June 2, 1953 K. KERSHAW 2,640,285

ROTARY TYPE BALLAST REMOVING APPARATUS

Filed Sept. 20, 1948 6 Sheets-Sheet 1

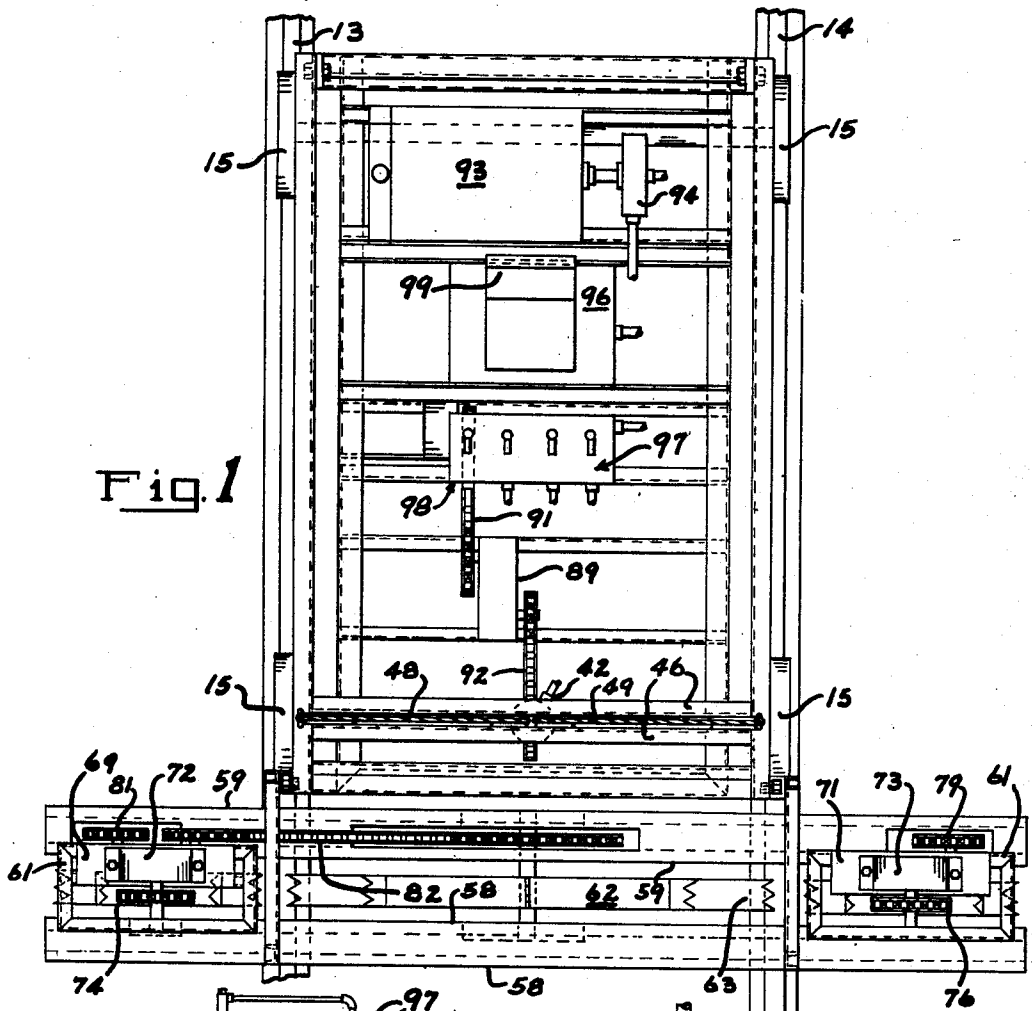


Fig. 1

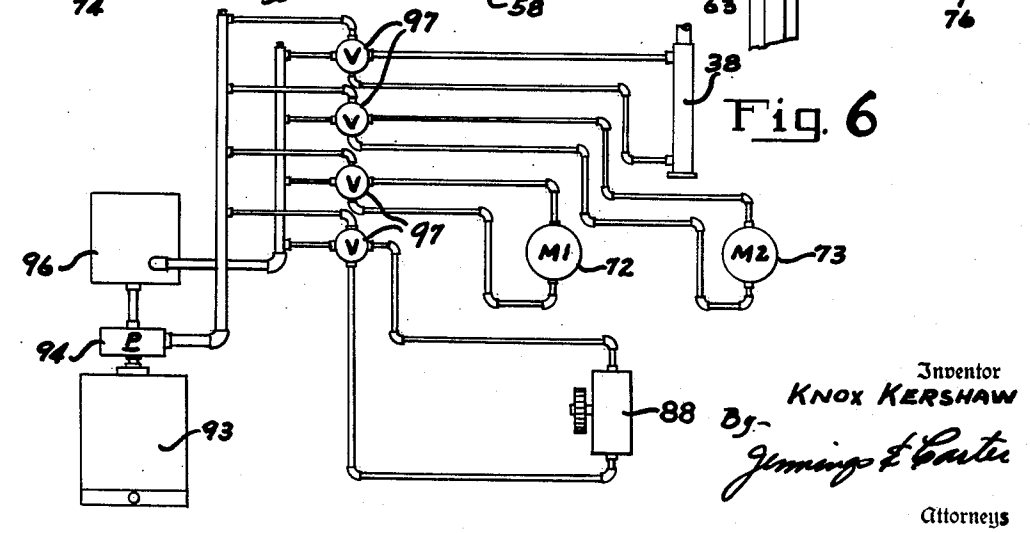


Fig. 6

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ROTARY TYPE BALLAST REMOVING APPARATUS

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6 Sheets-Sheet 2

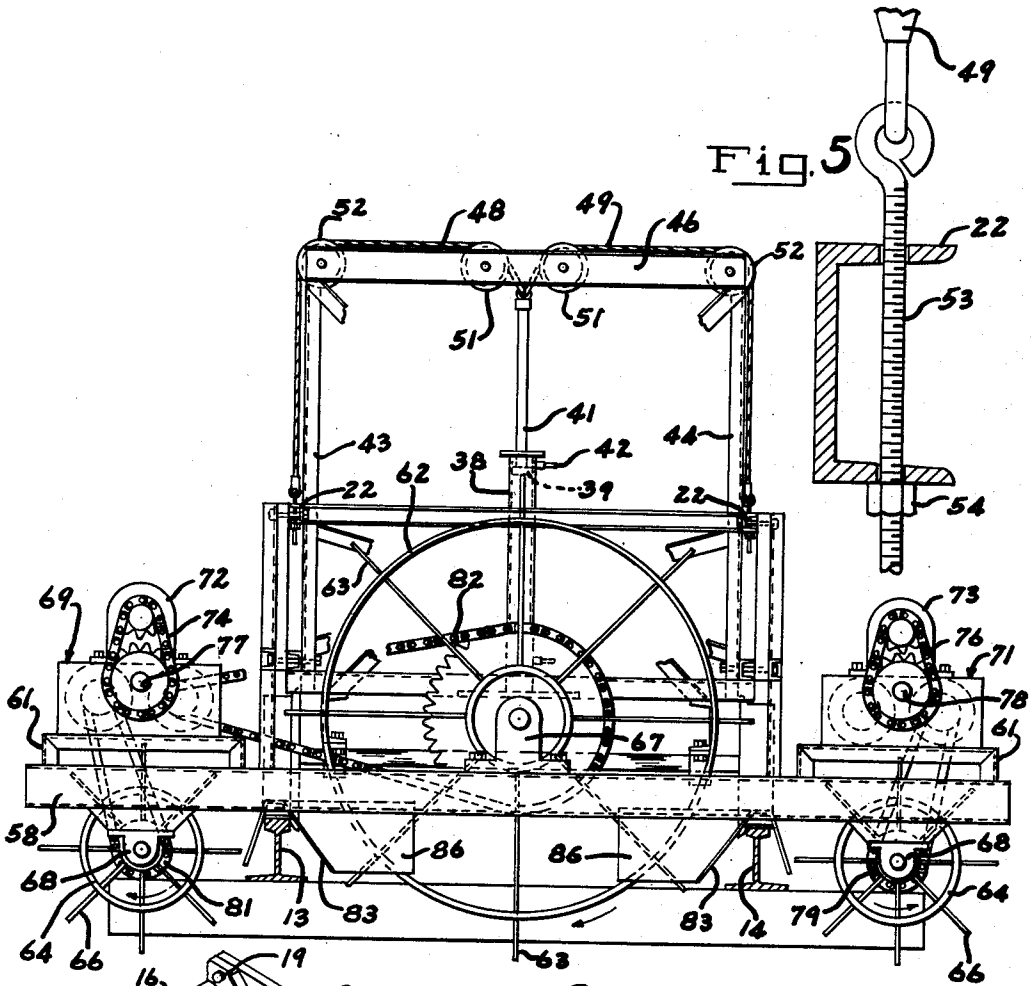


Fig. 2

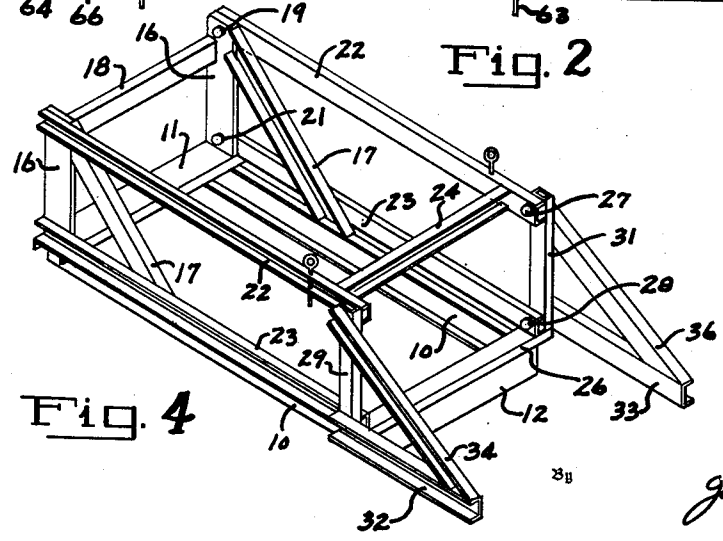


Fig. 4

Fig. 5

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ROTARY TYPE BALLAST REMOVING APPARATUS

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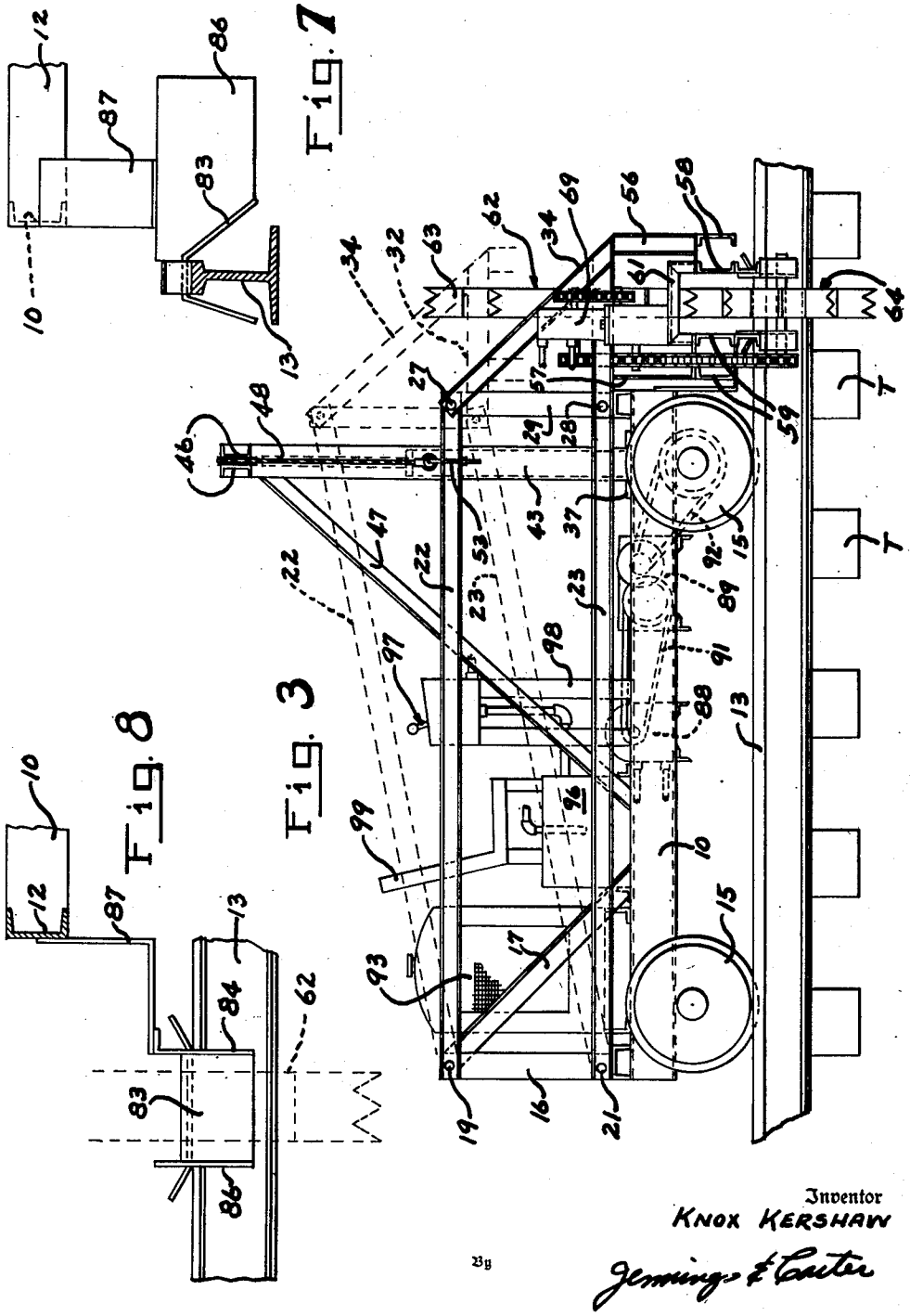


Fig. 7

Fig. 8

Fig. 3

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ROTARY TYPE BALLAST REMOVING APPARATUS

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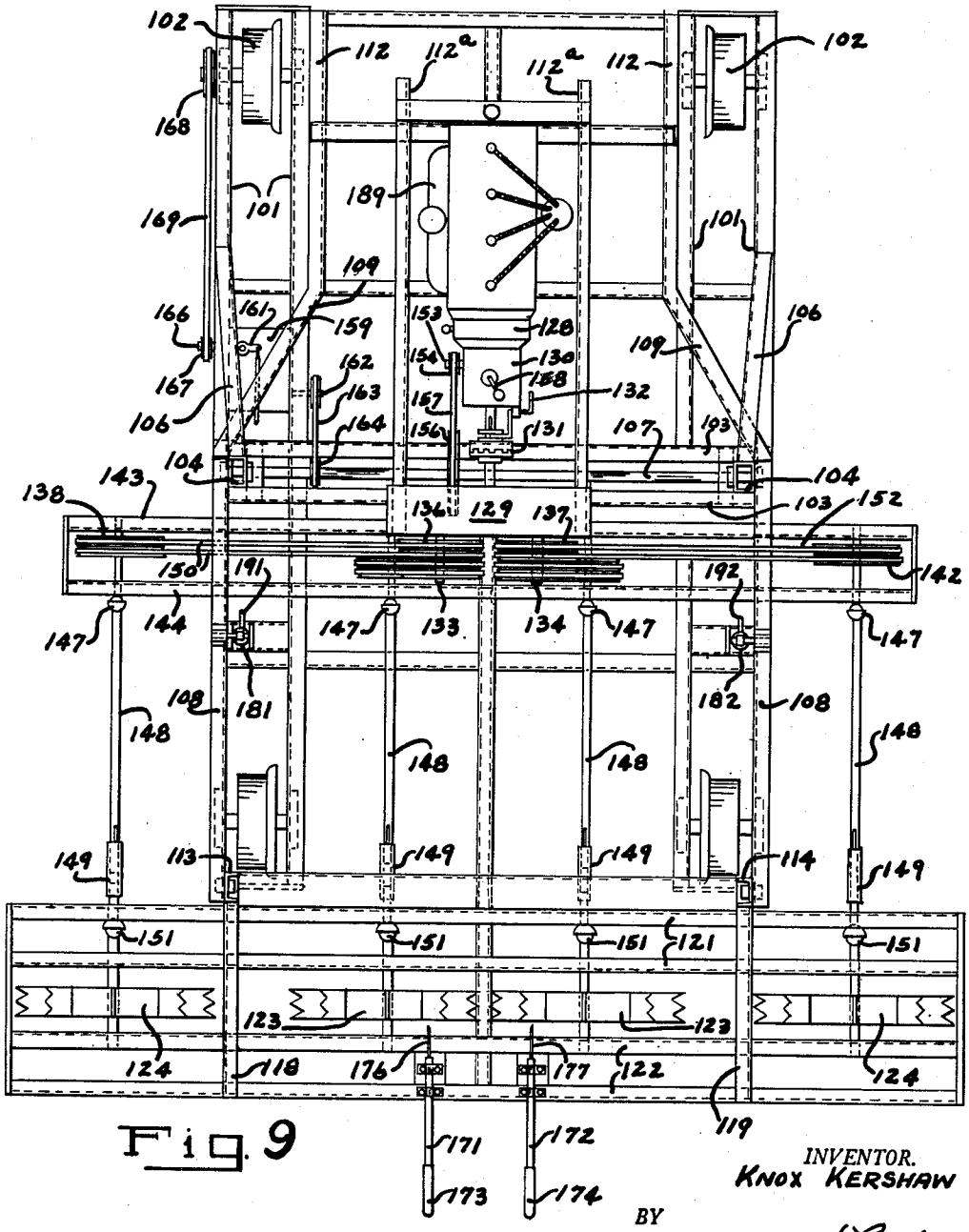


Fig. 9

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ROTARY TYPE BALLAST REMOVING APPARATUS

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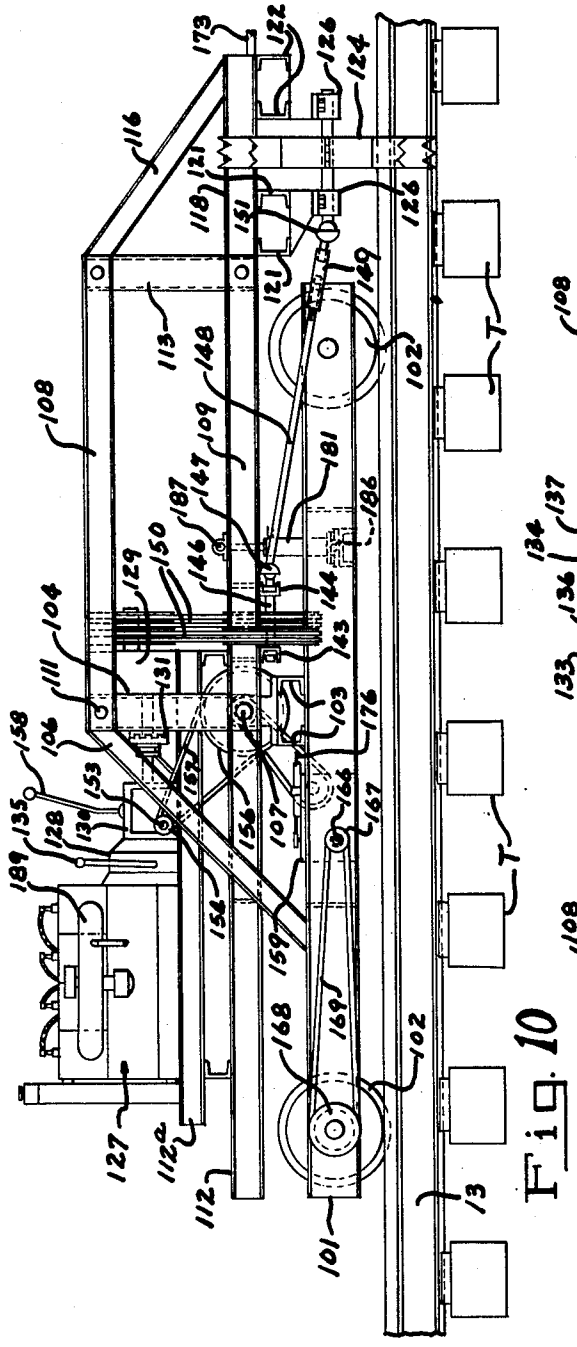


Fig. 10

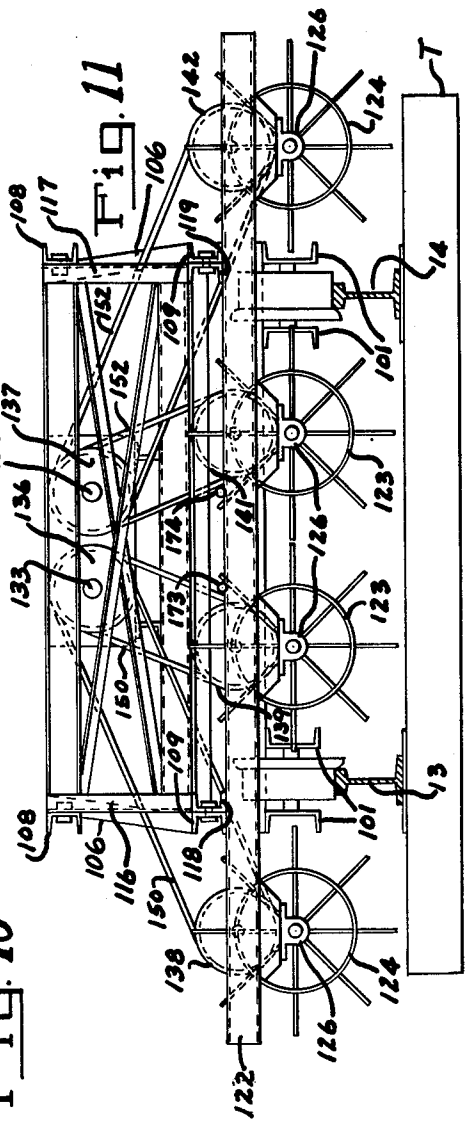


Fig. 11

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ROTARY TYPE BALLAST REMOVING APPARATUS

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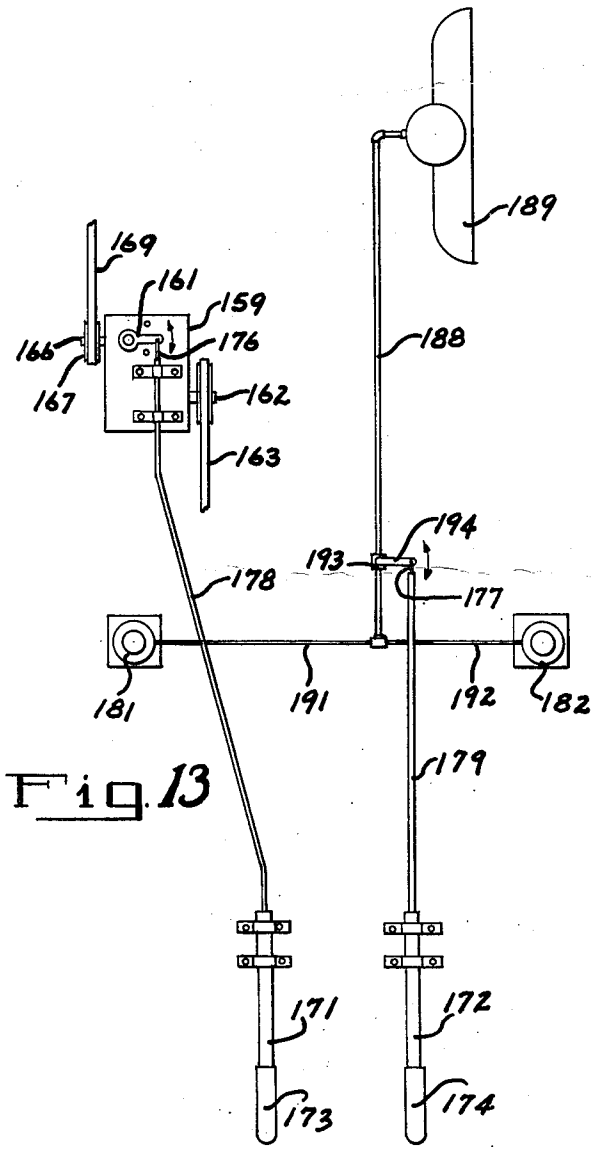


Fig. 13

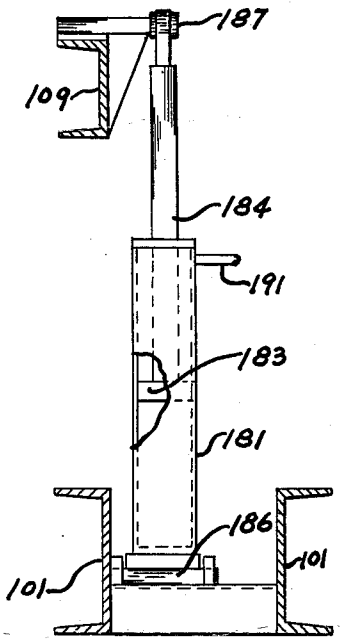


Fig. 12

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UNITED STATES PATENT OFFICE

2,640,285

ROTARY TYPE BALLAST REMOVING APPARATUS

Knox Kershaw, Birmingham, Ala.

Application September 20, 1948, Serial No. 50,160

3 Claims. (Cl. 37—104)

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My present invention relates to ballast working apparatus and more particularly to apparatus for loosening, removing, replacing or packing ballast between cross ties of a railroad track.

An object of my invention is to provide apparatus of the character designated mounted on a vehicle disposed to run along the track and embodying a transverse frame carrying ballast working implements adapted to enter between the cross ties and operate upon the ballast therebetween to remove the same across the entire width of the roadbed, or to replace or tamp ballast which has been previously removed.

Another object of my invention is to provide apparatus for supporting one or a plurality of ballast working tools and embodying a vehicle disposed to run on the track together with a frame pivoted at one end to the vehicle frame and carrying the ballast working implements at the other end, the pivoted frame embodying means to maintain the end carrying the implements always parallel longitudinally and transversely with respect to the roadbed, whereby the implements are positioned properly for digging in all vertical positions of the end of the pivoted frame.

Another object is to provide apparatus embodying the above features and in which hydraulic means are provided for raising the ballast working implement frame, thus clearing the implements from between the cross ties and permitting the apparatus to be moved from space to space between cross ties, together with means to propel the vehicle along the rails.

Another object is to provide apparatus of the character designated in which the implement frame is pivoted intermediate its ends, and in which the prime mover for the vehicle and ballast implements is mounted on the end of the frame opposite the implements thereby to substantially balance the implement frame, whereby a workman standing on the edge of the roadbed may easily raise and lower the implements with respect to the roadbed.

A further object is to provide ballast removing apparatus embodying digging units disposed simultaneously to engage the roadbed between the ties on both sides of each of the rails, thus removing ballast from between the cross ties across the entire width of the roadbed at one setting of the machine for each space.

A still further object is to provide apparatus embodying the above mentioned counterbalanced implement frame in which auxiliary means is provided for assisting the operator in raising the implement end of the frame, and manually operable controls for the lifting means, whereby the

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operator brings the auxiliary means into play when desired, thus to assist in raising the implements upwardly preparatory to moving the apparatus to another space between the cross ties.

A still further object is to provide controls by means of which an operator standing on the side of the roadbed may actuate the auxiliary lifting mechanism thus to aid in lifting the implements, and other controls by means of which the operator may connect the vehicle to its driving motor, thus to move the apparatus along the rails to the next crosstie space.

Apparatus illustrating the features of my invention is shown in the accompanying drawings, forming a part of this application, in which:

Fig. 1 is a plan view of one form of my invention;

Fig. 2 is an end elevational view of the apparatus shown in Fig. 1;

Fig. 3 is a side elevational view;

Fig. 4 is a detail perspective view of portions of the framework;

Fig. 5 is a detail fragmental view illustrating the adjustable connection of the lifting means for the pivotally mounted implement frame;

Fig. 6 is a diagrammatic view of the piping and valve arrangement for controlling the motors and hydraulic cylinder embodied in my improved apparatus;

Fig. 7 is an enlarged detail sectional view illustrating one of the ballast guides associated with the peripheries of the inner and outer digging units and the rails;

Fig. 8 is an end view of the guides shown in Fig. 7;

Fig. 9 is a plan view of a modified form of apparatus;

Fig. 10 is a side elevational view of the apparatus shown in Fig. 9;

Fig. 11 is a front elevational view of the apparatus shown in Figs. 9 and 10;

Fig. 12 is a detail sectional view illustrating one of the auxiliary lifting mechanisms connected between the vehicle frame and the pivoted implement frame; and,

Fig. 13 is a somewhat diagrammatic view illustrating the controls for the auxiliary lifting mechanism and for the clutch by means of which the vehicle is connected to its driving motor.

Referring now to the drawings for a better understanding of my invention and more particularly to Figs. 1 to 8, inclusive, my improved ballast removing apparatus comprises a vehicle having longitudinal frame members 10, transverse frame members 11 and 12, and mounted to move along the rails 13 and 14 on flanged wheels 15. The

rails are supported on spaced crossties T. At the rear corners of the vehicle are vertically disposed members 16 secured to the members 10 and 11 by means of angularly disposed braces 17, and cross braced adjacent the top by a member 18.

Pivotally mounted to the upper and lower ends of each of the members 16, as at 19 and 21, are upper and lower pairs of channel members 22 and 23, forming the longitudinal members of a frame for supporting the digging elements of my improved apparatus. The frame members 22 and 23 at each side are braced by a cross member 24 at the top, and by a cross member 26 at the bottom.

Pivotally mounted to the forward ends of the members 22 and 23 as at 27 and 28 are vertically disposed links 29 and 31. Projecting forwardly of the links 29 and 31 and secured at right angles thereto adjacent the lower end thereof are members 32 and 33. The members 32 and 33 are rigidly secured to the members 29 and 31 by means of braces 34 and 36, made fast to the outer ends of the members 32 and 33 and to the upper ends of the links 29 and 31.

Mounted on a cross member 37 spanning the members 10, 10 of the main frame, is a vertically disposed hydraulic cylinder 38. The cylinder 38 is disposed at the transverse center of the vehicle, and embodies the usual piston 39 and piston rod 41, together with a connection 42 adjacent the upper end for admitting and discharging fluid under pressure. At either side of the hydraulic cylinder and supported from the members 10, 10 are vertical members 43 and 44, cross braced by a member 46. The framework thus formed is braced by angular braces 47 extending rearwardly and secured to the members 10, 10. The piston rod 41 is operatively connected to the upper members 22 by means of cables 48 and 49, passing over sets of pulleys 51 and 52 mounted in the cross member 46. The cables 48 and 49 are secured to the members 22 through the medium of eye bolts 53, adjustably held to the members 22 by means of nuts 54.

From the foregoing description it will be apparent that when pressure is admitted to the upper end of the hydraulic cylinder 38, the piston rod 41 moves downwardly, pulling upwardly on the frame members 22, thus lifting the free end of the upper frame work. The members 22 and 23 pivot about the points 19 and 21 at the rear of the vehicle, and as will be understood, the links 29 and 31 remain vertical due to the pantograph action of the frame work. The members 32 and 33, therefore, remain always horizontal in all elevated positions of the upper frame work on which the ballast removing units are mounted, as will later be described.

Secured to the horizontal members 32 and 33 are depending members 56 and 57. Fastened to the lower ends of the members 56 and 57 is a frame comprising channels 58 and 59 spaced apart and cross connected at the ends across the top by members 61. This assembly of members forms a frame disposed transversely of the rails, parallel with the crossties T supporting the same. The ballast working implements may be digging units for removing the ballast from between the cross ties, and may be mounted on the free end of the transverse frame in the manner now to be described.

Journalled in the center of the transverse frame is a large rotary wheel 62 having digging teeth 63 on the periphery thereof. On the outer end of the frame, in position to remove ballast from between the outer ends of the crossties are smaller rotary digging wheels 64, having digging teeth 66 on the periphery thereof. The wheels 62 and 64 are mounted for rotation in bearings 67 and 68. The wheels are all of a width to enter the spaces between the crossties, and the teeth 63 and 66 are disposed to dig the ballast therefrom in the manner to be explained later.

Mounted at each end of the transverse frame are gear boxes 69 and 71. Mounted on top of the gear boxes are fluid motors 72 and 73, connected by chains 74 and 76 to drive the input shafts 77 and 78 of the gear boxes. As viewed in Fig. 2, the motor 73 and gear box 71 are connected by a chain 79 to the right hand small diameter wheel 64. The motor 72 and gear box 69 drive the left hand small diameter wheel 64 through a chain 81, and drive the large diameter wheel 62 through a chain 82. The direction of rotation of the wheels may be as indicated by the arrows, Fig. 2 or the rotation of the wheels may be independently reversed if so desired.

Referring more particularly to Figs. 7 and 8, I have found that the digging and ballast removing functions of the wheels are improved if I provide adjacent the peripheries thereof a plate 83 bent to bridge over the rails as indicated. At either end of the plate 83 I provide shields 84 and 86, extending inwardly, and between which the periphery of the large diameter wheel 62 passes. As shown, the plate 83 is bent upwardly to provide a sloping surface over which the wheel 62 throws the ballast removed from between the crossties, and the side plates 84 and 86 tend to confine the loose ballast to the working area of the wheel. I provide one of the plates 83 for each of the rails and preferably secure the same to the cross member 12 by means of a bracket 87.

The entire apparatus may be propelled along the rails 13 and 14 by means of a fluid motor 88, driving a gear box 89 through a chain 91. The wheels 15 at the front of the vehicle may be driven through a chain 92 from the gear box 89.

Fluid under pressure for operating the hydraulic mechanisms previously described may be furnished by an internal combustion engine 93 driving one pump 94 or a number thereof if necessary, and drawing fluid from a reservoir 96. The pressure and return lines from the motors 72, 73 and 88, and the cylinder 38, may be under control of a number of valves 97, suitably supported on a stand 98, all to be within easy reach of an operator's seat 99. The piping diagram is diagrammatically illustrated in Fig. 6, and in view of the well-known arrangement of such systems, no further detailed description is believed to be necessary.

From the foregoing, the operation and construction of the embodiment of my improved ballast removing apparatus so far described may now be readily understood. With the digging wheels rotating, gravity urges the free end of the frame work supporting the wheels downwardly, the same pivoting at the rear end about the pivot points 19 and 21. Due to the pantograph action of the frame embodying the members 22 and 23, the forwardly projecting members 32 and 33 remain always horizontal, and consequently the wheels 62 and 64 remain always vertical. They may thus be inserted between the cross ties, and the ballast removed therefrom without the necessity of the operator having to concern himself with vertical alignment of the digging wheels. Having cleaned out from between a given space, the operator admits pressure to the cylinder 38, pulling downwardly on the piston rod 41, thus

pivoting the implement frame upwardly to the dotted line position indicated in Fig. 3. This raises the transverse frame comprising the members 58 and 59, together with wheels 62 and 64, whereby the vehicle may be moved to the next space.

Referring now more particularly to Figs. 9 to 13 inclusive, I show a modified form of my invention embodying a vehicle having a frame 101 and flanged wheels 102 disposed to run on the rails 13 and 14. The vehicle frame side members are connected by a pair of transverse channels 103. Mounted vertically on the channels 103 are a pair of members 104, similar to the members 16 previously described. The members 104 may be braced by diagonal members 105 extending from the upper ends of the members 104 to the vehicle frame members 101.

Extending between the vertical members 104 and rotatably journalled therein is a cross shaft 107. Pivotally mounted on the shaft 107 is an implement frame, substantially similar to the one already described and embodying the upper members 108 and the lower members 109. The upper members 108 are pivotally connected at 111 to the vertical members 104, and the lower members 109 are pivotally connected to rock about the shaft 107. The members 109 are extended as indicated at 112 rearwardly of the vehicle, while the forward end of the members 108 and 109 are connected by links 113 and 114, similar to the links 29 and 31. The links carry the diagonal members 116 and 117 and the horizontal members 118 and 119 similar to the members 32 and 33. Likewise, the transverse implement carrying frame is provided and comprises the sets of channels 121 and 122, spaced apart and suitably secured to the members 118 and 119. Rotary digging implements in the form of wheels 123 between the rails 13 and 14, and 124 at the outside of the rails are journalled in suitable bearings 126 carried by the transverse frame members 121 and 122.

Mounted on members 112*a* forming a part of the implement frame is an internal combustion engine 127. The engine is mounted so as to substantially balance the weight of the implement frame, the shaft 107 forming a pivot point. The frame is left slightly unbalanced so that the digging units are urged by gravity toward the roadbed. The engine 127 drives a variable speed transmission 130 through a clutch 128, and thence a gear box 129 through a clutch 131. The clutch 128 is provided with operating lever 135 and the clutch 131 is provided with a manually operated lever 132 for engaging and disengaging the same. The gear box 129 has two output shafts 133 and 134 which carry multi-grooved pulleys 136 and 137.

Mounted below the pulleys 136 and 137 and in alignment therewith are other pulleys 138, 139, 141, and 142. The pulleys 138, 139, 141 and 142 are mounted on shafts suitably journalled in bearings carried by cross members 143 and 144 extending across the bottom of the lower members 109 of the implement frame. The shafts 146 each drive one of the rotary digging units through the medium of a universal joint 147 and shaft 148 and connecting through a splined tube 149 and a universal joint 151 with the shaft carrying the digging unit. Multiple V-belts 150 connect the pulley 136 with pulleys 138 and 139, while multiple V-belts 152 connect the pulley 137 with pulleys 141 and 142.

The power transmission 130 is provided with a power takeoff shaft 153 carrying a pulley 154. The pulley 154 drives the shaft 107 through a pulley 156 carried by the latter shaft and a V-belt 157. The speed and direction of rotation of the shaft 153 is determined by a setting of the shifter rod 158 of the transmission 130 in the manner understood.

Mounted on the vehicle frame 101 adjacent a side thereof is a speed reduction and reversing gear box 159 having an operating lever 161. The input shaft 162 of the gear box 159 is driven by a belt 163 from a pulley 164 on the shaft 107. The output shaft 166 is provided with a pulley 167. The pulley 167 drives a pulley 168 fast on one of the wheels 102 through a belt or chain 169.

In the form of my invention now being described, the operator walks along the edge of the trackway and controls the machine from the forward end adjacent the rotary digging units, where he is in position to watch the unit and correctly position the same at the proper depth between the ties. Accordingly, I mount on the channels 122 of the transverse frame a pair of operator's handles 171 and 172. The operator's handles each embody rotary grip members 173 and 174 each operable to cause axial movement of wires 176 and 177 associated therewith, in the manner well understood and as commonly employed for the throttle controls on motorcycles and the like. As understood, the wires 176 and 177 are enclosed within metallic sheathing 178 and 179.

In order to assist the operator in raising the digging unit when it is desired to advance to the next space, I provide between the vehicle frame and the implement frame a pair of cylinders 181 and 182. Each of the cylinders embodies a piston 183 and a piston rod 184. The cylinders are pivotally mounted as at 186 to the vehicle framework 101 and the outer ends of the piston rod are pivotally mounted on pins 187 carried by the lower members 109 of the implement frame. The form of cylinders selected for illustration may be vacuumatic cylinders, and the vacuum may be supplied by a conduit 188 connected to the manifold 189 of the internal combustion engine 127. The conduit 188 is connected by cross conduits 191 and 192 to the cylinders 181 and 182, respectively. A valve 193 provided with an operating handle 194 is provided in the conduit 188, and the handle 194 therefor is connected to the wire 177. By rotating the grip 174, the valve 193 is closed or opened thus to exhaust and admit air to the cylinders 181 and 182, thereby aiding in lifting the forward end of the implement frame.

In order that the operator may move the vehicle from space to space, I connect the wire 176, controlled by the grip 173, to the operating lever 161 of the transmission 159. With the control in the position indicated in Fig. 13, the transmission is in neutral. By moving the lever 161 forwardly responsive to rotation in one direction of the grip 173 the vehicle is moved in one direction along the rails. By moving the handle 161 in the opposite direction responsive to opposite rotation of the grip 173, the vehicle is moved in an opposite direction.

From the foregoing the method of constructing and operating that embodiment of my invention just described, may be readily understood. The implement frame comprising the upper members 108 and lower members 109, together with the transverse frame members 121 and 122 is pivoted on the shaft 107. With the engine 127 in operation, the operator turns the grip member 173 to

a position to place the lever 161 in neutral position so that the shaft 166 is not driven. The clutch 131 is engaged by suitable movement of its lever 132, thereby driving all of the rotating digging units 123 and 124. The operator, grasping the grips 173 and 174 of the handles 171 and 172, is in position to determine accurately the extent to which the diggers act upon the ballast between the cross ties, and controls the same by manually raising and pushing downwardly on the handles. He is aided in lifting the handles by rotating the grip 174 to open the valve 193, thereby exerting an upward pull on the piston 183 of the cylinders 181 and 182. When the operator has cleaned the ballast from between a given space, he raises the implement frame, and then rotates the grip 173, moving the lever 161 and causing rotation of shaft 166 in a selected direction. This action moves the entire vehicle along the rails, and the operator stops the same at the next space by reverse movement of the grip 173 to return lever 161 to neutral position.

While I have shown and described my improved apparatus in both embodiments as being especially adapted for use with rotary type units disposed to enter between the cross ties and remove ballast therefrom, it will be apparent to those skilled in the art that my improved apparatus is equally adapted for supporting such tools as tampers, ballast loosening devices, spike drivers, and the like.

In actual operation I have found that a machine embodying the features of my invention is entirely satisfactory in every way as the same is simple of construction, positive and trouble-free in operation, and that one operator only is required to operate my device. Likewise, when it is desired to move from job to job, the machine is self-propelled and may be operated at moderate speed by selecting the proper speed at the transmission 130.

While I have shown my invention in but two forms, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications, without departing from the spirit thereof, and I desire, therefore that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What I claim is:

1. In apparatus for operating upon ballast between the crossties of a railroad track with the rails in place, a vehicle having a frame and wheels disposed to run on the rails, an implement frame embodying a pair of spaced lower members extending generally parallel with the rails as viewed in plan and pivotally connected intermediate their ends to the vehicle frame, members disposed above and parallel with the lower members and pivotally connected to a portion of the vehicle frame adjacent their rear ends, the forward ends of all of said members extending substantially to the front of the vehicle, links pivotally connecting the forward ends of said members, a member overhanging the forward end of the vehicle and pivotally connected to the forward ends of the lower members to retain a substantially fixed angularity with respect to the rails in all positions of the implement frame, a transverse frame carried by the overhanging member, rotary ballast working implements carried by the transverse frame, a prime mover supported from the rear ends of said lower members and disposed to substantially balance the implement frame about its pivot points, means to drive the ballast implements from the prime mover, means to pivot the implement frame on its pivots thereby to raise and lower the implements with respect to the track, and means to connect the prime mover to the vehicle wheels to propel the same along the rails.

2. Apparatus as defined in claim 1 in which the pivot point for said lower members is a rotatable shaft driven from the prime mover, and in which the means to propel the vehicle along the rails includes a power takeoff from said shaft.

3. In apparatus for operating upon ballast between the crossties of a railroad track, a vehicle embodying a frame and disposed to run on the rails, a ballast implement frame pivotally mounted intermediate its ends on the vehicle frame, a tranverse frame carried by one end of the implement frame, ballast working implements on the transverse frame, a prime mover for the vehicle and ballast working implements mounted on the implement frame in position to substantially balance the same about the pivot points, a fluid operated cylinder for pivoting the implement frame embodying a piston and piston rod, means pivotally connecting the cylinder and piston rod to the vehicle and implement frames, a source of fluid under pressure for moving the piston, a valve controlling the admission and discharge of said fluid to the cylinder, and a control in reach of the operator of the apparatus for opening and closing the valve.

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