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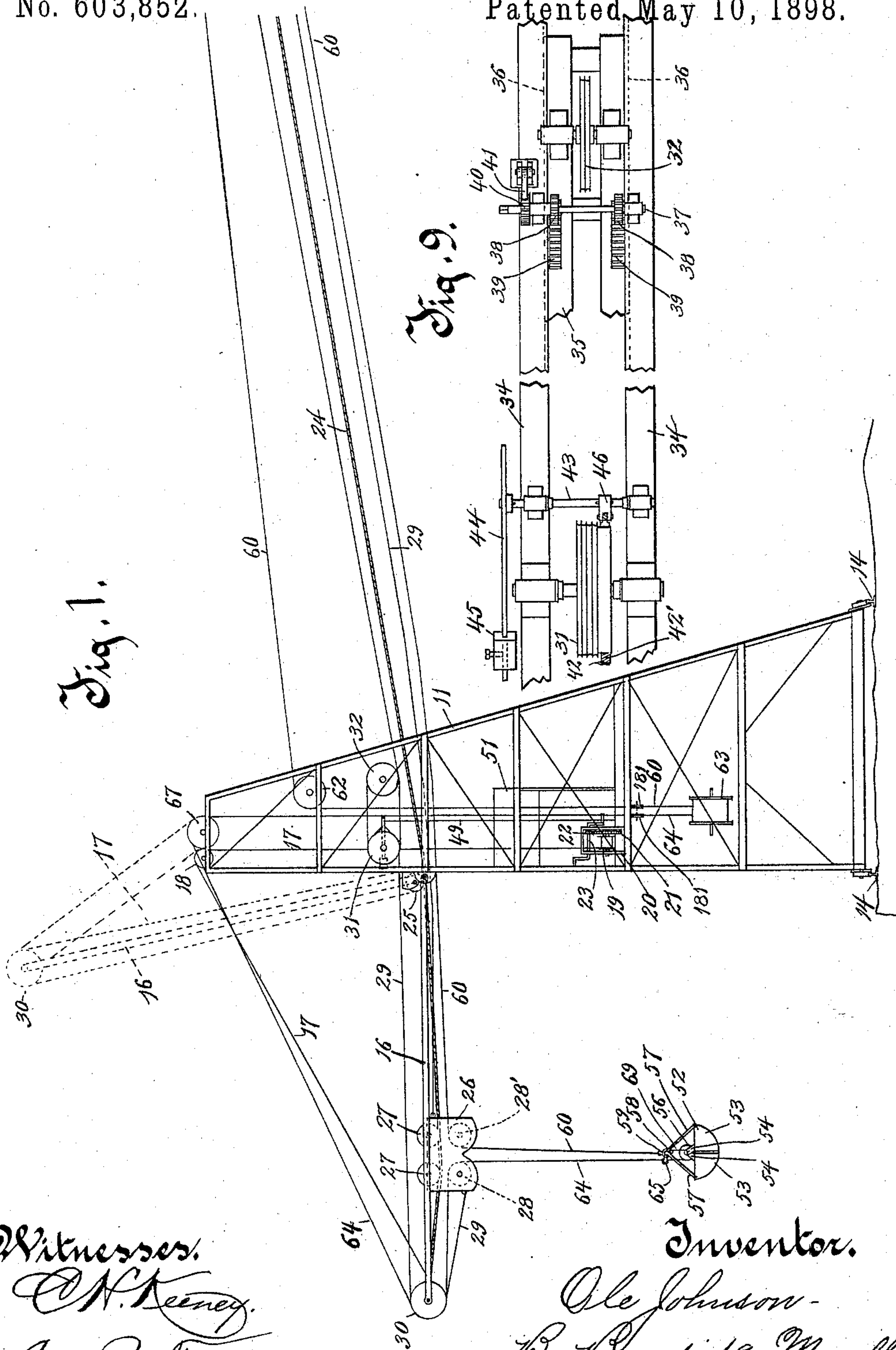
6 Sheets—Sheet 1.

O. JOHNSON.

APPARATUS FOR ELEVATING, TRANSPORTING, AND DISCHARGING
MATERIAL.

No. 603,852.

Patented May 10, 1898.



Witnesses.
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Anna V. Faust.

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(No Model.)

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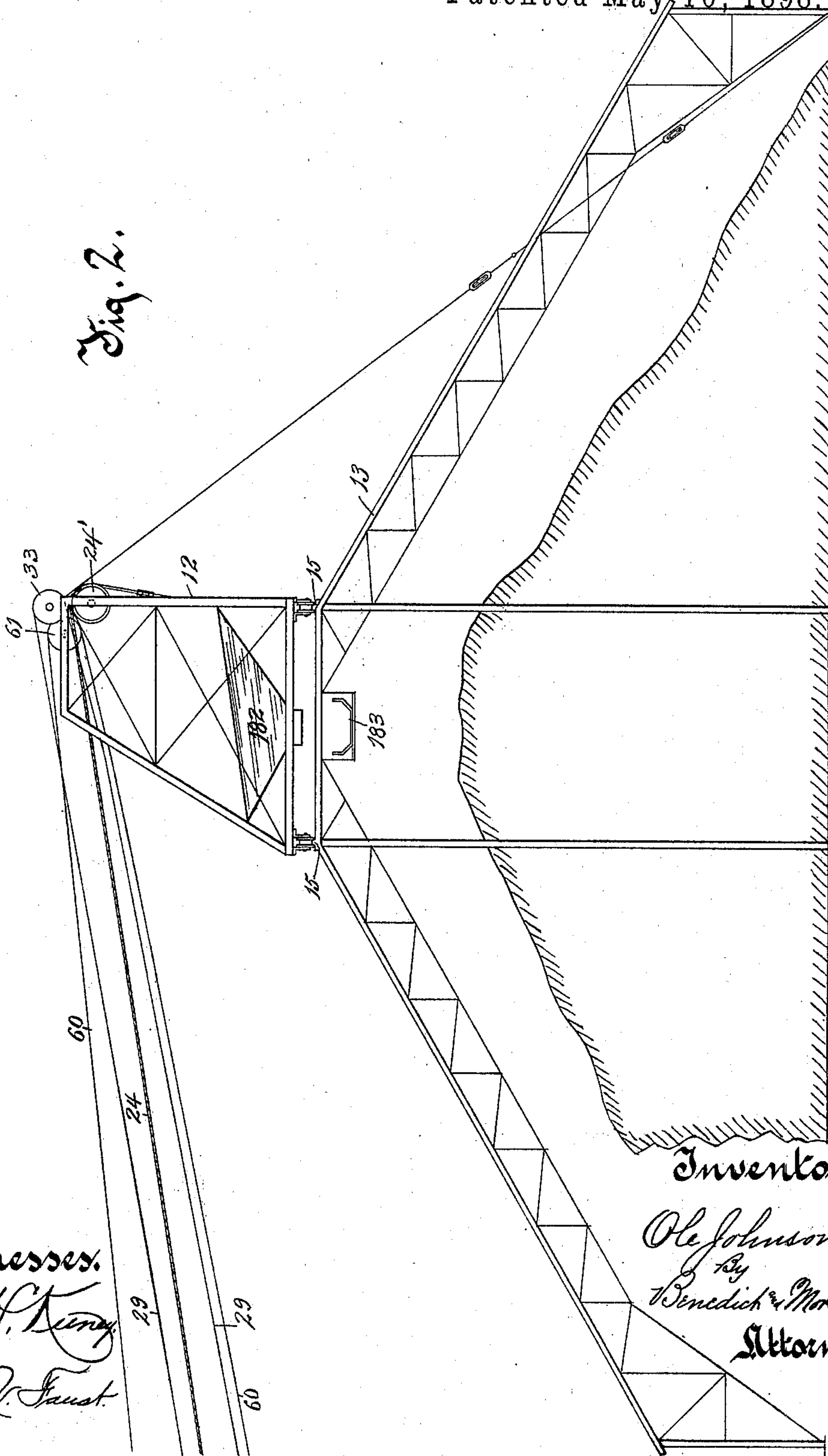
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Fig. 2.



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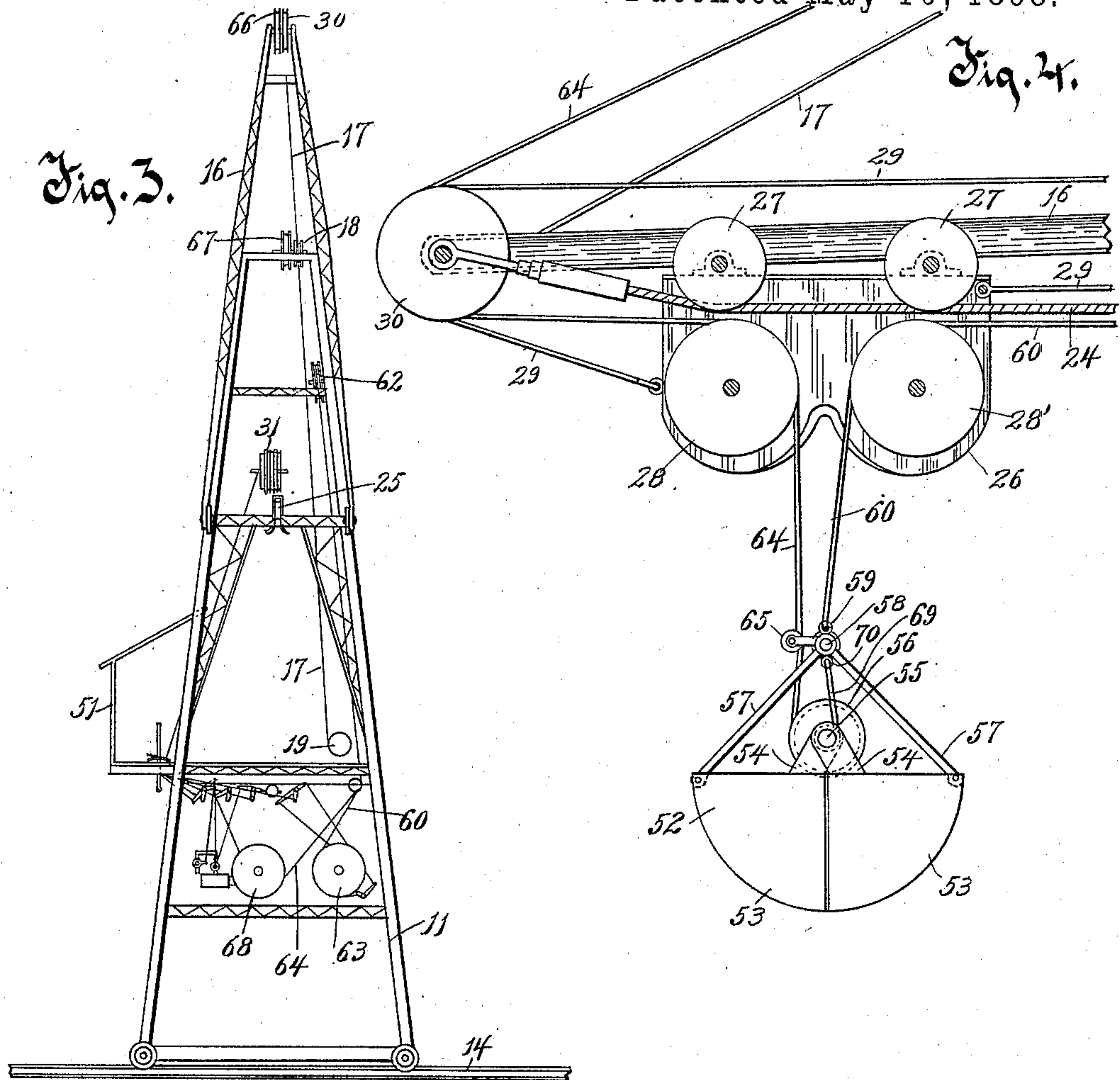
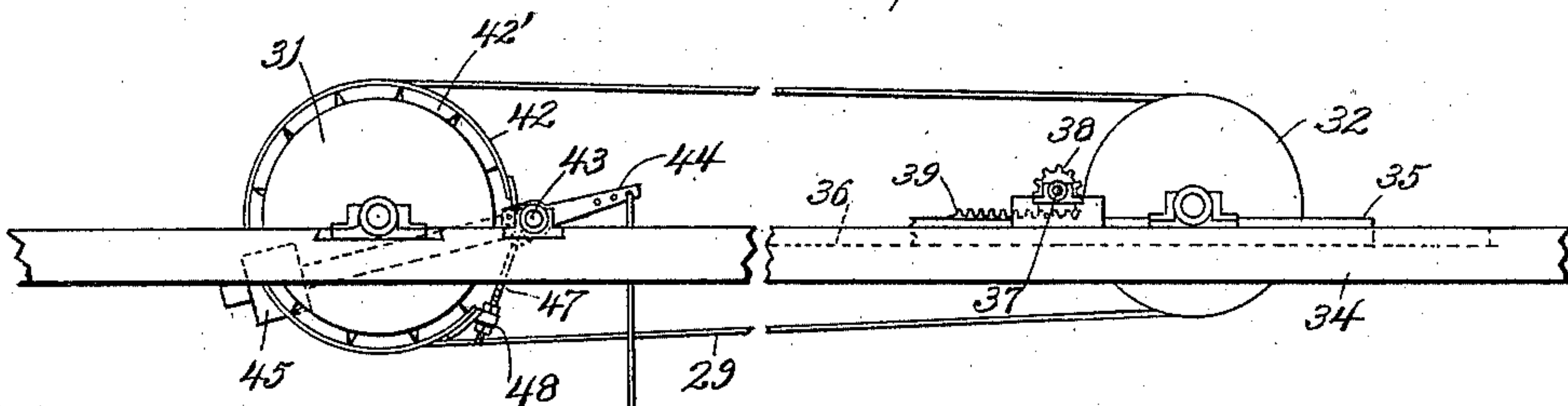


Fig. 8.



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6 Sheets—Sheet 4.

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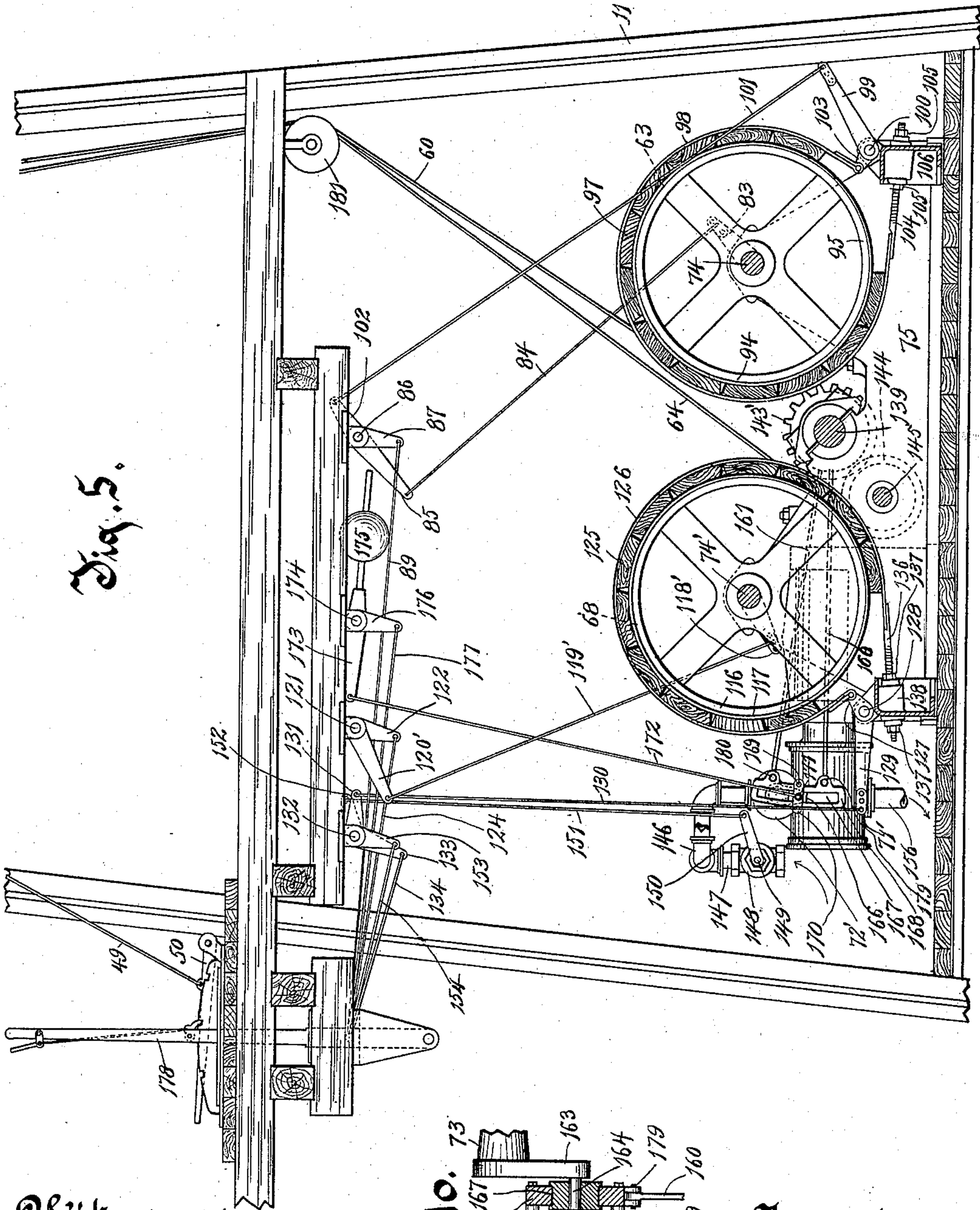


Fig. 5.

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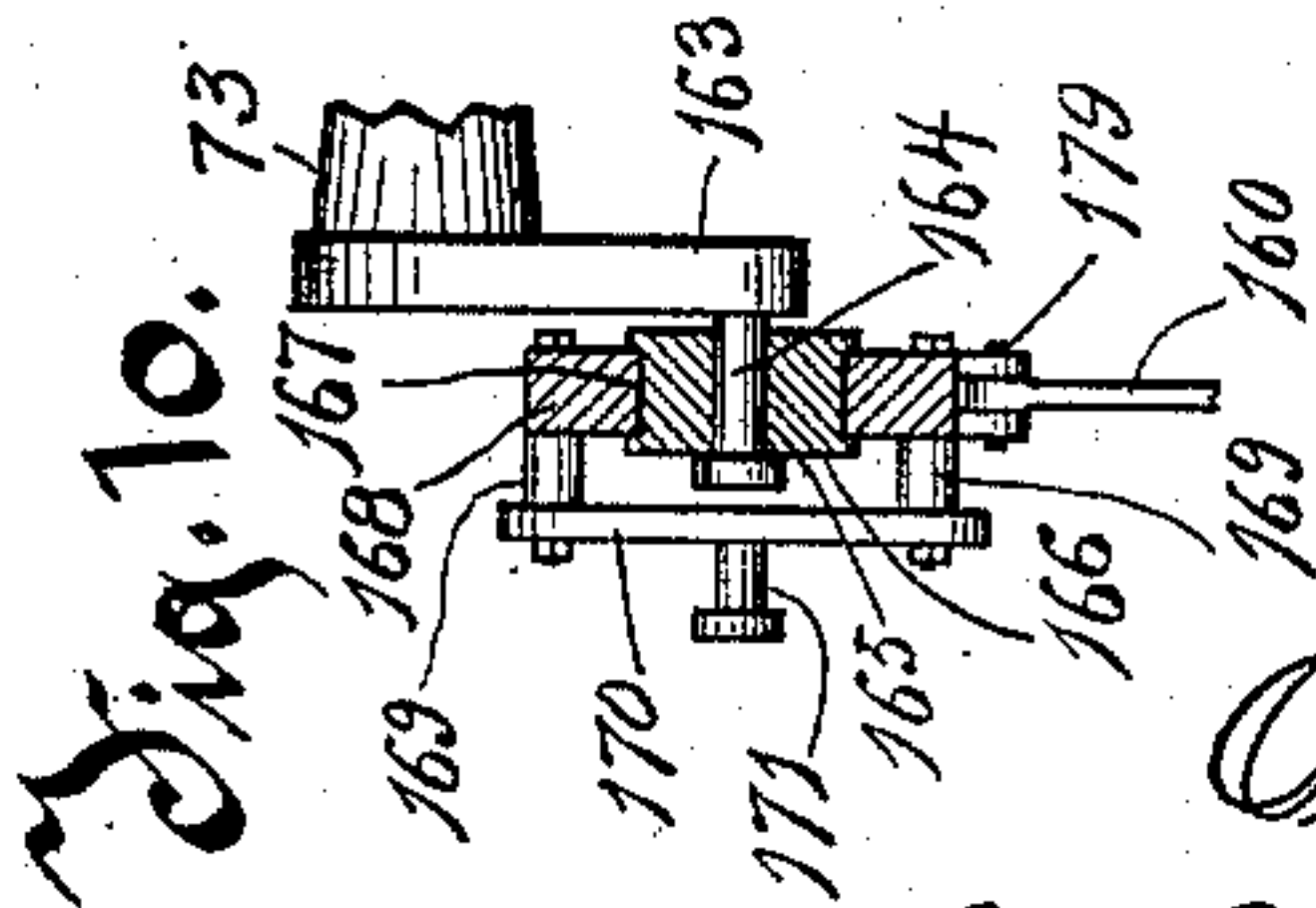


Fig. 10.

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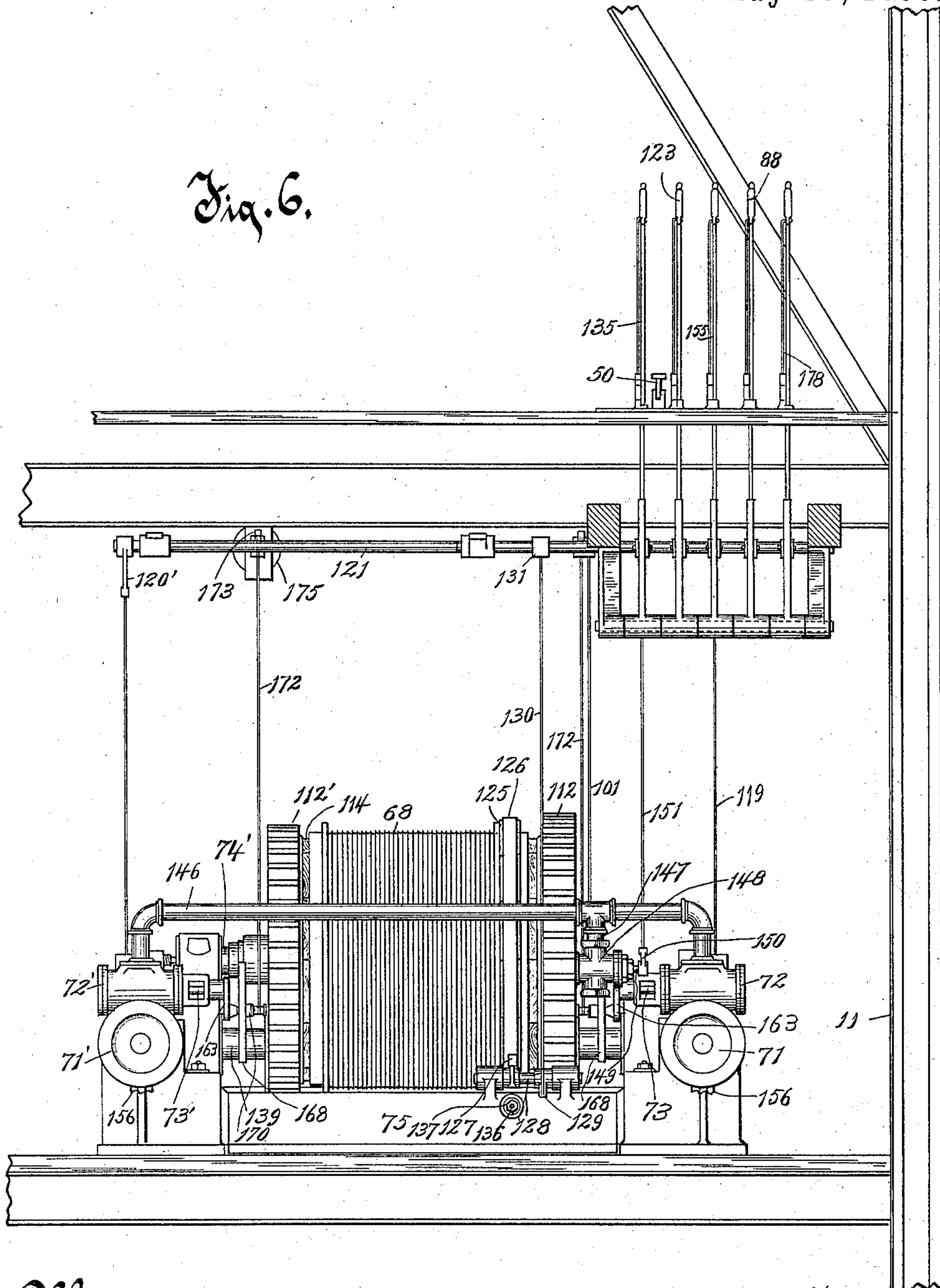
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Fig. 6.



Witnesses.

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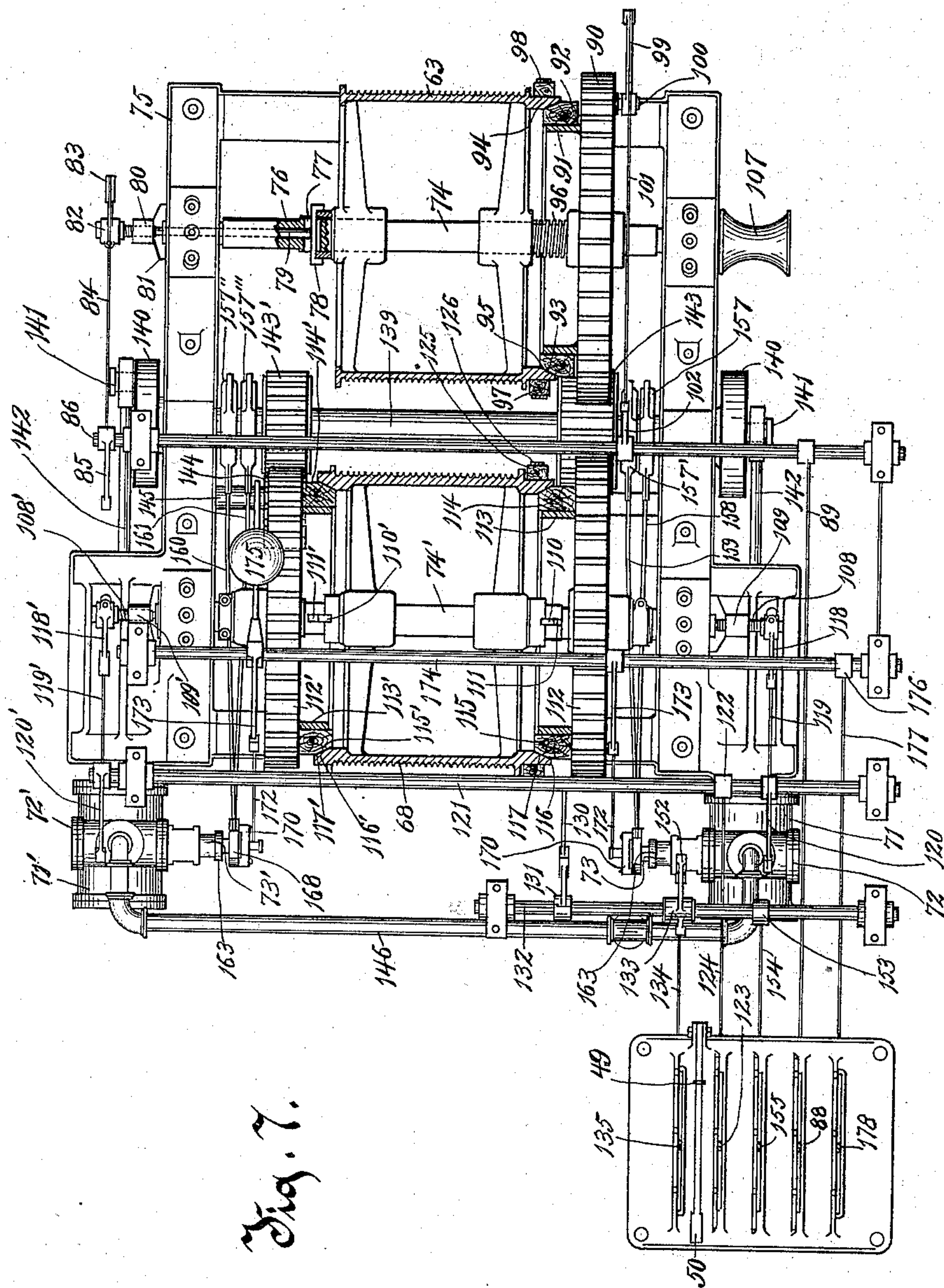


Fig. 7.

Witnesses.

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UNITED STATES PATENT OFFICE.

OLE JOHNSON, OF MILWAUKEE, WISCONSIN.

APPARATUS FOR ELEVATING, TRANSPORTING, AND DISCHARGING MATERIAL.

SPECIFICATION forming part of Letters Patent No. 603,852, dated May 10, 1898.

Application filed July 12, 1897. Serial No. 644,168. (No model.)

To all whom it may concern:

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

My invention has relation to improvements in apparatuses for elevating, transporting, and discharging material.

It appertains more especially to that class of devices which are adapted for discharging vessels of their cargoes, the apparatus being adapted to lift material from the hold of a vessel, and to transport the same into a receptacle, or at a locality desired.

It is one of the objects of my present improvements to provide improved means whereby the bucket can be raised and lowered at any point along the longitudinal line of travel. Furthermore, in the old form of apparatuses it has been found necessary to provide engine mechanism for causing the longitudinal travel of the carriage and in addition thereto a separate and distinct engine for hoisting and lowering. My improvements provide for one engine mechanism adapted to cause the longitudinal travel of the carriage and to also effect the elevating and lowering. Again, in the old forms of apparatuses it is necessary before the carriage can travel longitudinally that the bucket be hoisted up to and in engagement with the carriage. My invention contemplates the provision of means whereby the carriage can be made to travel either with the bucket hoisted up to the carriage or suspended therefrom at any point below said carriage.

A further object of the invention is to provide an improved construction whereby the material-holding device or bucket may be raised in a straight line from the hold of a vessel or other place containing the coal or material to be elevated until the bucket is clear of the vessel or place in which the material is stored and at this time causing the carriage to travel longitudinally and at the same time the bucket to complete its final upward travel to the carriage, said final travel, however, being at an incline of forty-five de-

grees or approximately forty-five degrees, whereby less power is required in hoisting the bucket than would be the case if said bucket were hoisted in a true vertical plane, the invention contemplating the employment of a novel arrangement of cables to accomplish this function, one cable extending forwardly from the carriage in one direction and the other in the opposite direction.

The invention furthermore provides an improved arrangement and combination of parts to be used in connection with a bucket having a pivoted bottom, more especially a bucket of the form known as a "clam-shell," said means, after the bucket has been filled with the material and just before said bucket is elevated, adapted to close the pivoted bottom of the shell against the material falling out and said means also adapted to permit of the pivoted bottom of the bucket automatically opening for the discharge of the material when the proper point of delivery has been reached.

The invention as a whole contemplates the combined objects of providing for the lowering of the bucket and the opening of the pivoted bottom thereof; the subsequent closing of the pivoted bottom and the consequent filling of the bucket; the raising of the bucket to its full elevation in a straight line, if desired, or the elevation of the bucket first in a straight line to clear the vessel and then to cause a longitudinal travel of the carriage, with a simultaneous upward movement of the bucket at an incline; the final longitudinal travel of the carriage and bucket together toward the place of discharge after the proper elevation of the bucket is secured; the stopping of the carriage at any point; the lowering of the bucket at an incline or in a straight line; the opening of the pivoted bottom of the bucket for the discharge of the material; the subsequent closing of the pivoted bottom; the elevation of the bucket in a straight line or at an incline or partial elevation in a straight line and the remaining portion of its elevation at an incline, and, finally, the return travel of the carriage and bucket.

With the above primary objects and others in view the invention consists of the devices and parts or their equivalents, as hereinafter more fully set forth.

In the accompanying drawings, Figure 1 is a side elevation of one half of the mechanism. Fig. 2 is a side elevation of the other half. Fig. 3 is a front elevation showing the boom in a raised position. Fig. 4 is an enlarged detail view of one end of the boom, showing the carriage at the end of its travel in one direction. Fig. 5 is a view, partly in section, of the hoisting mechanism. Fig. 6 is a front view of Fig. 5. Fig. 7 is a plan view of Fig. 5 with parts broken away. Fig. 8 is an enlarged view of the cable-tightening mechanism. Fig. 9 is a fragmentary plan view of Fig. 8, and Fig. 10 is a detail view of the steam-chest valve mechanism.

Referring to the drawings, the numeral 11 indicates the front tower of the apparatus, and 12 the rear tower. The latter is advisedly mounted on the top of a coal-shed or similar building 13, in which it is desired to deposit the material. The front tower is preferably mounted on a track 14, running near to and parallel with the edge of a wharf at which a vessel can be tied up for the purpose of unloading it. The rear tower 12, in view of the fact that it is here shown as mounted upon the top or roof of a coal-shed, is considerably less in height than the front tower, and is also mounted on a track 15 on the top of the shed, said track running parallel with the track 14. These towers can be anchored or secured in place against travel on their tracks by any convenient means.

On the front tower 11 is mounted a boom 16, said boom being so hinged to the tower as normally to project therefrom in a substantially horizontal plane and to be tiltable upwardly from that position to the dotted-line position shown in Fig. 1. This tilting is accomplished by means of a cable 17, secured at one end to the boom near the outer end of said boom, and thence extended upwardly over a pulley 18, mounted in the upper end of the front tower, and thence extended downwardly to and connected with a winch 19, the shaft of said winch being mounted in a suitable bracket or frame 20, extending upwardly from one of the cross-pieces of the tower. The shaft of the winch has also mounted thereon a gear-wheel 21, which meshes with a smaller gear 22, mounted on an upper shaft 23, said shaft having its opposite ends cranked for the purpose of conveniently turning the same. It is obvious that by turning the crank-shaft 23 the cable 17 can be wound or unwound upon the winch 19, and so as to either raise or lower the boom.

A cable 24 is secured at one end to the boom near its free extremity, and this cable is extended longitudinally to and passes over a roller 24' on the rear tower 12, being finally secured at its end to said tower. The cable passes under a pulley 25, located at the pivoted end of the boom, so that when the boom is swung upwardly to the dotted-line position, Fig. 1, the cable will be carried in a line parallel with the boom.

The numeral 26 indicates a carriage consisting of opposite side pieces, between which are mounted the upper rollers 27 27, which rollers rest upon the cable or track 24, and therefore form the track-wheels of the carriage. The sides of the carriage have also mounted therebetween, at a lower point, grooved pulleys 28 28'.

To one end of the carriage is connected a rope or cable 29. This cable is extended to and around a grooved pulley 30, journaled in the end of the boom. It is then extended rearwardly and passed a plurality of times around grooved rollers 31 and 32, thence from the roller 32 rearwardly to the rear tower 12 and around a pulley 33, mounted in said rear tower, and, finally, forwardly to connect with the rear end of the carriage. The shaft of the grooved roller 31 is mounted in bearings extending from the upper edge of longitudinal beams 34 34, connected to the front tower. The ends of the shaft of the grooved roller 32 are mounted in bearings extending upwardly from a slidable frame 35, the opposite edges of said frame adapted to fit and to be slid in recesses or guide-grooves 36 36, formed in the longitudinal beams 34. Mounted in bearings projecting upwardly from the longitudinal beams 34 and in advance of the grooved roller 32 is a shaft 37. This shaft has mounted thereon two pinions 38 38, which are adapted to engage with the teeth of rack-bars 39 39, formed on the slidable frame 35. The shaft 37 has also mounted thereon, near one of its extremities, a ratchet-wheel 40, which is adapted to be normally engaged by a pivoted pawl 41. One end of this shaft is squared, so as to be readily engaged by a tool for turning the same. The object of this slidable frame and means for actuating the same is for taking up any slack or looseness which may occur in the cable 29. In order to accomplish this, all that is necessary is to rotate the shaft 37 in the proper direction to cause a travel of the slidable frame rearwardly in its guide-ways. When the proper degree of tautness is secured, the shaft is prevented from reverse rotation by means of the pawl 41.

The primary function and purpose of the cable 29 is to hold the carriage 26 at any adjusted position on the cable or track 24. This is accomplished by providing in connection with the grooved roller 31 an improved form of brake mechanism. The rim or periphery of the roller 31 at one end is left plain or ungrooved, and around this surface is arranged a brake band or strap 42, embracing a series of blocks 42', which surround the plain periphery of the roller and are secured to the inner side of the brake-band. Mounted in the longitudinal beams 34 just to the rear of the roller 31 is a transverse shaft 43. This shaft has mounted on one extremity a lever 44, the long arm of said lever having a weight 45 adjustably mounted thereon. The shaft has mounted thereon medially a block 46, and to this block is pivoted one end of the brake-

band 42. The block has also pivoted thereto a downwardly-extending rod 47. The lower end of this rod is threaded, and engaging the threads is a threaded sleeve-nut 48. To this sleeve-nut is secured the other end of the brake-band 42. Connected to and extending downwardly from the short arm of the lever 44 is an operating-rod 49, said rod being extended to and connected with a lever 50, located within a housing 51, extending out from the front tower. It will be understood that when the carriage is traveling longitudinally the lever 44 is operated upon so as to turn the shaft by a pull on the rod 49, exerted through the medium of the lever 50. When the lever is in this position, the brake-band and blocks 42' loosely surround the smooth portion of the periphery of the roller 31, so as to permit said roller to readily revolve. When, however, a position is reached for stopping the carriage, the pull on the rod 49 is removed, and the weight on the end of the lever 44 will cause a tilting of said lever, so as to draw the brake-band tight, and thereby prevent rotation of the roller. It will therefore be obvious that it will be impossible for the carriage to travel. The brake-band therefore normally fits tightly around the roller to prevent rotation thereof.

The numeral 52 indicates the bucket. I have shown this bucket in the accompanying illustration as of the form known as a "clam-shell." Its bottom consists of two pivoted sections 53 53, said bottom pieces having extending upwardly therefrom ears or lugs 54. In these ears or lugs are mounted the ends of a shaft 55, said shaft having fast thereon a grooved roller 56. Links 57 57 are connected to the outer ends of the upper edges of the pivoted bottom pieces of the bucket and extend upwardly and inwardly to a common connecting-point 58, which point is formed with an upwardly-extending eye 59.

The hoisting-rope is indicated by the numeral 60. One end of this rope is connected to the eye 59 of the bucket and is then extended upwardly over and around the pulley 28' of the carriage, thence rearwardly to and around a pulley 61, mounted in the rear tower 12, thence forwardly to and around a pulley 62, mounted in the front tower 11, and thence downwardly for connection to a drum 63. The numeral 64 indicates another rope or cable which acts in conjunction with the rope 60 to effect the hoisting of the bucket and also serves the function of operating the pivoted bottom of the bucket, so as to close the same against the contents dropping out. One end of this cable is connected to the grooved roller 56, and is then extended upwardly into the groove of a guide-roller 65, thence upwardly into the groove of the pulley 28 of the carriage, thence forwardly around a grooved roller 66 in the end of the boom, thence upwardly and rearwardly and around a pulley 67, mounted in the upper end of the front tower, and thence downwardly for con-

nection to a drum 68. A short cable 69 is connected to the shaft 55 of the bucket and is then extended upwardly for connection to an eye 70. The effect of the lowering of the bucket is to wind the cable 64 upon the grooved roller 56 and to unwind the cable 69 from shaft 55. This permits the pivoted sections composing the bottom of the bucket to open, so that said bucket may be filled with the material to be elevated. On the raising of the bucket the reverse operation takes place—that is to say, the cable 64 unwinds from the grooved roller 56, while the short cable 69 winds up on the shaft 55, which of course has the effect of closing the pivoted lids.

Referring now to the engine mechanism for operating the drums 63 and 68, the numerals 71 71' indicate engine-cylinders mounted in the lower portion of the front tower 11, and 72 72' the steam-chests of the respective cylinders. These steam-chests are provided with the ordinary form of interior rotatable valves, (not shown,) which are provided with the outwardly-projecting valve-stems 73 73'. The drums 63 and 68 are mounted, respectively, loosely on the shafts 74 74', said shafts being journaled in a suitable framework 75. Shaft 74 is tubular from one end inwardly for a desired distance, as indicated at 76, and the inner end of the tubular portion is intersected by a transverse slot 77, into which is passed a transverse plate 78, which plate bears against one end of the drum 63. A rod 79 is fitted in the tubular portion of the shaft and is adapted to bear at its inner end against the plate 78. The outer end of this rod is threaded and passes through and engages a fixed threaded nut 80, formed on a bracket 81, projecting out laterally from the framework 75. On the extremity of the rod 79 is a collar 82, from which projects a crank-arm 83. A rod 84 is connected at one end to this arm and is extended upwardly to and connected with one end of a rocking arm 85, which arm is mounted on a rock-shaft 86. The shaft 86 has also extending downwardly therefrom near one end an arm 87, which arm is connected to a lever 88 by means of a rod 89. The drum-shaft 74 has also mounted fast thereon a gear-wheel 90. This wheel has projecting inwardly from its inner face an annular flange 91, which flange has secured therearound an annular band 92, preferably of wood, said band having an exteriorly-beveled end 93. The end of the drum 63 adjacent to this annular band projects outwardly, as indicated at 94, and is provided with an interior bevel 95, which is adapted to register with the beveled surface 93. A coiled spring 96 encircles the shaft 74 between one end of the drum 63 and the face of the gear-wheel 90. Surrounding the projecting portion 94 of the drum are a series of segmental blocks 97, which blocks are attached to a brake-band 98. Mounted upon a short shaft 100 is a crank-arm 99. Connected to this

arm is a rod 101. This rod is extended to and connected with another rocking arm 102 on rock-shaft 86. The shaft 100 has also projecting therefrom a short stud 103, to which stud one end of the brake-band 98 is secured. The other end of said brake-band is connected to a rod 104, which rod is passed through a boss formed on a bracket 106, the rod being threaded and having nuts 105 turning thereon. A winch 107 may for convenience be mounted on the outer end of the shaft 74.

The beveled surfaces 93 and 95 form clutch mechanism whereby the drum 63 is made fast to the gear-wheel 90, in order to rotate therewith. Normally the drum is loose on the shaft. When, however, the lever 88 is operated, the rock-shaft 86 is turned, and as said shaft is thus turned a rotation is imparted to the rod 79, which turns in the nut 80, and is thereby forced inwardly against the plate 78, which plate in turn presses against the end of the drum 63 and causes said drum to be slid longitudinally on the shaft toward the gear-wheel 90, effecting a firm wedging of the beveled surfaces 93 and 95 and causing the drum to be clutched to the gear-wheel, so as to rotate therewith. The operation of the lever 88 also has the effect at the same time of turning crank-arm 99, through the medium of the connecting-rod 101, so as to cause a looseness of the brake-band and to provide for the free rotation of the drum on its shaft. Of course a reverse movement of the lever 88 will have an opposite effect—that is to say, the rod 79 will be screwed outwardly, so as to release pressure on the end of the drum, and at the same time the brake-band 98 is tightened. The moment the rod 79 ceases to press against the end of the drum the recoil of the coiled spring 96 on shaft 74 will act to shift the drum to its normal unclutching position. The drum 68 is also loose on its shaft 74'. Said shaft 74', however, is tubular at both ends, and into these tubular portions extend rods 108 108', said rods having threaded portions which turn in fixed nuts 109 109'. The inner ends of the rods bear against plates 110 110', which fit in slots 111 111', intersecting the inner ends of the tubular portions of the shaft, said plates being adjacent to and fitting against the ends of the drum 68.

Mounted on the shaft 74' are gear-wheels 112 112', said gear-wheels provided on their inner faces with inwardly-extending annular flanges 113 113'. Both gear-wheels are loose on the shaft. Around the annular flanges 113 113' are secured bands 114 114', preferably of wood. The inner ends of these bands are provided exteriorly with bevels 115 115'. The cylindrical portion of the drum 68 is extended at opposite ends to form extensions 116 116', and these extensions are provided with interior bevels 117 117', which register with and are adapted to engage the bevels 115 115'. When in firm engagement with either, the drum is clutched to the respective gear-wheel,

and consequently said drum will be caused to rotate with said gear-wheel. The clutching is effected by a turning of either of the screw-rods 108 108'. This turning of the screw-rods is effected by means of arms 118 118', extending from the outer ends of said rods. To these arms 118 118' are connected rods 119 119', which rods are extended to and connected with arms 120 120', mounted on a rock-shaft 121. The rock-shaft 121 has also depending therefrom a crank-arm 122, which is connected up to an operating-lever 123 by means of a rod 124. It will be understood that the screw-rods 108 108' are so arranged that when the lever 123 is turned in one direction one of said screw-rods will be turned inwardly, so as to force the drum longitudinally in one direction, and when said lever is operated reversely the drum will be moved longitudinally in the opposite direction. If, therefore, the lever 123 is manipulated so as to screw in the screw-rod 108 and unscrew the screw-rod 108', the drum will be moved longitudinally, so that its bevel will be thrown into clutch with the beveled band 115' of the gear-wheel 112'. The result will be that the drum is rotated in one direction. If the lever is operated reversely, then the screw-rod 108' is screwed in and the screw-rod 108 screwed outwardly. This will have the effect of forcing the drum 68 longitudinally, so as to clutch with the gear-wheel 112, and thereby cause the drum to rotate with said gear-wheel in an opposite direction.

The end extension 116 of the drum 68 is surrounded by a series of segmental blocks 125, and these blocks are connected to a brake-band 126. One end of this brake-band is connected to a crank-arm 127, mounted on a short shaft 128. This short shaft has also extending therefrom an arm 129, and to this arm is connected the lower end of a rod 130. The upper end of this rod is connected to one member 131 of a bell-crank lever mounted loosely on a rock-shaft 132. The other member of the bell-crank lever is indicated by the numeral 133, to which member is connected a rod 134, said rod extending to and connected with an operating-lever 135. The opposite end of the brake-band 126 is connected to a screw-rod 136, said screw-rod passing through a boss forming part of a casting 138. Nuts 137 137 turn on the screw-rod. It is obvious that when the lever 135 is manipulated in one direction it has the effect of drawing the brake-band 126 tightly around the segmental blocks 125, and thereby preventing the drum from rotating on its shaft. When, however, the drum is shifted longitudinally, so as to clutch with either the gear-wheels 112 or 112', the lever 135 is turned in a direction to loosen the brake-band, so as to permit of the rotation of the drum 68 with the gear-wheel with which it is clutched.

The numeral 139 indicates the driving-shaft. On the opposite ends of this shaft are mounted disks 140 140, having extending

therefrom crank-pins 141 141'. To these pins are connected pitmen 142 142', which pitmen in turn are connected to the piston-rods of the engine mechanism. The shaft 139 has 5 mounted thereon pinions 143 143'. Pinion 143 meshes directly with gear-wheels 90 and 112. Pinion 143' meshes with an intermediate pinion 144, mounted on a short shaft 145. Said pinion 144 meshes with gear-wheel 10 112'. The steam-chests 72 72' are connected by means of a connecting-pipe 146, to which leads a steam-inlet pipe 147, said inlet-pipe formed with a suitable valve-casing 148, in which is fitted an ordinary form of rotatable 15 valve. (Not shown.) This valve is provided with a projecting valve-stem 149, to which is secured a crank-arm 150. To this crank-arm is connected the lower end of a rod 151. The upper end of this rod is connected to a crank- 20 arm 152, connected rigidly to and extending from the rock-shaft 132. The rock-shaft 132 has also rigidly connected thereto and depending therefrom an arm 153. To this arm 153 is connected a rod 154, which rod is extended to and connected with a lever 155. 25 It is obvious that by manipulating the lever 155 the crank-arm 150 may be turned so as to open or close the inlet or to regulate the amount of inflowing steam. The engine-cyl- 30 inders are also provided with downwardly depending exhaust-pipes 156.

Mounted on the driving-shaft 139, near the opposite ends of said shaft, are sets of eccentrics. The eccentrics of one set are sur- 35 rounded by eccentric-rings 157 157' and the eccentrics of the other set by eccentric-rings 157'' 157'''. Connected to the eccentric-ring 157 is a rod 158 and to the eccentric-ring 157' a rod 159. Connected to eccentric-ring 157'' is 40 a rod 160 and to eccentric-ring 157''' a rod 161.

The steam-chests 72 72', as previously stated, are controlled by means of ordinary rocking valves. (Not shown.) These valves are provided with the projecting valve-stems 45 73 73'. The outer ends of the valve-stems are provided with depending crank-arms similar to 163. (See Fig. 10.) Each of these crank-arms is provided with an outwardly-extending pin 164, which pin extends through an 50 opening 165 in a block 166. The block 166 fits in a curved elongated slot 167, formed in a frame 168. The frame 168 has extending outwardly therefrom at a medial point posts 169 169, to which are secured the opposite 55 ends of a cross-piece 170. This cross-piece is provided centrally with a projecting pin 171. To this pin is connected the lower end of a rod 172. The upper end of this rod is connected to one end of an arm 173, mounted upon a rock- 60 shaft 174. The other end of this arm 173 carries thereon a weight 175. The rock-shaft 174 has also depending therefrom an arm 176, to which arm is connected a rod 177, which rod is extended to and connected with an oper- 65 ating-lever 178. All the several operating-levers described are located within the hous-

ing 51, hereinbefore referred to. The rod 158, which is connected to the eccentric-ring 157, is extended to and connected with the lower 70 portion of the frame 168 at the point 179, and the rod 159, extending from the eccentric-ring 157', is secured to the frame 168 at the point 180. The rods 160 and 161, extending, respec- 75 tively, from the eccentric-rings 157'' 157''', are connected to their respective frame in a similar manner. The peculiar construction of frame 168 and allied parts, in connection with the valve-stems 73 73' and the connecting- 80 rods running to the respective eccentric-rings, is for the purpose of securing a reversal of rotation. In the position of the frame 168 shown in Fig. 5 of the drawings the rotation 85 of the driving-shaft 139 will merely have the effect, through the eccentric-rings and connecting-cables, of rocking the frames 168 with- out turning the valve-stems, as the pins 164, projecting from the crank-arms 163 of said 90 valve-stems, pass freely through the openings 165 of the blocks 166, and consequently the reversing-valves of the steam-chests are not effected. The position of the frame 168 shown 95 in Fig. 5 of the drawings is the normal position of the frame, and said frame is maintained in said normal position by the counter- poise-weight 175. If now it is desired that 100 the engine should be run so as to rotate the driving-shaft through the pitmen connections in one direction, the operating-lever 178 is manipulated. This will cause the rod 172 to be raised or lowered, so as to effect either a 105 raising or lowering of the frames 168. This will bring the center of rotation of said frames either above or below the centers formed by the pins 164. The frames 168 will therefore not only have rocking motions, but will also 110 be moved slightly forwardly and rearwardly. This will act on the pins 164, so as to cause the crank-arms 163 to be rocked, which rock- ing will be imparted to the valve-stems 73 73', 115 and consequently to the valves controlling the steam-chests. The result is that when the frames 168 are raised the driving-shaft 139 will be rotated in one direction, while when said frames 168 are lowered below their nor- 120 mal positions the driving-shaft will be rotated in an opposite direction—that is to say, in one instance the steam entering the cylinders from the steam-chests will pass to one side of the pistons and said cylinders will exhaust from 125 the other side, and vice versa. When the frames are moved in an opposite direction, the live steam will pass into the cylinders, so as to act upon the sides of the pistons opposite to the sides first referred to and exhaust from the other sides.

The cables 60 and 64 are preferably made to engage the grooves of guide-rollers 181 in order that they may be properly directed to their respective drums 63 and 68.

It will be noticed that the lower end of the 130 tower 12 is provided with a hopper 182, and this hopper is adapted to discharge into a

trough 183, said trough adapted to carry the material to any convenient point of delivery within the shed.

The operation of the apparatus will now be described.

In the position of the bucket shown in Fig. 1 it will be supposed that said bucket is being lowered into the hold of the vessel. When it is thus being lowered, both drums 63 and 68 are free from clutch with the gear-wheels; so as to be revolved by the heft of the bucket. The brake-bands 98 and 126, however, are regulated so as to cause said brake-bands to bind somewhat on the extended ends of the drums to prevent too rapid rotation of the drums. When the bucket reaches the hold of a vessel, the brake-band 98 for the drum 63, by properly manipulating the lever controlling said brake-band, is operated so as to tightly clamp the band around the end of the drum and prevent further rotation of said drum. The moment drum 63 is thus held against rotation cable 64 begins to slack, thereby permitting the pivoted lids to be swung on their pivots and opened, the slack of cable 64 being taken up by the winding of said cable on the grooved roller 56, while the opening of the pivoted bottom section 53 is accomplished by unwinding the short cable 69 from the shaft 55 of the grooved roller. This opening of the pivoted bottom sections of the bucket is effected just before said bucket is lowered to its full extent. After the opening of the bottom sections both cables 60 and 64 are then slackened and the bucket allowed to descend to the load. In order to fill the bucket, the cable 64 only is wound up, which is accomplished by manipulating the proper lever so as to throw drum 68 over into clutch with the gear-wheel 112', having the effect of drawing the pivoted bottom sections of the bucket to a closed position. After being thus filled and closed the next step is to raise the bucket, and this is accomplished by also throwing drum 63 into clutch with gear-wheel 90. Both drums are now in clutch, and wheel 90 derives rotation from pinion 143 and wheel 112' derives its rotation through the intermeshing wheels 143' and 144. The cables 60 and 64 are now wound up upon the drums and the bucket caused to ascend in a vertical plane until it clears the hold of the vessel. After it is clear of the vessel it could be still raised in a vertical line up to the carriage by continuing the pull on both cables; but this is undesirable, inasmuch as it requires considerable more power than if the bucket was pulled up at an angle. I therefore prefer to continue the ascent of the bucket at an angle of, say, approximately forty-five degrees. This is accomplished merely by winding up on cable 60, drum 68 being thrown out of clutch with gear-wheel 112' by manipulating the proper lever, and the brake-band 126 of drum 68 being set to prevent rotation of said drum. The foot-brake

50 at this time is also operated, so as to permit movement of the cable 29, and thereby allow of longitudinal travel of the carriage. By thus raising the bucket at an angle one-half or more of the load is thrown off the machine. The inclined movement of the bucket is continued for a desired distance, preferably until the bucket comes in contact with the carriage. The next step is to then throw drum 68 over to the gear-wheel 112 and loosen the brake-band 126. This will cause a rotation of the drum 68 in a direction to slacken cable 64, while on the other hand cable 60 is wound up upon its drum 63 by reason of said drum 63 being clutched to the gear-wheel 90. The effect of this is to carry the carriage along longitudinally. It will be understood that both drums are so geared that one cannot unwind faster than the other winds, or vice versa. When the place of discharge is reached, if it is desired to lower the bucket in a straight vertical line all that is necessary is to throw both drums entirely out of clutch and set the brake-bands 98 and 126, which control the rotation of said drums, or the lowering of the bucket in a straight vertical line could be accomplished by leaving the drums in clutch and merely reversing the engine mechanism. On the other hand, if it is desired to lower the bucket at an incline in either direction either cable 60 or 64 is slackened. If, for instance, cable 64 is slackened by unclutching drum 68, the brake-band 98 of drum 63 is set, so that said drum will not unwind. The bucket will then descend by the heft of the load at an incline toward the right hand of Fig. 1. If for any reason it is desired that the bucket should descend at an opposite incline, then cable 60 is slackened and drum 68 is unclutched and held from unwinding the cable 64 by setting the brake-band 126. After the bucket has reached the point of discharge the foot-brake 50 is set, so that the cable 29 is held stationary, and consequently the carriage prevented from traveling. Now the pivoted bottom sections of the bucket are opened merely by slackening cable 64 and holding cable 60 stationary by setting the brake-band 98. After the load is emptied the foot-brake is first operated, so as to slacken cable 29. A pull is then given on either of the cables 64 or 60—if, for instance, on cable 64 cable 60 is not operated, as drum 63 is still held against rotation by its brake-band 98. The carriage will therefore be compelled to travel longitudinally toward the front of the apparatus and the bucket to ascend. After the bucket has thus been raised to a proper height either below or up to the carriage there will be no further pull at an incline, and consequently no tendency for the carriage to travel longitudinally. In order to complete the longitudinal return travel of the carriage, therefore, it is necessary to reverse the engine mechanism, which is accomplished by manipulating the proper lever for throwing the valve-stems

73 73', which regulate the valves controlling the admission and exhaust of steam from the cylinders. When the engine mechanism is thus reversed, the drum 68 is left in clutch
5 with gear-wheel 112, and drum 63 is thrown over into clutch with gear-wheel 90. In this position cable 64 is wound upon its drum and cable 60 unwound.

If it is desired to stop the engine mechanism entirely, all that is necessary is to manipulate the proper lever for controlling the valve mechanism of the valve-casing 148. By the proper turning of this lever the steam can be turned on or off, so as to either start or
15 stop the engine mechanism.

What I claim as my invention is—

1. In an apparatus for elevating, transporting and delivering material, the combination, of a cable or track, a carriage adapted to travel
20 on said track, a bucket, cables connected to the bucket and extending to the carriage, and thence from said carriage in opposite directions, shafts having drums slidingly mounted thereon, and to which drums the respective
25 cables are connected, a gear-wheel loose on one of said shafts, clutch mechanism whereby the drum of this shaft may be connected to the gear-wheel, gear-wheels loose on the other shaft, clutch mechanisms for connecting the
30 drum of this latter shaft to either of the loose gear-wheels, a main driving-shaft having pinions mounted thereon, one of said pinions engaging a gear-wheel on each of the drum-shafts, and an intermediate pinion with which
35 the other pinion of the driving-shaft meshes, said intermediate pinion meshing with the second gear-wheel on one of the drum-shafts.

2. In an apparatus for elevating, transporting and delivering material, the combination,
40 of a cable or track, a carriage adapted to travel on the track, a cable connected to the forward end of the carriage, and thence extended for connection to the rear end of the carriage, pulleys around which the cable is wound a plurality of times, a lever mounted on a shaft, a
45 brake-band surrounding one of the pulleys, said brake-band having its opposite ends secured to the shaft, mechanism engaging the lever, and when operated in one direction
50 adapted to turn the shaft so as to normally hold the brake-band out of engagement with one of the pulleys, and when operated in the opposite direction adapted to turn the shaft so as to release the brake-band, cables connected to the bucket, drums to which the opposite ends of the cables are connected, driving mechanism, a clutch mechanism between the drums and the driving mechanism, whereby said drums may be both put into clutch
55 with the driving mechanism, or one separately, or one or both drums thrown out of clutch.

3. In an apparatus for elevating, transporting, and delivering material, the combination,
65 of a cable or track, a carriage adapted to travel on said track, a bucket, a cable connected to

the bucket and extending to the carriage, and thence from said carriage, a shaft provided with a tubular portion extending inwardly for a desired distance, a drum mounted loosely
70 on said shaft, and to which the cable is connected, a driven wheel mounted on the shaft, a screw-rod passing through a fixed nut and adapted at its inner end to bear against the drum, means for turning the screw-rod so as,
75 when turned in one direction, to cause said rod to slide the drum longitudinally on its shaft, clutch mechanism between the drum and the gear-wheel, and a coiled spring encircling the shaft and confined between the
80 gear-wheel and the drum, said spring adapted, when the screw-rod is turned in the opposite direction, to force the drum out of engagement with the clutch.

4. In an apparatus for elevating, transporting, and delivering material, the combination, of a cable or track, a carriage adapted to travel on said track, a cable connected to the bucket and extending upwardly to the carriage, and thence from said carriage, a
85 shaft provided with a tubular portion extending inwardly for a desired distance, a drum mounted loosely on said shaft and to which the cable is connected, a driven wheel mounted on the shaft, a screw-rod passing through a
90 fixed nut and adapted at its inner end to bear against the drum, an arm connected to the screw-rod, a rock-shaft, an arm mounted medially thereon, a rod connecting one end of this arm with the screw-rod, whereby when
95 the rock-shaft is turned the arm medially mounted thereon will, through the connecting-rod, cause a rotation of the screw-rod, which when rotated in one direction, will bear against the drum and slide said drum longitudinally on its shaft, clutch mechanism between the drum and the driven wheel, a brake-band surrounding the drum, one end of said band being connected to a fixed point, a rocking arm to which the opposite end of the band
100 is connected, and a rod connecting said arm with the other end of the arm which is medially mounted on the rock-shaft.

5. In an apparatus for elevating, transporting, and delivering material, the combination, of a cable or track, a carriage adapted to travel on said track, a bucket, a cable connected to the bucket and extended upwardly to the carriage, thence forwardly from the carriage, a shaft having opposite ends tubular for a desired distance inwardly, a drum loosely mounted on said shaft, gear-wheels mounted on the shaft, screw-rods passing through fixed nuts and entering the tubular ends of the shaft, means for turning said
105 screw-rods, so as to throw one or the other into engagement with the drum, in order to slide said drum longitudinally in either direction on its shaft into engagement with either of the gear-wheels, a driving-shaft,
110 pinions mounted thereon, one of said pinions adapted to mesh directly with one of the gear-

wheels of the shaft, another pinion on a separate shaft, which pinion meshes with the other gear-wheel, and also with the other pinion of the driving-shaft.

5 6. In an apparatus for elevating, transporting, and delivering material, the combination, of a cable or track, a carriage adapted to travel on said track, a bucket having a pivoted bottom, cables connected to the bucket,
10 one of said cables connected to a fixed point of the bucket and extending upwardly to the carriage and thence rearwardly, and the other cable connected to the bucket so as to operate on the pivoted bottom thereof to effect the
15 opening and closing of the pivoted bottom, said cable extending upwardly from the bucket to the carriage, and thence forwardly from the carriage, shafts, one of said shafts having one end tubular for a desired distance
20 inwardly, and the other of said shafts having both ends tubular for a desired distance inwardly, drums mounted loosely on said shafts, and to which the respective cables are connected, a gear-wheel mounted on one of the
25 shafts, two gear-wheels mounted on the other of said shafts, a rod screwing through a fixed nut and entering the tubular end of one of the shafts, and adapted to bear against the end of the drum, means for turning said rod so as to
30 slide the drum longitudinally on its shaft, clutch mechanism between this drum and the gear-wheel, rods screwing through fixed nuts and entering the tubular ends of the other shaft, means for turning said rods, so as to
35 cause one to be screwed inwardly to bear against the inner end of the drum and slide said drum longitudinally on its shaft, and the other to be simultaneously screwed outwardly, clutch mechanism between the opposite
40 ends of the drum and the gear-wheels, a driving-shaft having pinions mounted thereon, one of said pinions meshing with the single gear-wheel of one shaft and one of the gear-wheels of the other shaft, and the other
45 pinion meshing with an intermediate pinion between it and the other gear-wheel, a cable connected to the forward end of the carriage, and thence extended for connection to the forward end of the carriage, and means for preventing the movement of said cable, in order
50 to hold the carriage in adjusted position.

7. In an apparatus for elevating, transporting and delivering material, the combination, of a cable or track, a carriage adapted to
55 travel on said track, a bucket having a pivoted bottom, cables connected to the bucket, one of said cables connected to a fixed point of the bucket and extending upwardly to the carriage and thence rearwardly, and the other
60 cable connected to the bucket so as to operate on the pivoted bottom thereof to effect the opening and closing of the pivoted bottom, said cable extending upwardly from the bucket to the carriage, and thence forwardly
65 from the carriage, shafts, drums mounted loosely on said shafts and to which the re-

spective cables are connected, a gear-wheel mounted on one of the shafts, means for clutching and unclutching the drum to and from
70 this gear-wheel, two gear-wheels mounted on the other of said shafts, means for clutching and unclutching the drum of this shaft with either of the two gear-wheels of said shaft, a driving-shaft having pinions mounted thereon, one of said pinions meshing with the single
75 gear-wheel of one shaft, and one of the gear-wheels of the other shaft, and the other pinion of said shaft meshing with an intermediate pinion between it and the other gear-wheel, said intermediate pinion being in mesh
80 with the other gear-wheel, a cable connected to the forward end of the carriage and thence extended for connection to the rear end of said carriage, and means for preventing the movement of the cable in order to hold the
85 carriage in adjusted position, the construction adapting the bucket to be lowered and the pivoted bottom opened and subsequently closed when the bucket is filled, and also adapting said bucket to be raised in a vertical
90 line to a certain height, and thence the carriage caused to travel longitudinally, and the bucket to be simultaneously elevated at an angle, and when elevated to a desired height, the two to travel together longitudinally,
95 and said construction also adapted to permit the bucket to be lowered either in a straight line or at an angle, and the pivoted bottom to be opened for the discharge of the material, and the longitudinal travel of the
100 carriage to be reversed after final discharge and subsequent elevation of the bucket.

8. The combination, of a driving-shaft, sets of eccentrics mounted thereon, a double engine mechanism, a rotatable valve for controlling
105 said engine mechanism, crank-arms extending from the valve-rods of the double engine mechanism, frames provided with elongated slots, blocks fitting in said slots, pins extending from the crank-arms of the
110 valve-stems and passing into apertures in the blocks, rods extending respectively from the eccentrics to upper and lower pins of the slotted frames, a rock-shaft, arms mounted medially thereon, weights on said arms, rods
115 connecting the arms with the slotted frames, another arm mounted on a rock-shaft, an operating-lever, and a rod connecting said operating-lever with the other arm of the rock-shaft.
120

9. In an apparatus for elevating, transporting and delivering material, the combination, of a tower, a boom pivoted to the tower so as to swing upwardly and downwardly, a cable or track, a carriage adapted
125 to travel on the track, a cable connected to the forward end of the carriage and thence extended forwardly and around a grooved pulley at the outer end of the pivoted boom, thence upwardly over a pulley at the upper
130 end of the tower, and finally connected to the rear end of the carriage, cables connected to

the bucket and extended upwardly to the carriage, and from said carriage in opposite directions, one of said cables passing over a pulley at the end of the pivoted boom, and
5 thence upwardly and around a pulley at the upper portion of the tower, and drums to which the ends of said cables are connected.

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

OLE JOHNSON.

Witnesses:

ARTHUR L. MORSELL,
ANNA V. FAUST.