

I. S. MILLER.
 LOAD HOISTING AND TRANSFER APPARATUS.
 APPLICATION FILED APR. 16, 1915.

1,252,474.

Patented Jan. 8, 1918.
 4 SHEETS—SHEET 1.

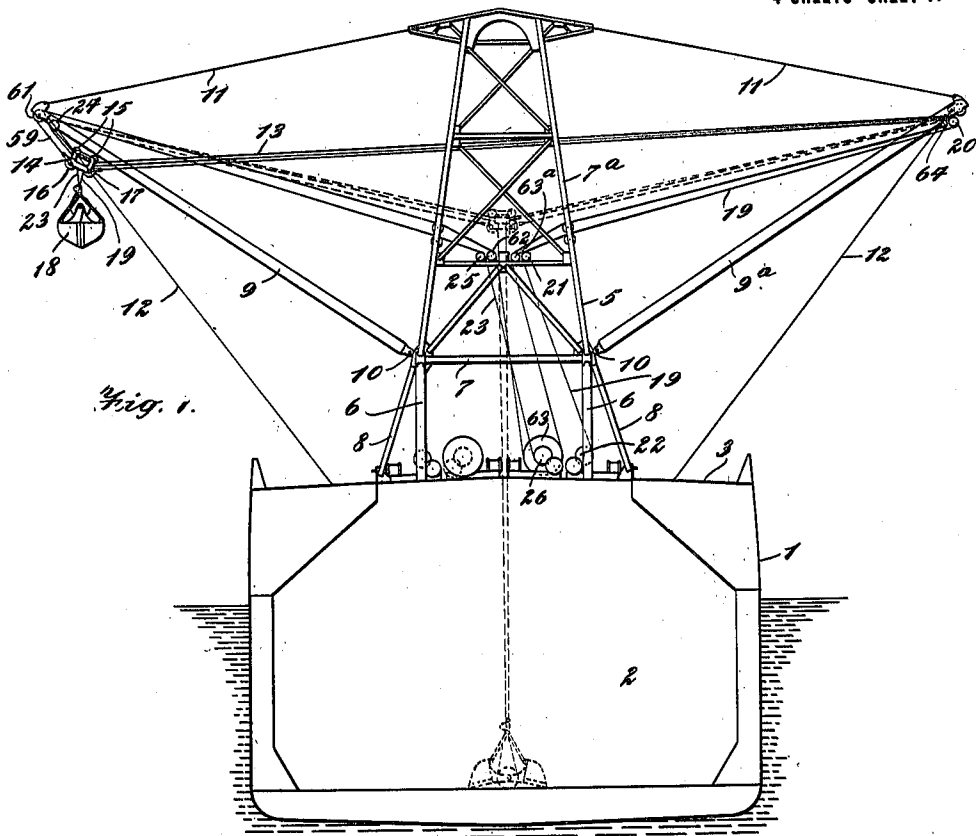


Fig. 1.

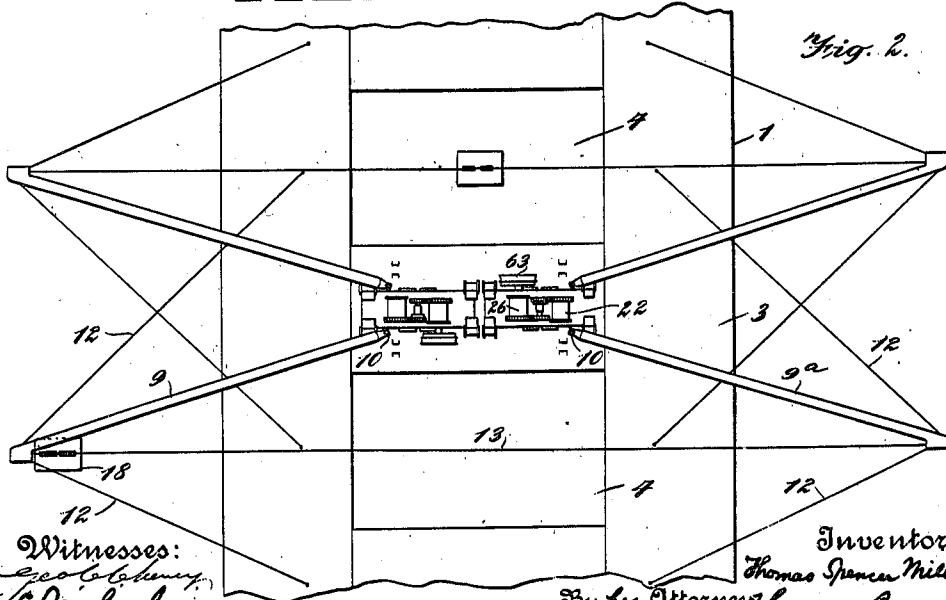


Fig. 2.

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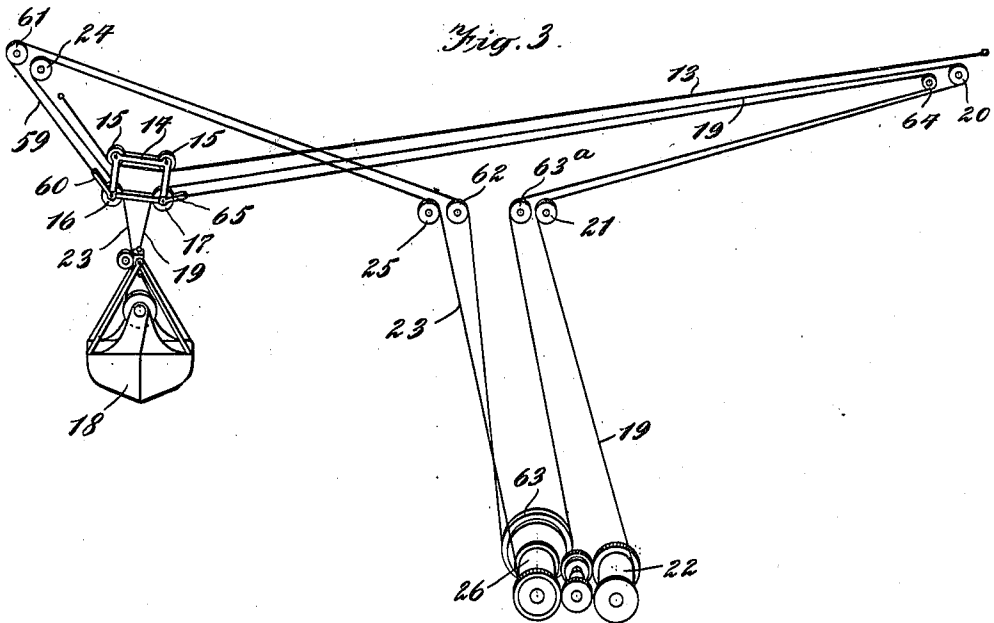
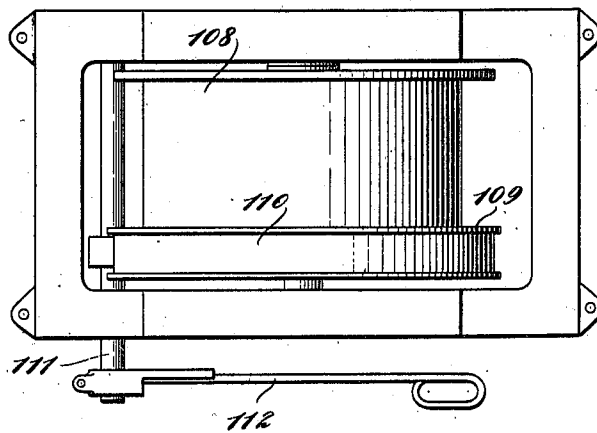


Fig. 8.



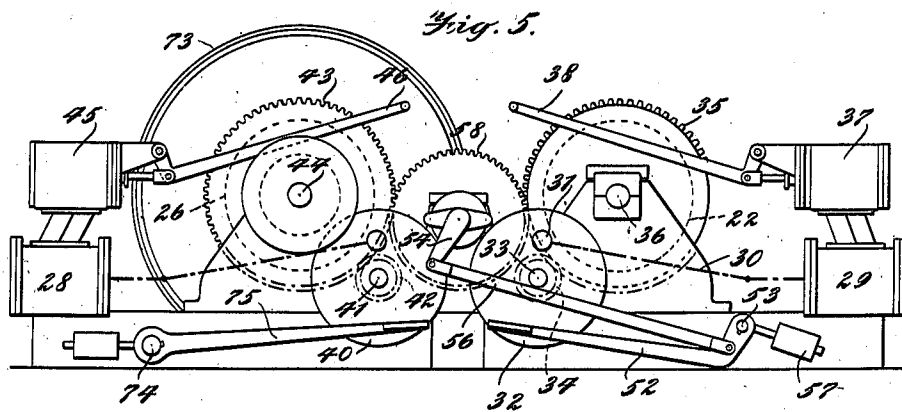
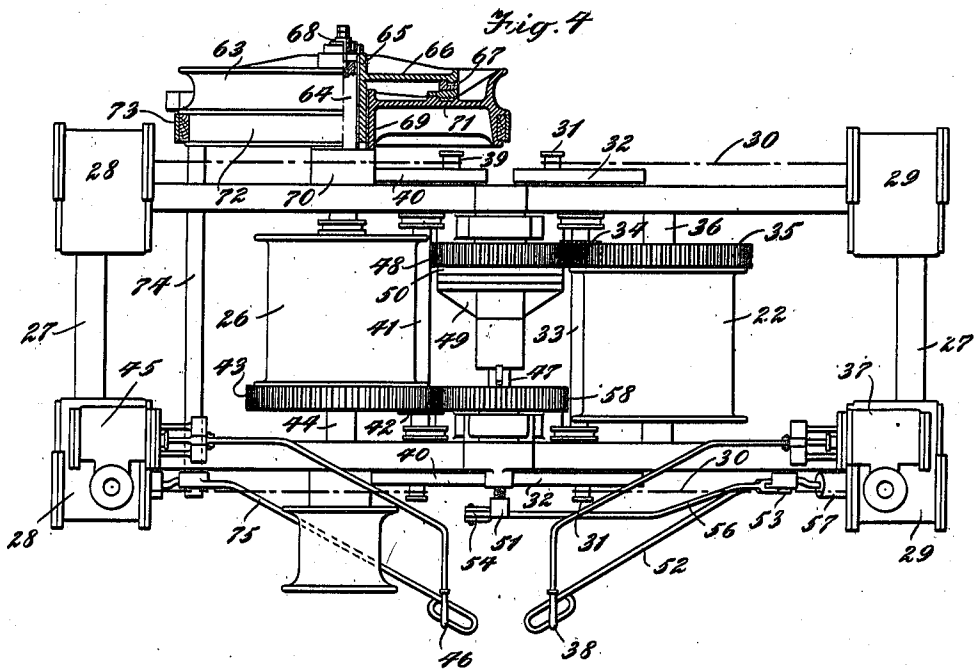
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 4 SHEETS—SHEET 3.



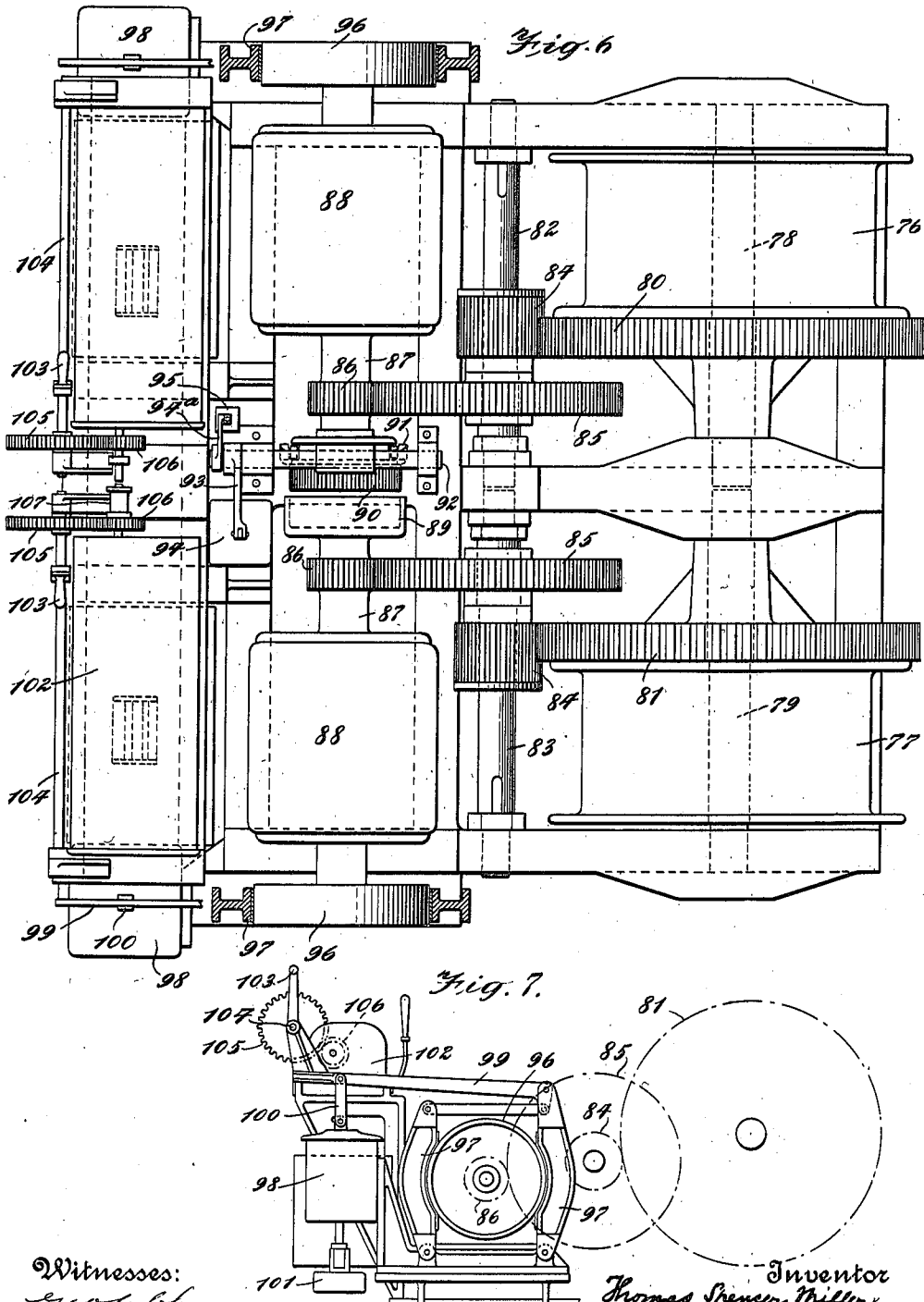
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 4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

THOMAS SPENCER MILLER, OF SOUTH ORANGE, NEW JERSEY.

LOAD HOISTING AND TRANSFER APPARATUS.

1,252,474.

Specification of Letters Patent.

Patented Jan. 8, 1918.

Application made April 16, 1915. Serial No. 21,666.

To all whom it may concern.

Be it known that I, THOMAS SPENCER MILLER, a citizen of the United States, residing at South Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Load Hoisting and Transfer Apparatus, of which the following is a specification.

My invention relates broadly and generally to load-hoisting and transfer apparatus, and more particularly to apparatus of that type adapted to form part of the equipment of a sea-going vessel, such as a collier, for the purpose of transferring loose material from the hold of the vessel to another vessel or dock, or for loading said vessel from another ship or dock.

Among other objects of the invention which will appear from the following description, I desire to provide an apparatus which will be simple of construction, which will permit of easy and rapid handling of the material, and in which will be employed an opening and closing bucket, the holding and closing lines of which will serve as a means for transferring the bucket, as well as for raising and lowering the same.

The invention consists in the improvements to be more fully described hereinafter, and the object of which will be particularly pointed out and distinctly claimed.

I have fully and clearly illustrated preferred embodiments of my invention in the accompanying drawings to be taken as a part of this specification and wherein:

Figure 1 is a view in vertical cross section of the hull of a vessel equipped with my invention, the latter being shown in front elevation.

Fig. 2 is a plan view of a portion of the hull of the vessel showing two hatchways, each provided with my present invention for transferring loads therefrom.

Fig. 3 is a detail perspective diagrammatic view of the bucket and rope leads for operating and controlling the same.

Fig. 4 is a plan view, partly in section, of a steam-operated rope engine for operating and controlling the rope leads.

Fig. 5 is a view in side elevation of the rope engine shown in Fig. 4.

Fig. 6 is a plan view of an electrically operated engine which may be used in connection with my invention for operating the rope leads.

Fig. 7 is a detail view in side elevation of that part of the engine shown at the left of Fig. 6.

Fig. 8 is a plan view of a rope drum employed in connection with the invention when the rope leads are controlled by the engine shown in Fig. 6.

Referring to the drawings by characters of reference: 1 designates the hull of a vessel, the construction of which may be varied to suit the conditions under which it is to be employed, which construction does not in any way affect or limit the scope of my present invention. The hull 1 has a hold 2 to contain the material to be transferred, and 3 designates the deck of the vessel provided with one or more hatchways 4 leading to said hold.

Supported on the deck 3 of the vessel between the hatchways, and extending transversely of the vessel, is a superstructure, preferably in the form of a tower 5, comprising vertical uprights 6 joined at their upper ends by a transverse beam 7 from the upper ends of which uprights rises a structural iron frame 7^a of any suitable design and dimensions. The tower may be braced by side brace-members 8, 8, connecting the deck and the posts 6 at a point adjacent the upper ends of the latter. 9, 9^a designate booms, each of which is pivotally mounted at its inner end, as at 10, on said tower at a point adjacent the upper ends of the members 6, said booms extending from their pivotal points in opposite directions from each other so that their ends take a position to one side of the hatchway and preferably outboard of the vessel, as shown in Figs. 1 and 2. The booms may be braced in position by means of guys 11 connecting the outer ends of said booms with the upper end of the frame 7^a, and by guys 12 connecting the outer ends of the booms with a convenient point on the vessel. I desire it understood that the construction and arrangement of the tower and the booms may be varied within wide limits without departing from the spirit of my invention.

I will now describe a preferred arrangement of rope leads supported by said structure and booms for transferring a load from the hold of the vessel to a point outboard of the vessel, or vice versa. Connected at its opposite ends to the outer ends of the booms 9, 9^a is a main cable or trackway 13, said cable being arranged to extend transversely

of the vessel over one of the hatchways, and preferably in a vertical plane extending through the center of the latter. Mounted on this main cable is a load-carriage 14, which may be of any suitable construction, the same being provided with running pulleys or wheels 15 to travel on the cable 13 and having a portion depending below said main cable and provided with oppositely disposed pulleys or sheaves 16, 17, as shown in Figs. 1 and 3 of the drawings, for a purpose to be presently set forth. 18 designates a load carrier, preferably in the form of an opening-and-closing bucket of the clam-shell type, although it will be understood that my invention is not limited to this type of opening and closing bucket. This bucket is supported at its upper end by a holding line 19 which passes over the pulley 17, and thence lengthwise of the main cable toward the outer end of the boom 9^a, where it passes over a sheave 20 and is doubled upon itself and passes over a pulley 21, preferably supported on one of the members of the frame 7^a. From the pulley 21 the line 19 passes downward and is wound upon a drum 22, which is provided with means for running it in opposite directions to take up and pay out said holding line, which means will be presently described. Connected at one end to the bucket opening-and-closing means is a closing line 23 which passes from the bucket upward and over the sheave 16, whence it is carried lengthwise of the main cable and doubled over a sheave 24 on the outer end of the boom 9. From the sheave 24 the line 23 is carried back lengthwise of the cableway and passed over a sheave 25, preferably supported on the frame 7^a, from which point it is carried downward and wound upon a drum 26 provided with means for running the same in opposite directions to take up and pay out said closing line, which means will be presently described.

By the arrangement of rope leads described I am enabled to dispense with a separate line or lines, in addition to the closing and holding lines, for the purpose of traversing the load-carriage back and forth, and employ the bucket-closing line and the holding line not only for opening and closing the bucket and raising and lowering the same, but also for accomplishing the traversing of the carriage and bucket. In employing the holding-and-closing lines for the purposes set forth, I pay out both lines at the same speed in lowering the bucket and take them up at the same speed in raising the bucket, and, when it is desired to raise or lower the bucket through an angle, say, of 45 degrees, to the vertical or horizontal, I hold one line and take up the other. When it is desired to traverse the carriage after the hoisting of the bucket, I pay out one of the lines and take up at equal speed on the

other, so that the carriage and bucket traverse the main cable in a straight line. I do not desire to limit myself to the specific means shown and hereinafter described for operating the closing-and-holding lines in the manner just set forth, but have devised simple and effective means for accomplishing these results, which means will now be described.

I will first describe a steam or fluid pressure-operated means for controlling the closing-and-holding lines, which means comprises a bed-plate 27 at the opposite ends of which are arranged pairs of steam engine cylinders 28, 29, each pair constituting an independent steam motor which may be driven independently of the other. The pistons of the cylinders 29 are connected by piston connections 30, indicated by dot-and-dash lines in Figs. 4 and 5, to crank pins 31 mounted on crank disks 32 rotating with a power shaft 33 mounted in suitable bearings on the side members of the bed-plate 27. This power shaft carries a pinion 34 meshing with a gear 35 having a driving connection with a drum shaft 36 having bearings in the bed-plate, said gear being connected to one end of the drum 22 for the holding line, hereinbefore described. Any suitable valve mechanism may be employed for controlling the flow of motive fluid to the cylinders 29, but I preferably employ one of that type known as a reversing valve, which is operable to reverse the movement of the pistons in the cylinders to drive the power shaft 33 in either direction, and which has a neutral position at which the steam will be cushioned in the cylinders to hold the piston against movement. I have indicated such a valve at 37, but have not specifically illustrated the details thereof, as it may be of any of the well-known types which may be suitable for the purpose. The valve operating lever is shown at 38. In a manner similar to that just described, the engine cylinders 28 are connected to crank pins 39 on crank disks 40 driving a power shaft 41, which carries a gear 42 meshing with a drum gear 43 on a drum shaft 44, and having a driving connection with the drum 26 for the closing line. The engine 28 is also provided with a valve similar to that employed by the other engine, the same being indicated at 45 and having a controlling lever 46, said levers 38 and 46 being arranged with their hand-grasps in such relation that they may both be readily operated by the same operator grasping one of said hand-grasps in each hand. By this arrangement it will be apparent that each drum may be operated independently of the other to either pay out or take up the line wound thereon, or each drum may be held stationary so as to hold its line. When it is desired to traverse the carriage along the cableway to transport the

bucket from the hold of the vessel to a point outboard, or to return it to the hold after having discharged its load outboard, it is desirable to pay out one line and take up the other accordingly as the bucket moves outboard or inboard, at the same speed, and, in order to accomplish this, I provide means for driving both the drums 22 and 26 from the same engine, and preferably accomplish it by interlocking the drums so that they both revolve in the same direction, it being taken for granted that one rope is wound on its drum in a reverse direction from that in which the other rope is wound on its drum. This means may take a number of forms, but, in the present instance, I employ a counter-shaft 47 journaled in the side members of the bed-frame and having loosely mounted thereon at one end a gear 48 arranged in mesh with the gear 35, said shaft being provided with a clutch member 49 adapted to engage a clutch member 50 on said gear whereby said gear may be connected to said shaft to rotate therewith. Any suitable means may be provided for applying and relieving the friction between the clutch members 49 and 50, but I prefer to employ a well-known type of screw thrust 51 operated from a foot-lever 52 journaled on the frame, as at 53, and connected to the crank member 54 of the thrust by a connecting rod 56. This lever is preferably moved automatically to release position by a weight 57. Rigidly mounted on the shaft 47 is a second gear 58, which meshes with the gear 43, heretofore described. By this arrangement it will be seen that either drum may be driven from the other by operating the clutch to connect the gear 43 to the shaft 47 and that, when said gear is disconnected from driving connection with its shaft, said drums may be run independently of each other. Means is provided whereby the carriage may be held stationary during the opening and closing of the bucket, as it will be apparent that the carriage would shift its position on the main cable, due to the slacking or taking in of the closing line if such means were not provided. This means preferably consists of a line 59 having one end connected, as at 60, to one side of the carriage, said line being carried thence over a pulley 61 on the outer end of the boom 9, from which point it is carried inboard over a pulley 62 on the structure 7^a, and then down to a drum 63, said line being rove about the drum and having its opposite end portion carried upward therefrom over a pulley 63^a on the frame; thence outboard over a pulley 64 on the outer end of the boom 9^a, from which point it is carried to the opposite side of the carriage from the connection 60, and connected to the carriage, as at 65.

65 Means is provided for holding the drum

63 during the opening and closing of the bucket, so that the carriage is held stationary, and said drum is adapted to rotate freely during the traversing of the carriage by the holding or closing line so as not to retard free movement of the carriage.

I will now describe the preferred construction of this drum 63 when I employ the form of engine shown in Fig. 4 for controlling the rope leads. Referring particularly to Fig. 4, the shaft 44 is at one end extended outside the main frame 27, as at 64, and is provided with a sleeve 65 feathered thereto to rotate therewith, said sleeve carrying a clutch disk 66 having an annular clutch face 67. The sleeve 65 is capable of movement lengthwise of said shaft extension 64 and, on the outer end of the latter is provided an expansion spring 68 normally urging said sleeve and the clutch disk carried thereby inward toward the side of the bed-plate. The drum 63 is provided with a hub 69 rotatably mounted on said sleeve 65 and held against movement longitudinally of said sleeve in one direction by a sleeve 70 mounted on the shaft 44 between said hub 69 and the side frame of the bed-plate. This drum 63 is provided on its face toward the clutch disk 66 with an annular clutch-face 71 adapted to cooperate with the clutch-face 67, whereby the drum 63 is driven from said shaft 44. The drum 63 is provided with an annular brake-face 72 with which cooperates a friction brake-band 73 of any suitable construction, whereby the drum may be held against rotation, under which conditions the friction disk will slip relative thereto, due to its resilient engagement therewith by virtue of the spring 68. The brake may be operated by a suitable brake-shaft 74 journaled in the bed-plate and operated by a foot-lever 75. The ends of the foot-levers 52 and 75 preferably are brought to a point adjacent each other and beneath the hand-grasps 38 and 46, whereby said levers are all in convenient position to be operated by the same operator.

I will now proceed to describe the operation of the apparatus constructed as above described, employing the form of engine shown in Fig. 4, and premising that the parts are in the positions shown in Figs. 1, 2 and 3. In order to return the bucket from the outboard position to the hold to take a load, the operator relieves the brake action on the drum 63 to permit the line 59 to run free. The operator then operates the clutch 49 to interlock the drums 22 and 26 so that the line 19 is taken up and the line 23 is paid out, both at the same speed, whereby the carriage is traversed inboard. When the carriage reaches a point over the hatchway and the bucket is to be lowered therein, the carriage is stopped and the clutch 49 operated to break the driving connection between the

drums 22 and 26, whereupon the operator operates both engines to cause the drums 22 and 26 to pay out their lines to permit the bucket to drop. It will be understood that the bucket is opened at the desired point by holding the holding line and permitting the closing line to pay out. It will also be understood that, when the bucket is being opened, the brake 72 is applied to the drum 63 so as to hold the line 59 to maintain the carriage in a fixed position over the hatchway. When the open bucket has engaged the material to be loaded, the operator takes up on the closing line sufficient to close the bucket, and then drives both drums 22 and 26 independently to take up the holding line and the closing line to raise the bucket to the carriage. During this operation, if the load is to be shifted without traversing the carriage, both lines are taken up at the same speed, the carriage being held by the drum 63, but if it be desired to hoist the bucket in a line at an angle to the vertical, this can be accomplished by releasing the carriage from the drum 63 and taking up both the holding line and the closing line, but at different speeds, the carriage and bucket moving laterally in the direction of the line taken up at the greater speed. For instance, in the arrangement as shown in Fig. 3, assuming the bucket to be lowered, the bucket would be moved in a line at an angle to the left when the closing line is taken up at the greater speed, while it would be moved to the right, if the holding line were driven at the greater speed. In the latter case the pull of the bucket on the closing line would maintain the bucket closed. When the bucket is raised to the desired point the drums are then interlocked by means of the clutch 49 and both may be driven from one engine—that is, the engine 28, to take up the closing line 23 and pay out the holding line at equal speeds whereby the carriage, with the bucket, is moved to the outboard position—that is, to the left of Figs. 1, 2 and 3. Upon the carriage reaching the desired outboard position, drum 63 is held, and the bucket is dumped by paying out on the closing line, the drums being disconnected from driving connection with each other and the drum 26 operated for the purpose stated. If it is desired to first lower the bucket before dumping, the carriage may be held by the drum 63 and both engines may be operated to pay out the lines 19 and 23 to lower the bucket, after which the bucket may be dumped by holding the line 19 and paying out on the line 23. If, after having been loaded, the bucket is to be moved to the right at an angle to the vertical, the engine 29 is operated to take up on the holding line and the engine 28 either remains at rest or is operated to pay out the closing line until the bucket reaches the desired elevation; whereupon

the drums may be driven at the same speed to further raise the bucket, and then interlocked and driven to take up the holding line and pay out the closing line at equal speed. As the operations are simply reversed when the bucket is moved from the right or the left of the hold, or to or from either the right or left of the ship, it is believed that the operation of the bucket, when operated to the right of Figs. 1, 2 and 3, will be clear from the above description.

In Figs. 6 and 7 of the drawings I show another form of engine for controlling the drums for operating the lines 19 and 23. In this form of engine are shown two drums 76, 77, corresponding, respectively, to the drums 22, 26, heretofore described. These drums are mounted, respectively, on shafts 78, 79, journaled in a suitable bed-plate or frame, and said drums are also provided with gears 80, 81, having any suitable form of driving connection with the drums. Running parallel to the axis of rotation of the drums are two driving shafts 82, 83, arranged in longitudinal alinement, and each provided with a pinion 84, the pinion on each shaft meshing with the adjacent gear 80 or 81 on the said drums. Each of said shafts 82, 83, is also provided with a gear 85, said gears 85 meshing with driving pinions 86, 86, mounted, respectively, on the armature shafts 87, 87, of reversible electric motors 88, 88. By this arrangement it will be seen that each drum may be driven independently of the other, and in either direction, by its own independent motor.

Mounted on the end of one of the shafts 87 is an internally toothed clutch member 89 adapted to be engaged by a peripherally toothed clutch member 90 slidably mounted on the end of the other shaft 87, whereby said shafts may be connected to drive both drums 76, 77, at the same speed of revolution. The clutch member 90 is shiftable into and out of engagement with the clutch member 89 by means of a yoke 91 carried by a rock-shaft 92 having suitable bearings on the main frame and carrying a lever or arm 93 which, in turn, is connected to the core of a solenoid 94. This shaft 92 also carries a lever 94^a operating a switch 95, which serves a purpose to be presently described. Said armature shafts are provided, respectively, with brake disks 96 which are engaged by the members 97 of suitable machine brakes which are applied by means of a solenoid 98, it being understood that there is an independent solenoid for operating each brake. The brake members are connected to the cores of the solenoids 98 by levers 99 and links 100, so that, when the solenoids are energized, the brakes will be released. The core of each solenoid is provided with a weight 101 whereby the brakes are applied when the solenoids are deenergized.

gized. Each motor is provided with an independent controller 102 of any suitable type, which is operated from a hand-grasp 103 on a controller shaft 104, said controller shaft 104 being geared by suitable gears 105, 106, to the rotating part of the controller. If desired, a suitable sleeve coupling 107 may be provided for connecting the gears 106 whereby both controllers may be operated from the same hand-lever 103, when desired, to have both motors run at the same speed, and in the same direction.

As heretofore stated, the motors are of the reversible type and the operating lever for each controller is movable to three positions—namely, two extreme positions in one of which the motor drives its drum in the opposite direction from that when the lever is in the other position, and said lever also has an intermediate position in which the current is off. The solenoids 98 are arranged in circuit with the controller in such a manner that, when the controlling levers 103 are in the off or intermediate position, the solenoids will be deenergized, allowing the weights to apply the brakes to the disks 96, and thereby hold the motors and the drums driven thereby against rotation in either direction. The switch 95, heretofore described, is arranged in circuit with the brake solenoids 98, so that, when the clutch members 89, 90, are connected, said switch will be operated to so control the solenoid circuits that both brake solenoids 98 will be energized to release both brakes when one of the controllers is operated to drive its motor. By the construction and arrangement described both drums may be controlled from the same controller lever, and one motor, whenever the drum is interlocked, will be capable of conveying all that two motors of approximately the same size would be effective to hoist.

When the electric motors are provided for operating the rope leads, I provide a separate drum 108 for controlling and operating the line 59, said drum being provided with a brake flange 109 with which coöperates a brake-band 110 operable by a brake shaft 111 and foot-lever 112. The brake is adapted to be applied to the drum 108 to hold the same under all the conditions necessary for holding said line 59, as heretofore described in detail with reference to the drum 63, and it is, therefore, not deemed necessary to repeat in detail that description here at this point. It will be understood that, when using the electric motor control, when the clutch members 89, 90, are disconnected, said drums 76, 78, respectively, controlling the holding line and the hoisting lines 19 and 23, may be driven independently of each other at different speeds and in different directions, or in different directions at the same speed, or in the same direction at the same or different speeds, and that, when the

said clutch-members are connected, both drums 76, 77, may be driven in either direction at the same speed. It will be understood that, when the electric motor drive is employed, the lines 19 and 23 will be wound in reverse directions on the said drums 76, 77, so that, when said drums rotate in the same direction, one rope will be paid out and the other taken in. It will be understood that the brake solenoids are so controlled as to release the brakes whenever the motors are energized and to apply the same when the motors are at rest. As the circuits for the motors form no part of my present invention, and can be supplied by any one skilled in the art, I do not deem it necessary to either illustrate or describe the same in detail. I also do not consider it necessary to repeat the operation of the cableway and bucket heretofore described with reference to the form of motor shown in Fig. 4, as it will be readily understood in what manner said operation may be effected by use of the motor control.

The engine shown in Figs. 6 and 7, is not my sole invention and is not claimed herein, but is the joint invention of myself and Louis G. Ruggles, and is the subject matter of an application filed by us jointly under date of July 3, 1915, Serial Number 37,894, the same being a division of an earlier application filed jointly by the said Louis G. Ruggles and me under date of June 3, 1913, Serial Number 771,399.

What I claim and desire to secure by Letters Patent of the United States is:—

1. In a load-transferring means, a trackway, a carriage thereon, an opening and closing bucket, a holding line for the bucket extending lengthwise of said trackway, a closing line for the bucket extending lengthwise of the trackway in opposite direction to the holding line, independent drums for operating said lines, separate motors for driving said drums, and means for connecting said drums whereby both are driven from the same motor.

2. In a load-transferring means, a trackway, a carriage thereon, an opening and closing bucket, a holding line for the bucket extending lengthwise of said trackway, a closing line for the bucket extending lengthwise of the trackway in opposite direction to the holding line, independent drums for operating said lines, separate motors for driving said drums whereby said drums may be operated independently and at different speeds, and means whereby both drums may be driven at equal speed from the same motor.

3. In a load-transferring means, a trackway, a carriage thereon, an opening and closing bucket, a holding line for the bucket extending lengthwise of said trackway, a closing line for the bucket extending length-

wise of the trackway in opposite direction to the holding line, independent drums for operating said lines, a holding line for the carriage extending in opposite directions
 5 lengthwise of the cableway, a holding drum upon which the said carriage-holding line is wound, and connections between one of said first-named drums and the holding drum whereby they may run together simulta-
 10 neously, and the said carriage-holding line drum may be held stationary during the running of said first-named drum.

4. In a load-transferring means, a trackway, a carriage thereon, an opening and
 15 closing bucket, a holding line for the bucket extending lengthwise of said trackway, a closing line for the bucket extending lengthwise of the trackway in opposite direction to the holding line, independent drums for

operating said lines, a carriage-holding line
 20 connected to the carriage and extending lengthwise of the cableway in opposite directions, a drum upon which said carriage-holding line is wound, means for coupling
 25 said carriage-holding line drum and one of said first-named drums whereby they are operable simultaneously, and means whereby the carriage-holding line drum may be held
 30 stationary during the rotation of the other drum.

In testimony whereof I have hereunto signed my name in the presence of two subscribing witnesses.

THOMAS SPENCER MILLER.

Witnesses:

ERNEST PULSFORD,

WILLIS A. DIBBLE, Jr.