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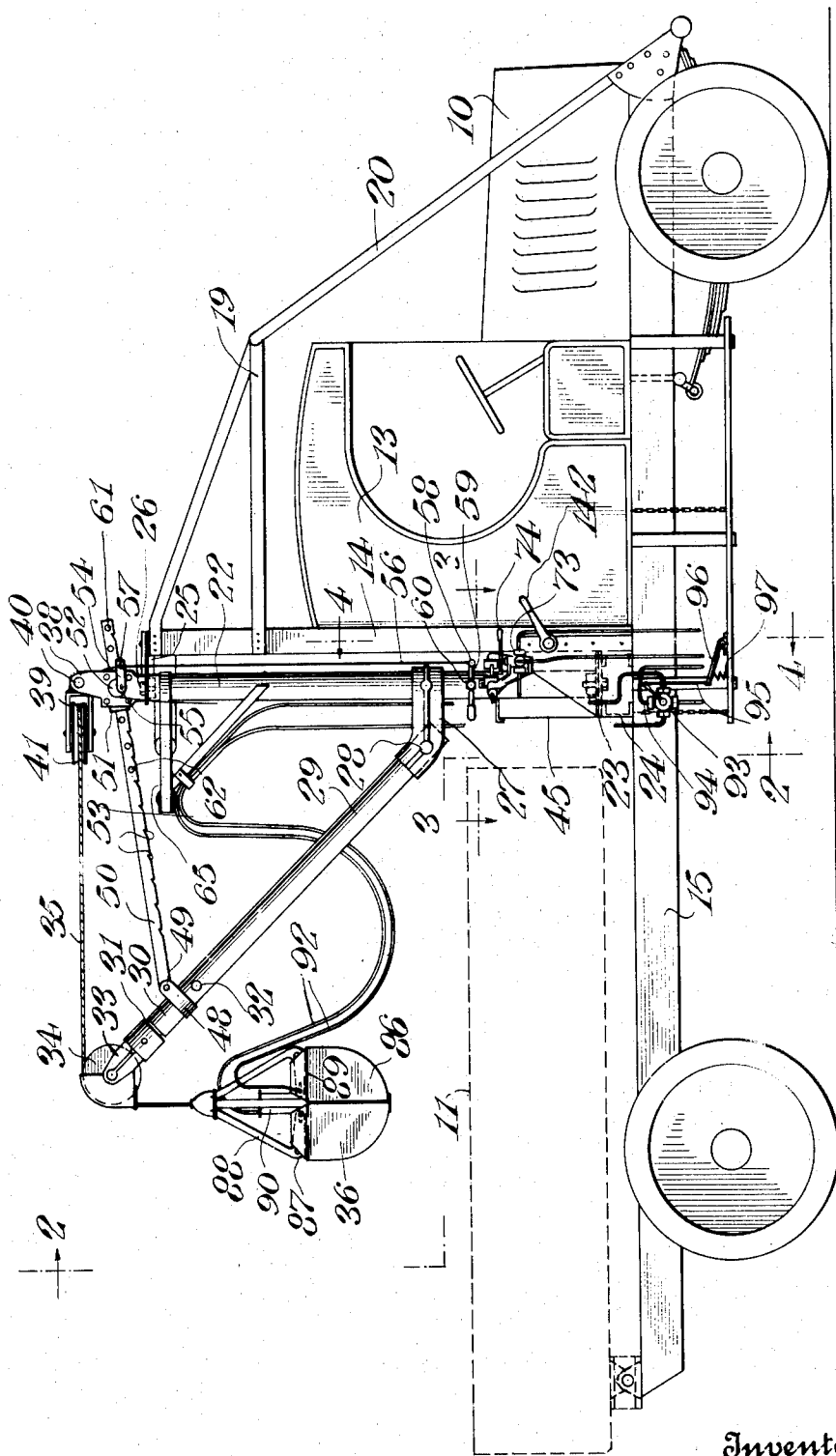
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1,874,189

HOISTING APPARATUS FOR ROADWAY VEHICLES

Filed Nov. 16, 1928

6 Sheets-Sheet 1



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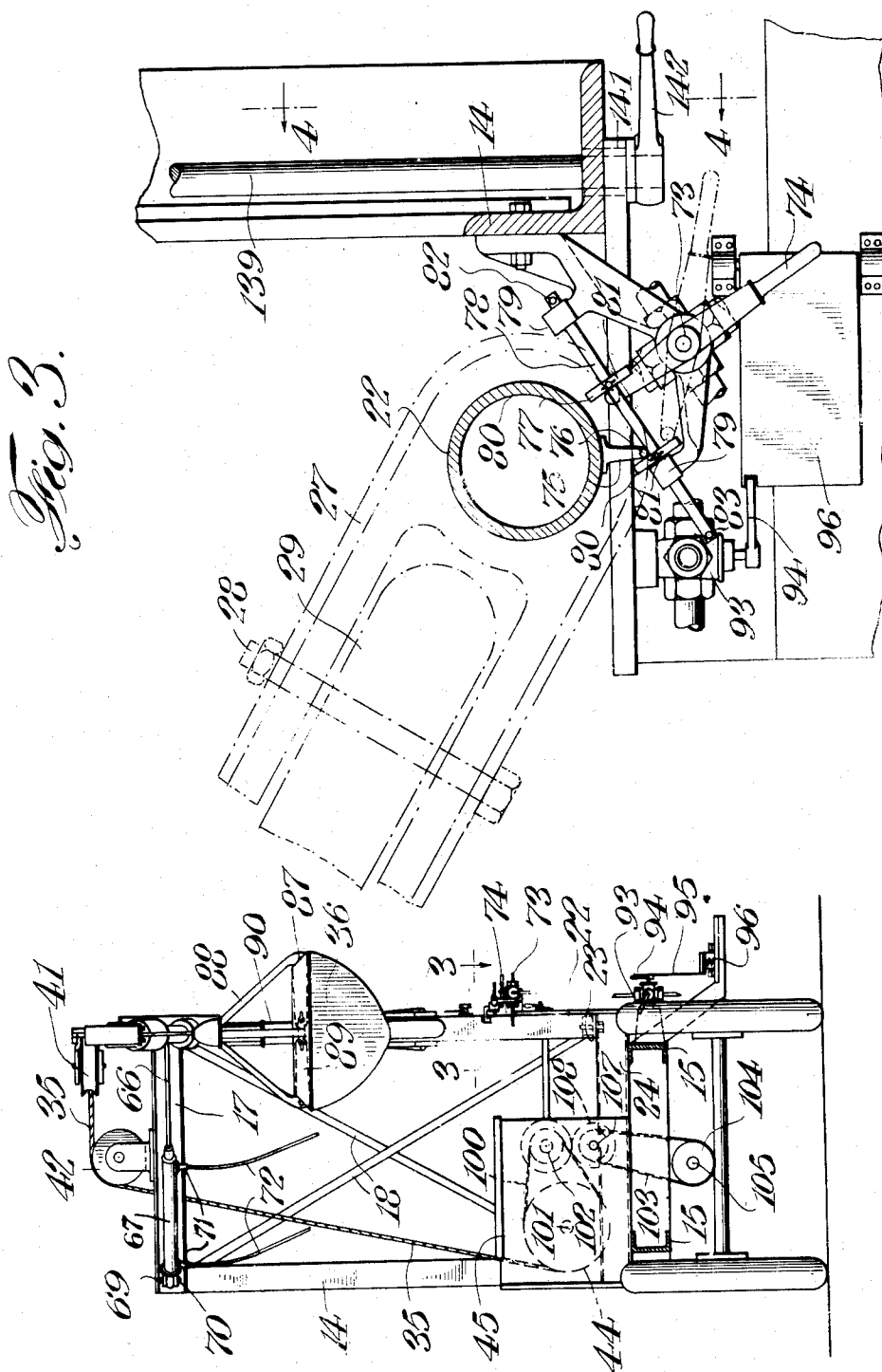
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HOISTING APPARATUS FOR ROADWAY VEHICLES

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6 Sheets-Sheet 2



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6 Sheets-Sheet 3

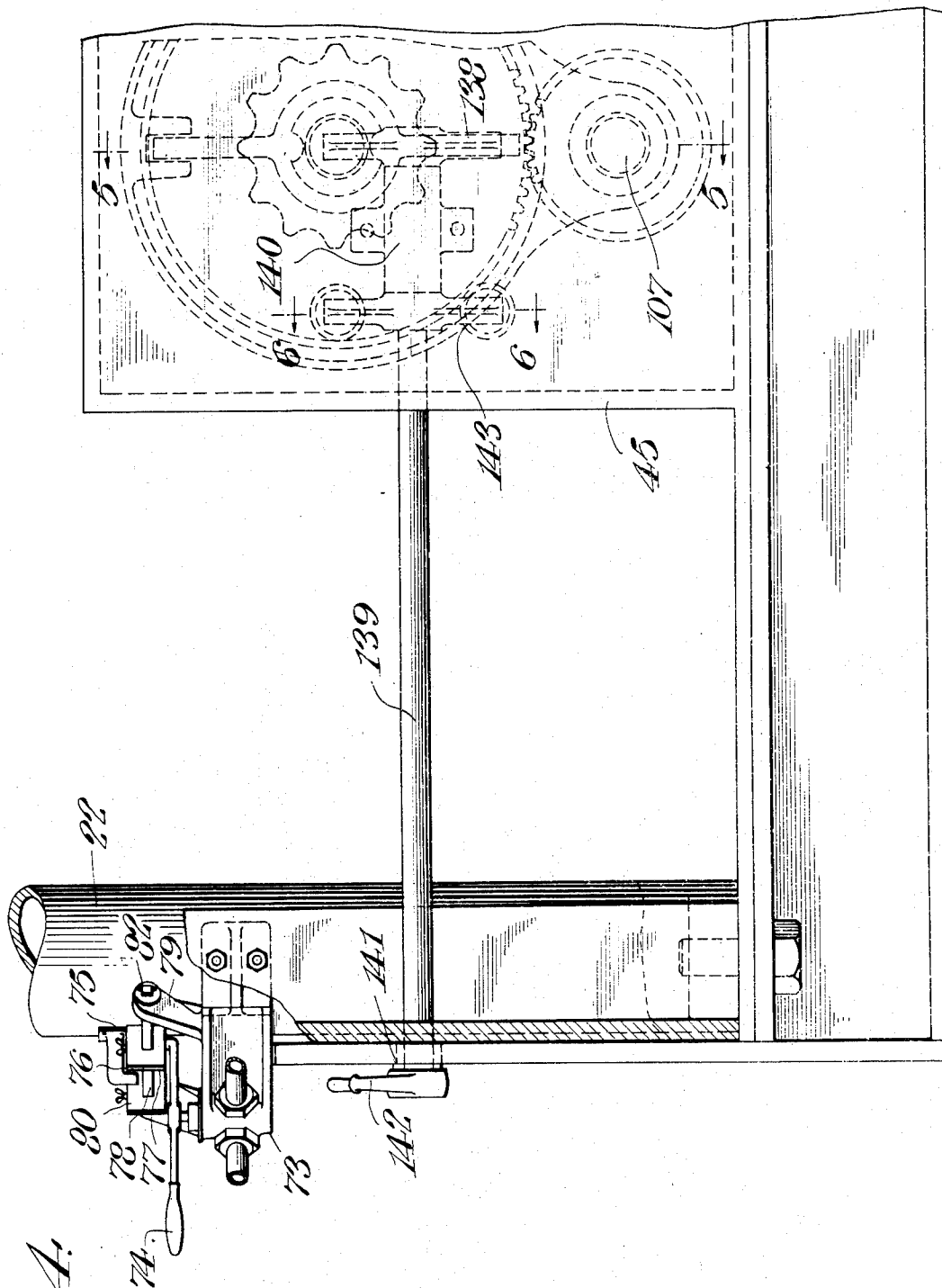


Fig. 4.

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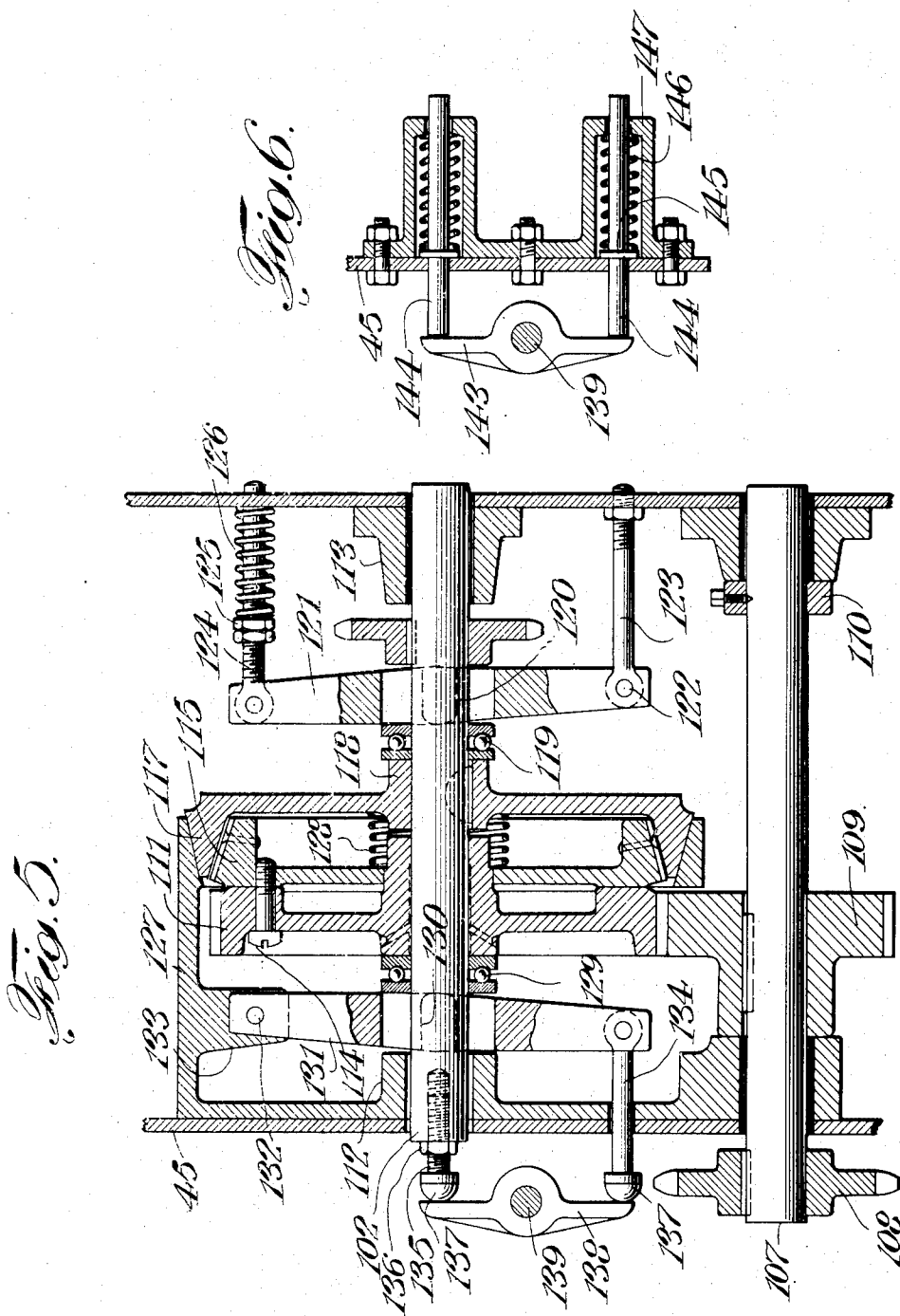
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6 Sheets-Sheet 4



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6 Sheets-Sheet 5

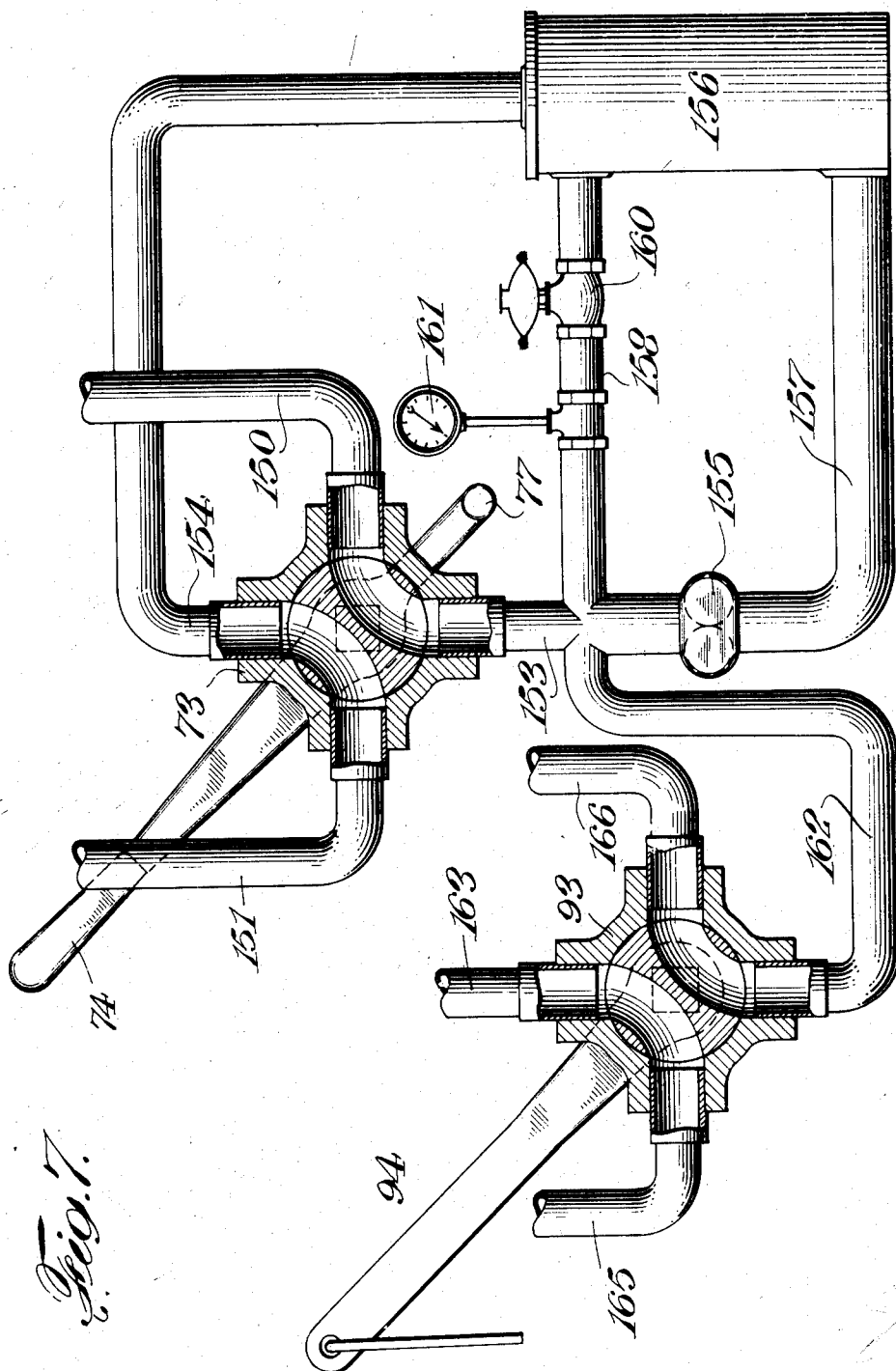


Fig. 7.

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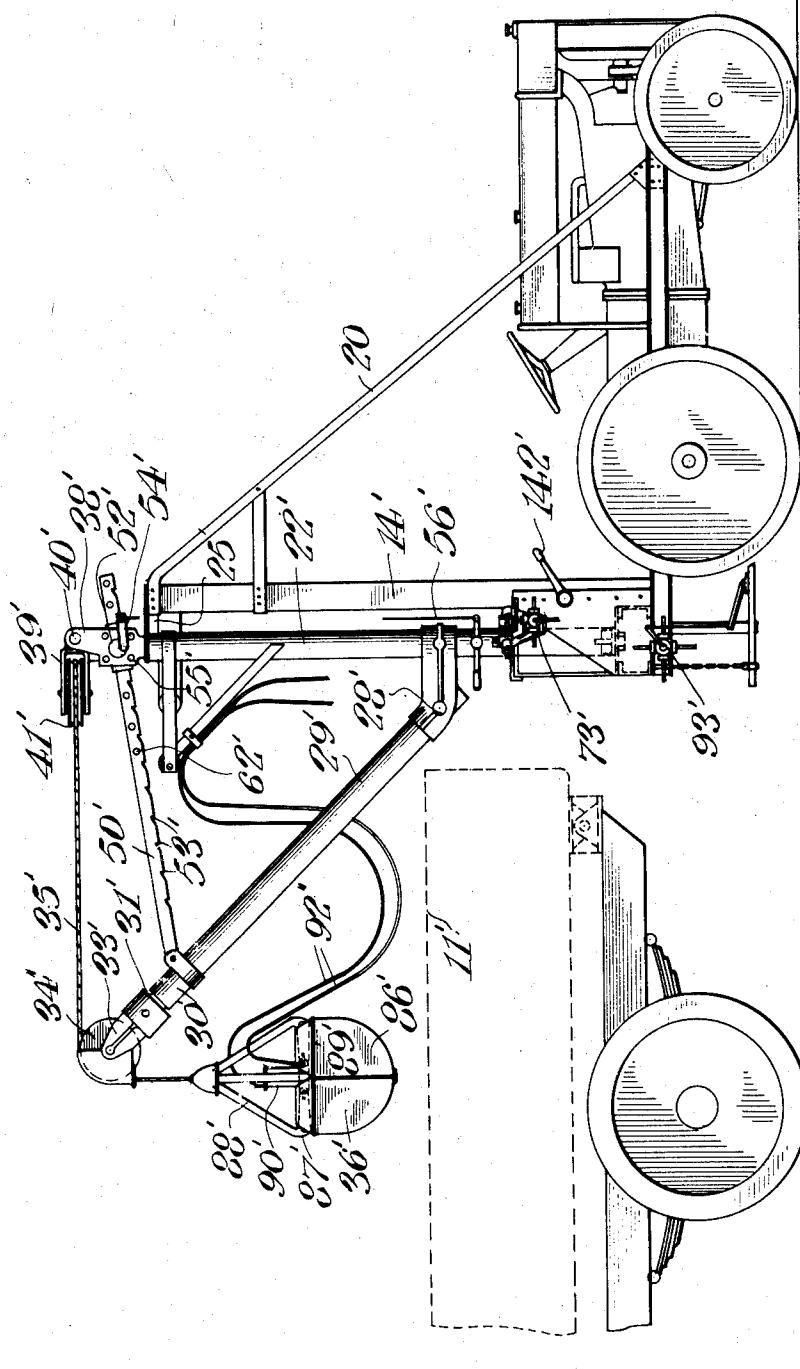
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Fig. 8.



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UNITED STATES PATENT OFFICE

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HOISTING APPARATUS FOR ROADWAY VEHICLES

Application filed November 16, 1928. Serial No. 319,352.

This invention relates to hoisting apparatus for roadway vehicles and has for one of its objects the provision of improved apparatus of this character which is convenient and effective in its operation, easy to control, and substantial in all of its parts. More particularly the invention relates to portable self-powered apparatus for cleaning out street catch-basins.

Heretofore when using swinging-boom hoists for street collection it has been the usual practice to swing or slue the boom by manual means, either directly or by hand actuated gearing. On streets having any appreciable slope to the side, manual swinging is difficult if not impossible or at best too slow when gearing is used. To overcome this difficulty it is often necessary to block up one side of the vehicle to bring it to level to permit easy swinging of the boom. Since the apparatus is required to make numerous short stops it follows that this expedient is highly unsatisfactory. The present invention overcomes these difficulties by employing a power device for swinging and holding the boom. This operates rapidly and effectively whatever may be the inclination of the street.

The openings to catch-basins are relatively small and hence there has been difficulty in positioning a hoist bucket used for removing material from the basin accurately over the opening. In the present apparatus controls are provided which stop the boom directly over the opening at each trip. In addition the controls stop the boom in proper position over the dump body or other receptacle into which the material is loaded and include automatic elements which may be quickly reset to stop the boom in any desired positions throughout its arc of movement.

Means of a simple and convenient nature is herein provided for varying the dumping position of the bucket with respect to the length of the body of the vehicle in order to distribute the material as it is loaded. This is accomplished, however, without inconvenience in positioning the bucket over the catch-basin opening, even though this opening be at a different distance from the vertical

axis of the boom from that of the point of discharge of the bucket.

The invention provides means for elevating and lowering the material-handling device, which device is herein illustrated as a grab bucket. The means includes a cable drum and a clutch-brake mechanism which is designed to provide effective and easy control of the bucket at all times. No free movement is permitted the bucket between the time it is under control of power mechanism for raising it and the time it is under the influence of a brake to hold it at any given elevation. The bucket is permitted to drop of its own weight and this movement may be free and rapid but is at all times subject to immediate and effective braking action. Between the descent and elevation of the bucket it is obliged to come under the influence of the brake so that there can be no sudden strains imposed to injure the mechanism.

The hand controls for all movements provide natural actions on the part of the operator and thus promote faster and safer operation. The handle controlling the swinging of the boom is mounted to turn in direction with the boom. If the handle is turned left hand the boom swings left hand, if turned to the right the boom swings to the right; and if stopped in mid-position the boom is stopped and retained in the position to which it has been moved. Likewise the handle controlling the elevating mechanism of the bucket is mounted to move in correspondence with the bucket. If the end of this handle is raised the clutch is engaged and the bucket raised; if the handle is lowered the holding brake is released and the bucket lowered; and if the handle is released it moves to mid-position and the bucket is effectively held by the brake in the position to which it has been moved. Further, the member controlling the opening and closing of the bucket must be positively actuated by the operator to open the bucket. Normally, and upon release of the control member by the operator, the bucket is closed so as to hold its contents or to pass freely through the catch-basin opening. The invention in representative embodi-

ment is illustrated in the accompanying drawings, wherein:

Fig. 1 is a side elevation of a vehicle embodying the present invention;

Fig. 2 is a transverse section taken approximately on the line 2—2 of Fig. 1 looking toward the front end of the vehicle;

Fig. 3 is an enlarged horizontal section taken on the line 3—3 of Figs. 1 and 2 showing certain control mechanism;

Fig. 4 is an elevation taken on the line 4—4 of Fig. 1;

Fig. 5 is a section on the line 5—5 of Fig. 4;

Fig. 6 is a section on the line 6—6 of Fig. 4;

Fig. 7 is a schematic view of certain hydraulic control devices and piping therefor;

Fig. 8 is a side elevation of a modified form of the invention.

Referring to the modification illustrated in Figs. 1 to 7 of the drawings and in particular to Figs. 1 and 2, there is shown a self-contained motorized unit in which a motor truck 10 having a dump body 11 is supplied with the hoist apparatus in accordance with the present invention.

Directly behind the driver's cab 13 there is secured a vertical frame comprising vertical columns 14 which may be in the form of angle beams resting upon the side sills 15 of the truck, surmounted by a cross beam 17 and braced by angle bars 18. As clearly shown in Fig. 1 the vertical columns 14 are braced at the top by V-frames 19 which in turn are connected at their pointed ends to some fixed and substantial part of the vehicle frame by inclined rods 20.

Behind this upstanding frame and preferably located on the right or curb side of the truck there is a mast 22 pivoted at its lower end and bolted to a plate 23 resting upon the upper surface of a pair of transverse sills 24. At its upper end the mast 22 is connected with the cross-beam 17 by a pivot plate 25, the plate being secured to the beam 17 by riveting or otherwise and being provided with a hole (not shown) through which an axial pin 26 of the mast, shown in dotted lines in Fig. 1 may pass in order that the mast may have swinging movement and yet be held upright by the plate 25.

Between the ends of the mast a boom bracket 27 is secured and to this bracket there is hinged as by journals 28 a boom 29. The boom is preferably of cylindrical shape and formed of telescopic members 30 and 31, the smaller of which 31 is held in adjusted relation within the larger by a holding pin 32. If desired, means may be provided for extending the telescopic members of the boom but as herein illustrated the extension is adapted to be effected by hand. It is convenient to lower the boom to substantially horizontal position and when this is done

the outer member of the boom may be pulled out without exertion by hand.

It is to be noted that the lower end of the boom is pivoted sufficiently high on the mast to allow the boom to be extended substantially horizontally over the body. At all events the boom will be so arranged with respect to the body of the truck that there will be no interference to its movement. To this end, if desired, the boom bracket 27 may be arranged to be clamped at different heights along the mast.

To the outer end of the smaller member 31 of the boom there is secured a pulley mounting 33 carrying a boom pulley 34 over which a hoist cable 35 passes outwardly to a point of attachment to a grab bucket 36, preferably of the orange-peel type.

Above the pivot plate 25 the mast 22 at its upper end carries a mast-head 38 to the top of which a pulley frame 39 is pivoted to swing about a horizontal pin 40. The hoist cable 35 passes over the mast-sheave 41 of this frame 39 and extends inwardly, as shown to the left in Fig. 2 over a lead-in pulley 42, being directed by this pulley 42 downward to a winding drum 44, shown in dotted lines within a cable-control box 45. The winding drum may be controlled by mechanism to be described hereinafter.

Near the upper end of the larger telescopic member 31 of the boom a pivot strap 48 is fastened and to the strap is connected by a pin 49 a notched bar 50 slidable through a bar guide 51 fitting within and pivoted on its sides by journals 52 to the mast-head 38. The notches 53 of the bar 50 are inclined toward the boom so as to support it in part by engagement with a U-shaped detent 54 pivoted upon studs 55 anchored in the ends of the journals 52. The detent may be controlled from the bottom of the mast by means of a detent release rod 56 pinned at its upper end to the detent 54 by a pin 57 and connected at its lower end by a pin 58 with a hand lever 59, the hand lever being movable about a fixed center 60 on the side of the mast. The detent may be biased against the bar in any desired way. If the weight of the handle end of lever 59 is not sufficient for this purpose, springs or other common devices may be used. Care is taken in locating this lever 59 to insure that it will not strike the column 14 or any fixed parts when the boom is swung; that it will be convenient to an operator; and that the hand of the operator will not be injured by holding on to the lever while the mast is turned. The free end of the notched bar 50 may be provided with a stop pin 61, which pin, however, may be removable when necessary to lower the boom to a horizontal position. When in position, however, the pin insures that the boom will not drop below a certain definite position and that the notched bar

will not be completely withdrawn from the bar guide 51. If desired the notched bar 50 may be provided with a number of other holes 62 along its length in addition to that in which the pin 61 is located.

The notched bar 50 is shown to be of relatively light stock but this will be adequate since the strain imposed upon it is relatively small due to the positions chosen for the journal 28 of the boom, the pulley 41, and the pulley 34. These locations are such that in the lowest position of the boom and the shortest adjustment of its length, the weight of the empty bucket on the end of the cable 35 will be sufficient to impose some downward pull upon the outer end of the boom. That is, the vertical component of the weight of the bucket will be greater than the component in the approximately horizontal direction. Thus there will be no tendency for the boom to collapse back upon the mast but at the same time the strain upon the notched bar will never be very great.

In operation the bucket is raised by the cable to the height necessary to pass over the edge of the body. If the boom had been lowered in reaching toward the catch basin to a position too low to permit the bucket to clear the edge of the body, it may be raised again by continued pull on the cable 35, which first brings the bucket up against the end of the boom and then raises both bucket and boom to the desired height. The bar 50 is engaged by the detent 50 to hold the boom in raised position. The bucket is swung over the body and if the load is to be deposited in the rear end of the body, the hand lever 59 is operated to release the detent and the cable is let out to lower the boom. To return the bucket outward the same procedure may be followed. Thus by the use of a single hoist cable and the notched bar the various movements may be effected and the boom held in any position while the bucket is operated independently of the boom.

Still referring to Figs. 1 and 2, the mast near its upper end is provided with a braced arm 65 to which is attached the outer end of a piston rod 66 passing out of the end of a hydraulic cylinder 67. This cylinder at its "head" end is journaled by a bolt 69 to lugs 70 secured to the side of the top frame beam 17. The cylinder has pipes 71 leading into either end for the intake and exhaust of motive fluid, preferably oil under pressure. Fluid is led to these pipes by two lengths of flexible hose 72 and the flow of fluid to the hose is controlled by a three-way valve generally indicated by the numeral 73 provided with a horizontally movable operating handle 74. This handle from the operator's viewpoint is arranged to move in correspondence with movements of the boom which it produces. That is, if the operator turns the handle to the left the boom will move to the

left and vice versa, while if the handle be left in central position the boom will be held in any position to which it has been moved.

Here it may be observed by reference also to Fig. 7 that when fluid is admitted to one side of the piston in the cylinder 67, fluid is being expelled by the piston on its other side, the rate of discharge being sufficiently retarded to insure some resistance to the movement of the piston at all times. By this arrangement free swing of the boom is avoided.

Means is herein provided for supplementing the manual control of the handle 74 by movement derived from rotation of the mast 22 to stop it automatically at either end of its swing. As shown in Fig. 3 the mast is provided with a bracket 75 having in the outer end thereof a shift pin 76. The end of the handle 74 is extended beyond the stem of the three-way valve 73 and at its outer end is provided with a shift pin 77. Between the mast and the valve there is disposed a slidable bar 78 mounted in fixed guides 79. Adjustable on this bar are a pair of plates 80 held in adjusted position by thumb nuts 81. The bar is also provided with stop pins 82 and 83.

In operation when the handle is turned right hand, it operates the three-way valve 73 to admit pressure to the proper end of the cylinder 67 to cause the mast to be moved to the right. This movement of the handle brings its shift pin 77 away from the adjustable plate 80 which has last caused its movement.

When the boom and mast are turned, the shift pin 76 of the bracket 75 carried by the mast will come against the other adjustable plate 80 and begin moving the handle 74 toward central position and when the boom is moved to the limit of its swing the valve handle will be stopped in its central position, the flow of fluid at such position being cut off from both ends of the boom-swinging cylinder 67. To start the boom on its swing in the reverse direction the valve handle 74 is moved over against the other adjustable plate (the position indicated in dotted lines in Fig. 3) and the operation is repeated as the boom completes its swing in that direction. At all times, however, the valve handle is left free for manual control independently of the automatic action of the boom controls, excepting, however, that the boom may not be moved beyond the limits for which the automatic control is set, unless the adjustable plates 80 are loosened from the bar 78. By this arrangement, after the mast has been moved to such position that the bucket will drop fairly through the opening of the catch-basin and the adjustable plates set up it will at each succeeding swing be accurately stopped in the same position without manipulation on the part of the operator. And the same applies to the stopping of the boom over the body of the vehicle.

In the present embodiment the bucket 36 is opened and closed by a fluid pressure device. As shown particularly in Fig. 1 the segments 86 of the bucket are hinged at their outer edges upon pins 87 to supports 88. The supports 88 converge and are attached at their upper ends to the hoist cable 35. Operating arms 89 extend inwardly from each of the bucket segments and are pivotally and slidably connected to the lower end of a movable cylinder 90. Fluid is supplied to either end of the cylinder 90 by lengths of flexible hose 92 leading to a three-way valve 93 disposed in convenient position to be actuated by the operator. A sufficient length of the hose is allowed for accommodating all of the movements of the bucket. To insure that this hose will interfere as little as possible with the entrance of the bucket into the catch-basin opening the hose is looped upward to some elevated point of attachment as, for example, to the arm 65 by which the boom is swung.

Valve 93, as shown in Fig. 1 is provided with an arm 94 pivotally connected to the rod 95 attached at its lower end to a hinged foot pedal 96. A spring 97 beneath the foot pedal 96 normally holds the pedal upward. In this position of parts, fluid, preferably oil under pressure, is admitted to the upper end of the cylinder 90 to keep the bucket closed. By this arrangement it requires an overt act on the part of the operator to open the bucket which otherwise is maintained in condition to pass through the catch-basin opening and to retain its burden.

In Fig. 2 it may be observed that the cable winding drum 44 disposed within the cable control box 45 is actuated by a sprocket chain 100 acting upon sprockets on the drum shaft 101 and the clutch shaft 102. It is also seen that power is taken off from the principal motor of the vehicle by a sprocket chain 103 operated by sprocket 104 on the prime mover shaft 105 and driving a gear shaft 107 by a sprocket 108 thereon.

In Figs. 4, 5 and 6 the drum operating mechanism is shown in detail. In the lower portion of Figs. 4 and 5 the gear shaft 107 with its sprocket 108 is shown to be mounted in suitable bearings in the box 45. Within the box the shaft 107 carries rigidly attached thereon a spur gear 109. This gear together with a collar 110 prevent axial movement of the shaft. The gear 109 meshes with a larger spur gear 111 loosely mounted on the clutch shaft 102 previously mentioned. The shaft 102, in turn, is slidably mounted in fixed bearings 112 and 113 secured within the box 45.

To the right hand side of the gear 111 there is rigidly secured as by cap screws 114 a clutch cone 115 adapted to engage a clutch-brake cone 117, which cone is rigidly attached at its hub 118 to the shaft 102. The hub 118 of the member 117 bears against a ball bearing assembly 119 which is pressed to the

left by engagement with the lugs 120 of an embracing split lever 121. The lever 121 is pivoted at its lower end by a pin 122 to an eyebolt 123. At its upper end the lever 121 is provided with a pivoted rod 124 guided at its outer end within one of the walls of the box 45. The rod 124 is provided with lock-nuts 125 and is pressed to the left to urge the lever 121 against the ball bearing assembly by a compression spring 126 disposed between the wall of the box and the lock-nuts 125.

The clutch-brake cone is thus normally urged to the left in order to engage a brake drum 127. A spring 128 disposed between the clutch cone 115 and the member 117 constantly presses the clutch cone to the left to keep it disengaged. The hub of gear 111 presses against a ball bearing assembly 129 which engages the lugs 130 of a split lever 131 pivoted at its upper end at 132 to a projection 133 within the brake drum 127. Pivoted to the lower end of the lever is a rod 134 guided toward its outer end within the wall of the box 45.

In vertical alignment with this rod 134 the slidable shaft 102 carries an adjustable stud 135 adapted to be held in set position by a lock-nut 136. Both the rod 134 and the stud are provided with rounded caps 137 for engagement with a rocker 138 rigidly attached to a manual control shaft 139. The shaft 139 is mounted in fixed bearings 140 and 141 attached to the box 45 and one of the columns 14 respectively. At its outer end this shaft is keyed to a manual operating handle 142. The shaft 139 as shown in Fig. 6 is provided with a similar rigid rocker 143 acting at its ends upon sliding rods 144. The rods 144 are equipped with rigid collars 145 pressed upon by coil springs 146 held within enclosing cages 147. By virtue of this construction, the handle 142 is normally held in its mid-position and the parts which it is adapted to control are normally held in the position in which they are shown in Fig. 5.

In Fig. 7 the system for supplying the fluid to the sluing cylinder 67 and to the bucket-opening cylinder 90 is shown. Here the three-way valve 73 for the sluing cylinder is seen to be provided with ports and corresponding conduits 150 and 151 leading to the lengths of hose 72 for the sluing cylinder. Between these cylinder-supply ports the valve casing is provided with other ports, and corresponding conduits 153 and 154 lead respectively from a pump 155 on the one side and to a sump tank 156 on the other side. That is, the conduits 153 and 154 are supply and exhaust conduits respectively.

In the position of parts shown in Fig. 7 cylinder conduit 150 is connected with the supply conduit 153 while the other cylinder conduit 151 is connected to the exhaust conduit 154.

In this position of the valve the boom is

being swung in one direction. When the valve handle 74 is turned ninety degrees the swing of the boom is reversed and when moved forty-five degrees the boom is firmly held in a fixed position by fluid confined in both ends of the cylinder.

A suction pipe 157 leads from the sump tank back to the intake side of the pump. On the supply side of the pump a pressure relief pipe 158 extends to the top of the sump. This pipe is controlled by a pressure regulating valve 160 and the pressure at which the valve 160 acts may be read upon the pressure gauge 161.

The pump also supplies fluid to the bucket leaf operating cylinder 90 by way of valve 93. For this purpose a supply pipe 162 leads from the supply side of the pump to the inlet port of the valve 93. Exhaust fluid is led from the valve 93 by way of an exhaust pipe 163 back to the sump 156. Pipes 165 and 166 lead to the opposite ends of the bucket cylinder. In the position of parts shown in Fig. 7 the cylinder pipe 165 is connected to exhaust while the other cylinder pipe 166 is connected to the supply conduit 162. In this position the bucket leaves are operated in one direction. When turned ninety degrees the valve reverses the flow of fluid to the cylinder and the bucket leaves are operated in opposite direction. No intermediate position is required as the bucket is always operated to fully open or fully close.

The apparatus shown in Fig. 8 is exactly the same as that shown in Figs. 1 to 7 except that it is mounted on a tractor instead of a dump body truck. When thus mounted the apparatus may be kept on duty at the catch basins while a number of dump trucks may be used to cart material away. The parts shown in Fig. 8 are indicated by the same numerals as have been used for the other modification except that a prime has been applied to the reference characters in Fig. 8.

The description of the apparatus has been given in sufficient detail, it is believed, to dispense with a particular description of the operation of the apparatus, which will be readily apparent to those skilled in the art from the description.

While only one specific embodiment of the apparatus itself has been shown (though mounted in two different ways) it is to be understood that the invention is not thus limited but may be variously modified within the spirit of the invention and the scope of the appended claims.

What is claimed is:

1. In a motor vehicle, in combination a mast mounted on one side of the vehicle, a frame extending across the vehicle, a cylinder attached to said frame toward the other side of the vehicle from said mast, an arm rigid with said mast, and a piston rod asso-

ciated with a piston in said cylinder pivoted to said arm for swinging the mast.

2. A vehicle loading device mounted on a self-motorized vehicle, in combination, a swinging mast-supported boom adapted to be positioned alternately over a catch-basin opening and the dump body of a vehicle, a power device for swinging said boom, a manual control for said power device, and mechanism controlled jointly by said boom and said control member for stopping said boom at each end of its swinging movement, said mechanism comprising a slidable bar provided with spaced elements thereon.

3. A vehicle loading device mounted on a self-motorized vehicle, in combination, a swinging mast-supported boom adapted to be positioned alternately over a catch-basin opening and the dump body of a vehicle, a power device for swinging said boom, a manual control for said power device, and mechanism controlled jointly by said boom and said control member for stopping said boom at each end of its swinging movement, said power device including a hydraulic piston, a valve for regulating the flow of fluid to opposite sides of said piston, said valve being actuated by said control member, and said mechanism acting upon said member to stop the boom.

4. A vehicle loading device mounted upon a self-motorized vehicle, in combination, a swinging boom adapted to be positioned alternately over a catch-basin opening and the dump body of a vehicle, a fluid operated device for swinging said boom, said device having fluid intake and exhaust means at each end, a valve for controlling the fluid for said device, said valve having opposite positions in which it admits fluid to one end of the device while exhausting it from the other end and a median position in which it traps fluid in both ends of said device to cause it to act as a brake to check the movement of said boom, and means controlled mutually by hand and by movement of the boom for operating said valve, the boom placing it in the median position at each end of its movement.

In testimony whereof, I have signed my name to this specification this 15th day of November, 1928.

WILLIAM S. HOWARD.