Sept. 25, 1962 L. E. MOSS 3,055,309

COMBINATION TRACK LIFTING AND BALLAST REMOVING MACHINE

Filed Oct. 28, 1957 3 Sheets-Sheet 1

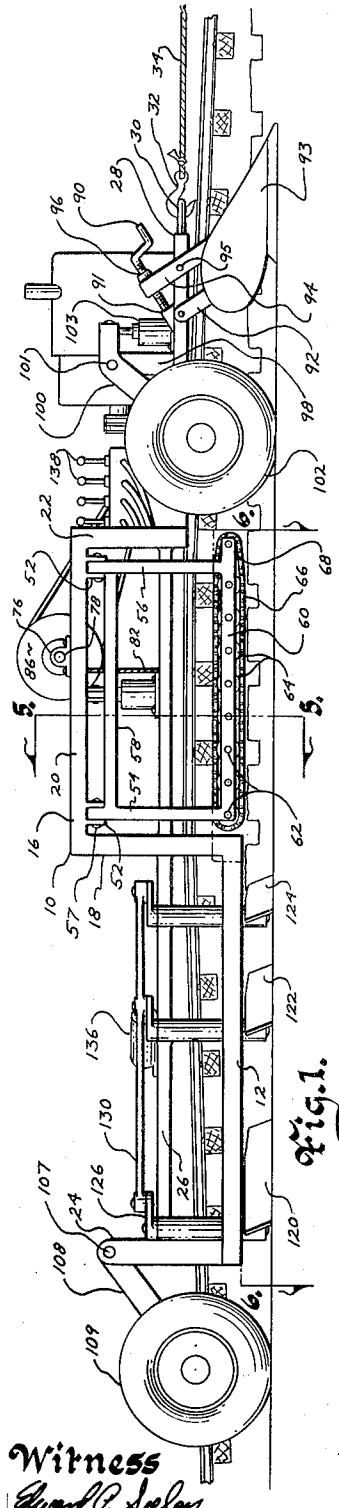


Fig. 1.

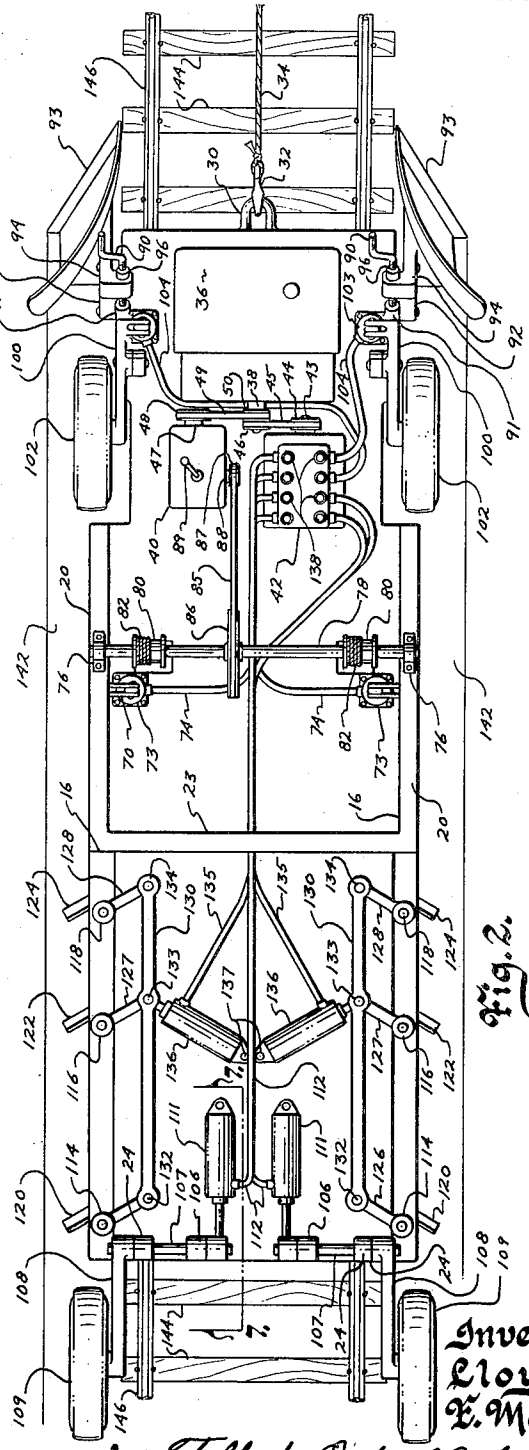


Fig. 2.

Witness
Edward P. Farley

Inventor
Lloyd E. Moss
by Talbert Dick and Farley
Attorneys

Sept. 25, 1962 L. E. MOSS 3,055,309

COMBINATION TRACK LIFTING AND BALLAST REMOVING MACHINE

Filed Oct. 28, 1957 3 Sheets-Sheet 2

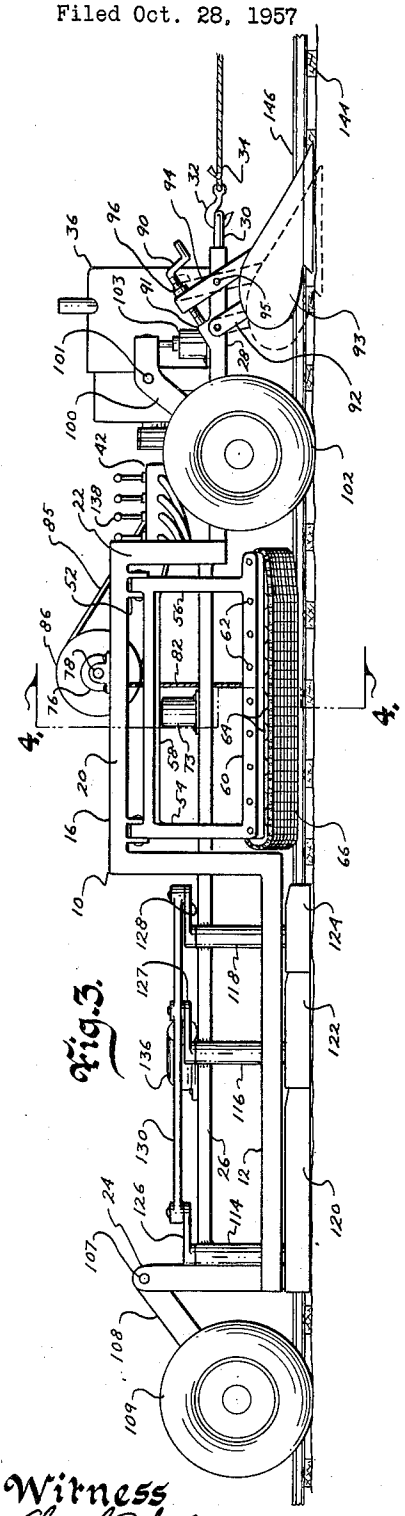


Fig. 3.

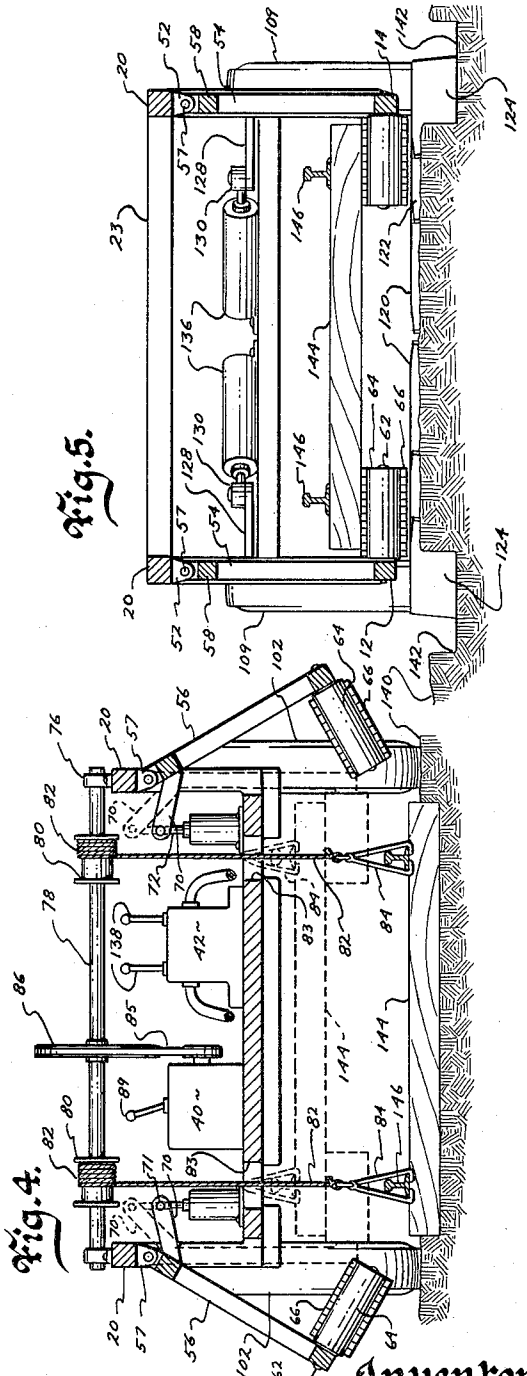


Fig. 5.

Fig. 4.

Witness
Edward P. Seeley

Inventor
Lloyd E. Moss
by Talbert Dick and Parley
Attorneys

Sept. 25, 1962 L. E. MOSS 3,055,309

COMBINATION TRACK LIFTING AND BALLAST REMOVING MACHINE

Filed Oct. 28, 1957 3 Sheets-Sheet 3

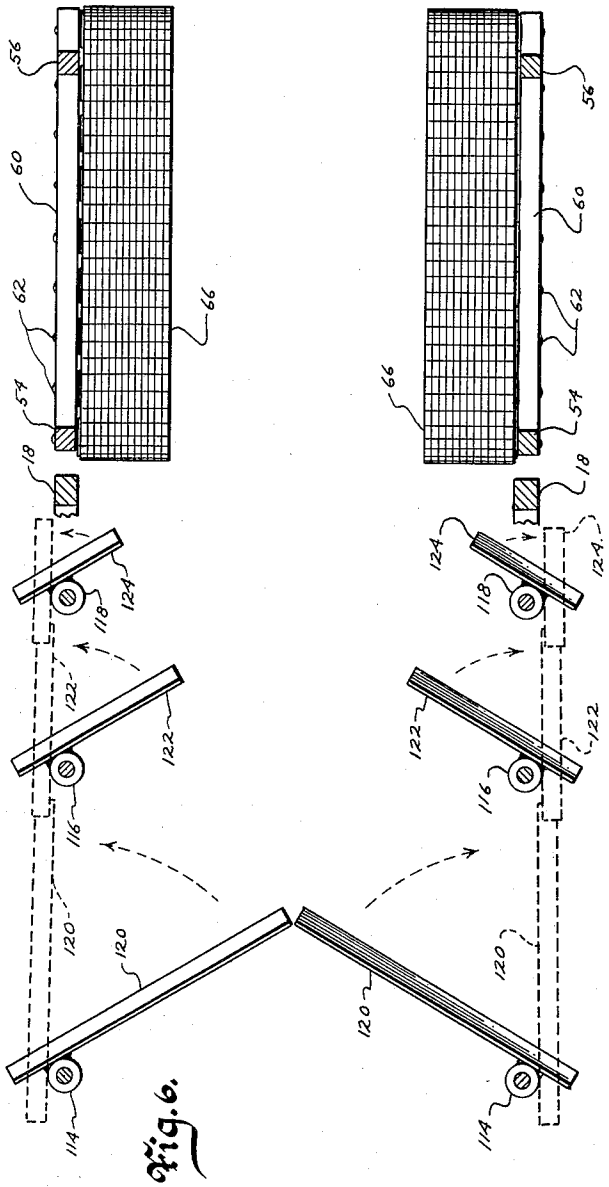


Fig. 6.

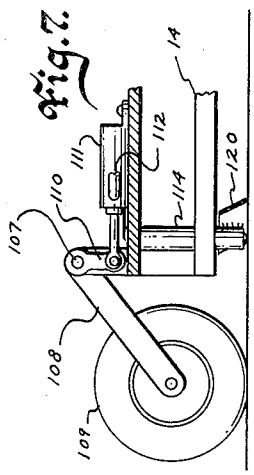


Fig. 7.

Witness
Edward P. Seeley

Inventor
Lloyd E. Moss
by Talbert Dick and Farley
Attorneys

United States Patent Office 3,055,309 Patented Sept. 25, 1962

3,055,309

COMBINATION TRACK LIFTING AND BALLAST REMOVING MACHINE

Lloyd E. Moss, 1612 Willis Ave., Perry, Iowa

Filed Oct. 28, 1957, Ser. No. 692,680
7 Claims. (Cl. 104—7)

My invention relates to railroad construction equipment and more particularly to equipment which is used in connection with the conditioning of the roadbed after the track has been constructed.

The roadbed directly underneath the ties and rails of a railroad track must be kept loose and resilient to provide a cushioning effect for the track as the impact of a moving train is imposed thereon. This cushioning reaction is brought about by a cinder or rock-like material, generally referred to as ballast, and it is located on a top of a firm roadbed foundation and between and underneath the ties. However, when the ballast material becomes compacted and loses its resiliency, adverse results occur which are harmful to both the train and the track. The impact of a moving train over a track resting on "solid" ballast increases the wear and depreciation on the train. But even more serious is the tendency of the train to tear up the track and derail and sometimes demolish both the track and train. A further danger of solidified ballast is that it does not permit a hot rail to expand under warm climatic conditions and the rails sometimes tear themselves loose from their positions when the ballast refuses to allow them to expand gradually.

Throughout the years, railroad engineers have endeavored to loosen, remove, or recondition the solidified ballast material with a variety of machines. Some of these machines have mechanical fingers which reach in between the ends of the ties to retrieve the ballast. Other machines pull a V-shaped plow or sled underneath the ties to extract the ballast. Neither of these general types of devices accomplish a satisfactory result because the ties and the rails cause so much interference with the ballast removing operation. The finger-type machine has difficulty reaching ballast in the area between the rails and the sled unit tends to snag the ties while moving underneath. The rate at which these machines operate is necessarily reduced by their great inefficiency.

Therefore, the principal object of my invention is to provide a ballast removing machine that can eliminate interference to the ballast removing operation by the track structure.

More specifically, an object of my invention is to provide a ballast removing machine that can simultaneously lift the track and remove the ballast material.

A further object of my invention is to provide a ballast removing machine that can compensate for differences in the depth of the ballast and elevational differences in the terrain along the track.

A still further object of my invention is to provide a ballast removing machine that can have its forward movement impeded only by the ballast material.

A still further object of my invention is to provide a ballast removing machine than can easily lift the track to a proper elevation to permit cuts of various depths into the ballast material.

A still further object of my invention is to provide a ballast removing machine that is economical of manufacture, durable in use, and refined in appearance.

These and other objects will be apparent to those skilled in the art.

My invention consists in the construction, arrangements, and combination, of the various parts of the device, whereby the objects contemplated are attained as hereinafter more fully set forth, specifically pointed out

in my claims, and illustrated in the accompanying drawings, in which:

FIG. 1 is a side elevational view of my device in its cutting position with the track in its elevated position,

FIG. 2 is a plan view of my device while in the position of FIG. 1,

FIG. 3 is a side elevational view of my device while in its inoperative position with the plow and cutting blades withdrawn from the ground and the treadmill units pivoted outwardly away from the track,

FIG. 4 is a sectional view of my device taken on line 4—4 of FIG. 3,

FIG. 5 is a sectional view of my device taken on line 5—5 of FIG. 1,

FIG. 6 is a sectional view of my device taken on line 6—6 of FIG. 1, and

FIG. 7 is a partial sectional view of my device taken on line 7—7 of FIG. 2.

I have used the numeral 10 to generally designate a frame unit comprised of parallel horizontal beams 12 and 14 and inverted U-shaped frame member 16 attached to the forward ends thereof in parallel fashion and having rear vertical legs 18, center horizontal portions 20 and front vertical legs 22. I have shown leg 22 to be shorter than leg 18. Beam 23 connects the upper ends of legs 18. Vertical posts 24 are secured to the rearward ends of beams 12 and 14. A horizontal platform 26 is welded to frame 10 and is located in a plane above beams 12 and 14 and below horizontal portion 20 of inverted U-shaped frame members 16. As shown in FIGS. 1, 2 and 3, a platform 28 extends forwardly from the front ends of frame members 16, and a clevis 30 is secured to the front end thereof and adapted to receive towing hook 32 attached to cable 34.

A power unit 36, such as a diesel motor, is mounted on platform 28 and has a power shaft 38 extending rearwardly therefrom. As clearly shown in FIG. 2, a transmission gear box 40 and hydraulic pump 42 are located to the rear of power unit 36. Pump 42 has shaft 43 protruding therefrom with pulley wheel 44 secured thereon. Belt 45 connects pulley wheel 44 with pulley wheel 46 on shaft 38 of power unit 36.

Transmission gear box 40 has input shaft 47 upon which pulley wheel 48 is mounted. Belt 49 connects pulley wheel 48 with pulley wheel 50 on shaft 38 of power unit 36.

A pair of ears 52 are extending from each end of the lower side of portion 20 of the inverted U-shaped frame member 16. Arms 54 and 56 are pivotally secured between each pair of ears 52 by pin 57. Horizontal cross bars 58 and 60 rigidly connect the upper and lower ends, respectively, of arms 54 and 56. A plurality of shafts 62 are rigidly secured by their outer ends to cross bar 60 and form a substantial right angle with arms 54 and 56. Roll members 64 are rotatably mounted on shafts 62 and are adapted to receive flexible belt 66. It should be noted that the roll 68 on the forward-most shaft 62 is of smaller diameter than rolls 64.

Arms 70 are rigidly secured to and extending inwardly from cross bars 58. The inward ends of arms 70 are pivotally secured by pins 71 to the piston rod 72 of hydraulic cylinders 73. Hydraulic cylinders 73 are rigidly secured to platform 26 and are connected to hydraulic pump 42 by conduits 74.

Bearing members 76 are secured in any convenient manner to the tops of horizontal portions 20 on inverted U-shaped frame members 16. A shaft 78 is rotatably mounted by its ends in bearing members 76. Drums 80 are rigidly secured to shaft 78 near its ends and cables 82 have one of their ends secured to each of the drums and are adapted to wind thereabout in conventional fashion. The other ends of cables 82 can pass through openings 83

in platform 26 and can then be tied to tong members 84, as shown in FIG. 4. A pulley wheel 86 is rigidly secured to shaft 78 and is connected by belt 85 to pulley wheel 87 on the output shaft 88 of transmission gear box 40. Lever 89 on gear box 40 may be used to selectively connect input shaft 47 to output shaft 88 and to control their movement with respect to each other.

On the sides of the forward end of platform 28, crank 90 is threadably mounted in bearing hub 91. As shown in FIGS. 1 and 3, arm 92 is pivoted by one of its ends to the side of platform 28 and extends downwardly and forwardly where it is pivotally secured (not shown) to plow unit 93. A second arm 94 is pivotally secured (not shown) to plow unit 93 forwardly of arm 92. Arm 94 extends upwardly substantially parallel to arm 92 and is pivoted to platform 28 by pin 95. The upper end of arm 94 thereupon extends upwardly towards crank 90 and slidably embraces crank 90. A lug 96 on crank 90 is adapted to engage arm 94, as shown in FIGS. 1 and 3.

Vertical posts 98 are rigidly secured to the forward end of platform 28 and near the side edges thereof. L-shaped arms 100 are pivotally secured to posts 98 by pins 101, as shown in FIGS. 1 and 3. Wheels 102 are rotatably secured to the lower end of arms 100 and are adapted to track behind the path of plow unit 93. It will be noted that plow unit 93 is capable of cutting a furrow which is greater in width than wheels 102. The upper ends of arms 100 are pivotally secured in any convenient manner to the piston rods of hydraulic cylinders 103 which are rigidly mounted on platform 28. Hydraulic cylinders 103 are connected to hydraulic pump 42 by conduits 104.

Vertical posts 106 are rigidly secured to the rear edge of platform 26 and are in line with posts 24 on beams 12 and 14. As shown in FIG. 2, jack shafts 107 extend between the posts 24 and 106 and are rotatably supported therein. Arms 108 are rigidly secured by one of their ends to the outer ends of jack shafts 107. Wheels 109 are rotatably secured in any convenient manner to the outer ends of rearwardly extending arms 108. Wheels 109 are spaced apart a distance equal to that distance between wheels 102 on the forward part of platform 28. As shown in FIG. 7, an arm 110 is rigidly secured by one of its ends to jack shaft 107 and the other end is pivotally connected to the piston rod of hydraulic cylinder 111. Hydraulic cylinders 111 are connected to platform 26 in any convenient manner and hydraulically connected to hydraulic pump 42 by conduits 112.

Vertical posts 114, 116, and 118 are rotatably mounted between platform 26 and each of the beams 12 and 14 of frame 10. Each of these posts 114 and 116 and 118 extends slightly above platform 26 and slightly below the beams 12 and 14. Elongated cutting blades 120 are welded to the lower ends of posts 114 and are adapted to move in a pivotal path underneath platform 26 when posts 114 are rotated. Cutting blades 122 and 124 are similarly welded to posts 116 and 118, respectively, and blade 124 is shorter than blade 122, which is of shorter length than blade 120.

Horizontal arms 126, 127 and 128 are rigidly secured to the upper ends of posts 114, 116 and 118, respectively, and these arms can extend from their respective posts in the same direction that the cutting blades on the bottom end of the post extend. As shown in FIG. 2, arms 126, 127 and 128 should be substantially parallel. The outer free ends of arms 126, 127 and 128 are interconnected by link bar 130 which is pivotally secured to each of these arms by pins 132, 133 and 134, respectively. Horizontal hydraulic cylinders 136 can be pivotally connected to the center of platform 26 by pins 137 and the piston rods of each of these cylinders can also be pivotally connected to link bars 130 by pin 133. Cylinders 136 are thereupon hydraulically connected to hydraulic pump 42 by conduit 135. Cutting blades 120, 122 and 124 are normally parallel to beams 12 and 14 when the machine is not operating.

It will be noted that hydraulic pump 42 has eight levers 138 extending therefrom. These levers 138 are operatively connected to conventional hydraulic valves (not shown) so that the eight hydraulic cylinders 73, 73, 103, 103, 111, 111, 136 and 136 may be independently operated.

FIG. 5 shows the normal ground surface 140 and the furrow openings 142 created by plow unit 93. The numerals 144 designated conventional railroad ties with rail members 146 secured thereon in the conventional manner.

The normal operation of my device is as follows: The whole unit can be towed to its position astride the tracks by any desirable prime mover utilizing tow cable 34. It is understood that the inventive embodiment of my machine will not be changed by making it self-propelled. FIG. 3 shows my device astride the tracks in its non-operating position. It should be noted that additional clearance underneath the cutting blades 120, 122 and 124 could be accomplished in FIG. 3 by activating cylinders 103 and 111 to rotate wheels 109 and 102 and their respective supporting arms about their respective points of support. This action would enable the wheels 109 and 102 to "lift" the whole machine to a higher elevation. By rotating these wheels in a counterclockwise direction, the device could be similarly lowered to the position of FIG. 3. It should be noted that the arms 54 and 56 are in the extended position of FIG. 4 when the elevation of the machine appears as in FIG. 3.

After my machine has been positioned with respect to the rails 146 and ties 144, as shown in FIGS. 3 and 4, with blades 120, 122 and 124 in the bottom of furrow openings 142, crank 90 is rotated outwardly from bearing hub 91 to permit the upper end of arm 94 to slight upwardly on the crank as the weight of plow unit 93 attempts to rotate both arms 92 and 94 downwardly or in a clockwise direction, as viewed in FIG. 3. This action will permit the plow unit to drop from the position of the solid lines in FIG. 3 to the position of the dotted lines in the same figure. The forward movement of the machine by the prime mover will thereupon permit plow units 93 to create the furrow openings 142 shown in FIG. 5 Obviously, the continued forward movement of the machine will permit the wheels 102 and 109 to follow down the furrow openings 142.

With the power unit 36 in operation, control lever 89 on transmission box 40 is moved so as to effect the rotation of shaft 78 through transmission gear box output shaft 88, pulley wheel 87, belt 85 and pulley wheel 86 to lower cables 82 and tongs 84. The tongs 84 are then hooked under the rails 146 as shown in FIG. 4. Lever 89 can then be moved to reverse the rotation of shaft 78 and to raise the tongs 84, rails 146, and ties 144 to the position shown by the dotted lines in FIG. 4. The elevated position of the rails 146 and ties 144 is also shown in FIG. 1.

The hydraulic cylinders 73 are then actuated by the proper lever 138 on hydraulic pump 42 to lift arms 70 to the position shown by the dotted lines in FIG. 4. The raising of arms 70 will result in the rotation of arms 54 and 56 and belt 66 (hereafter called "treadmill unit") into the position shown by the dotted lines in FIG. 4. This position of the treadmill unit will place the belts 66 directly under the ends of ties 144. By again changing the direction of rotation of shaft 78 by transmission gear box lever 89, the tongs 84 can be lowered to deposit the entire weight of the ties and rails on the treadmill units. The above described operations concerning the lifting of rails and the deposit thereof on the treadmill units is preferably done while the machine has momentarily stopped its forward motion.

After the ties and rails have been placed upon the treadmill units, forward motion of the machine may be resumed by the prime mover. The downward weight of the ties 144 on the belt 66 combined with the forward motion of the machine will cause the belt 66 to rotate on

rolls **64** and **68** which in turn rotate on shafts **62** to reduce the frictional effect of the track upon the forward motion of the machine. Since roll **68** is of smaller diameter than rolls **64**, the treadmill is therefore tapered at its forward end which prevents belt **66** from snagging any low-hanging ties.

As the forward motion of the machine is resumed as described above, cylinders **136** can be actuated by moving the proper lever **138** on hydraulic pump **42**, and the pistons of these cylinders can be withdrawn to rotate arms **126**, **127** and **128** towards the center of the machine through link bar **130**. The inward rotation of these arms will also cause the inward rotation of cutting blades **120**, **122** and **124** through posts **114**, **116** and **118**, respectively, because the respective blades and the respective arms are both rigidly connected to their own respective posts. Since the cutting blades were riding in the furrow **142** before being rotated inwardly, their inward rotation would result in the cutting away of the ballast material located between the furrows **142**. The cutting action of the blades is aptly illustrated in FIG. 5. Since the furrows cut by plow units **93** extend beyond the sides of the machine, the cut away ballast material is forced to the outside of the furrow by the cutting blades and does not pile up and flow over the cutting blades. As shown in FIG. 5, the rear wheels **109** trail the cutting blades so that the cut away ballast does not interfere with the smooth path of travel of the machine. By making blades **124**, **122** and **120** progressively longer, the cutting burden is distributed to relieve the tremendous cutting shear from one single cutting unit. Thus, each blade cuts only that portion of the ballast which is left uncut by all of the forward blades with the length of each blade and angle of rotation with respect to the frame limiting its maximum possible cut. It is important to note that since each wheel is independently adjustable, the wheels can be individually regulated to maintain the level or horizontal position of the cutting blades despite any irregularities in the terrain along the ends of the ties.

It is assumed that cylinders **136** can have their operating direction reversed either through by-pass valves or double-acting characteristics. Blades **120**, **122** and **124** can be rotated back to their parallel position with beams **12** and **14** to terminate the cutting operation. Tongs **84** can be replaced on the rails **146** to assume the support of the track while treadmill units are returned to their extended positions of FIG. 4. The tongs **84** and cables **80** can then be lowered by rotating shaft **78** as described above and ties **144** can thereupon be placed again upon the ground surface. The removal of the tongs from the rails will free my machine from the track and the prime mover can then tow the machine to any desired point. As mentioned above, the wheel supporting arms **108** and **100** can be hydraulically rotated at any time to lift the frame **10** to a higher clearance with respect to the ground surface.

The key to my invention is the ability of the machine to lift the track during the cutting operation because the presence of the track has herebefore made the ballast removing operation a slow, expensive, insufferable task. From the above, it is seen that my invention will accomplish at least all its stated objectives.

Some changes may be made in the construction and arrangement of my combination track lifting and ballast removing machine without departing from the real spirit and purpose of my invention and it is my intention to cover by my claims, any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

I claim:

1. In a ballast removing machine,
a frame,
a plurality of ground engaging wheels,
connecting means for adjustably securing said wheels to said frame,
said wheels being laterally spaced a sufficient distance on said frame to straddle a track structure,
said frame and said wheels providing an open space in between said laterally spaced wheels and underneath said frame to permit vertical movement of a track structure therein
a track structure supporting means secured to said frame between said laterally spaced wheels and adapted to support a track structure underneath said frame in an elevated position relative to the lowermost portions of said wheels,
earth cutting means secured to the underneath portion of said frame to remove ballast material from underneath a track structure supported in an elevated position on said track supporting means,
and means on said frame secured to said connecting means for independently vertically adjusting the relative position of said wheels with respect to said frame.

2. The structure of claim 1 wherein plow units are adjustably secured to said frame forwardly of and in alignment with the wheels on opposite sides of said frame to level the terrain forwardly of said wheels.

3. The structure of claim 1 wherein the track supporting means is movably secured to said frame, and means connected to said frame for selectively moving said track structure supporting means away from a position underneath said frame at times.

4. The structure of claim 1 wherein a hoist is mounted on said frame, and means on said frame for connecting said hoist unit to a track structure in the open space underneath said frame and between said laterally spaced wheels whereby said hoist can vertically move a track structure within said open space.

5. The structure of claim 1 wherein the track structure supporting means is comprised of frame members pivotally secured by their upper portions to said frame, roll members extending laterally and inwardly from the lower portion of said frame members when said frame members are vertically disposed, said roll members adapted to rotate about their respective longitudinal axes, and means on said frame for pivoting said frame members at times.

6. The structure of claim 5 wherein an endless flexible belt extends around said roll members.

7. In a ballast removing machine,
a frame,
a plurality of ground engaging wheels,
connecting means for adjustably securing said wheels to said frame,
said wheels being laterally spaced a sufficient distance on said frame to straddle a track structure,
said frame and said wheels providing an open space in between said laterally spaced wheels and underneath said frame to permit vertical movement of a track structure therein,
a track structure supporting means secured to said frame between said laterally spaced wheels and adapted to support a track structure underneath said frame in an elevated position relative to the lowermost portions of said wheels,
said track supporting means movably secured to said frame,
means connected to said frame for selectively moving said track structure supporting means away from a position underneath said frame at times,
plow units adjustably secured to said frame forwardly of and in alignment with the wheels on opposite sides of said frame to level the terrain forwardly of said wheels,
a hoist mounted on said frame,

means on said frame for connecting said hoist unit to a track structure in the open space underneath said frame and between said laterally spaced wheels whereby said hoist can vertically move a track structure within said open space,

earth cutting means secured to the underneath portion of said frame to remove ballast material from underneath a track structure supported in an elevated position on said track supporting means,

and means on said frame secured to said connecting means for independently vertically adjusting the relative position of said wheels with respect to said frame.

References Cited in the file of this patent

UNITED STATES PATENTS

748,503	Holbrook	Dec. 29, 1903
2,609,619	Jones	Sept. 9, 1952
2,725,016	Fogelberg et al.	Nov. 29, 1955

FOREIGN PATENTS

60,591	France	Nov. 9, 1954
	(1st addition to Pat. No. 1,014,140)	
850,044	France	Dec. 6, 1939
1,014,140	France	Nov. 9, 1954
695,500	Great Britain	Aug. 19, 1953