A. E. NORRIS.

HOISTING APPARATUS.

APPLICATION FILED JAN. 18, 1908. RENEWED NOV. 9, 1912.

1,068,070.

Patented July 22, 1913.

5 SHEETS—SHEET 1.

Fig. 1

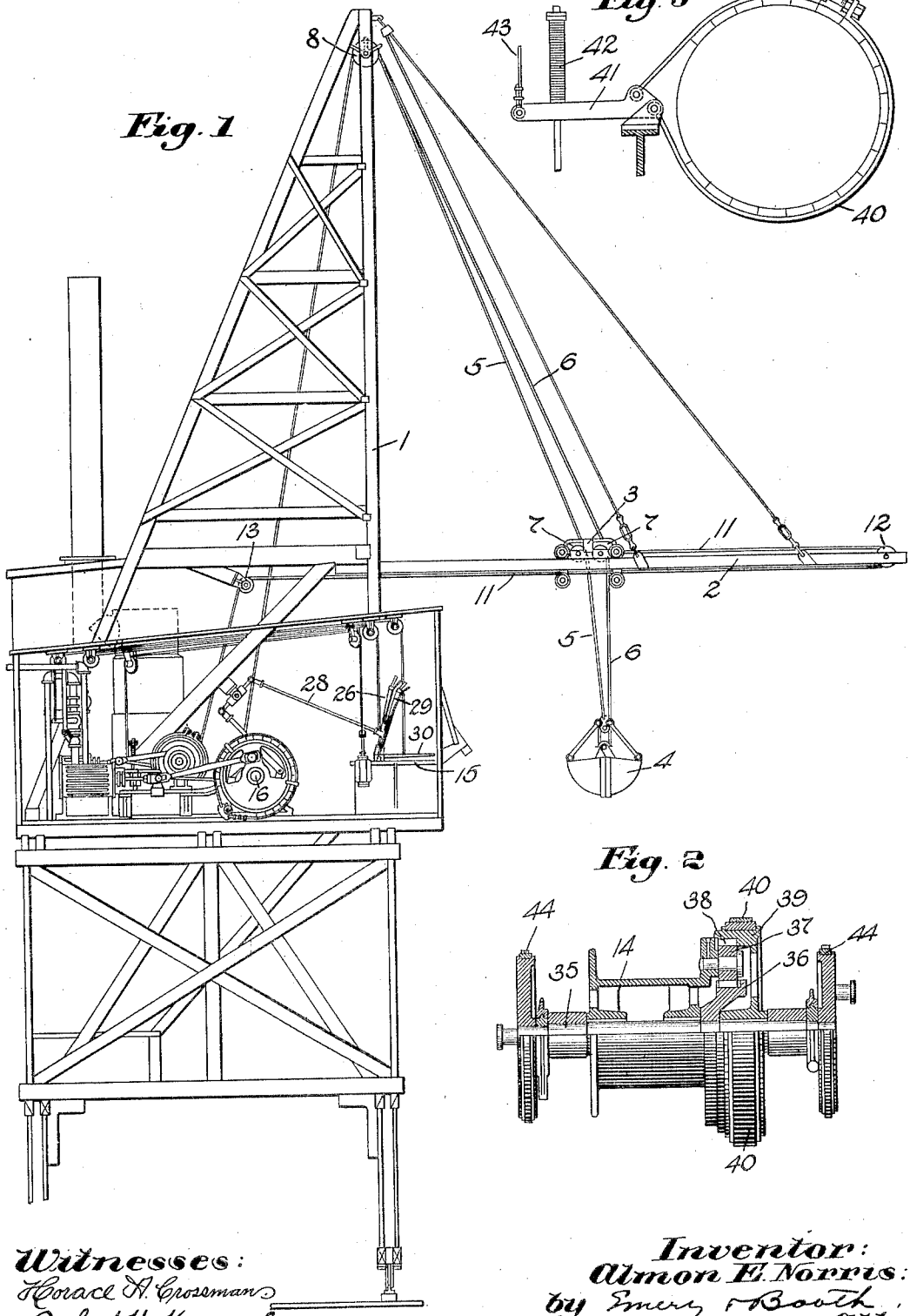


Fig. 3

Fig. 2

Witnesses:
Horace A. Grosman
Robert H. Kammler.

Inventor:
Almon E. Norris:
by Emery Booth
Attys

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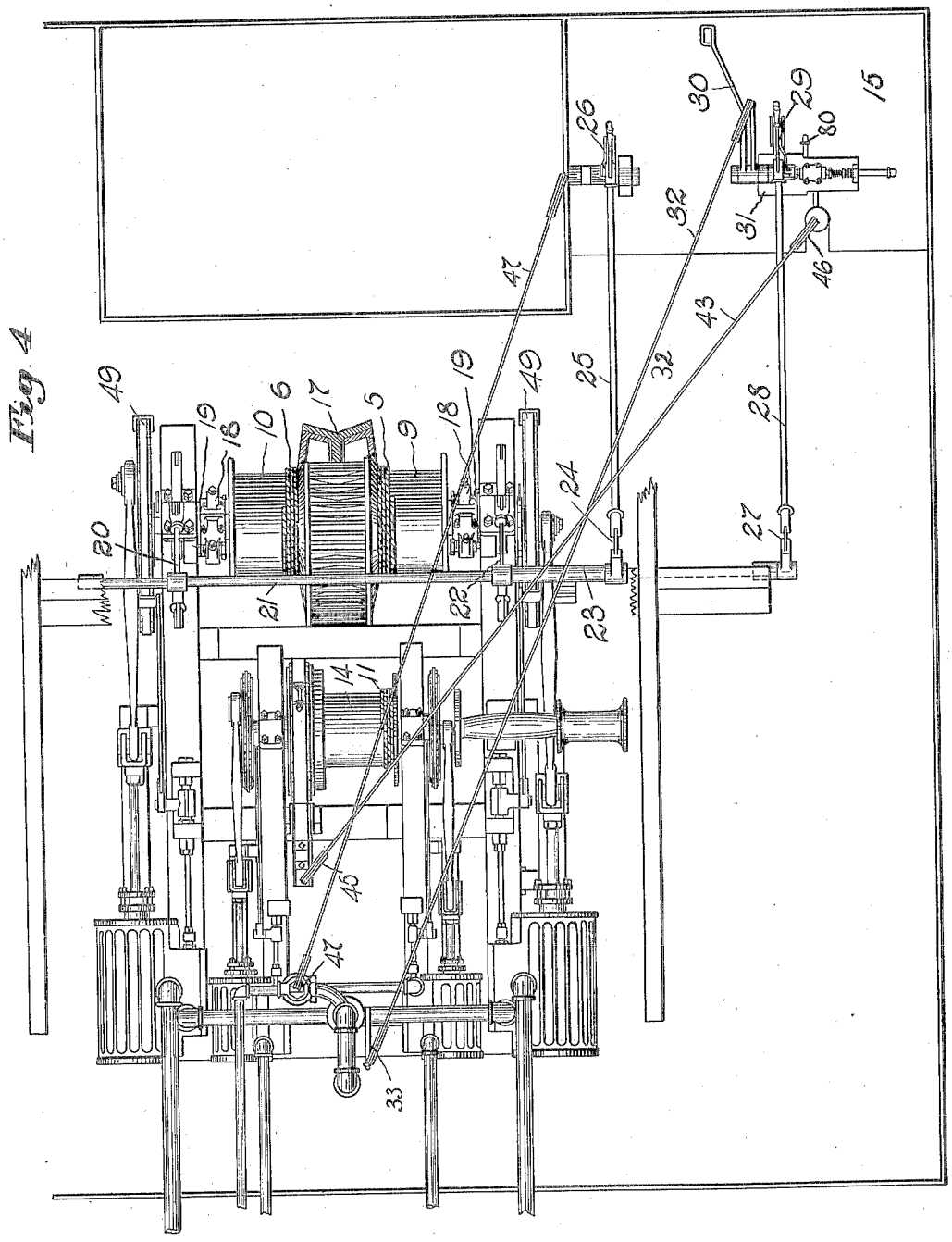
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5 SHEETS—SHEET 2.

Fig 4



Witnesses

Horace A. Grosvenor

Robert H. Kammler.

Inventor:

Aimon E. Norris.

by Emery Booth Attys.

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5 SHEETS—SHEET 3.

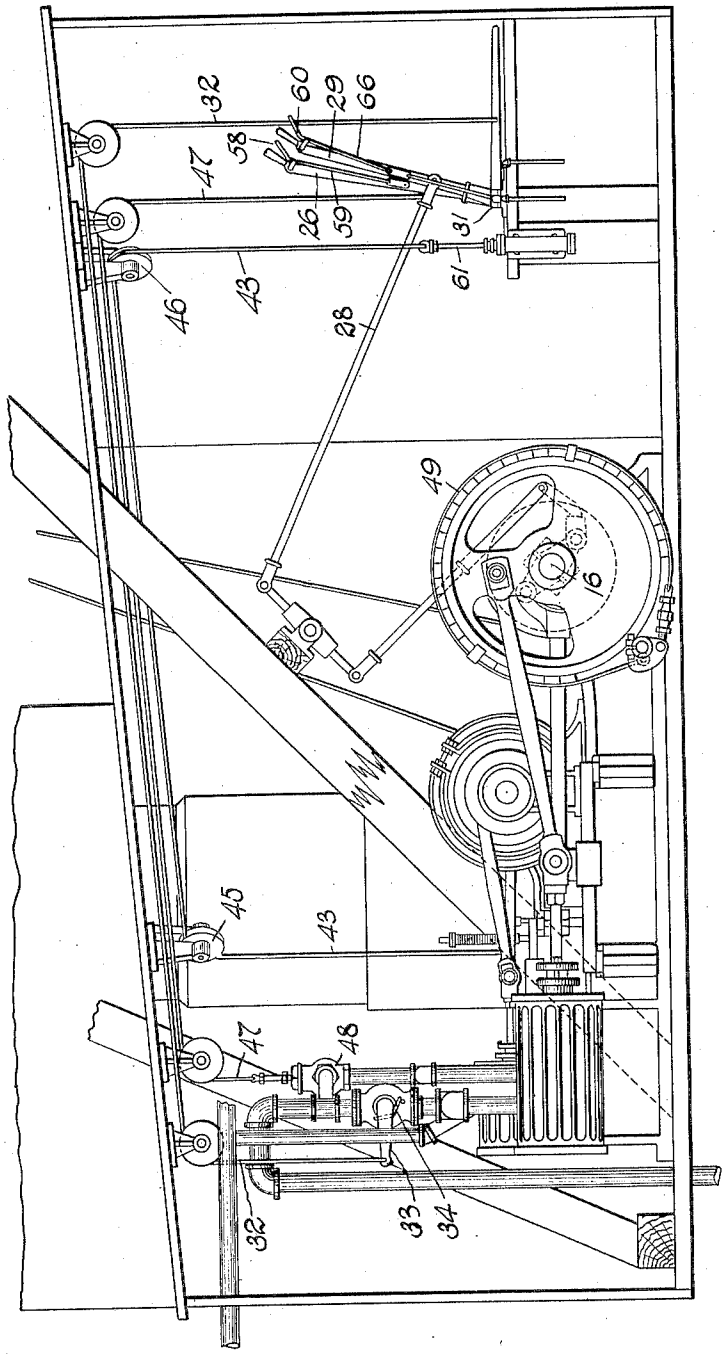


Fig. 5

Witnesses:
Horace A. Crossman
Robert H. Kammler.

Inventor:
Almon E. Norris
by Emery Booth
Attys.

A. E. NORRIS.

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5 SHEETS—SHEET 4.

Fig. 6

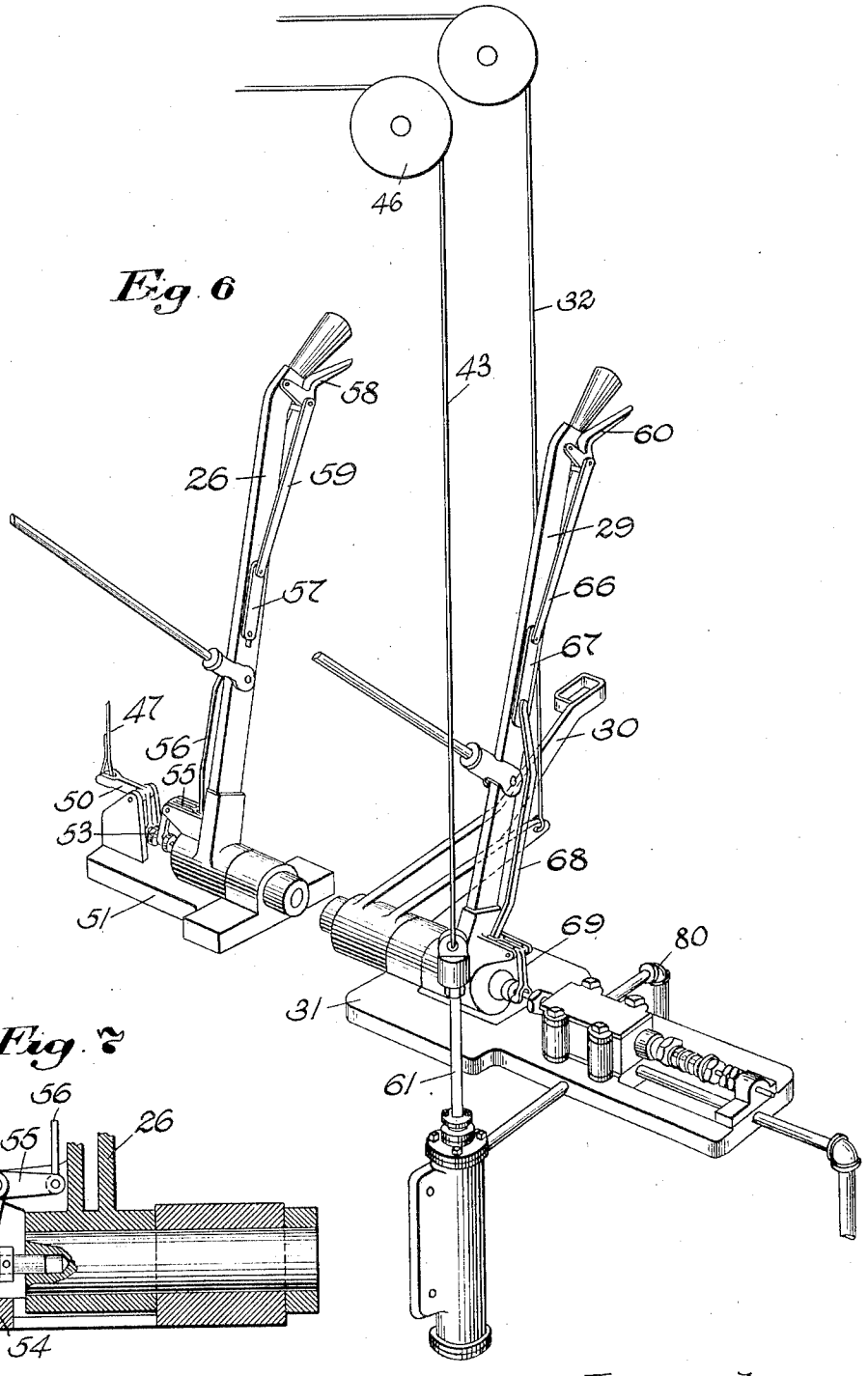


Fig. 7

Witnesses:
Horace A. Grossman
Robert H. Kammler.

Inventor:
Almon E. Norris.
by Emery Booth
Attys

A. E. NORRIS.

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5 SHEETS—SHEET 5.

Fig. 8

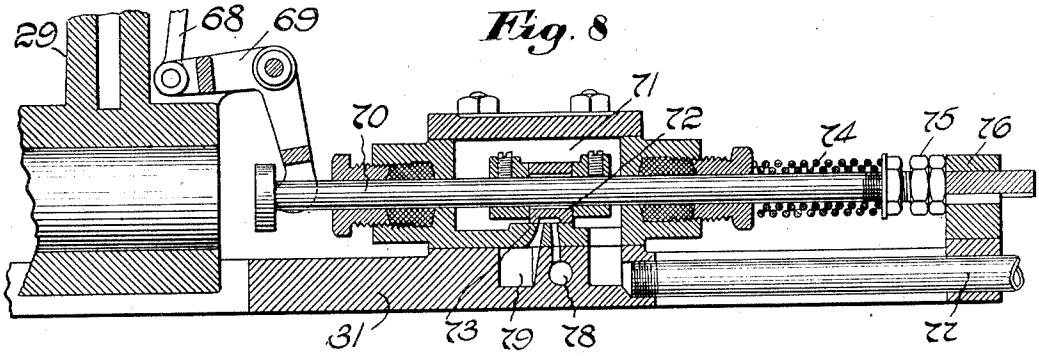


Fig. 9

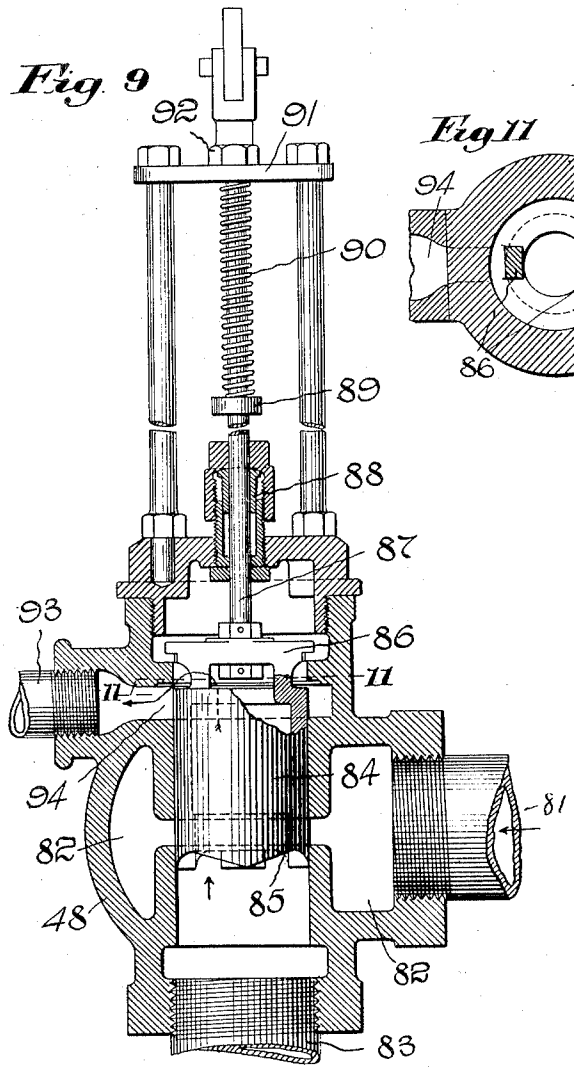
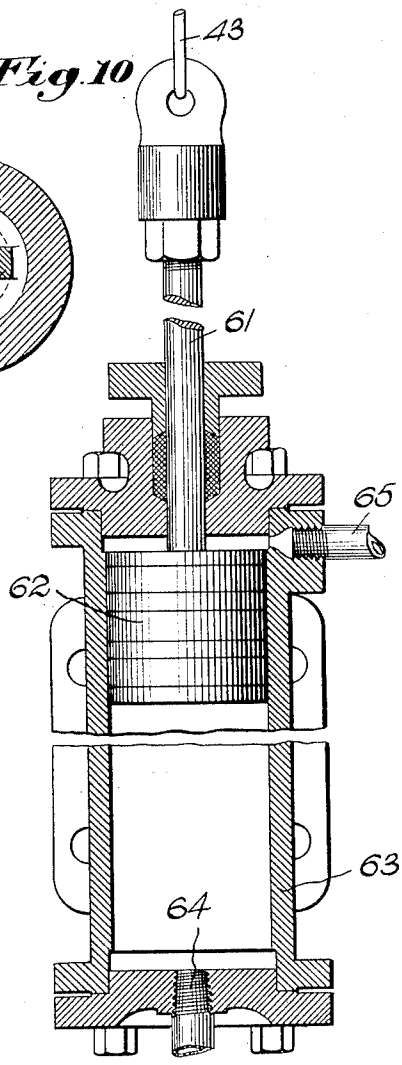


Fig 11

Fig. 10



Witnesses:
Horace A. Crossman
Robert H. Kammler.

Inventor:
Almon E. Norris
by Emery Booth Attys

UNITED STATES PATENT OFFICE.

ALMON E. NORRIS, OF CAMBRIDGE, MASSACHUSETTS.

HOISTING APPARATUS.

1,068,070. Specification of Letters Patent. Patented July 22, 1913.

Application filed January 18, 1908, Serial No. 411,466. Renewed November 9, 1912. Serial No. 730,500.

To all whom it may concern:

Be it known that I, ALMON E. NORRIS, a citizen of the United States, residing at Cambridge, in the county of Middlesex and State of Massachusetts, have invented an Improvement in Hoisting Apparatus, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention relates to hoisting apparatus and consists more particularly in improvements which add to the efficiency and economical operation, as well as facilitating the control of such apparatus.

My invention will be best understood by reference to the following description when taken in connection with the accompanying illustration of one specific embodiment thereof, while its scope will be more particularly pointed out in the appended claims.

In the drawings:—Figure 1 shows in side elevation a hoisting tower embodying one form of my invention; Fig. 2 shows an elevation partially in section of the trolley rope-winding drum; Fig. 3 is a detail showing the friction band and associated parts controlling the trolley drum; Fig. 4 is a sectional plan and on an enlarged scale showing the principal controlling and motive parts for controlling the movements of the trolley and bucket; Fig. 5 is a side elevation of the parts shown in Fig. 4; Fig. 6 shows in perspective and on an enlarged scale the construction and connections of the controlling levers; Fig. 7 is a longitudinal sectional elevation taken through the base of the left-hand controlling lever; Fig. 8 is a longitudinal sectional elevation of the valve which governs the pressure-actuated controller for the trolley drum; Fig. 9 is a sectional elevation showing a form of the throttle valve adapted for use in conjunction with the disclosed form of hoisting apparatus; Fig. 10 is a sectional elevation showing the pressure controller for the trolley drum; and Fig. 11 is a section on the line 11—11 in Fig. 9 showing the construction of the sliding throttle valve.

Referring to the drawings, I have there shown my invention as applied to a hoisting tower 1, carrying the laterally extending boom 2, which latter provides a trackway for the trolley carriage 3, by which the hoisting element, herein represented as the grab or bucket 4, is carried. While I have shown my invention as embodied in an apparatus of this type, that is, a tower hoist, and employing the instrumentalities which are herein specifically described, and while this will sufficiently set forth the broad principles of the invention for the understanding of those skilled in the art, it is to be understood that the application of this invention is not limited to this particular type of hoisting apparatus, or to a hoisting apparatus employing the elements which are here alone set forth, but that numerous other applications and embodiments of the herein described invention may be had.

Referring to the specific details of the illustrated apparatus, the bucket 4, which may be of any suitable or usual construction, such for example, as that set forth in U. S. Patent No. 699,000, dated April 29, 1902, is provided with operating ropes by which the raising and lowering of the bucket and the opening and closing of the bucket jaws may be controlled. In the present instance the operating ropes are two in number, and comprise the hoisting rope 5, by which the bucket is suspended and raised or lowered, and the opening and closing rope 6, by which the jaws are opened or closed. These ropes both pass upward over and about suitable sheaves 7 upon the trolley, thence obliquely upward over the guide sheaves 8 near the top of the tower 1, and thence downward to the operating room near the base of the tower, where they pass over and about and are secured to suitable rope-winding drums 9 and 10 (Fig. 4), the former, or the hoisting drum, serving to control the hoisting rope 5, and the latter, or the opening and closing drum, serving to control the opening and closing rope 6. The trolley with its attached bucket is traversed outwardly along the boom by means of the trolley rope 11 fixed to the outer end of the trolley carriage, whence it passes to the end of the boom over the guide sheave 12, thence back to the tower over and about the guide sheave 13, and thence to the trolley drum 14 (Fig. 4) upon which it is wound or unwound at the will of the operator. When the bucket is hoisted the inward pull of the oblique hoisting rope 5 tends to traverse the trolley inwardly along the boom toward the tower, so that the trolley may be traversed at will in either direction by merely winding in the trolley rope on the trolley drum, or releasing the trolley drum to permit the rope to unwind.

One important feature of my invention is the arrangement of controlling devices in such simple and efficient manner that the entire control of the bucket through the three rope-winding drums described, may be handled by a single operator stationed upon the platform 15 in the operating room.

Any suitable devices for driving the rope-winding drums may be employed, but referring to the details of the driving connections for the drums, which are here shown for the purpose of illustrating my invention, the hoisting drum 9 and opening and closing drum 10 are loosely journaled side by side upon the main driving shaft 16, but may be clutched thereto, either separately or together by being forced into engagement with the centrally located clutch member 17 (see broken away portion, Fig. 4). The drum shaft is connected at opposite ends through a crank and connecting-rod connection, to a two-cylinder horizontal engine, for which, however, may be substituted any suitable motor.

Any suitable clutch-operating devices may be employed for the drums 9 and 10 and I have here indicated sliding collars 18 and clutch-operating screws 19 of the type described in my prior Reissue Patent No. 12,085, for forcing the drums either separately or together into clutching engagement with the shaft. For this purpose the clutch screws for the drum 10 are connected through suitable connections to the operating rod 20 which is connected to be advanced or retracted by the overhead operating shaft 21. The clutch-operating screws for the drum 9 are connected to the rod 22, which latter is connected to be moved as the sleeve 23 is turned, which sleeve is journaled for independent movement upon the shaft 21. The clutch-operating sleeve 23 carries the arm 24 attached to the link connection 25, the latter extending to the operating platform 15, where it is attached to the hand lever 26. The clutch-operating shaft similarly has connection through the upright arm 27 and a connecting link 28 with the hand-lever 29 also at the operating platform. The hand levers 26 and 29 are pivotally mounted side by side (see Fig. 6) so that through their manipulation the operator can readily control the clutching or unclutching of the rope-winding drums. By the side of the hand lever 29 is a substantially horizontal foot lever 30 (see also Fig. 6) fulcrumed upon the supporting bracket 31 with the hand lever 29. The foot lever which is arranged to be conveniently operated by the tower operator is connected to a flexible member, such as the rope 32, which, passing up and over suitable sheaves, leads across the tower and thence down to the arm 33 of the throttle valve for the main hoisting engine. To the throttle valve arm is also connected the spring 34 tending normally to close said throttle. The latter, however, may be readily opened to a greater or less extent through the upward pull of the throttle rope 32 caused by downward pressure upon the foot treadle 30. It will therefore be seen that the operator can entirely control the movements of the hoisting and opening and closing ropes from the two hand levers 26 and 29, and, through the foot lever 30, can also control the starting and stopping of the engine which drives the hoisting and opening and closing drums 9 and 10. In the present embodiment of my invention I have also associated with the operating platform other controlling devices by which the movements of the trolley can be regulated so that the entire control of all the movements of the bucket may be exercised by a single operator without altering his position upon the operating platform.

Although other means for winding in or letting out the trolley rope 11 may be employed, I have here provided for that purpose an additional but smaller double-cylinder horizontal trolley engine connected by means of a crank and connecting rod to drive the trolley drum 14. The latter is loosely journaled upon its driving shaft 35 but is adapted to be driven therefrom when desired through the medium of interposed planetary gearing. The latter (Fig. 2) comprises the driving pinion 36 keyed or secured to the driving shaft 35, the intermediate pinion or pinions 37 carried by and journaled upon a part of the drum, and the internal gear 38, the latter secured to or comprising a part of the rotatable member 39 which is mounted for free rotation about the shaft 35 excepting when held or opposed by the friction band brake 40. The latter (Fig. 3) encircles a suitably formed drum face on the rotatable member and is connected to the operating lever 41, depression of which acts to apply the band, and elevation to release the same. When, therefore, it is desired to drive the drum 14 and wind in the trolley rope the band is tightened to hold the rotatable member 39 fast, this causing the drum to turn in the same direction as its driving shaft but at a slower rate of speed. When necessary to release the drum for unwinding the band may be loosened leaving the rotatable member and the drum free to turn. The band is normally kept applied to hold the rotatable member against movement by suitable means such as the spring 42 acting against the lever 41, but may be released by lifting movement of the rope 43 attached to one end of the lever. The reverse or rope-unwinding movement of the trolley drum driving shaft, and therefore, of the drum itself when connected to the shaft, is preferably prevented by some such means as the automatic brakes 44

which are shown encircling the crank disks at the opposite ends of the trolley drum shaft. These permit turning movement of the driving shaft in a forward direction only. Any suitable brake construction may be employed for this purpose such, for example, as that shown in my prior Patent Reissue No. 12,040. The rope 43 controlling the trolley drum passes upwardly over the sheaves 45 and 46 and thence down to suitable controlling devices (to be described) at the operating platform. The starting and stopping of the trolley engine may also be controlled from the operating platform by means of a third controlling rope 47, which, passing over approximate sheaves, is connected (see Figs. 4 and 5) to the throttle valve 48 of the trolley engine. Automatic brakes 49 are preferably provided upon the hoisting drum shaft for preventing the latter from turning, except in the direction when winding on, these being similar to the brakes provided at opposite ends of the trolley drum shaft.

Referring now more particularly to the controlling devices at the operating platform, the trolley engine throttle rope 47 is connected (Figs. 6 and 7) to one arm of a bell-crank lever 50, pivoted upon the bracket 51, the other arm of said lever being forked to embrace the slide rod 52 between fixed collars 53 and 54. Reversely arranged with reference to said rod is a second bell-crank lever 55 connected to a link 56, the latter jointed to a sliding block 57 upon the hand-lever 26, the hand latch 58 being provided to lie closely adjacent to the handle of the lever 26 and have connection to the sliding block through the links 59, whereby the operator, without removing his hand from the lever 26, may also open and close or partially close the throttle for the trolley engine by pressing or releasing the hand latch 58. When the hand latch 58 is pressed the bell-crank lever 55 is moved to slide the rod 52 inwardly and draw down the rope 47, thereby opening or partially opening the throttle. The slide rod 52 being arranged substantially in line with the axis about which the hand-lever 26 is moved, movement of the latter does not tend to draw down the trolley rope or otherwise affect the same.

In order to control the trolley drum and, therefore, the movements of the trolley, I have provided a hand latch 60 pivoted adjacent the handle of the hand-lever 29, but, in order that the control of such hand latch over the trolley drum may be exercised with nicety and effectiveness, I have interposed between such latch and the friction band 40 a pressure-actuated controller, by which power is directly applied to the control of the said friction band.

Referring to Figs. 6, 8 and 10, the trolley drum controlling rope 43 is connected at the operating platform to a piston-rod 61, the latter having attached thereto (Fig. 10) the piston 62 working within the pressure cylinder 63. It therefore follows that when the piston is drawn down it draws down the operating rope 43, lifting the brake-operating lever 41 and releasing the band 40 to permit the free unwinding movement of the trolley drum. The lower part of the cylinder 63 is connected to the atmosphere through the vent pipe 64, but the upper part has connection to the pipe 65 which may be placed in communication with a source of steam or other pressure or with the atmosphere at will, by means of the hand latch 60 on the hand-lever 29. The piston is normally held at the top of the cylinder by the effect of the spring 42 at the trolley drum, but when the hand latch 60 is moved to admit pressure through the pipe 65 the piston is forced down and the brake released. To control the supply of pressure through the pipe 65 the hand latch has jointed connection through the link 66 with a sliding block 67, the latter attached through the link 68 to the pivoted bell-crank lever 69. The depending end of the latter (Figs. 6 and 7) is forked and embraces the headed end of the valve stem 70 arranged in line with the axis about which the hand lever 29 turns. The valve stem passes through suitably packed openings through the valve chamber 71, within which it is attached to a D-slide valve 72, adapted to slide along the valve seat 68. At the opposite side of the valve chamber the valve stem is encircled by a spiral spring 74 adapted to press against a washer and nut upon the stem, so that the latter is normally held in the position shown with the nuts 75 abutting against the stop piece 76. Steam or other pressure is admitted to the valve chamber through the admission pipe 77. The port 78 is connected to the cylinder through the pipe 65 and the port 79 is connected to the exhaust pipe 80 (see Fig. 6). In the position shown, and so long as the hand latch 60 is not gripped by the hand of the operator, the valve 72 maintains communication between the ports 78 and 79, and therefore between the cylinder 63 and the exhaust. When the hand latch is pressed by the hand of the operator the valve 72 is moved to the left, and viewed in Fig. 8, against the pressure of the spring 74, opening the port 78, and, therefore, the cylinder 63 to the live pressure in the valve chamber. This immediately releases the brake at the trolley drum and renders the latter effective for letting out the rope, the speed of the traverse of the trolley being within the control of the attendant through variations of the hand pressure upon the latch 60.

From the description of the operating levers it will be seen that the operator has

within the control of his right hand the clutching and unclutching of the grab opening and closing rope, and, at the same time, through the hand latch 60, the control of the inward movement of the trolley. Subject to the control of his left-hand is the clutching and unclutching of the hoisting rope drum and the throttle control of the trolley engine, the throttle control of the hoisting engine being within his supervision through the medium of the foot lever 30. This places within the control of a single operator these functions which customarily require the presence of two different attendants.

During the operation of the tower the trolley is normally held in the position where it is left by the automatic brakes 44. When the operator desires to run the trolley out it is necessary merely to press the left-hand latch 58, thereby starting the trolley engine which winds in the trolley rope, the winding in movement of the drum being unhindered by the automatic brakes 44. When it is desired to run the trolley in it is necessary only to press the right-hand latch 60, thereby releasing the friction band 40 more or less according to the speed of trolley movement desired.

Where a pressure fluid engine is employed for the purpose of traversing the trolley in an apparatus of the class described, it is desirable to provide some means for stopping the traverse of the carriage at the precise point desired. If an ordinary throttle valve is employed, when the steam is shut off from the trolley engine cylinders by releasing the throttle controlling latch 58, the pressure trapped and remaining in the cylinder is apt to cause a creeping or continuation of the traversing movement of the trolley due to the expansion of the trapped pressure within the cylinder and the consequent turning of the trolley drum. In this connection, therefore, I preferably employ a form of throttle valve, which, when closed by the release of the controlling latch 58 not only shuts off the pressure from the cylinder, but opens the latter to the exhaust sufficiently to clear the cylinders of the trapped steam. Referring to Fig. 9 I have there shown one form of a throttle release valve which is well suited for this purpose, and which in Figs. 4 and 5 is shown as applied to the trolley engine. This valve has connection to the steam admission pipe 81 which conducts the steam to the annular chamber 82 where its admission to the cylinder pipe 83 is controlled by the sliding throttle valve 84. The latter has its edge notched as at 85 so as to give a gradual initial admission. The valve is in the form of a hollow cylinder open from end to end but having its upper end provided with the arched piece 86, to which is secured the valve rod 87 passing through the stuffing box 88. On the outside the rod is provided with the adjustable collar 89 and the compression spring 90, the latter abutting against the yoke 91 and acting against the collar to normally close the valve as shown in Fig. 9. The nut 92 upon the valve stem limits its closing movement by contact with the yoke 91. At the opposite side of the steam pipe 81 the valve chamber is provided with a connection 93 leading to the exhaust, the said connection entering the chamber by an opening 94 which is partly uncovered by the upper edge of the valve when the latter is in its closed position, as shown. It therefore provides that the steam, if any be trapped in the cylinder on the closing of the valve, may pass upwardly through the hollow valve to the space above the valve and thence outward through the opening 94 and connection 93, as indicated by the arrows in Fig. 9. By this means the steam left in the cylinder when the valve is closed is released and any tendency to move the trolley carriage precluded after the release of the throttle controlling latch 58.

While I have employed the term "rope" in designating the various power transmission members, it will be understood that the same is intended to apply to and include cables, chains or other like transmission devices where the latter are capable of performing equivalent functions.

While I have shown and described one form of my invention, it is to be understood that the same is not limited to the details of parts herein shown, or to the specific application of the invention described, but that extensive modifications may be made therein without departing from the spirit of the invention.

Claims:

1. A hoisting apparatus having a trolley carriage, a trolley traversing drum, a driving motor, a driving shaft, planetary gearing between the trolley drum and the driving shaft, including a rotatable member, means for restraining the latter from rotation, and means for preventing the rotation of said driving shaft except in one direction.

2. A hoisting apparatus having a trolley carriage, a traversing rope therefor, a rope-winding drum for said rope, a driving shaft for said drum, a driving motor, planetary gearing between said driving shaft and said drum, the same including a rotatable member, means for holding said member against rotation to cause said motor to turn said drum and wind in said traversing rope, means to prevent the driving shaft from turning except in a rope-winding direction and means to release said rotatable member to permit the unwinding movement of said drum.

3. In a hoisting apparatus the combina-

tion with a trolley, a hoisting bucket carried thereby, controlling ropes associated with said bucket, controlling levers therefor, a trolley traversing rope, a rope-winding drum, a driving shaft, planetary gearing between said shaft and said drum adapted when effective to cause the rope-winding movement of said drum, controlling means associated with said bucket and controlling levers for rendering said planetary gearing effective or ineffective at will.

4. In a grab hoist the combination with a trolley, a trolley drum and trolley drum driving motor, of a plurality of controlling levers for controlling the movement of the grab, planetary gearing between the trolley drum and the driving motor, a braking device for controlling said planetary gearing and means on one of the said levers for controlling said braking device.

5. In a hoisting apparatus the combination with a traversing carriage, of a traversing drum therefor, driving means, planetary gearing through which said drum is adapted to be connected to said driving means and a pressure-controlled device for controlling the connection thereof through said planetary gearing.

6. In a hoisting apparatus the combination with a traversing carriage, of a traversing drum therefor, driving means, planetary gearing through which said drum is adapted to be connected to said driving means and a hand latch for controlling the connection thereof through said planetary gearing.

7. The combination with a trolley, a hoisting device, a trolley traversing drum, of driving means therefor, planetary gearing between said driving means and said drum adapted to throw the latter into or out of operative connection with the driving means, a controlling lever for said hoisting device and auxiliary controlling means upon said lever for controlling said planetary gearing.

8. In a hoisting apparatus the combination with a trolley, a hoisting device carried thereby, a trolley traversing drum, a pressure fluid engine for operating said drum and a pressure relief throttle for said engine.

9. A hoisting apparatus comprising a trolley, a grab carried thereby, a controlling lever for said grab, a trolley traversing drum, a pressure fluid engine for operating said drum, a pressure relief throttle valve for said engine and auxiliary means to control said throttle valve associated with said grab controlling lever.

10. A hoisting apparatus having a trolley carriage, a trolley traversing drum, a driving shaft for said drum, planetary gearing between the trolley drum and the driving shaft, including a rotatable member, means for preventing the rotation of said driving shaft except in one direction, a band brake encircling said rotatable member, and means accessible to the operator for applying said brake.

11. A hoisting apparatus having a trolley carriage, a trolley traversing drum, a driving shaft for said drum, planetary gearing between the drum and the driving shaft, including a rotatable member, means for restraining the latter from rotation, a hand-operated controlling lever, and an auxiliary controlling device mounted upon said controlling lever and connected to operate said restraining means.

12. In a hoisting apparatus, the combination with a bucket, of a pair of bucket levers, a traversing rope, a winding drum and pressure fluid engine for turning the drum, a combined throttle and relief valve for controlling the engine, and means operated from the bucket operator's position at the bucket levers for controlling said valve.

13. In a hoisting apparatus, the combination with a bucket of a pair of bucket levers, a traversing rope, winding drum and pressure fluid engine for turning the drum, a combined throttle and relief valve for controlling the engine and a grasping device on a bucket lever for controlling said valve.

14. In a hoisting apparatus, the combination with a bucket of a pair of bucket operating levers, a traversing rope, a traversing drum, and a pressure-fluid engine connected to turn the drum, throttle means and relief means for the engine and manually controlled means at the bucket operator's position to control said relief means and said throttle means.

15. In a hoisting apparatus, the combination with a bucket of a pair of bucket operating levers, a traversing rope, a traversing drum and a pressure-fluid engine connected to turn the drum, throttle means and relief means for the engine and means connected to one of the bucket-operating levers for controlling said relief means and said throttle means.

16. In a hoisting apparatus, the combination with a bucket of a pair of bucket operating levers, a traversing rope, a traversing drum and a pressure-fluid engine connected to turn the drum, throttle means and relief means for the engine, a grasping device on one of the bucket levers for controlling said relief means and said throttle means.

17. In a hoisting apparatus the combination with a bucket of a pair of bucket levers, a traversing rope, a rope winding drum and a pressure-fluid engine connected to turn the drum, throttle means, engine relief means, means controlling said throttle means and said relief means at the bucket operator's position including a throttle control element connected to one of the bucket levers.

18. The combination with a bucket of a pair of bucket operating levers, a traversing rope, a rope winding drum, a pressure fluid

engine to turn the drum, throttle means, relief means and a movable grasping device on one of the levers for controlling both the throttle means and the relief means.

19. The combination with a bucket of a pair of bucket operating levers, a traversing rope, a rope winding drum, a pressure fluid engine to turn the drum, engine relief means and a grasping device pivoted on one of said bucket operating levers and adapted to close said relief means when grasped.

20. The combination with a bucket of a pair of bucket operating levers, a traversing rope, a rope winding drum, a pressure fluid engine to turn the drum, engine relief means, a brake and means for controlling said relief means and said brake at the bucket operator's position including a control element for opening and closing said relief means and a separate control element for controlling the brake.

21. The combination with a bucket of a pair of bucket operating levers, a traversing rope, a rope winding drum, a pressure fluid engine to turn the drum, engine relief means, a brake and means for controlling said relief means and said brake at the bucket operator's position including a grasping device on one bucket lever for controlling said relief means and a separate control element for controlling the brake.

22. The combination with a bucket of a pair of bucket operating levers, a traversing rope, a rope winding drum, a pressure fluid engine to turn the drum, engine relief means, a brake and means for controlling said relief means and said brake at the bucket operator's position including manually actuated devices on one of said bucket levers for controlling the brake, and a separate controlling element for opening and closing said relief means.

23. The combination with a bucket of a pair of bucket operating levers, a traversing rope, a rope winding drum, a pressure fluid engine to turn the drum, engine relief means, a brake and means for controlling said relief means and said brake at the bucket operator's position including a movable auxiliary control element on each bucket lever, one for controlling the brake and the other for controlling said relief means.

24. The combination with a bucket of a pair of bucket levers, a traversed support, a traversing rope, a rope winding drum, a pressure fluid engine to turn the same, engine relief means, throttle means, a brake for said drum and two controlling elements at the bucket operator's position for controlling said relief means, throttle and brake, a movement of one of said elements serving to release the brake with the relief means open to move the traversed support in one direction and movement of the other serving to open the throttle means with the brake released, and relief means closed to cause movement of said support in the opposite direction.

25. In a hoisting apparatus, the combination with a trolley, a bucket, a trolley rope for hauling the trolley in one direction, a rope winding drum, a driving engine for said drum, a brake for automatically preventing the unwinding movement of said drum while permitting the engine driven winding-on movement thereof, means for releasing the brakes to permit the unwinding movement and simultaneously relieving the pressure in the engine cylinder.

26. In a hoisting apparatus, the combination with a hoisting device such as a grab or the like, controlling means therefor, a trolley, a trolley rope, a rope-winding drum therefor, a brake normally preventing the unwinding movement of the drum, while permitting winding-in movement thereof, a driving engine for the drum, throttle means and relief means for the engine, and means to control said relief means and said throttle means.

27. In a hoisting apparatus, the combination with a bucket 4, a trolley 3 and trolley engine, of throttle means and relief means 84, 85, 93.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

ALMON E. NORRIS.

Witnesses:
THOMAS B. BOOTH,
EVERETT S. EMERY.