNEYS.**

O. JOHNSON, DEC'D.

N. JOHNSON, ADMINISTRATRIX.

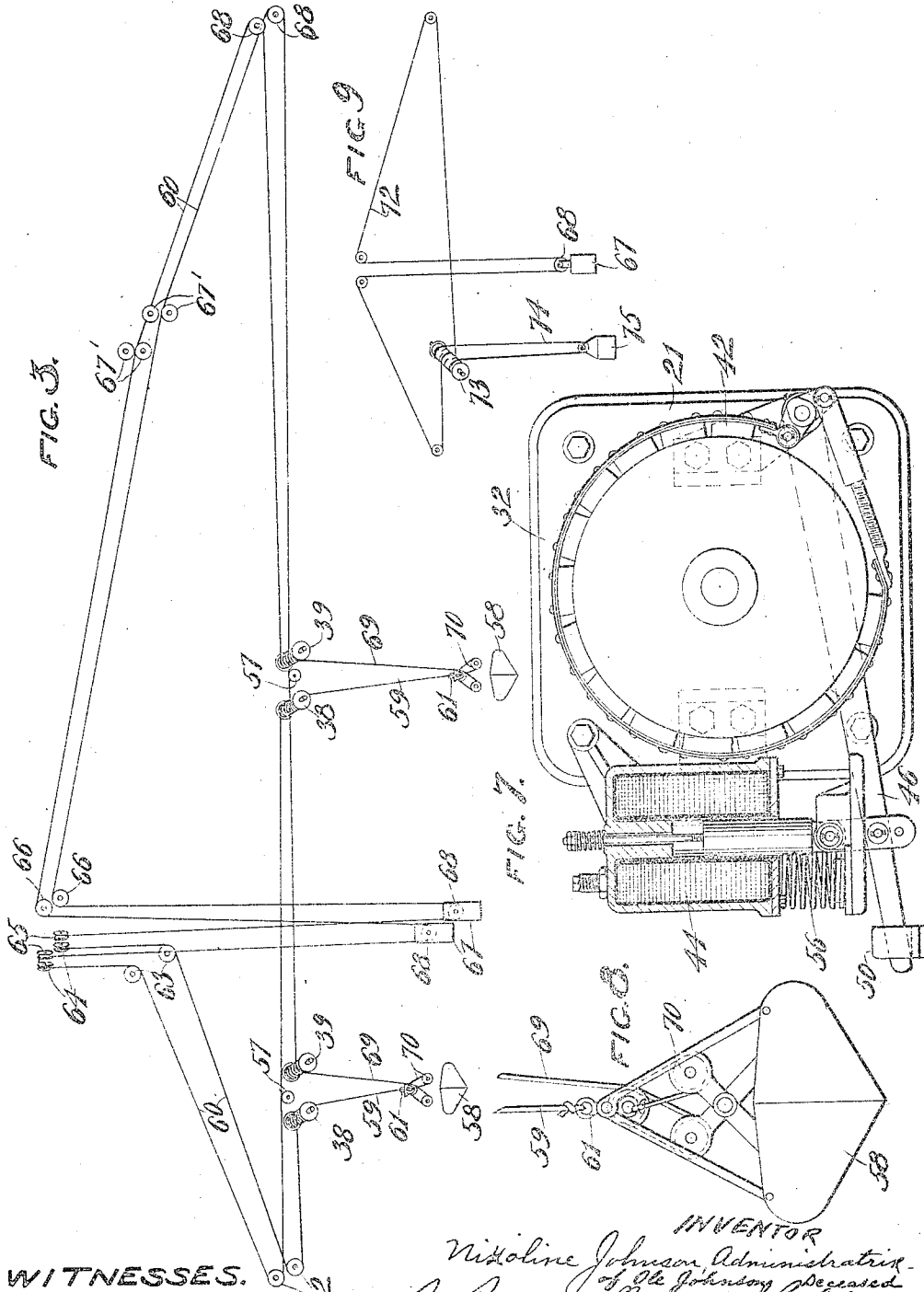
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3 SHEETS-SHEET 2.

994,004.



WITNESSES.

*J. E. Thurner*  
*Anna E. Schmidtbauer*

INVENTOR  
*Nicholine Johnson Administratrix*  
*of O. Johnson Deceased*  
By *Benedict Mossell Caldwell*

ATTORNEYS.

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3 SHEETS—SHEET 3.

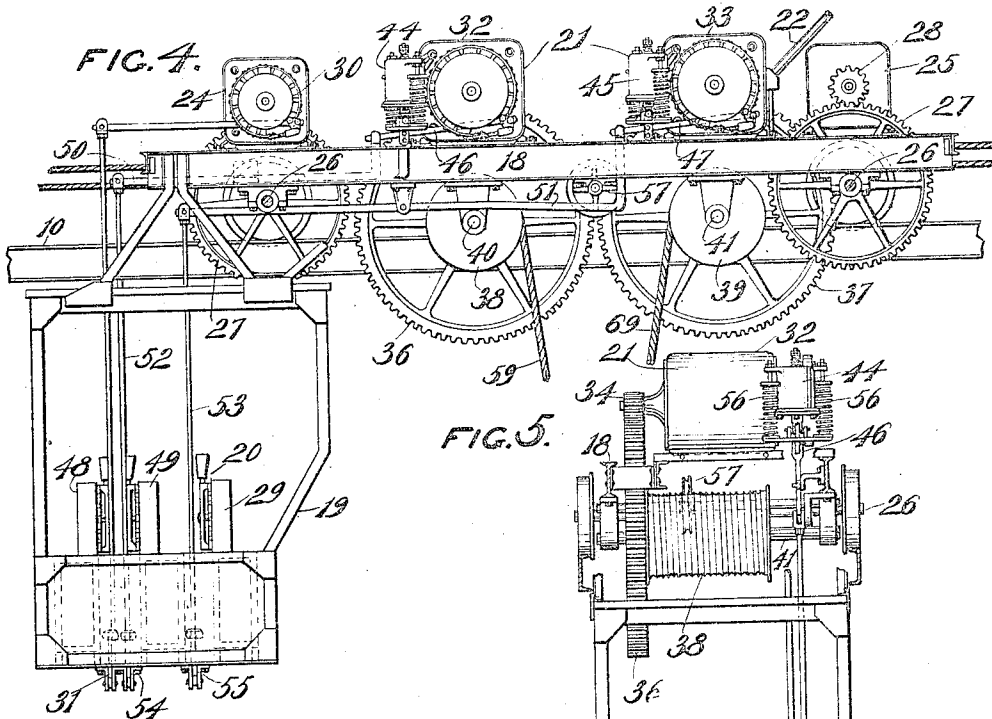


FIG. 5.

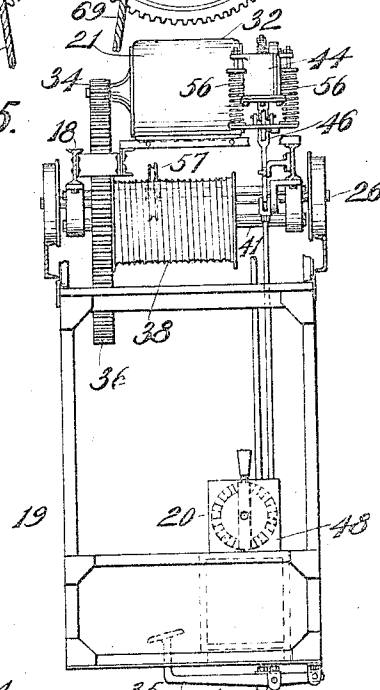
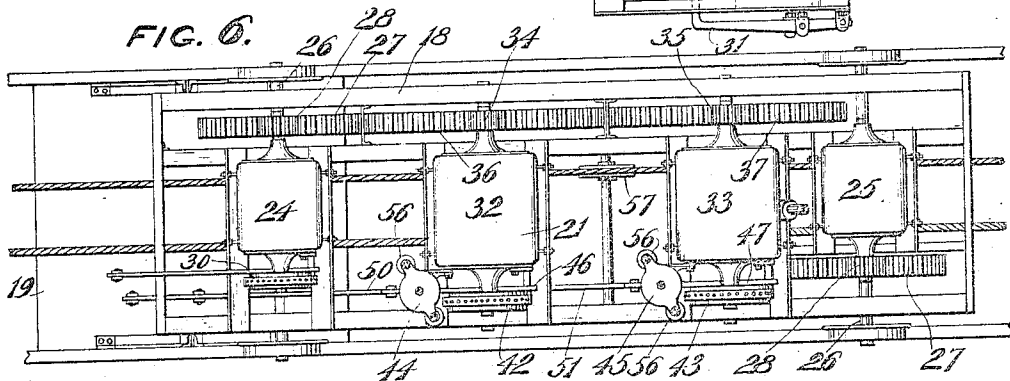


FIG. 6.



WITNESSES.

*L. J. Thuermer*  
*Anna E. Schmittbauer*

*Nikoline Johnson, Administratrix*  
*By Benedict, Morrill & Caldwell*  
ATTORNEYS.

# UNITED STATES PATENT OFFICE.

NIKOLINE JOHNSON, OF MILWAUKEE, WISCONSIN, ADMINISTRATRIX OF OLE JOHNSON, DECEASED.

APPARATUS FOR ELEVATING, TRANSPORTING, AND DISCHARGING MATERIAL.

994,004.

Specification of Letters Patent.

Patented May 30, 1911.

Application filed January 15, 1909. Serial No. 472,405.

*To all whom it may concern:*

Be it known that OLE JOHNSON, deceased, late a citizen of the United States and a resident of Milwaukee, in the county of Milwaukee and State of Wisconsin, invented new and useful Improvements in Apparatus for Elevating, Transporting, and Discharging Material, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

This invention has relation to improvements in apparatus for elevating, transporting and discharging material, and more particularly to that class of apparatus in which the power operating medium is carried directly on the carriage.

One of the objects of this invention is to provide a construction whereby a plurality of carriages carrying material holding receptacles are adapted to travel to and fro on the same track independently of each other or jointly, thereby increasing the capacity of an apparatus of given size.

A further object of the invention is to provide a construction in which the material holding receptacles are independently counterbalanced with counterweights.

A still further object of the invention is to provide a construction in which the material holding receptacles are counterbalanced by means of counterweights acting on both the hoisting cables and on the receptacle opening cables whereby either cable may be relieved of the effects of the counterweight while the other cable is performing its function. Another advantage derived from this construction is that the size and weight of the counterweights are reduced to the minimum.

A further object of the invention is to provide a construction in which the movement of the cables for raising and lowering the material holding receptacles is controlled both electrically and nonelectrically.

With the above, and other objects in view, the invention consists of the apparatus and its parts, and all equivalents thereof, as hereinafter more fully set forth.

Referring to the drawings in which the same reference characters indicate the same parts in all of the views; Figure 1 is a view

in side elevation of the complete apparatus embodying the improvements, a medial portion removed to reduce its length; Fig. 2 is a diagrammatic plan view of the cables of the apparatus and the pulleys and drums in connection therewith; Fig. 3 is a diagrammatic perspective view of the cable system shown in connection with the pulleys, drums, counterweights and material holding receptacles; Fig. 4 is an enlarged side view of one of the carriages; Fig. 5 is an end view of one of the carriages, parts broken away and other parts in section; Fig. 6 is a plan view of one of the carriages; Fig. 7 is an end view of one of the carriage motors with a magnetically operated brake connected thereto, the solenoid being in section; Fig. 8 is an enlarged detail view of the material holding receptacle showing the path of the cable in connection therewith; and, Fig. 9 is a diagrammatic perspective view of a modified form of cable system.

Referring to the drawings, the numeral 10 indicates the bridge which is supported on piers 11 and 12 provided with wheels 13 adapted to travel on the rails of the track 14. The bridge is provided with hinged booms 15 on both ends for convenience in loading or unloading material from boats alongside of docks on which the apparatus is located. The bridge, piers and booms are formed of structural metal in the ordinary way and may be of any shape, length or height desired. The booms 15 may be swung upwardly by means of the adjusting cables 16 in order to avoid obstructions in the path of movement of the booms when in their lowermost position and when being moved horizontally by the bridge and piers traveling on the rail tracks. The bridge and booms are provided with horizontally positioned channel irons 17 forming part of the bridge and piers and also serving as rails or a trackway for carriages 18 to travel thereon. These carriages, which are similar in construction with the exception that they are reversed endwise, are provided with cabs 19 depending therefrom and containing electric controllers 20 for controlling motors 21 positioned on the frames of the carriages. The motors are supplied with current by means of the trolley poles 22 traveling on

the trolley wire 23 positioned above and extending parallel with the channel iron tracks. Each carriage is provided with four motors, two of which, indicated by the numerals 24 and 25 are adapted to propel the carriage on the bridge track and the other two are for operating the material holding receptacle cables. Axles 26 extending transversely of each carriage frame and connected thereto are provided with wheels which travel on the channel iron tracks of the bridge. These axles have mounted thereon large gears 27 which mesh with pinions 28 mounted on the shafts of the propelling motors and are driven thereby to propel the carriage. The two propelling motors are both controlled by means of the electric controller 29 in the cab 19. The motor 24 is provided with a brake 30 which is connected to and operated by a foot lever 31 located within the cab, so that the operator within the cab has complete control of the travel, and the starting and stopping of the carriage by means of the controller and the foot operated brake. The two motors 32 and 33 are provided with pinions 34 and 35 meshing with gears 36 and 37 to which rope or cable winding drums 38 and 39 respectively are connected. These drums are mounted on shafts 40 and 41 having bearings depending from the carriage frame 18.

The motors 32 and 33 are each provided with brakes 42 and 43 which are electromagnetically operated by means of solenoids 44 and 45, the cores of which are connected to brake levers 46 and 47. In these solenoid-operated brakes, which are of ordinary construction, the brakes are normally in an on position with the braking effect applied to the motors when the motors are not energized thus automatically preventing the retrograde movement of the drums when current is shut off from the motors, and the solenoids are adapted to release the brakes when the current is supplied to the motors and the solenoids. The degree of the brake release depends upon the regulation of the current supplied by the controllers 48 and 49 within the cage. The controllers 48 and 49 are also adapted to reverse the direction of rotation of the motors 32 and 33.

It is desirable and economical at times to permit the rotation of the drums by the gravity of the load suspended therefrom without the necessity of supplying current to the motors and the solenoids, and to accomplish this result levers 50 and 51 pivotally connected to the carriage and having inner bifurcated ends which engage the outer ends of the brake levers 46 and 47 are provided. The outer ends of these levers are connected by means of rods 52 and 53 to foot operated levers 54 and 55 located within the cab 19. By the provision of the bifurcated ends of the levers the brake levers

are free to be drawn upwardly by the cores of the solenoids without any movement being imparted to the foot operated levers, and when it is desired to release the brakes manually a simple pressure of the foot levers will lift the brake levers and release the motor armatures from the brake effect and the armatures will run idle and permit the rotation of the drums and the lowering of the load by gravity at a speed depending upon the extent to which the motors are relieved of the brake effect. The solenoids are provided with springs 56 which assist in holding the brakes in the normal full on position.

Each carriage is provided with an idle pulley 57 which is adapted to support and guide the cable, which passes therethrough and is connected to the other carriage.

Referring now to the rope or cable system which is one of the important and novel features whereby both carriages are enabled to travel back and forth on the same track and by which the effect of the counterweight may be transferred from one cable to another or to both cables of the same carriage, the numeral 58 indicates the grabs or material holding receptacles, which are in this case clam shell buckets, adapted to be suspended from the carriages by the hoisting ends 59 of the cables 60 which are connected to eyes 61 with which the buckets are provided. Each hoisting end 59 of the cables 60 extends from its respective bucket to the hoisting drums 38 and are wound around said drums a number of times and extend therefrom to and around pulleys 62 mounted on the end of the front boom. From these pulleys the cables 60 extend rearwardly at an upward incline and pass beneath and around pulleys 63 mounted on standards forming part of the bridge. The cables then extend vertically from said pulleys and pass over pulleys 64 and depend downwardly and upwardly in a loop from pulleys 65 and 66 all of which are mounted on the top of said standard. Counterweights 67 provided with pulleys 68 are suspended from the loops in the cables and serve to substantially counterbalance the weight of the buckets. The cables then extend rearwardly from the pulleys 66 to and between guide pulleys 67 mounted on the rear standard of the bridge and around pulleys 68 mounted on the end of the rear boom. From these pulleys the cables return to their respective carriages and wind around the bucket opening and closing drums 39 and depend therefrom as bucket opening and closing ropes or cables 69. The depending cables 69 then extend to and around the bucket opening and closing pulleys 70 forming part of the clam shell bucket jaw opening mechanism in the ordinary way and are finally connected to eyes 61 forming part thereof. Each cable in

passing through the carriage other than the one to which it is connected is supported and guided by the pulley 57 as before mentioned.

5 In the modified form shown in Fig. 9 only one drum is used which is desirable in some cases where an ordinary bucket is used and it is unnecessary to provide a bucket opening and closing cable. In this  
10 modified form both ends of a cable 72 are connected to and wound around the drum 73 a number of times and extend back and forth in the direction of the line of travel of the carriage and over guide pulleys and  
15 is provided with a counterweight substantially in the same manner as in the principal form. A hoisting cable 74 the ends of which are wound around and connected to the drum 73 depends therefrom in a loop  
20 which is adapted to support the bucket 75 and by means of the provision of the loop to compensate for unequal strain on the cable caused by unequal winding of the ends of the cable on the drum.

25 In operating the apparatus the carriages are propelled back and forth on the track by means of the propelling motors mounted on each carriage which receive current from the trolley wire by means of the trolley poles and connections, and are controlled by the  
30 operators within the cabs by means of the electric controllers. The foot levers for operating the motor controlling brakes also being located within the cabs, the operators  
35 are enabled to control the exact positions which it is desired to stop the carriages for the purpose of loading or unloading the buckets.

40 The buckets may be raised or lowered in a closed position by the operation of motors controlling the respective cable drums and when it is desired to open a bucket, the hoisting cable is held taut and the opening and closing rope is paid out permitting the  
45 jaws of the bucket to open by gravity or the opening and closing cable may be paid out at a faster rate of speed than the hoisting cable in lowering the bucket and the same results obtained. By means of the manu-  
50 ally operated brakes connected to the drum motors, the buckets may be lowered or opened, or both, without the necessity of providing the motors with current thus providing a very economically operated appa-  
55 ratus.

By the provision and novel arrangement of the cables passing through the carriage other than the one to which each particular cable is connected two carriages are adapted  
60 to travel back and forth on the same track together or they may be simultaneously operated on different portions of the track without in any way interfering with each other as each cable travels freely through  
65 the carriage other than the one to which it

is connected thus substantially doubling the capacity and expediency of the apparatus at comparatively slight increase in first cost and operating expense. As both cables extend in the direction of the line of travel of  
70 the carriages, the buckets connected to the carriages will be counterbalanced by the counterweights in all positions to which the carriages may be moved unless it is desired to relieve the buckets of such counterbal-  
75 ancing effect. If it is desired to relieve the buckets of the effect of the counterweights the cables located between the buckets and one of the drums of each carriage are slackened by releasing the brakes and by operat-  
80 ing the controllers to reversely turn the motors and the drums and lift the weights the strain of the counterweights will then be directly carried by the drums and the buckets will be relieved of the full effects of  
85 said counterweights. By means of the novel arrangement of both ends of each cable being connected to a drum it is only necessary to provide counterweights of one half the weight that would be required in a construc-  
90 tion in which one end of each cable was connected directly to the carriage instead of the drum, although in some cases one end of the cable may be so connected.

Both drums being similar in construction  
95 and operation it is obvious that the jaw opening and closing means of the buckets may be connected to the cable depending from either drum without changing the construction or operation of the apparatus and  
100 the same results will be obtained.

It is obvious that one of the carriages and the cables connected thereto may be removed from the bridge and the apparatus used in connection with a single carriage  
105 and bucket or that the modified form of construction in which only one carriage provided with a single drum is shown may be used in connection with another single drum carriage and cable connection similar to the  
110 principal form without departing from the spirit and scope of the invention. It is also obvious that the portions of the cables which depend from the drums and are connected to the receptacles may be separate from the  
115 cables which extend in the direction of the line of travel of the carriages. In this case, it is only necessary to have the ends of the cables wound around the drums and be connected thereto and the same results will be  
120 obtained as if the cables were in one piece.

In the specification and claims, for convenience, the statement has been used that the counterweights counterbalance the receptacles, when as a matter of fact they only  
125 substantially counterbalance said receptacles.

What is claimed is:

1. An apparatus for elevating, transporting, and discharging material, comprising a track, a carriage provided with a material  
130

holding receptacle adapted to travel on said track, a cable connected to said carriage and extending in the direction of the line of travel of said carriage, another carriage  
5 mounted on said track and provided with a material holding receptacle, and a cable connected to said last mentioned carriage and extending in the direction of the line of travel of said carriage, both cables extend-  
10 ing substantially parallel with relation to each other for a certain distance and each cable also extending beyond the carriage other than the one to which it is connected.

2. An apparatus for elevating, transport-  
15 ing, and discharging material, comprising a track, a carriage provided with a material holding receptacle adapted to travel on said track, a cable connected to said carriage and extending in the direction of the line of  
20 travel of said carriage, another carriage mounted on said track and provided with a material holding receptacle, and a cable connected to said last mentioned carriage and extending in the direction of the line of  
25 travel of said carriage, both cables extending substantially parallel with relation to each other for a certain distance and each cable also extending in the direction of the line of travel of said carriages beyond the  
30 carriage other than the one to which it is connected.

3. An apparatus for elevating, transport-  
ing, and discharging material, comprising a  
35 track, a carriage provided with a material holding receptacle adapted to travel on said track, a cable connected to said carriage and extending in the direction of the line of travel of said carriage, a counterweight asso-  
40 ciated with said cable, another carriage mounted on said track and provided with a material holding receptacle, a cable connected to said last mentioned carriage and extending in the direction of the line of  
45 travel of said carriage, and a counterweight associated with said last mentioned cable, both cables extending substantially parallel with relation to each other for a certain distance and each cable also extending beyond  
50 the carriage other than the one to which it is connected.

4. An apparatus for elevating, transport-  
ing, and discharging material, comprising a  
55 track, a plurality of carriages adapted to travel on said track and provided with material holding receptacles, drums mounted on the carriages, cables connected to said drums and extending in the direction of the line of travel of said carriages in substan-  
60 tially parallel lines with relation to each other for a certain distance and each cable also extending in the same direction beyond the carriage other than the one to which it is connected, and counterweights associated with the cables to counterbalance the mate-  
65 rial holding receptacles.

5. An apparatus for elevating, transport-  
ing, and discharging material, comprising a  
track, a plurality of carriages adapted to  
travel on said track and provided with ma-  
terial holding receptacles, drums mounted  
70 on the carriages, cables connected to said receptacles and drums and extending in the direction of the line of travel of the carriages in substantially parallel lines with relation to each other for a certain distance  
75 and each cable also extending in the same direction beyond the carriage other than the one to which it is connected, loops formed in said cables, and counterweights associated with the loops of the cables to counterbal-  
80 ance the material holding receptacles.

6. An apparatus for elevating, transport-  
ing, and discharging material comprising a  
track, a plurality of carriages adapted to  
travel on said track and provided with ma-  
85 terial holding receptacles, drums mounted on the carriages, cables connected to said drums and extending in the direction of the line of travel of said carriages in substan-  
90 tially parallel lines with relation to each other for a certain distance and each cable also extending in the same direction beyond the carriage other than the one to which it is connected, counterweights associated with  
95 said cables to counterbalance the material holding receptacles, and means for relieving the receptacles of the full effect of said counterweighting means.

7. An apparatus for elevating, transport-  
ing, and discharging material, comprising a  
100 track, a plurality of carriages adapted to travel on said track and provided with material holding receptacles, drums mounted on the carriages, cables connected to said re-  
105 ceptacles and drums and extending in the direction of the line of travel of the carriages in substantially parallel lines with relation to each other for a certain distance and each cable also extending in the same  
110 direction beyond the carriage other than the one to which it is connected, loops formed in said cables, counterweights suspended from the loops formed in said cables to counter-  
115 balance the material holding receptacles, and means for relieving the receptacles of the full effect of said counterweighting means.

8. An apparatus for elevating, transport-  
ing, and discharging material, comprising a  
120 track, a plurality of carriages adapted to travel on said track and provided with material holding receptacles, drums mounted on the carriages, cables connected to said recep-  
125 tacles and drums and extending in the direction of the line of travel of the carriages in substantially parallel lines with relation to each other for a certain distance and each cable also extending in the same direction be-  
130 yond the carriage other than the one to which it is connected, loops formed in said

cables, counterweights suspended from the loops formed in said cables to counterbalance the material holding receptacles, and means for lessening the effect of said counterweighting means on said receptacles.

9. An apparatus for elevating, transporting, and discharging material, comprising a track, a plurality of carriages adapted to travel on said track and provided with material holding receptacles, drums mounted on the carriages, cables connected to said receptacles and drums and extending in the direction of the line of travel of the carriages in substantially parallel lines with relation to each other for a certain distance and each cable also extending in the same direction beyond the carriage other than the one to which it is connected, guiding means provided on each carriage for guiding the cable connected to the carriage other than the one on which the guiding means is provided, loops formed in said cables, and counterweights associated with the loops of the cables to counterbalance the material holding receptacles.

10. An apparatus for elevating, transporting, and discharging material, comprising a track, a plurality of carriages adapted to travel on said track and provided with material holding receptacles, drums mounted on the carriages, cables connected to said receptacles and drums and extending in the direction of the line of travel of the carriages in substantially parallel lines with relation to each other for a certain distance and each cable also extending in the same direction beyond the carriage other than the one to which it is connected, a guide roller provided on each carriage for guiding the cable connected to the carriage other than the one on which the guide roller is provided, loops formed in said cables, and counterweights associated with the loops of the cables to counterbalance the material holding receptacles.

11. An apparatus for elevating, transporting, and discharging material, comprising a track, a plurality of carriages adapted to travel on said track, material holding receptacles having opening and closing jaws provided for each carriage, drums mounted on each carriage, brakes for retarding the movement of said drums, cables connected to said receptacles and wound around said drums and extending in the direction of the line of travel of said carriages in substantially parallel lines with relation to each other for a certain distance and each cable also extending in the same direction beyond the carriage other than the one to which it is connected, loops formed in said cables, counterweights suspended from the loops formed in said cables to counterbalance the material holding receptacles, means for driving said drums in either direction, and con-

trolling means for controlling the movements of the carriages, the operation of the brakes and the rotation of the drums.

12. An apparatus for elevating, transporting, and discharging material, comprising a track, a plurality of carriages adapted to travel on said track, material holding receptacles having opening and closing jaws provided for each carriage, receptacle hoisting drums mounted on the carriages, cables connected to the receptacles and wound around said drums, opening and closing drums mounted on said receptacles, cables connected to the opening and closing mechanism of said receptacles and wound around said opening and closing drums, a cable for each carriage extending in the direction of the line of travel of the carriages and passing around guiding devices at opposite ends of the track and wound, one end around the hoisting drum and the other end around the opening and closing drum of each carriage, said cables extending in substantially parallel lines with relation to each other for a certain distance, loops formed in said cables, counterweights suspended from said loops to counterbalance the receptacles, brakes for retarding the movement of each drum, means for driving said drums in either direction, means for automatically setting the brakes when current is shut off from the motors, and controlling means for controlling the movements of the carriages, the operation of the brakes and the rotation of the drums.

13. An apparatus for elevating, transporting, and discharging material, comprising a track, a plurality of carriages adapted to travel on said track, material holding receptacles having opening and closing jaws provided for each carriage, receptacle hoisting drums mounted on the carriages, cables connected to the receptacles and wound around said drums, opening and closing drums mounted on said carriages, cables connected to the opening and closing mechanism of said receptacles and wound around said opening and closing drums, a cable for each carriage extending in the direction of the line of travel of the carriages and passing around guiding devices at opposite ends of the track and wound, one end around the hoisting drum and the other end around the opening and closing drum of each carriage, said cables extending in substantially parallel lines with relation to each other for a certain distance and each cable also extending in the same direction beyond the carriage other than the one to which it is connected, a guiding means provided on each carriage for guiding the cable connected to the carriage other than the one on which the guiding means is provided, loops formed in said cables, counterweights suspended from said loops to counterbalance the receptacles, brakes for retarding the movement of each



drum, means for driving said drums in either direction, means for automatically setting the brakes when the current is shut off from the motors, and controlling means  
5 for controlling the movements of the carriages, the operation of the brakes and the rotation of the drums.

14. An apparatus for elevating, transporting, and discharging material, comprising a  
10 track, a carriage provided with a material holding receptacle adapted to travel on said track, a drum mounted on said carriage, a cable connected to said receptacle and wound  
15 around said drum, a cable extending in the direction of the line of travel of the carriage and passing around guiding devices at opposite ends of the track and having one end wound on the drum and the other  
20 end connected to the carriage, a loop formed in said last mentioned cable, a counterweight suspended from said loop to counterbalance the receptacle, driving means for said drum, a brake connected to the carriage for automatically retarding or preventing retrograde  
25 movement of the drum when power supply is diminished or shut off from the driving means, other means for rendering the automatic portion of the brake inoperative to permit a retrograde movement of the drum  
30 when the power supply is diminished or shut off from the driving means, and controlling means available to an operator carried by the carriage for controlling the movement of the carriage, the operation of the brake  
35 and the driving of the drum.

15. An apparatus for elevating, transporting, and discharging material, comprising  
40 a track, a self propelled carriage adapted to travel on said track, a hoisting drum mounted on said carriage, a material holding receptacle provided with jaw opening and closing mechanism, a hoisting cable connected to the receptacle and wound around the hoisting  
45 drum, an opening and closing drum mounted on the carriage, a cable connected to the opening and closing mechanism of the receptacle and wound around the opening and closing drum, a cable having portions  
50 thereof wound on both drums and extending in the direction of the line of travel of the carriage and passing around guiding devices at opposite ends of the track, a loop formed in said last mentioned cable, a counterweight suspended from said loop to counterbalance the receptacle, driving means for  
55 said drums, brakes connected to the carriage for automatically retarding or preventing retrograde movement of the drums when power supply is diminished or shut  
60 off from the driving means, and controlling means available to an operator carried by the carriage for controlling the movement of the carriage, the operation of the brakes, the driving of the drums and the opening  
65 and closing of the receptacle jaws.

16. An apparatus for elevating, transporting, and discharging material, comprising a track, a self propelled carriage adapted to travel on said track, a hoisting drum mounted on said carriage, a material holding  
70 receptacle provided with jaw opening and closing mechanism, a hoisting cable connected to the receptacle and wound around the hoisting drum, an opening and closing drum mounted on the carriage, a cable connected  
75 to the opening and closing mechanism of the receptacle and wound around the opening and closing drum, a cable having portions thereof wound on both drums and extending in the direction of the line of travel of  
80 the carriage and passing around guiding devices at opposite ends of the track, a loop formed in said last mentioned cable, a counterweight suspended from said loop to counterbalance the receptacle, driving means for  
85 said drums, a brake connected to the carriage for automatically retarding or preventing retrograde movement of the drums when power supply is diminished or shut off from the driving means, other means for  
90 rendering the automatic portion of the brake inoperative to permit a retrograde movement of the drum when the power supply is diminished or shut off from the driving means, and controlling means available to  
95 an operator carried by the carriage for controlling the movement of the carriage, the operation of the brakes, the driving of the drums and the opening and closing of the receptacle jaws.  
100

17. An apparatus for elevating, transporting, and discharging material, comprising  
105 a track, a self propelled carriage adapted to travel on said track, a hoisting drum mounted on said carriage, a material holding receptacle provided with jaw opening and closing mechanism, a hoisting cable connected to the receptacle and wound around the hoisting drum, an opening and closing  
110 drum mounted on the carriage, a cable connected to the opening and closing mechanism of the receptacle and wound around the opening and closing drum, a cable having portions thereof wound on both drums and extending in the direction of the line of  
115 travel of the carriage and passing around guiding devices at opposite ends of the track, a loop formed in said last mentioned cable, a counterweight suspended from said loop to counterbalance the receptacle, electric  
120 motors mounted on the carriage for rotating the drums, brakes operatively connected to the shafts of said motors, magnetic means for automatically applying the brakes to said motors when the current  
125 supply is diminished or shut off from said motors to retard or prevent retrograde rotation of the drums, levers available to an operator carried by the carriage for releasing the brakes when said brakes are auto-  
130

atically set by the shutting off of the current supply, and other controlling means available to said operator for controlling the movement of the carriage, the operation of the brakes and drum motors and the opening and closing of the receptacle jaws.

18. An apparatus for elevating, transporting, and discharging material, comprising a track, a carriage provided with wheels and shafts adapted to travel on said track, a motor mounted on said carriage and having geared connection with one of the shafts, a brake for said motor, a cab carried by the carriage, a foot lever connected to the cab for operating the brake, a controller carried by the cab for controlling the motor, transverse shafts provided with gears and mounted in bearings connected to said carriage, electric motors mounted on said carriage and provided with pinions in mesh with said gears, brakes for retarding the rotation of said motors, brake levers for operating said brakes, manually operated levers available to an operator within the cab for moving the brake levers to release the brakes, magnetic means for operating the brake levers independently of the manually operated levers to release the brakes, controllers within the cab for controlling the current to the motors and to the magnetic means, a hoisting drum mounted on one of the transverse shafts, a receptacle provided with jaw opening and closing mechanism, a hoisting cable connected to the receptacle and wound on said hoisting drum, an opening and closing drum mounted on the other transverse shaft, an opening and closing cable connected to the opening and closing mechanism of the receptacle and wound on the opening and closing drum, a cable having portions thereof wound on both drums and extending in the direction of the line of travel of the carriage and passing around guiding devices at opposite ends of the track, a loop formed in said last mentioned cable, and a counterweight suspended from said loop to counterbalance said receptacle.

19. In an apparatus of the class described, the combination with traversing carriages, of hoisting devices suspended therefrom, cables connected to said carriages and extending in the direction of the line of travel of said carriages in substantially parallel lines with relation to each other for a certain distance and each cable also extending in the same direction beyond the carriage other than the one to which it is connected, and counterweights associated with said hoisting devices and located at fixed points relatively to the carriages.

20. The combination with a trackway, of a traversing carriage therefor, self-propelling means for said carriage, means for carrying an attendant thereon, a grab, a rope-winding drum on said carriage, a hoist-

ing rope connected to said grab and said drum, a rope leading to suitable guiding devices at opposite ends of the trackway and connected, one end to said carriage and the other end to the drum thereon, a counterweight suspended on a loop in said rope and acting to assist the winding in of the grab, an opening and closing rope and its winding drum on the carriage, driving means for said drums and adapted to become operative or inoperative, means automatically to prevent retrograde movement of said driving means, means for driving said hoisting drum in a reverse direction at will, and controlling means available to the operator for controlling the traverse of the carriage, and the said drum driving means.

21. The combination of a trackway, of a traversing carriage, self-propelling means thereon, a grab, a hoisting drum connected to raise or lower said grab, an endless rope connected with the hoisting drum upon said carriage while permitting the traversing of the carriage along the trackway, a counterweight associated with said rope and tending to assist the said drum in the raising of said grab, an opening and closing rope, a rope winding drum upon said carriage, driving means for said drums also thereon and adapted to become operative or inoperative, and means for reversely turning said hoisting drum to relieve the grab of the said counterweight.

22. The combination with a traversing carriage, of a grab suspended therefrom, an opening and closing rope for said grab, a hoisting rope therefor, a rope-winding drum for said hoisting rope upon said carriage, means for counterweighting the grab, and means for lessening the effect of the counterweighting means on said grab, while the jaws of the grab are open, and while moving said opening and closing rope to close the jaws of the grab.

23. A hoisting and conveying apparatus having a traversing carriage, a grab suspended thereon, a hoisting drum on the carriage, an opening and closing drum also on the carriage, each with its controlling rope or ropes connected to the grab, counterweighting means for the grab located at a fixed point relatively to the carriage, and means for permitting reversal of the hoisting drum to positively lift said counterweight.

24. A hoisting and conveying apparatus having a self-propelling traversing carriage, a grab suspended thereon, a hoisting drum, an opening and closing drum, suitable controlling ropes connecting said drums and the grab, a counterweight associated with the hoisting drum, and means for reversing the movement of the latter to elevate said counterweight.

25. A hoisting and conveying apparatus

having a self-propelling traversing carriage, a grab suspended thereon, a hoisting drum, an opening and closing drum, suitable controlling ropes connecting said drums and said grab, means for driving said drums together in a given direction, a counterweight operatively associated with said opening and closing drum, and means for reversing the movement of the hoisting drum to positively raise said counterweight, while continuing the movement of the opening and closing drum.

26. In a hoisting and conveying apparatus, the combination with a self-propelling and traversing carriage, of a grab thereon, means for counterweighting the same, an opening and closing rope, a hoisting rope and means for simultaneously paying out or taking in said ropes, and means for paying out the hoisting rope to the unbalanced grab while the jaws of said grab are in open position, and while taking in the opening and closing rope.

27. In a hoisting and conveying apparatus, the combination with a traversing carriage, of a grab, counterweighting means therefor, an opening and closing rope, a hoisting rope, means for simultaneously paying out or taking in said ropes, and means also on said carriage for paying out the hoisting rope to the unbalanced grab while the jaws of said grab are in open position, and while taking in the opening and closing rope.

28. In an apparatus of the class described, the combination with a traversing carriage, of a hoisting device, an opening and closing rope leading thereto, a hoisting rope, means for counterweighting said device, and means upon the carriage for lessening the counterweighting effect of the counterweight on the hoisting device, while said hoisting device is in open position, and while taking in said opening and closing rope.

29. In an apparatus of the class described, the combination with a self-propelling traversing carriage, of a hoisting device suspended thereon, an opening and closing rope leading thereto, a hoisting rope, means for counterweighting said device, and means for lessening the counterweighting effect of the counterweight on the hoisting device, while said hoisting device is in open position, and while taking in said opening and closing rope.

30. In an apparatus of the class described, the combination with a traversing carriage, of a hoisting device, a cable having a looped portion distant from the travel of the carriage and fixed with relation thereto and extending in the direction of the line of travel of the carriage and having both ends connected to the carriage, an operating cable connected to the hoisting device and to the carriage, a hoisting cable connected to the

hoisting device and to the carriage, a counterweight suspended in the loop of the cable to counterbalance the weight of the hoisting device, and power means for operating the cables in either direction simultaneously or separately to open or close and to raise or lower the hoisting device.

31. In an apparatus of the class described, the combination with a traversing carriage, of a hoisting device, a cable having a looped portion distant from the travel of the carriage and fixed with relation thereto and extending in the direction of the line of travel of the carriage and having both ends connected to the carriage, an operating cable connected to the hoisting device and to the carriage, a hoisting cable connected to the hoisting device and to the carriage, a counterweight suspended in the loop of the cable to counterbalance the weight of the hoisting device, power means for operating the cables in either direction simultaneously or separately to open or close and to raise or lower the hoisting device, and means carried on the carriage for controlling the operation of the cables.

32. A hoisting mechanism movably mounted upon a track, a rope extending along the path of movement of the hoisting mechanism, the ends of the rope connected with the hoisting mechanism, and a counterweight in said rope arranged to assist said hoisting mechanism in lifting a load.

33. A track, a hoisting mechanism movably supported thereon, a rope extending along the track, the ends of said rope connected with the hoisting mechanism, a counterweight, and a sheave connected with the counterweight, said counterweight sheave being supported by the rope and arranged to assist said hoisting mechanism in lifting a load.

34. A track, a hoisting mechanism movably supported thereon, said mechanism comprising a hoisting drum, a rope extending along the track, the ends of said rope connected with the hoisting drum, a counterweight for assisting said hoisting mechanism in lifting a load, and a sheave connected with the counterweight, said counterweight sheave being supported by the rope and so arranged that the lateral movement of the hoisting mechanism does not affect the position of the counterweight.

35. A laterally movable hoisting mechanism comprising a pair of hoisting drums, a counterweight outside the path of movement of said mechanism, and a rope connecting the counterweight and the two hoisting drums.

36. A laterally movable hoisting mechanism comprising a pair of hoisting drums, a counterweight outside the path of movement of said mechanism, and a rope connecting the two hoisting drums, said counter-

weight being in a loop in the connecting rope.

37. A track, a hoisting mechanism movably supported thereon, said mechanism comprising a pair of hoisting drums, a counterweight near one end of the track, a sheave connected with the counterweight, and a rope connecting the two hoisting drums, said counterweight sheave being in a loop in said connecting rope.

38. A track, a hoisting mechanism movably supported thereon, said mechanism comprising a pair of hoisting drums, a load bearing member connected with said drums, a counterweight near the end of the track, and a rope connecting the counterweight with the two hoisting drums, said counterweight being in a loop in the connecting rope.

39. A track, a hoisting mechanism movably supported thereon, said mechanism comprising a pair of hoisting drums, a load bearing member, ropes or cables connecting the load bearing member with both of the drums, a counterweight near the end of the track, a sheave connected with the counterweight, and a rope connecting the counterweight with the two hoisting drums, said counterweight sheave being in a loop in the connecting rope.

40. A track, a hoisting mechanism movably supported thereon, said mechanism comprising a pair of hoisting drums and means for actuating the drums, a hoisting bucket, ropes or cables connecting the bucket with both of the drums, a counterweight near the end of the track, and a rope system connecting the counterweight with the hoisting drums, said rope system being so ar-

40 ranged that the lateral movement of the hoisting mechanism does not affect the position of the counterweight.

41. A track, a hoisting mechanism movably supported thereon, said mechanism comprising a pair of hoisting drums and means for actuating the drums, a hoisting bucket, ropes or cables connecting the bucket with both of the drums, a counterweight near the end of the track, a rope system connecting the counterweight with the hoisting mechanism, and means for moving the hoisting mechanism along the track, the rope system being so arranged that the lateral movement of the hoisting mechanism does not affect the position of the counterweight.

42. A track, a hoisting mechanism movably supported thereon, said mechanism comprising a pair of hoisting drums and motors for actuating the drums, a hoisting bucket, ropes or cables connecting the bucket with both of the drums, a counterweight near the end of the track, a rope system connecting the counterweight with the hoisting drums, and an independent motor for moving the hoisting mechanism along the track, the rope system being so arranged that the lateral movement of the hoisting mechanism does not affect the position of the counterweight.

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

NIKOLINE JOHNSON,  
*Administratrix of the estate of Ole Johnson,*  
*deceased.*

Witnesses:

A. L. MORSELL,  
ANNA F. SCHMIDTBAUER.