

Aug. 27, 1929.

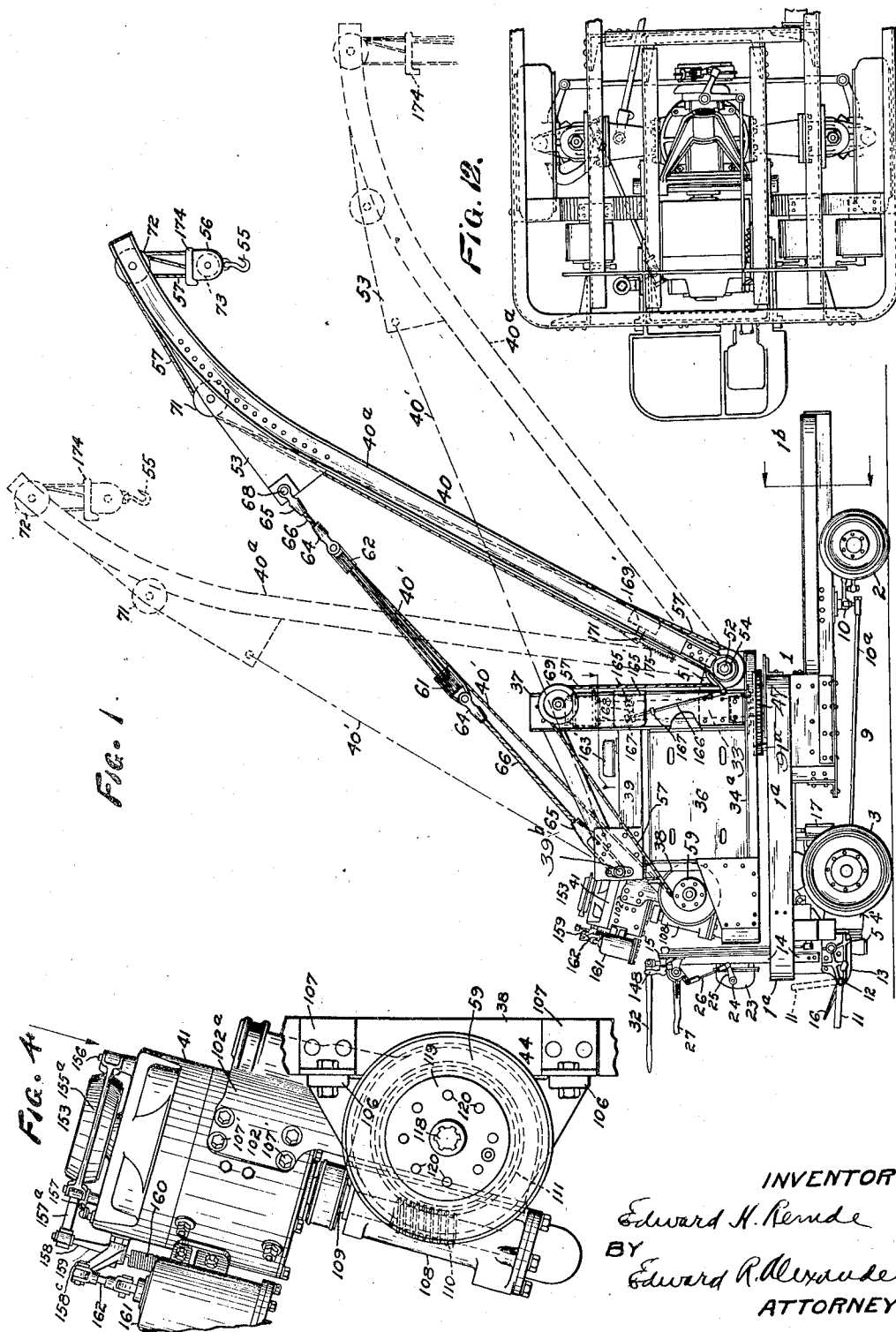
E. H. REMDE

1,725,968

OPERATING MECHANISM AND CONTROL MEANS THEREFOR

Original Filed Dec. 10, 1923

5 Sheets-Sheet 1



INVENTOR

Edward H. Remde

BY

Edward R. Alexander

ATTORNEY

Aug. 27, 1929.

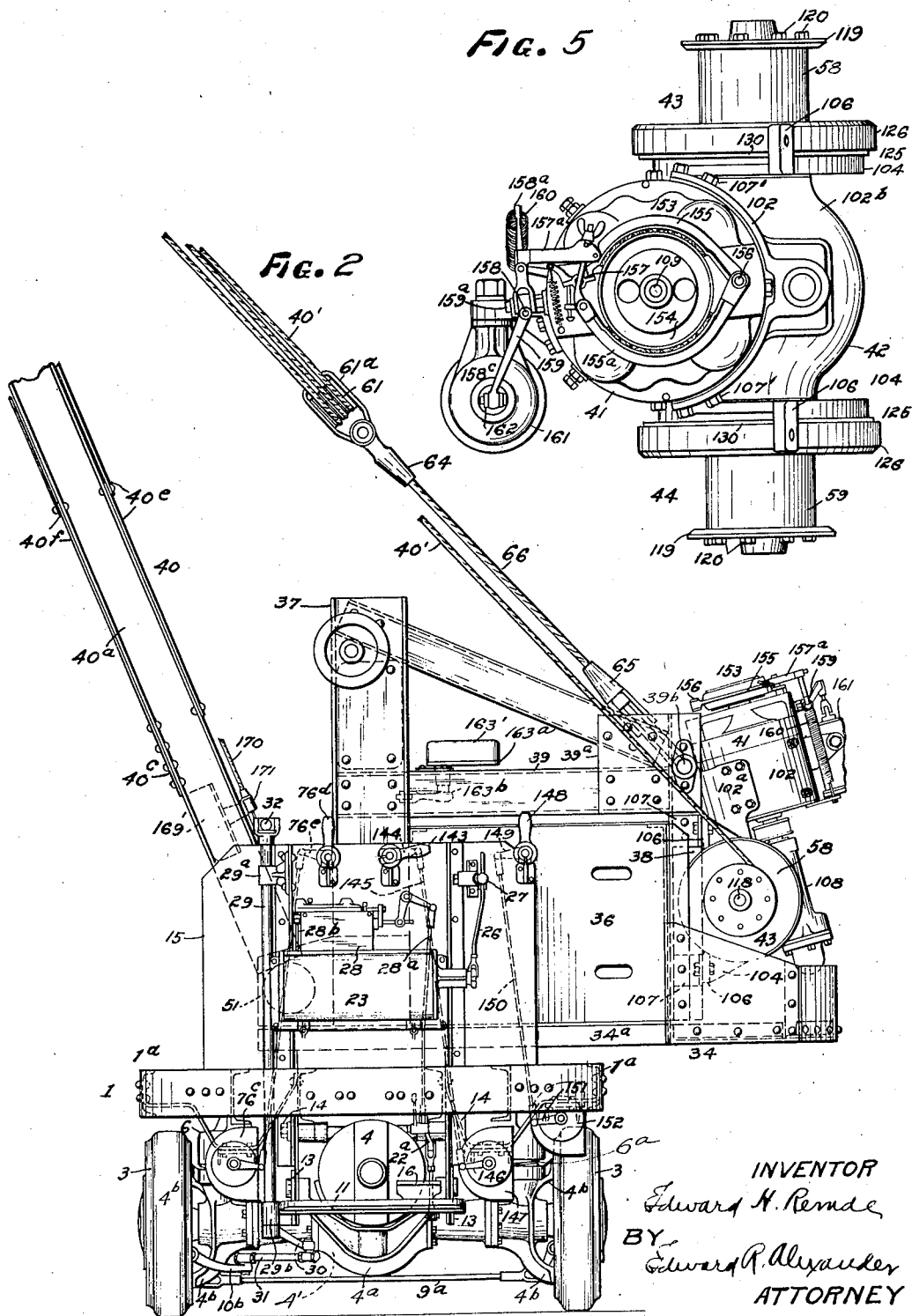
E. H. REMDE

1,725,968

OPERATING MECHANISM AND CONTROL MEANS THEREFOR

Original Filed Dec. 10, 1923

5 Sheets-Sheet 2



Aug. 27, 1929.

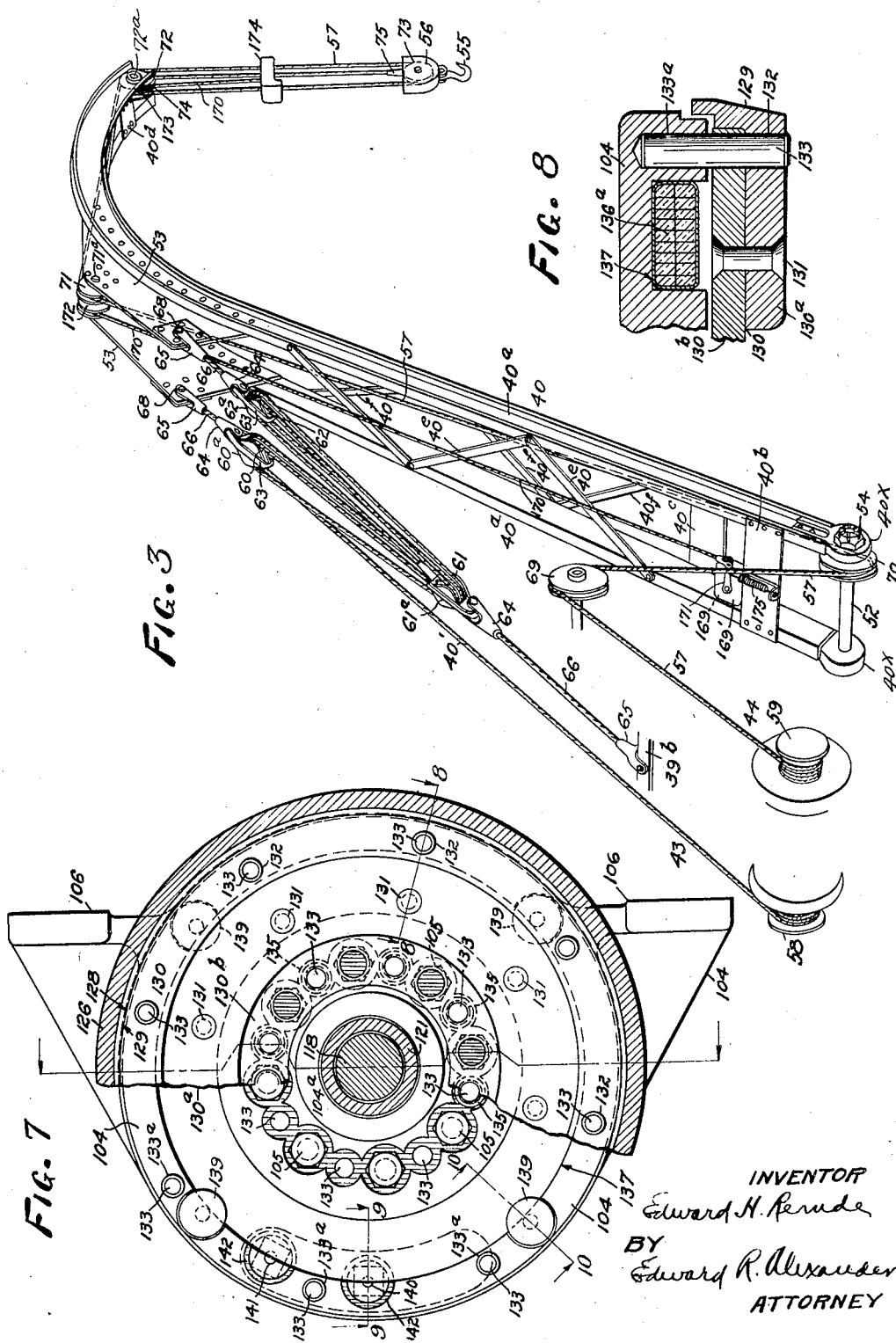
E. H. REMDE

1,725,968

OPERATING MECHANISM AND CONTROL MEANS THEREFOR

Original Filed Dec. 10, 1923

5 Sheets-Sheet 3



INVENTOR
Edward H. Remde
BY
Edward R. Alexander
ATTORNEY

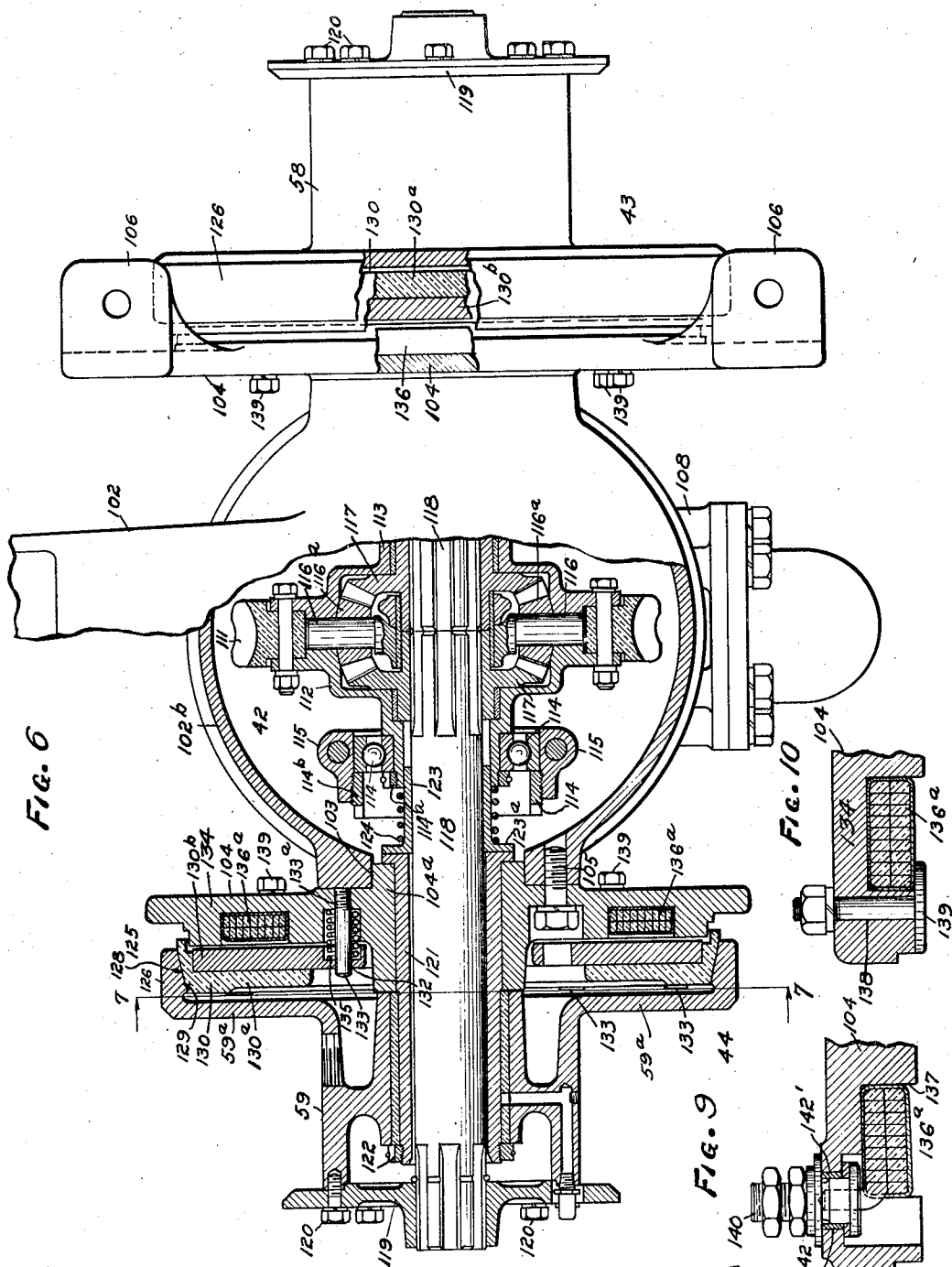
Aug. 27, 1929.

E. H. REMDE

1,725,968

OPERATING MECHANISM AND CONTROL MEANS THEREFOR
Original Filed Dec. 10, 1923

5 Sheets-Sheet 4



Edward H. Remde
By Edward R. Alexander
att'y

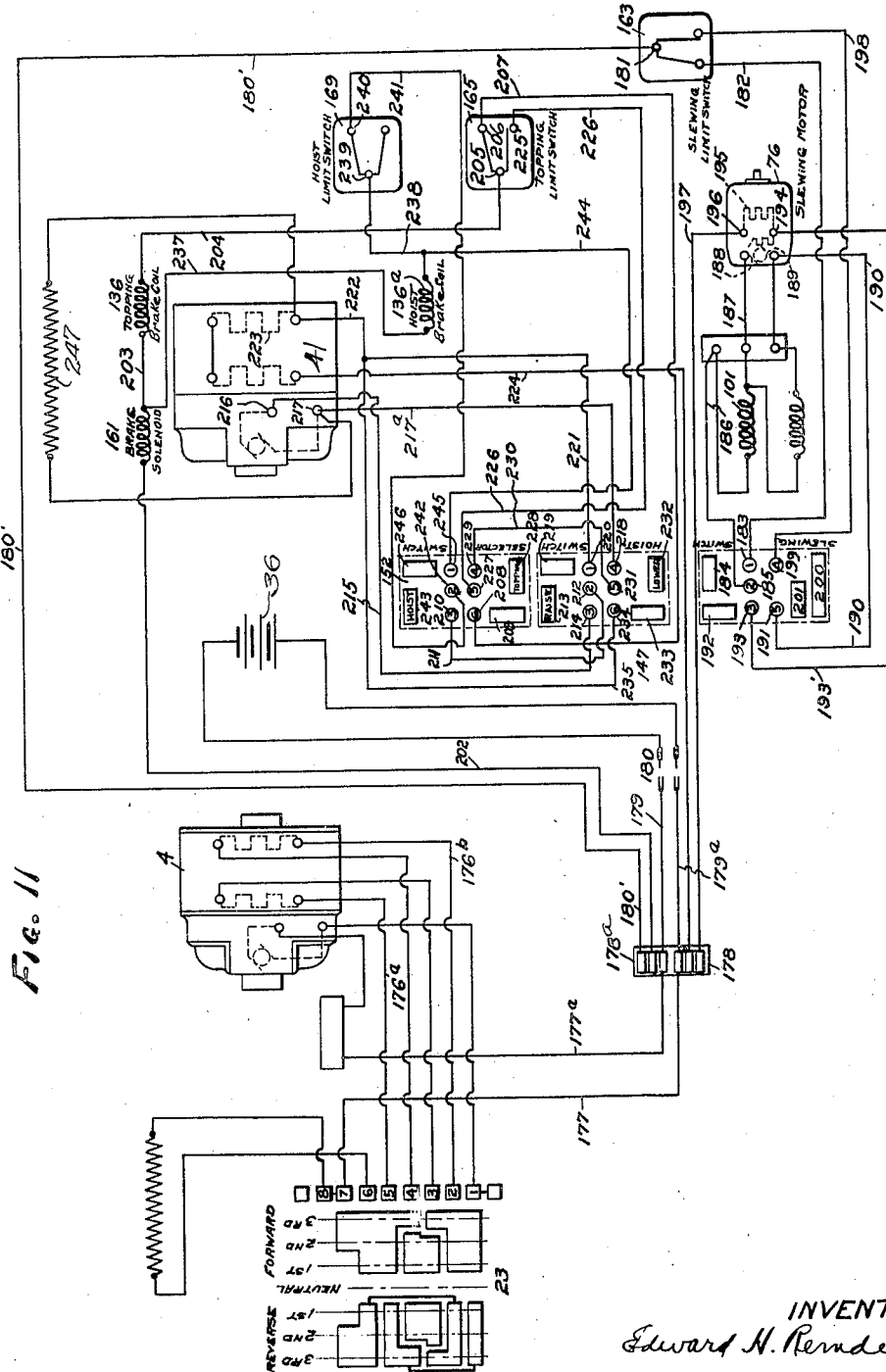
Aug. 27, 1929.

E. H. REMDE

1,725,968

OPERATING MECHANISM AND CONTROL MEANS THEREFOR

Original Filed Dec. 10, 1923 5 Sheets-Sheet 5



INVENTOR
Edward H. Remde
BY
Edward R. Alexander
ATTORNEY

UNITED STATES PATENT OFFICE.

EDWARD H. REMDE, OF CLEVELAND, OHIO, ASSIGNOR TO THE BAKER-RAULANG COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

OPERATING MECHANISM AND CONTROL MEANS THEREFOR.

Original application filed December 10, 1923, Serial No. 679,605. Divided and this application filed November 11, 1924. Serial No. 749,141.

This invention relates to an operating mechanism and the control means therefor whereby such mechanism may be utilized to effect two or more operations.

5 This application is a division of my application filed December 10, 1923, Serial Number 679,605.

One object of the invention is to construct an improved mechanism capable of performing two or more operations and a control means therefor whereby either of said operations may be readily effective.

A further object of the invention is to combine with a plurality of operating mechanisms driven by a single motor or single driven means a selecting or control means whereby either of said mechanisms may be actuated by such motor or driven means.

15 A further object of the invention is to combine with a plurality of operating mechanisms driven from a single motor, electrically actuated means and a control means therefor whereby the cutting in of the source of current supply to said motor will actuate 20 either of said mechanisms as desired.

Other objects of the invention will be apparent to those skilled in the art to which my invention relates from the following description taken in connection with the accompanying drawings, wherein

30 Fig. 1 is a side elevation of a truck and a load handling mechanism thereon which mechanism is operated by an operating mechanism and a control means therefor embodying my invention.

Fig. 2 is end elevation of the truck and load handling mechanism (with parts broken away), the latter being shown slewed or swiveled about its pivot to one operative position to illustrate its manner of use.

40 Fig. 3 is a perspective view of the crane or boom, hoisting device, operating drums and flexible connections from the drums to the crane or boom and hoisting device, respectively, arranged to clearly illustrate the weaving of the connections to operate and control the crane and hoisting device.

Fig. 4 is a fragmentary side elevation of the motor and operating mechanism.

50 Fig. 5 is a top plan view of the parts shown in Fig. 4.

Fig. 6 is a front elevation of the operating mechanism, cable drums and the holding and

release means for the latter, parts being broken away.

Fig. 7 is a section on the line 7—7 of Fig. 6.

Fig. 8 is a section on the line 8—8 of Fig. 7.

Fig. 9 is a section on the line 9—9 of Fig. 7.

Fig. 10 is a section on the line 10—10 of Fig. 7.

Fig. 11 is a diagram showing the electric circuits for the motor which drives the operating mechanism, the means which release the drum holding means and the traction motor, and the controllers or switch devices for closing the circuits.

Fig. 12 is a fragmentary view to show the motor brake and its operating spring.

In the drawings, 1 indicates a frame of any desired shape and form, preferably constructed from channel and angle bars suitably connected by rivets or otherwise. In the illustrated form of construction the frame 1 comprises a main portion 1^a on which the mechanisms for raising and lowering loads and moving the load carrying member, to be later referred to, are supported, and a platform portion 1^b, on which loads may be placed; this latter frame portion serving as a supplemental support for a load, especially where it is necessary to transport the load to a distant point by the driving or operation of the truck. Where the frame is constructed as shown in the drawings, I preferably provide a pair of relatively small trailing wheels 2 below the platform portion 1^b and a pair of relatively large wheels 3 below the main frame portion 1^a.

4 indicates a motor, the shaft of which is connected by a suitable power transmitting mechanism 4' with the axles of the wheels 3 to drive them in either direction. The power transmitting mechanism 4' and its connection with the wheel axles and the connecting mechanism 5 may be similar to corresponding parts shown in Letters Patent No. 1,628,145 dated May 10, 1927. 5 indicates a mechanism of any desired construction interposed between the motor 4 and housing members 4^a and the frame 1 for connecting them together. The mechanism 5 may be constructed to permit of relative movements between the motor and housing members and the frame 1 incident to the driving of the truck. 6 indicates pairs of casing elements enclosing springs 6^a between the frame 1 and hous-

ing members 4^a, each pair of casing elements 6 being formed with openings through which extends a rod or bolt carrying nuts on its outer end to prevent separation of the casing elements relative to each other beyond certain limits.

The outer ends of the housing members 4^a are shaped to form suitable knuckles 4^b on which the traction wheels 3 are pivoted for steering purposes, the connection between the wheels or the axles therefor and the power transmitting mechanism 4' being of such character—universal joints for example—that the wheels may be driven while being steered. The axle for the trailing wheels is also preferably provided with suitable knuckles, which serve as pivotal supports for the wheels 2, whereby they may be steered and thereby enable the truck to be turned in areas of relatively small dimensions. 9 indicates steering connections between the wheels 2 and wheels 3, whereby both pairs of wheels may be simultaneously operated about their pivots for steering purposes. The connections 9 preferably comprise a tie rod 9^a between the wheels 3, a lever 10^b fixed to the hub of one of the wheels 3, a rod 10^a connected to the lever 10^b and one arm of a bell crank 10 pivoted on the frame 1 and connecting devices between the other arm of the bell crank and the wheels 2.

11 indicates a support for an operative. In the illustrated example, the support 11 comprises a plate or base adapted to serve as a platform on which the operative stands while operating the truck and the load supporting and engaging members in the manner to be later described. The platform 11 is preferably pivoted to a rod 12, the opposite ends of which are supported in suitable brackets 13 secured to the lower end of a pair of uprights 14. By pivoting the platform 11, it may be swung upwardly—see dotted lines in Fig. 1—when the truck is not in use. The uprights 14 may comprise spaced angle bars rigidly secured to certain of the longitudinal or transverse sills of the frame 1 (see Fig. 2), and extend upwardly to form a support for a dash 15. The dash 15 preferably supports certain of the controlling or operating elements for the truck and the load supporting and engaging members and the handles or levers for operating these elements, this arrangement permitting the operator to stand within easy reach of all the handles or levers by which the several operations of driving, steering and handling the load and load carrying member are effected. 16 indicates a foot pedal associated with the platform 11, and arranged to control the release and application of a brake mechanism, indicated as an entirety at 17. The pedal 16 is preferably mounted on the rod 12 so that it may readily swing upwardly with the platform 11 for reasons already set forth.

The brake mechanism 17 is arranged to brake the movement of the truck or to hold it against movement, its operating elements being so arranged and connected to a suitable spring that the latter normally acts to apply the brake and to swing the pedal 16 upwardly, as shown in Fig. 1. Accordingly, movement of the pedal 16 downwardly, will release the brake. As a result of this arrangement, the truck is held against movement in either direction at all times and can only be moved upon the positive operation of the pedal 16.

23 indicates as an entirety a controller for cutting in or closing the circuit to the motor 4 to operate it at different speeds and in opposite directions, in a well known manner. The controller is operated by a shaft 24 carrying an arm 25, which is connected by a link 26 to a lever 27. The lever 27 is pivoted on the dash 15 to swing in vertical planes. 28 indicates as an entirety a switch mechanism associated with the controller 23 and brake mechanism 17, and automatically controlled by the latter through a rod 28^a to break the circuit to the controller or to the motor when the brake is on (that is, the brake shoes are operated by the spring already referred to) and to close the circuit when the brake is released (that is, the foot pedal is pushed downwardly), the purpose being to prevent operation of the motor 4 by means of the controller if the latter is moved from its "off" position in either direction when the brake is in its applied position. By preference, the switch mechanism is interconnected with the controller by means of a link 28^b to prevent closing of the circuit in the event the controller lever is in or is moved to an "on" position and attempt is made to release the brake. As this mechanism does not form part of the present invention, further description thereof is thought to be unnecessary.

29 indicates a post or steering column rotatably mounted in suitable bearings 29^a, 29^b, and connected by an arm 30 and link 31 with the arm 10^b. The upper end of the column 29 has connected to it a hand lever 32, by means of which the column may be rotated in opposite directions to effect steering of the wheels 2, 3, through the connections 9 already referred to.

33 indicates an axle or pivot member disposed in vertical position on the main frame portion 1^a and extending upwardly therefrom to form a vertical shaft for a frame 34. The lower end of the shaft 33 is fitted into a sleeve (not shown) fixed or seated between certain of the longitudinal sills constituting the main frame portion 1^a and platform portion 1^b, these sills being arranged in spaced overlapping relation for this purpose, as shown in Fig. 1. The frame 34 comprises a base section 34^a, having cross bars forming a support for a box containing a battery or batteries 36 and pairs of upright members 37, 38, con-

5 nected by horizontal members 39. 39^a indicates plates disposed at the joints between the horizontal members 39 and upright members 38 and connected in spaced relation by a cross
 10 bar 39^b, the purpose of which will be later set forth. The pairs of upright members 37, 38, are arranged at points intermediate the front and rear end of the base section 34^a to provide a support for a load supporting member, such as a crane or boom 40, and space for
 15 a motor 41, a power transmitting mechanism 42 and operating means 43, 44, which will later be described. Suitable bearings are provided for the frame 34 to swing on the shaft 33. 47 indicates a gear fixed to the frame 34 and serving as the element by means of which it may be rotated in either direction (see Fig. 2) by a suitable power means, one element of which, as shown in Fig. 1, comprises a pinion meshing with the gear 47.

20 51 indicates a pair of plates vertically disposed on the base 34^a at opposite sides of and slightly forward of the opening therein for the shaft 33 and provided with hollow bosses which form bearings for a pivot pin 52 on which the crane or boom 40 is pivotally supported. The plates 51 are formed with openings aligned with the bearing openings in the bosses through which the pivot pin extends.

25 30 The crane 40 preferably comprises a pair of channel members 40^a arranged in spaced relation, but slightly converging toward their upper ends. The upper portions of the members 40^a may be curved forwardly and downwardly. The channel members are secured together in spaced relation by a plurality of cross-pieces 40^b, 40^c, 40^d and diagonal pieces 40^e, 40^f. At a point remote from their free ends, the members 40^a are provided with up-
 35 standing plates 53, the purpose of which will later appear. The lower ends of the channel bars 40^a are provided with suitable knuckles 40^g through which the pivot pin 52 extends, the opposite ends of the pin being provided with nuts 54 to prevent the pin from moving
 40 endwise in the knuckles and bosses. The crane 40 is raised and lowered about the pivot pin 52 by any suitable means, but preferably by means of a cable or other flexible connection 40' connected to the operating means 43.

45 50 55 55 indicates as an entirety a member for engaging a load, whereby the load may be raised or lowered or otherwise handled. The load engaging member may be of any desired construction, such as a clam shell bucket or a platform, but for illustrative purposes I have shown such member as comprising a hook depending from a casing 56, which in turn is supported or suspended from the free end
 60 of the crane 40 by a cable or other flexible connection 57, connected with the operating means 44 as will be later described.

65 The operating means 43, 44, comprise a pair of drums 58, 59, on which the cables 40', 57, respectively, wind and unwind, for swing-

ing the crane 40 about its pivotal support and for raising or lowering the load engaging member 55. The drums 58, 59, are rotated independently of each other in either direction in the manner to be later set forth, to
 70 swing the crane 40 and raise or lower the member 55. The cable 40' may be connected at its inner end to the drum 58 in any desired manner. From the drum 58, the cable 40' leads to and weaves through and around a
 75 plurality of sets of sheaves 60, 61, 62, supported in suitable blocks 60^a, 61^a, 62^a, respectively, as clearly shown in Fig. 3, the opposite or outer end of the cable being carried down and preferably connected or anchored
 80 to the block 61^a. Each of the blocks 60^a, 62^a, is preferably connected by a strap 63, sockets 64, 65, and a rope 66, to one of the plates 53 the latter being formed with an opening through which a rod 68 extends to engage the
 85 bifurcated ends of the sockets 65. The block 61^a is preferably connected by similar devices to the cross bar 39^b—see Fig. 3.

The cable 57 is connected at its inner end in any suitable manner to the drum 59. From
 90 the drum 59, the cable 57 runs around a guide sheave 69, supported on the adjacent upright member 37, and then around a sheave 70 loosely mounted on the shaft 52 adjacent one of the bosses 40^g. From the sheave 70 the
 95 cable 57 extends over a sheave 71, rotatably mounted on a shaft 71^a, which is supported at its opposite ends by the plates 53. From the sheave 71 the cable weaves around a sheave 72 supported in the free end of the crane
 100 40, then around a sheave 73 mounted in the casing 56, and then around a sheave 74 supported in the free end of the crane 40, the outer end of the cable being carried down and connected by a socket and loop to the shaft
 105 of the sheave 73.

102 indicates as an entirety a casting shaped and constructed to form a cradle 102^a for the motor 41 and a housing section 102^b for the power transmitting mechanism 42.
 110 The end walls of the housing section 102^b are formed with openings 103 through which the driving means for the drums 58, 59, extend, as will be hereinafter described. The end walls of the housings 103 are thickened to
 115 form suitable seats for a pair of annular supporting disks or members 104, and such walls and members are formed with aligned openings to receive cap screws 105 by means of which the disks or members 104 are rigidly
 120 secured to the end walls of the housing section 102^b. The supporting disks or members 104 are provided with integral extensions to provide feet 106, each of which is secured to an angle 107 carried by the adjacent upright
 125 member 38. The feet 106 operate through the disks or members 104 and the housing and cradle casting 102 to support the motor 41 and power transmitting mechanism 42 in fixed relation upon the support 34 and in operative
 130

relationship to each other. The motor 41 is fixed to the cradle 102^a by a plurality of screws 107'. 108 indicates a housing section shaped to fit upon the open end of the housing section 102 and be clamped thereto and also to enclose the propeller shaft 109 connected to the shaft of the motor 41. The housing section 108 is adapted to support a pair of spaced bearings for the propeller shaft. Between the propeller shaft bearings, the shaft is provided with a worm 110 which meshes with and drives a gear 111 forming one of the elements of the power transmitting mechanism 42.

The power transmitting mechanism 42 for the operating means 43, 44, may be of any desired construction. I prefer to use some form of gear mechanism and accordingly show for illustrative purposes a well known type of differential mechanism, such as is commonly used for driving the wheels of automobiles. Such mechanism may be similar in construction to the differential mechanism 4' utilized in the truck construction herein illustrated for driving the wheels 3 from the motor 4. By the use of a differential mechanism a single motor may be employed to operate the operating means through the cooperation of certain devices and means, to be later described, for holding or releasing the driven elements of the differential mechanism, whereby either drum will be rotated in a simple manner. In the illustrated form of construction, the differential mechanism comprises the main gear or worm gear 111, already referred to, connected to a casing 112 having oppositely extending hubs 113. The hubs 113 are mounted in suitable bearings 114 seated in pillow blocks 115, carried by the housing sections 102^b, 108, and secured together in any well known manner. As shown in Fig. 6, the hubs 113 are reduced to form seats for the inner races of the bearings 114. 114^a, 114^b, indicate ring nuts screw threaded to the pillow blocks 115 and free ends of the hubs, engaging the races of the bearings to hold them in place. The casing 112 supports a plurality of stud shafts 116, on which loosely rotate bevel pinions 116^a. The pinions 116^a mesh with bevel gears 117 to drive them. 118 indicates axle sections keyed at their inner ends to the hubs of the bevel gears 117. At their outer ends the axle sections 118 are keyed or otherwise secured to the drums 58, 59, to rotate them, preferably through the interposition of cap plates 119, keyed upon the free ends of the axle sections 118 and connected to the peripheral edges of the drums 58, 59, by cap screws 120. 121 indicates sleeves surrounding the axle sections 118 and supported at their inner ends in the openings extending through the hubs 104^a of the supporting disks or members 104, the inner free ends of the sleeves having flanges which abut against

the inner end wall of the hubs 104^a to prevent movement of the sleeves outwardly. The outer ends or extended portions of the sleeves serve as bearings for the drums 58, 59, to rotate on, bushings being mounted on the sleeves to provide suitable bearing surfaces. The outer free ends of the sleeves 121 are provided with screw threads to receive nuts 122, which engage the ends of the hubs for the drums to hold them in position on the sleeves 121. The hubs of the drums preferably have a width equal to the length of the extended portions of the sleeves so that the drums are held between the nuts 122 and outer ends of the hubs 104^a of the disks or members 104 to prevent movement of the drums endwise of the sleeves 121. 123 indicates a dust sleeve surrounding and loosely fitting each axle section 118 and interposed between the adjacent hub 113 of the casing 112 and inner end of the adjacent sleeve 121. The inner end of each dust sleeve fits within the end of the adjacent hub 113 and its opposite end is flanged at 123^a to abut the flange of the sleeve 121. 124 indicates a coiled spring surrounding each dust sleeve 123 and engaging the free end of the adjacent hub 113 and the flange 123^a and arranged to act on the latter to maintain it in close arrangement with the flange of the sleeve 121.

125 indicates as an entirety means for holding, locking or connecting each drum 58, 59, to the adjacent disk or member 104 which, being fixed to the frame 34 in the manner already described, serves to prevent rotation of the drum by the power transmitting or differential mechanism 42 when the motor 41 is operated. As the holding means 125 for the drums 58, 59, are similar in construction, the description of one of them will suffice for both. Each said holding means 125 preferably comprises a brake, one element of which is carried by the drum and the other element of which is carried by the adjacent supporting disk or member 104. The movable element of the brake may be carried by the drum or by the disk, as desired, but I have chosen to show such element as carried by the latter to insure simplicity in construction. The brake shown for illustrative purposes is of the frictional type. The brake comprises a rim 126 extending laterally from and surrounding the periphery of the drum flange 59^a, being preferably formed integrally therewith. The inner surface of the rim 126 is of conical shape to form a friction engaging surface 128 with which the friction engaging surface or wall 129 of the movable brake element 130 engages. The brake element 130 is of annular shape so as to extend entirely around the brake element 126. The brake element 130 preferably comprises a pair of rings 130^a, 130^b, connected together, preferably in face to face relation, by any suitable means, for example, rivets 131 (see Fig. 130

8). The ring 130^a is preferably formed from bronze and carries at its outer peripheral edge a flange portion which forms the wall 129 which engages the brake element 126; the ring 130^b is formed from soft iron, so that it may serve as an armature to effect separation of the brake elements in the manner to be later described. By forming the ring 130^a of bronze, that wall of the brake element 130 which engages and disengages the brake element 126 will freely disengage the latter, since the metal of which it is formed is non-magnetic, and hence it will not stick to the brake element 126 when the armature is acted upon, as will later appear. 132 indicates a set of openings formed in the brake element 130 and spaced from each other therearound and arranged to receive supporting and guiding pins 133 supported in openings 133^a formed in the supporting disks 104. The openings 132 are of a size to permit the brake element 130 to freely slide on the pins 133. The openings 132 and pins 133 are preferably disposed in outer and inner annular series, so that the brake releasing means, indicated as an entirety at 134, may be disposed substantially midway between the outer and inner edges of the brake element 130. 135 indicates springs coiled around certain of the pins 133 and disposed between the brake element 130 and inner face of the disk or member 104. The springs 135 normally operate to move the brake element 130 laterally on the pins 133 into engagement with the brake element 126, so that the drum to which the rim is connected and the adjacent disk or member 104 will be connected together, the purpose of which is to hold or lock the drum against rotation.

Of the releasing means, 136 136^a, indicate windings or coils carried by the disks or members 104 and arranged, when energized to attract the brake rings or armatures 130^b and through it to move the rings 130^a away, or to effect disengagement thereof, from the brake elements 126. As both releasing means are similar in construction, but one thereof need be described. As shown in the drawings, the coil 136^a is preferably of ring shape and fits into an annular recess 137 formed in the face of the supporting disk 104. 138 indicates openings formed in the disk 104 and spaced therearound to receive bolts 139, the heads of which over-lie the coil 136^a to hold it in the recess 137. The inner face of the disk 104 is countersunk to receive the heads of the bolts 139 and the recess 137 is formed deep enough to receive the coil and permit the bolt heads to engage its outer surface. The arrangement prevents the bolt heads from projecting beyond the inner face of the disk 104 and also prevents the armature from actually contacting with the coil 136^a, 140, 141, indicate the terminals of the ends of the coils, each terminal being mounted in an insulating

bushing 142 which in turn is mounted and fixed in an opening 142' formed in the disk 104. The terminals are connected to the batteries 36 by leads in the manner to be later described. From the foregoing description it will be understood that the brake elements are normally engaged, through the action of the springs 135, so that both drums 58, 59, are normally locked or held against rotation in either direction, since the brake elements 130 are connected to or carried by the frame 34, being connected thereto through the supporting disks 104, feet 106 and angles 107. In carrying out my invention, I utilize suitable gearing, preferably of the type wherein the power of its driving means may be transmitted to one driven element of a pair of driven elements when the other driven element is locked or held against movement. Accordingly, it will be seen that if the releasing means 134 for one brake is operated to disengage the elements thereof and the motor 41 is set in motion, the power thereof will be transmitted through the power transmitting or differential mechanism 42 to rotate the drum which has been released and thus effect the winding of the rope 40' or 57 thereon or therefrom accordingly as the motor is driven in one direction or the other.

The circuits to the coils 136, 136^a may be closed by separate switch devices to energize the coils independently and a separate circuit for the motor 41 closed by a suitable controller; but to simplify the construction of the mechanism, as well as to simplify and increase the speed of operation of the load supporting and engaging devices, I so arrange the circuits for the coils 136 and 136^a and the switch and control devices therefor, that either coil may be connected in series with the motor, whereby the operation of the controller to drive the motor 41 in either direction will simultaneously effect the operation of either releasing means and the unlocking of the brake acted on thereby to permit operation of the adjacent operating means 43 or 44. As a result either drum 58, 59, may be rotated in one direction or the other to swing the crane 40 about its pivot pin 52 or to raise or lower the load engaging device 55, as desired. To carry out these operations, I provide (1) a lever 143, pivotally mounted on the dash 15 and connected through an arm 144 and link 145 with a crank arm 146, which is connected to the shaft of a controller indicated as an entirety at 147; and (2) a lever 148, pivotally mounted on the dash 15, and connected through an arm 149 and a link 150 with a crank arm 151 which is connected to the shaft of a switch device 152. The purpose of the controller 147 is to supply current to the motor 41 to drive it in either direction, such operation being dependent upon the movement of the lever 143 to either side of its neutral position, as shown in Fig. 2. The

purpose of the switch device 152 is to select or connect either one of the coils 136, 136^a, dependent upon which one of the drums is to be operated, in series with the motor 41, so that upon the operation of the controller lever 143, the selected drum will be rotated in one direction or the other, according to the direction of movement of the lever.

The selector lever 148 is shown in a neutral position in Fig. 2, that is, that position in which neither coil 136, 136^a, is connected in the circuit of the motor and batteries, but by movement of the lever to the right or left, one of the coils may be connected in the circuit as already described. This arrangement insures the complete cutting out of one coil and its de-energization before the other coil can be connected to it. The operation of the levers 143 and 148 and the controllers 147, 152, operated thereby, respectively, will be more clearly understood from the diagrammatic view (Fig. 11), which will be later described.

The motor 41 is preferably of the electric type in order that it may be operated from batteries and co-operate with the operation of the means for releasing the drum holding means herein illustrated and described; but it will be understood that the holding means and the motor may be operated in some other manner without departing from the scope of the invention. The motor 41 may be of any desired construction. It preferably has associated with it a brake mechanism, indicated as an entirety at 153, to stop the rotation of its shaft and elements driven thereby following the opening of the motor circuit. Of the brake mechanism 153, 154 indicates a brake wheel fixed to the motor shaft, which is extended beyond the upper end of the motor casing for this purpose. 155, 155^a, indicate brake shoes pivoted at corresponding ends upon a shaft 156 mounted in a boss on the adjacent end of the motor casing. The opposite ends of the shoes are connected to a pair of levers 157, 157^a, which are so connected to each other that upon the movement of the latter in one direction the levers will operate to clamp the shoes against the brake wheel. The lever 157^a is connected to one arm 158 of a lever 159, which is mounted upon a shaft 159^a suitably supported by the motor casing. The arm 158^a of the lever 159 is connected to one end of a spring 160. The spring 160 operates to move the lever 157^a in that direction which applies the brake shoes and thus normally keeps the latter in braking position. To release the brake shoes, the lever 159 is rocked about the pivot or shaft 159^a in the opposite direction, this operation being preferably effected by a solenoid 161, the core of which is connected by a link 162 with the arm 158^a of the lever 159. The winding on the solenoid is connected in series with the circuit to the motor as will

later be set forth in connection with Fig. 11, so that when the circuit is closed the solenoid is energized and automatically effects the release of the brake shoes; likewise, upon the opening of the motor circuit the solenoid winding is de-energized and thus permits the spring 160 to automatically actuate the brake shoes to clamp the brake wheel.

As will be understood from the foregoing description, the load is raised and lowered by winding the rope 57 on or unwinding it from the drum 59, the crane 40 is swung upwardly or downwardly by winding the rope 40' on or unwinding it from the drum 58 and the support 34 is swung or rotated about the shaft 33 by the operation of a suitable motor indicated at 76 in Fig. 11. The movement of each of these elements is automatically stopped when moved in either direction (except in the downward movement of the load engaging element 55) at a predetermined position by a mechanism which opens the circuit to the motor that operates such element. The mechanisms for stopping the movements just referred to may be similar in construction, each being preferably similar in construction to the mechanism which forms the subject matter of my copending application Serial No. 610,791. The mechanism for stopping the swinging or rotation of the frame 34, comprises a switch means 163 enclosed in a casing 163'. The casing 163' is fixed to a plate 163^a, supported upon the horizontal bars 39. The mechanisms for stopping the movement of the crane or boom 40 comprises a switch means 165 enclosed in casing 165', preferably supported on the outer face of one of the upright members 37, a rod 166 carrying a pair of spaced tappets 167 and pivotally connected to an arm mounted on the lower end of the adjacent frame channel bar 40^a. The movement of the crane 40 about its fulcrum 52 will move the rod 166 endwise and thus cause one of the tappets 167 to engage and move the arm 168, which in turn will open the circuit and stop the motor 41. The mechanism for stopping the raising of the load engaging member or element 55 comprises a switch means 169 enclosed in a casing 169' carried by the crane 40, a flexible connection 170 connected at one end to the arm 171 of the switch means and leading over sheaves on the shafts 71^a and 72^a and connected at its opposite end to a weight 174, which is disposed in the path of movement of the casing 56. The arm 171 is connected to a spring 175 which tends to swing the arm in one direction—that direction which will operate the switch means to open the circuit. The arm is moved in the other direction—that direction which operates the switch means to close the circuit—by the weight 174. The weight 174 is of a size to overcome the tension of the spring 175 and thus normally maintains the switch means in the latter

position. If the motor 41 is operated and the drum 59 rotated to raise the load-engaging member 55, the casing 56, upon approaching its extreme upper position, will engage the weight 174 and lift it, which operation will release the tension on the rope or cable 170, and thus permit the spring 175 to move the arm 171 and through it effect the opening of the circuit through the switch means 169. As a result, the motor 41 will be automatically stopped.

Referring to Fig. 11: the traction motor 4 is connected with the terminals of the controller 23 by leads constituting the circuits 176^a, 176^b, to control the direction of rotation of the motor and leads 177, 177^a, to the terminals of terminal blocks 178, 178^a, and through wires 179, 179^a, with the opposite sides of the batteries 36. 180 indicates a connection in the circuit leads 179, 179^a, which permits the batteries to be connected with the terminals or with a charging plug to recharge the batteries.

The circuit for the motor 76 may be traced as follows: from the terminal 178^a by the lead 180' to the terminal 181 of the switch means 163; if the frame 34 is to be rotated to the right, the circuit is through the lead 182 to terminal 183, across contact 184 to terminal 185, lead 186, winding of brake solenoid, lead 187 to brush 188, from brush 189 to lead 190, terminal 191, contact 192, terminal 193, lead 193', terminal 194, field coil 195, terminal 196 and lead 197 to terminal 178. If the frame 34 is to be rotated to the left as shown in Fig. 2, the circuit is traced as follows: terminal 178^a, lead 180', terminal 181, lead 198, terminal 199, contact 200, terminal 191, lead 190, brush 189, brush 188, lead 187, winding of brake solenoid, lead 186, terminal 185, contact 201, terminal 193, lead 193', terminal 194, field coil 195, terminal 196 and lead 197 to terminal 178.

If the crane 40 is to be raised, the circuit for the motor 41 and the electro-magnet to be connected in series with the motor 41 so as to release the brake 130 which holds the drum 58, is traced as follows: from terminal 178^a, through lead 202, winding of brake solenoid, lead 203, winding of magnet 136 adjacent the drum 58 (see Fig. 6), lead 204, terminal 205 of switch means 165, terminal 206, lead 207, contact 208, contact 209, terminal 210 of the selector switch 152, lead 211, terminal 212 of the controller 147, contact 213, terminal 214, lead 215, terminal 216, motor brushes, terminal 217, lead 217^a, terminal 218, contact 219, terminal 220, leads 221, 222, field coils 223 and lead 224 to terminal 178; if the crane 40 is to be lowered, the circuit is as follows: from terminal 178^a, through lead 202, winding of the brake solenoid, lead 203, winding of magnet 136, lead 204, terminal 205 of switch means 165, terminal 225, lead 226, terminal 227 of the selector switch 152, contact

228, terminal 229, lead 230, terminal 231 of the controller 147, contact 232, terminal 218, lead 217^a, terminal 217, motor brushes, terminal 216, lead 215, terminal 214, contact 233, terminal 234, lead 235, lead 222, field coils 223 and lead 224 to terminal 178.

If the load engaging element 55 is to be raised, the circuit may be traced as follows: from the terminal 178^a, through lead 202, winding of the brake solenoid, lead 237, winding of electro-magnet 136^a, lead 238, terminal 239 of switch means 169, terminal 240, lead 241, terminal 242, contact 243, terminal 210, lead 211, terminal 212, contact 213, terminal 214, lead 215, terminal 216, brushes of motor 41, terminal 217, lead 217^a, terminal 218, contact 219, terminal 220, leads 221, 222, field coils 223 of motor and lead 224 to terminal 178. If the load engaging element is to be lowered, the circuit may be traced as follows: from terminal 178^a through lead 202, winding of brake solenoid, lead 237, winding of electro-magnet 136^a, lead 244, terminal 245, contact 246, terminal 229, lead 230, terminal 231, contact 232, terminal 218, lead 217^a, terminal 217, brushes of motor, terminal 216, lead 215, terminal 214, contact 233, terminal 234, lead 235, lead 222, field coils 223 and lead 224 to terminal 178.

247 is a resistance arranged to be connected in shunt with the motor circuit when the motor is operated to lower the crane 40 or the load engaging member 55, to prevent acceleration in the speed of the motor shaft.

From the foregoing description it will be seen that I have provided a load handling mechanism in which the load may be moved or operated in anyone of a plurality of directions in a rapid and simple manner, for example, by a raising or lowering of the load engaging member, and by a raising or lowering of the crane; such operations being effected by providing locking means for certain elements through which the power of the motor is transmitted to driven means and causing a release of one of such elements accordingly as one movement of the load or another is desired. While I have shown an electrically operated means for operating—that is, releasing—either brake, it will be understood that other types of brake means may be employed.

In my construction I am enabled to effect the various operations of the load engaging member and the crane from a single motor and a unitary driving or power transmitting mechanism, which tends toward economy and simplicity as well as compactness of the construction. While I have shown the driven means as directly connected to the driven elements of the power transmitting mechanism, this is merely for the purpose of illustrating the preferred embodiment of the invention as adapting it to a construction in which the loading engaging member is controlled in its

vertical and topping movements by flexible members wound on and off drums.

It will also be noted that the selector handle and the controller actuated thereby are arranged to be set at a neutral position, at which time neither electro-magnet winding is energized, and that they must be moved in one direction or the other to effect the operation (release) of the desired clutch elements. By this arrangement I insure the de-energizing of one magnet winding prior to the energizing of the other magnet winding, so that proper operations of the load engaging member and crane to handle the load as desired are effected in a rapid and positive manner.

It will also be noted from the foregoing description that in my construction I provide a mechanism wherein separate operations may be effected from a single motor or a driving means connected therewith and associate with such mechanism and motor a selecting means which permit either operation to be carried out upon the driving of the motor. While I have disclosed a mechanism wherein two separate operations may be effected, as desired, it will be apparent that this mechanism can be developed to provide for a larger number of operations so that the selecting means can operate to effect one of any number of operations upon the operation of the motor or its driven means.

To those skilled in the art to which my invention relates many alterations in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the spirit and scope thereof. The disclosures and the description herein are purely illustrative and are not intended to be in any sense limiting.

What I claim is:

1. In apparatus of the class described, the combination of a motor, a controller for operating the motor in either direction, a plurality of electrically actuated elements, and selector means for connecting either of said elements in series with said motor whereby said motor and one of said elements are operated when said controller is moved in one direction.

2. In apparatus of the class described, the combination of a motor, a controller for operating the motor in either direction, a plurality of devices arranged to be driven by said motor, electrically actuated elements controlling the operation of said devices, and selector means for connecting either of said electrically actuated elements in series with said motor, whereby said motor and one of said elements are actuated when said controller is moved in one direction to effect a driving of one of said devices.

3. In apparatus of the class described, the combination of a motor and a circuit therefor, a pair of devices to be driven by said motor, a controller for said motor, a plurality

of electrically actuated elements, selector means for connecting either of said elements in series with said motor to control the driving of one of said devices, and a switch in said circuit arranged to open the circuit when either one of said devices is driven beyond a predetermined position.

4. In apparatus of the class described, the combination of a motor, a circuit for said motor, a pair of devices arranged to be driven by said motor, a controller for operating said motor, a pair of electrically actuated elements; selector means for connecting either of said elements in series with said motor to control the driving of one of said devices, and a pair of switches in said circuit each arranged to be actuated by one of said devices to open the circuit when it is driven beyond a predetermined position.

5. In apparatus of the class described, the combination with a support, of a motor, a circuit for said motor, a pair of devices each connected to said motor and said support, a controller for connecting the said motor in said circuit, a pair of electrically actuated elements arranged to disconnect said devices from said support, and a selector means for connecting either of said elements in series with said motor to effect the release of one of said devices and its operation by said motor.

6. In apparatus of the class described, the combination with a support, of a motor, a circuit for said motor, a pair of devices, means for connecting each of said devices to said motor and to said support, a controller for connecting said motor in said circuit, a pair of electro-magnets arranged to disconnect said devices from said support, and a selector means for connecting the winding of either of said electro-magnets in series with said motor to effect the release of one of said devices and its operation by said motor.

7. In apparatus of the class described, the combination with a support, of a motor, a circuit for said motor, a pair of devices, means for connecting each of said devices to said motor and to said support, a controller for connecting said motor in said circuit, a pair of electro-magnets arranged to disconnect said devices from said support, and a selector means for connecting the winding of either of said electro-magnets in series with said motor to effect the release of one of said devices and its operation by said motor, said selector means including a member movable from a neutral position to an "on" position for connecting either winding in said circuit.

8. In apparatus of the class described, the combination with a support, of a motor, a controller for operating said motor, a plurality of devices operatively connected with said motor, electro-magnetic means arranged to be connected in series with said motor and arranged between each of said devices and said support, one element of each said electro-

magnetic means operating to connect the adjacent device with said support, and selector means for connecting either of said electro-magnetic means in the motor circuit.

5 9. In apparatus of the class described, the combination with a support, of a motor, a controller for operating said motor, a plurality of devices operatively connected with said motor, means normally tending to connect
10 each of said devices to said support, electro-magnetic mechanisms arranged to be connected in series with said motor, one element of each of said electro-magnetic mechanisms being connected with the connecting means
15 between the adjacent device and said support, whereby said connection is broken when the controller is operated, and selector means for connecting either of said electro-magnetic mechanisms in the motor circuit.

20 10. In apparatus of the class described, the combination with a support, of a motor, a controller for operating said motor, a plurality of devices operatively connected with said motor, means normally tending to connect
25 each of said devices to said support, electro-magnetic mechanisms arranged to be connected in series with said motor, one element of each of said electro-magnetic mechanisms

being connected with the connecting means between the adjacent device and said support, 30 whereby said connection is broken when the controller is operated, selector means for connecting either of said electro-magnetic mechanisms in the motor circuit, and means for automatically stopping the motor when the
35 operated device operates to a predetermined position.

11. In apparatus of the class described, the combination with a support, of a motor, a circuit for said motor, a pair of devices, each arranged to be operated in opposite directions
40 by said motor, means for connecting each of said devices to said motor and to said support, a controller for connecting said motor in said circuit, a pair of electro-magnets arranged to
45 disconnect said devices from said support, and a selector means for connecting the winding of either of said electro-magnets in series with said motor to effect the release of one of
50 said devices and its operation by said motor, irrespective of the direction of operation of said device.

In testimony whereof, I have hereunto subscribed my name.

EDWARD H. REMDE.