Oct. 13, 1959 R. KERSHAW 2,908,228

APPARATUS FOR REMOVING AND REPLACING CROSS TIES IN A RAILWAY TRACK

Filed Oct. 25, 1954 4 Sheets-Sheet 1

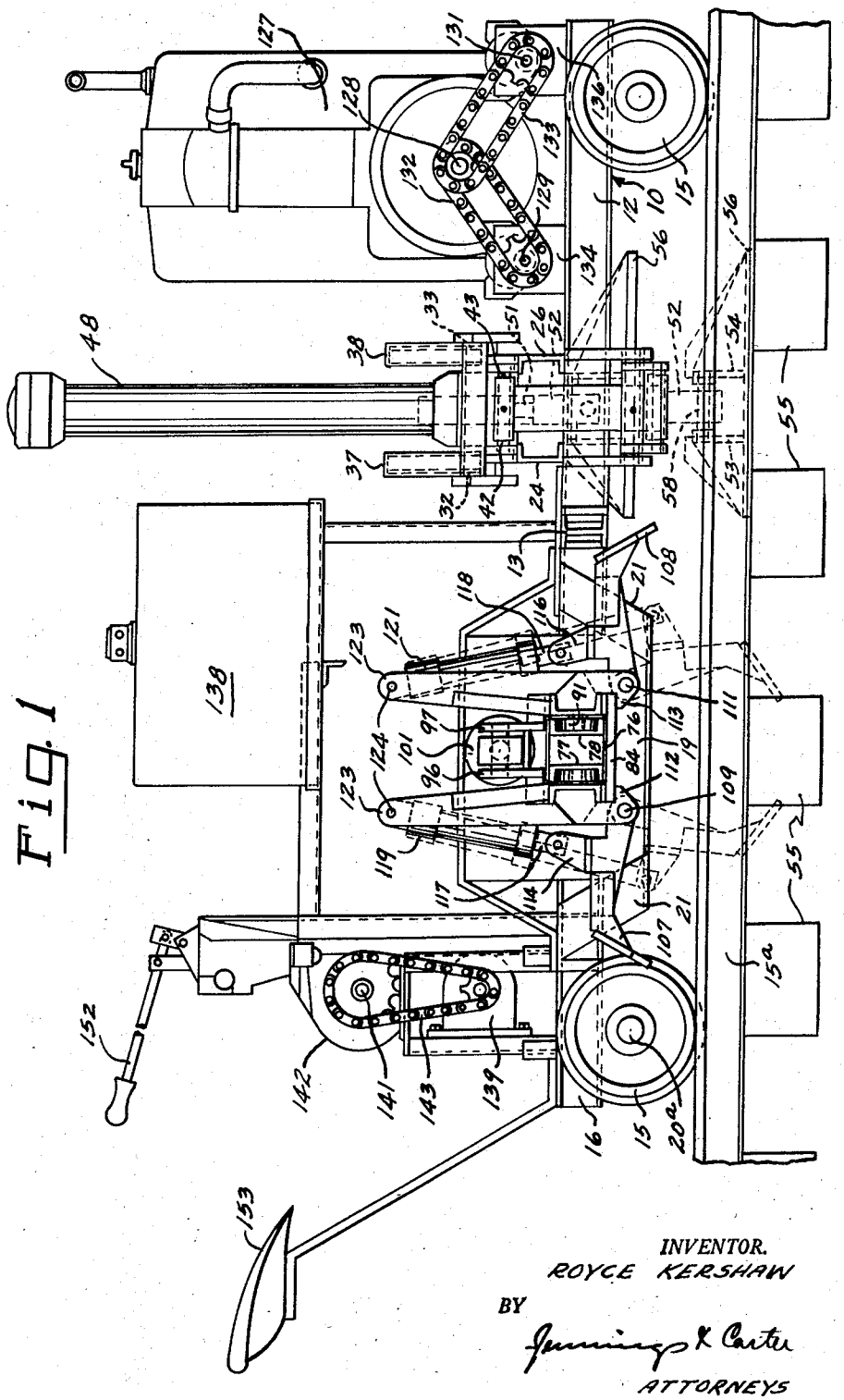


Fig. 1

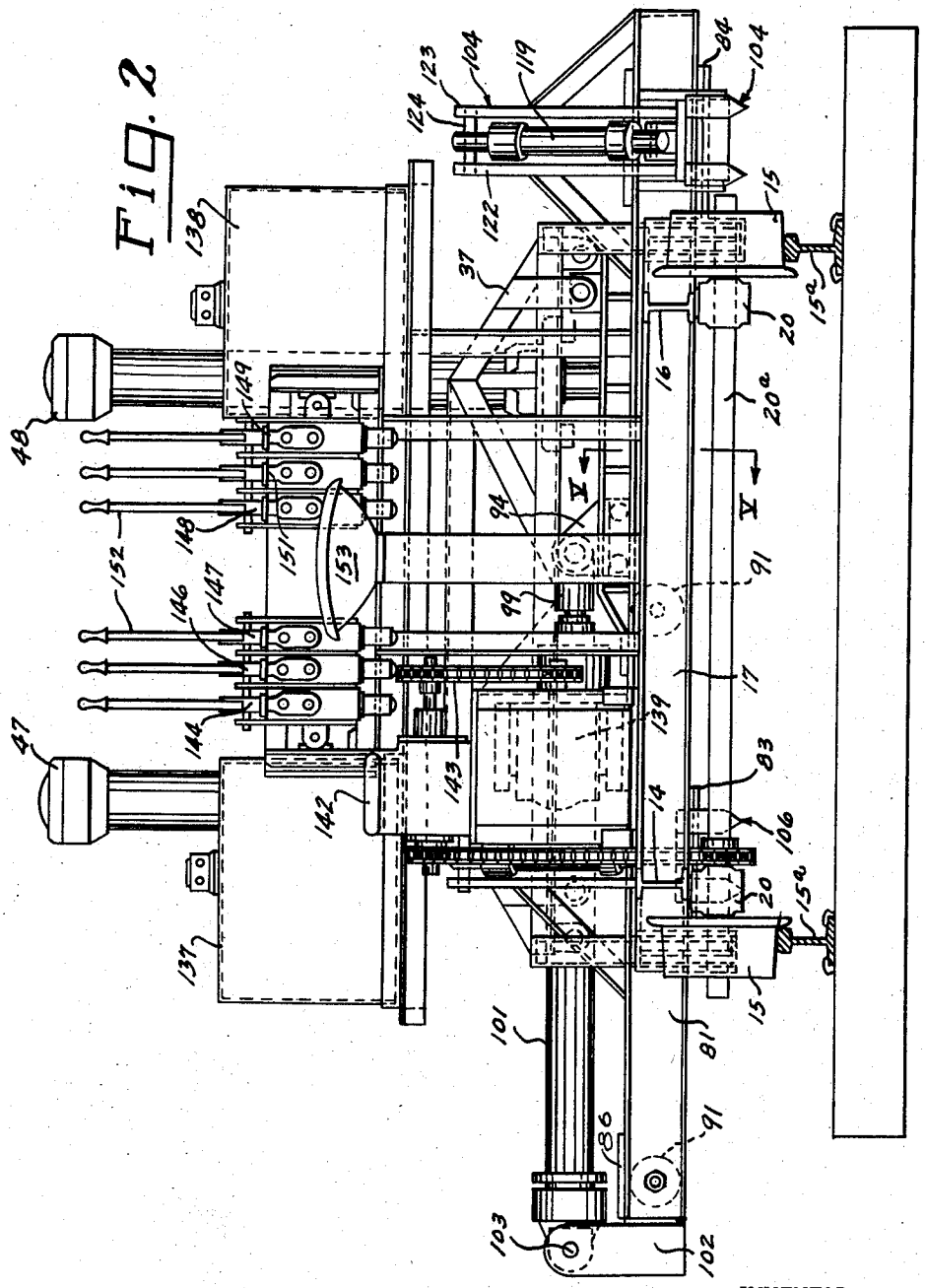
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Fig. 2



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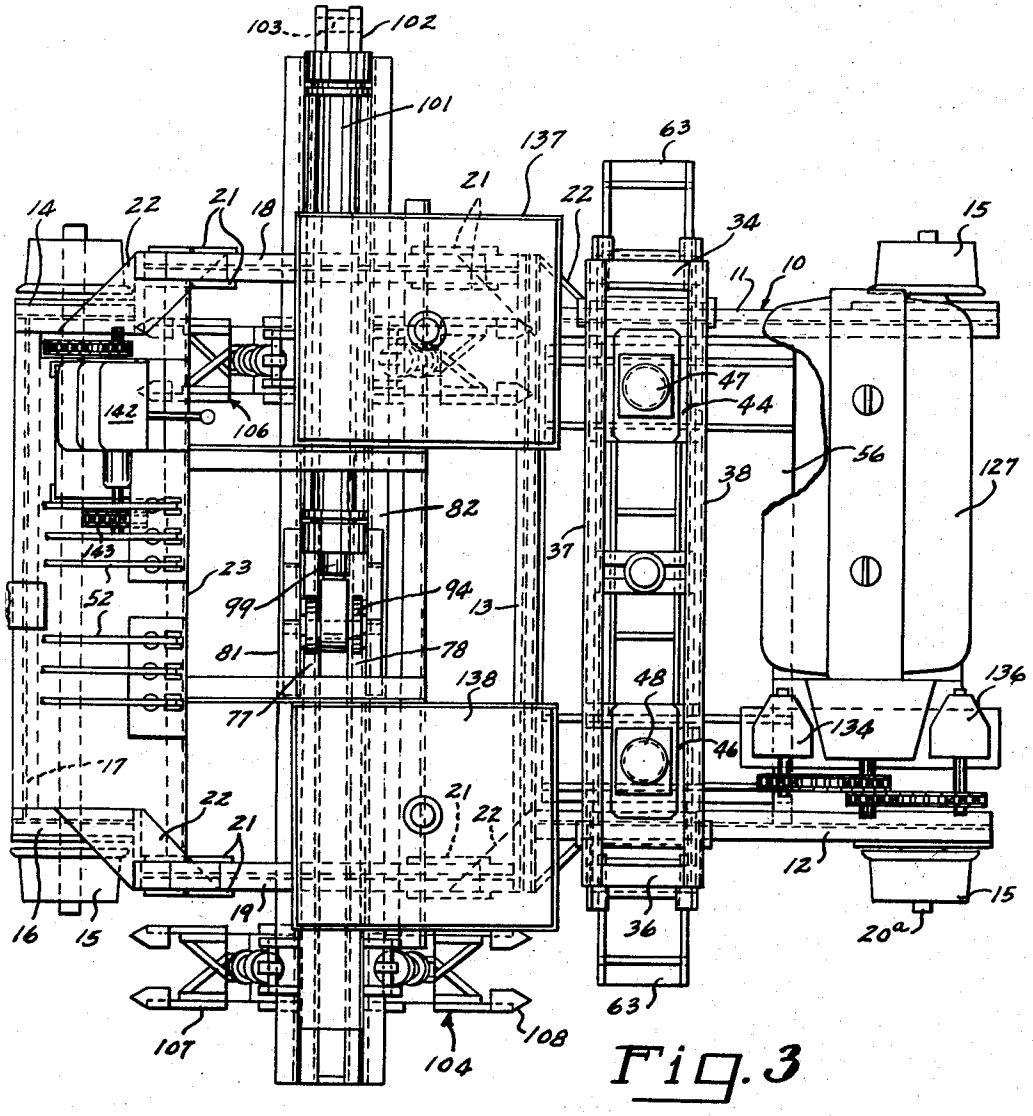


Fig. 3

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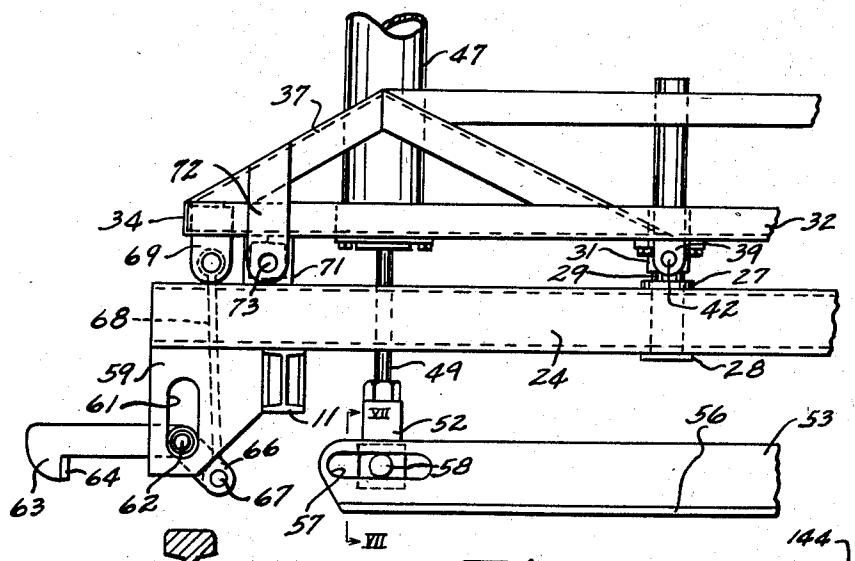
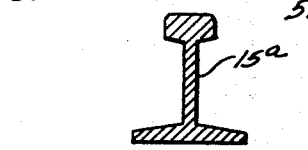


Fig. 4



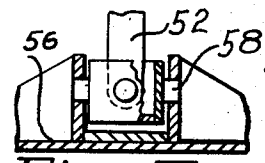


Fig. 7

Fig. 5

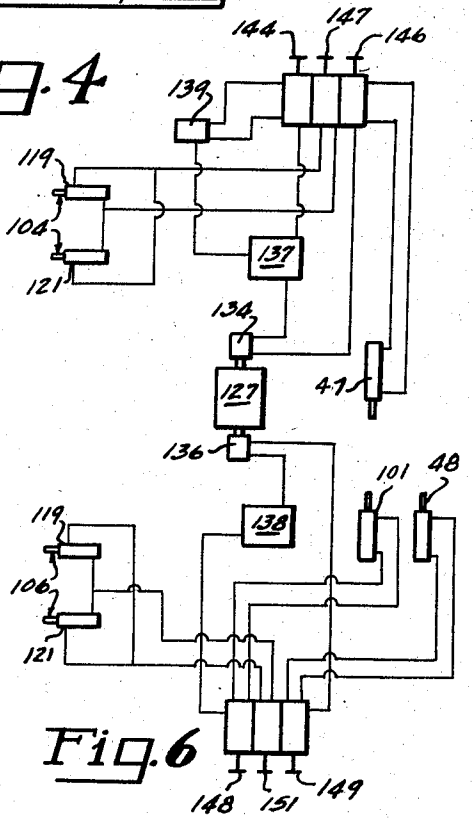


Fig. 6

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2,908,228

APPARATUS FOR REMOVING AND REPLACING CROSS TIES IN A RAILWAY TRACK

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Application October 25, 1954, Serial No. 464,334

3 Claims. (Cl. 104—9)

This invention relates to apparatus for removing and replacing cross ties in a railway track and more particularly to mechanisms for lifting the rails above the cross tie to be removed in combination with gripping mechanism which is adapted to grip the cross tie and move the same transversely beneath the rails.

An object of my invention is to provide apparatus of the character designated which shall be adapted for use in replacing old cross ties, in retimbering operations, in a minimum of time and with a minimum of labor.

A further object of my invention is to provide apparatus of the character designated which raises the rails and removes a cross tie in one operation and then places a new cross tie beneath the raised rail in another operation.

A still further object of my invention is to provide apparatus for removing and replacing cross ties which shall be simple of construction and operation and one which is adapted for use on a large number of different rails sizes without change in the structure thereof or requiring any manual adjustments of the apparatus.

Briefly, my improved apparatus comprises a vehicle frame adapted to run upon the rails of a track and having a lifting frame mounted thereon which is adapted to engage the subjacent cross ties whereby the lifting frame is moved relative to the vehicle frame. Rail grippers are mounted on the movable frame and are constructed and arranged to engage the rails of the trackway in response to upward movement of the lifting frame whereby the lifting forces are transmitted to the rails. Mounted on the vehicle frame is a transversely movable frame having laterally spaced gripping elements thereon positioned to engage a cross tie after the rail is lifted and move the same transversely beneath the rails.

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

Fig. 1 is a side elevational view of the apparatus, showing in dotted lines the engaged position of the cross tie grippers and the lowered position of the lifting foot of the movable frame;

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

Fig. 3 is a plan view of the apparatus, drawn to a slightly smaller scale and partly broken away for the sake of clarity;

Fig. 4 is an enlarged detail view of the mechanism for gripping and lifting the rails;

Fig. 5 is a detail sectional view taken generally along the line V—V of Fig. 2;

Fig. 6 is a schematic diagram illustrating the fluid pressure system employed; and,

Fig. 7 is an enlarged sectional view taken generally along the line VII—VII of Fig. 4.

Referring now to the drawings for a better understanding of my invention it will be seen that my improved apparatus embodies a vehicle frame indicated generally at **10** having wheels **15** adapted to run upon

the rails **15***a* of the track. The vehicle frame comprises longitudinally extending I-beams **11** and **12** at the front side thereof which are joined at their rear ends by a transverse I-beam **13**. Relatively short I-beams **14** and **16** are provided at the rear sides of the vehicle frame and are connected by a transverse I-beam **17**. The forward portion of the vehicle frame **10** is connected to the rear portion thereof by longitudinally extending I-beams **18** and **19** which are positioned outwardly of and below the I-beams **11**, **12**, **14** and **16**, as shown in Figs. 1 and 3. The I-beams **18** and **19** are supported by downwardly converging support members indicated at **21**. Suitable horizontal brace members **22** are provided at the juncture of the I-beams **18** and **19** with the front and rear sections of the vehicle frame. To add further strength to the vehicle frame a transverse channel **23** connects the rear ends of the I-beams **18** and **19**, as shown in Fig. 3.

Secured to the I-beams **11**, **12**, **14** and **16** are journal boxes **20**. Mounted for rotation in the journal boxes **20** are transverse axles **20***a* upon which the wheels **15** are mounted.

Extending transversely of the I-beams **11** and **12** and secured thereto by any suitable means, such as by welding, are channel members **24** and **26**. As shown in Fig. 4, welded on top of and below the channels **24** and **26** are a pair of cross plates **27** and **28**. The cross plates **27** and **28** are positioned adjacent the longitudinal midpoint of the channels **24** and **26** and secured within the plates, as by welding, is an upstanding pin **29**. Mounted for sliding movement on the upstanding pin **29** is a sleeve **31** which supports the upper movable frame now to be described.

The upper movable frame comprises a pair of transverse angles **32** and **33**, parallel to each other and having cross angles **34** and **36** at the ends thereof. The angles **32** and **33** are strengthened in vertical planes by means of V-shaped trusses **37** and **38** which may be formed of angles welded to the tops of the angles **32** and **33**. The upper frame angles **32** and **33** carry suitable bearing blocks **39** for receiving the outer ends of short shaft members **42** and **43**. The inner ends of the shaft members **42** and **43** are welded to the sleeve member **31** which is mounted for sliding movement on the upstanding pin **29**.

Spanning the angles **32** and **33** are plates **44** and **46** having mounted thereon upstanding fluid pressure actuated cylinders **47** and **48**, respectively. Projecting downwardly from the cylinders **47** and **48** are piston rods **49** and **51**, respectively. As shown in Fig. 4, the piston rods **49** and **51** are secured at their lower ends in sleeve members **52**. The sleeve members **52** are positioned between a pair of upstanding plates **53** and **54** which are secured rigidly at their lower ends to a horizontal plate **56** which extends transversely of the apparatus in position to span a pair of subjacent cross ties **55**, as shown in Fig. 1. The upstanding plates **53** and **54** are provided with elongated slots **57** adjacent each end thereof and passing through the slots and the sleeve members **52** are pins **58** which are slidable in the slots **57**, thus pivotally connecting the sleeve to the upstanding plates and providing a universal action therebetween. The horizontal plate **56** forms in effect the lifting foot of the apparatus which is pressed downwardly into contact with the subjacent cross ties **55**.

Mounted at opposite ends of the transverse channels **24** and **26** and extending downwardly therefrom are plates **59** which are provided with aligned vertically disposed slots **61**. Passing through the slots **61** and movable vertically therein is a pin **62**. Secured to the pin **62** are rail clamping dogs **63** which are cross connected at their lower ends by means of a plate **64**. Each of the

dogs 63 has an inwardly extending arm 66 provided with suitable openings therethrough for receiving pins 67 which are pivotally connected to the lower ends of links or tension members 68. The upper ends of the tension members 68 are pivotally connected to depending lugs 69 mounted adjacent the ends of the transverse angles 32 and 33.

Mounted inwardly of the depending brackets 69 and welded across the tops of the channels 24 and 26 are short lengths of channel 71 with the flanges thereof abutting. Depending from the sides of the transverse angles 32 and 33 are sets of lugs 72 which, when the upper frame is in its lowermost position, lie at each end of the channels 71. When it is desired to lock the upper movable frame relative to the lower frame, such as when lifting the device from the track or when it is not desired to dog the rail, pins 73 may be inserted through the brackets 72 and the channel 71. As shown in Fig. 4, the pins 73 also hold the dogs 63 out of engagement with the rails. The channels 71 also serve to limit downward movement of the upper frame relative to the lower frame 10.

Extending transversely of the I-beams 18 and 19 and secured thereto as by welding at 74, is a plate 76. Mounted on the plate 76 are transverse channel members 77 and 78 having outwardly disposed flanges, as shown in Figs. 1 and 5. Connecting the upper flanges of the channels 77 and 78 at opposite ends thereof are transverse plates 79. Mounted outwardly of the channels 77 and 78 are transverse channels 81 and 82 which are secured to each other by transversely spaced plates 83 and 84, as shown in Fig. 2. The transverse channels 81 and 82 are connected adjacent one end by a cross member 86. The flanges of the channels 81 and 82 extend outwardly away from each other and the webs thereof are provided with suitable openings for receiving inwardly projecting shaft members 88 which are locked in place by means of annular abutments 89 formed on the shaft and nuts 90. Mounted for rotation on the short shafts 88 in position to ride on the lower flanges of the channel members 77 and 78 is a plurality of rollers 91. The outer channel members 81 and 82 are thus free to move transversely relative to the fixed inner channel members 77 and 78.

Mounted on the upper flanges of the channel members 81 and 82 are suitable brackets 92 and 93, respectively, for supporting a yoke member 94 having upstanding legs 96 and 97. Pivotally connected to the yoke 94 by means of a pin 98 is the end of a piston rod 99 of a fluid pressure actuated cylinder 101. The fluid pressure actuated cylinder 101 is operatively connected to a source of fluid under pressure and the movement thereof is controlled by valve means to be described hereinafter. The cylinder 101 is pivotally connected to an upstanding bracket 102, which is secured to the channel pieces 77 and 78, by means of a pivot pin 103.

Mounted adjacent the ends of the channel members 81 and 82 opposite the upstanding brackets 102 is a cross tie gripping element indicated generally at 104. A second cross tie gripping element 106 is mounted on the channel members 81 and 82 in position to lie between the rails of the railway track. In view of the fact that the construction and operation of the cross tie gripping elements 104 and 106 are identical, a description of one will suffice for both. Each cross tie gripper comprises dogs 107 and 108 mounted for pivotal movement about shafts 109 and 111, respectively. The shafts 109 and 111 are supported by brackets 112 and 113 which are secured in any suitable manner to the cross plates 83 and 84, and channels 81 and 82, as shown in Fig. 1. The dogs 107 and 108 are provided with outwardly extending arms 114 and 116, respectively. Pivotally connected to the outer ends of the arms 114 and 116 are the lower ends of piston rods 117 and 118, respectively, of fluid pressure operated cylinders 119 and 121, respectively. As shown in Fig. 2, each

of the fluid pressure operated cylinders 119 and 121 is mounted between upstanding brackets 122 and 123 by means of a pivot pin 124. As fluid under pressure is admitted to the upper ends of the cylinders 119 and 121, by means to be described hereinafter, the dogs 107 and 108 move to the dotted line position whereby they engage the cross tie 55.

Mounted on the vehicle frame 10 adjacent the forward end thereof is an internal combustion engine 127. The output shaft of the engine, indicated at 128, drive shafts 129 and 131 through the medium of sprocket chains 132 and 133, respectively. The shafts 129 and 131 are operatively connected to fluid pressure pumps 134 and 136, respectively. As shown in Fig. 6, the pumps 134 and 136 are supplied with fluid from supply tanks 137 and 138, respectively.

Mounted adjacent the rear end of the vehicle frame 10 is a reversible fluid motor 139 which drives the input shaft 141 of a two speed forward and reverse transmission, such as the sliding gear type indicated generally by the numeral 142, through the medium of a sprocket chain 143. The transmission 142 drives one of the axles 20*a* of the vehicle in a manner well understood to propel the vehicle along the rails 15*a*. Fluid for the motor 139 is taken from the pump 134 and the motor is under control of a valve 144. Fluid for the cylinder 101 is taken from the pump 136 and the cylinder is under the control of a valve 148. In like manner, a valve 147 controls the flow of fluid from the pump 134 to the cylinders 119 and 121 of the cross tie gripper 104.

Fluid for the cylinder 47 is taken from the pump 134 and is under control of valve 146. Fluid for the cylinder 48 is taken from the pump 136 and is under the control of valve 149. Fluid for the cylinders 119 and 121 of the cross tie gripper 106 is also taken from the pump 136 and the cylinders are under the control of a valve 151. The several valves are of the type to admit fluid under pressure from the pumps to the respective fluid pressure device and simultaneously to return the fluid to the supply tanks and are actuated by suitable lever arms indicated generally at 152.

Mounted adjacent the rear end of the vehicle frame 10 is an operator's seat 153 which is in position to place the operator in easy reach of the levers 152 and also places the operator in position to observe the entire process of removing and replacing the cross ties.

From the foregoing description, the operation of my improved apparatus will be readily understood. When it is desired to remove a cross tie the vehicle is moved into position whereby the grippers 104 and 106 lie over the cross tie to be removed. In this position, the plate 56 spans the adjacent ties forwardly of the tie to be removed, as shown in Fig. 1. Valves 146 and 149 are actuated to admit fluid under pressure to the cylinders 47 and 48 thereby causing the plate 56 to move into engagement with the cross ties. Upon further admission of fluid into the clinders 47 and 48, the upper frame moves relative to the vehicle frame 10, thus lifting the links 68 and causing the dogs 63 to move about their pivot point into engagement with the rails 15*a*. Further movement of the cylinders 47 and 48 lifts the entire vehicle 10 together with the rails 15*a* which are attached thereto by the grippers 63. The plate 56, which spans the cross ties adjacent the one being removed, holds these ties down thus preventing the same from moving upwardly with the rail thereby preventing ballast, dirt and the like from moving beneath the cross ties at this time. Also, by holding the adjacent cross ties down, the plate 56 aids in pulling the spikes from the cross ties.

In actual practice, the rails 15*a* are lifted very slightly since a very slight raise of the track above a loose tie ordinarily is sufficient to permit the same to be withdrawn and to permit the installation of a new tie. With the rails 15*a* in raised position and the grippers 104 and 106

in the position shown in Fig. 2, the valves **147** and **151** are actuated thus introducing fluid into the cylinders **119** and **121** of the cross tie grippers **104** and **106** whereby the dogs **107** and **108** move into position to engage the cross tie **55**. The valve **148** is then actuated to admit fluid under pressure to the cylinder **101** thus causing the channel members **81** and **82** which carry the cross tie grippers **104** and **106**, to move transversely of the rails, thereby removing the cross tie from beneath the rails. After the cross tie gripper **106** is moved the limit of its travel, the grippers **104** and **106** are disengaged from the cross tie. The cross tie may be moved further by hand or by engaging the cross tie with the gripper **104**. This is accomplished by actuating the valve **148** to move the cross tie grippers to the original position, shown in Fig. 2. The valve **147** is then actuated to cause the gripper element **104** to engage the cross tie adjacent the rail and the cylinder **101** is actuated to complete the removal of the cross tie.

To place a new cross tie beneath the rails, the cross tie is first moved beneath the adjacent rail by means of the gripper **104**. After the cross tie has passed beneath the adjacent rail and where the gripper **106** can engage the same, the gripper **104** is released and the fluid pressure operated cylinder **101** is actuated to shift the grippers **104** and **106** whereby both are in position to engage the cross tie to complete the movement of the cross tie beneath the rails. The cylinders **47** and **48** are then actuated to raise the plate **56**, thus lowering the rails **15***a* onto the cross ties and removing the dogs **63** from engagement with the rails.

From the foregoing it will be seen that I have devised improved apparatus for lifting rails and removing and replacing cross ties beneath the same. By providing apparatus for lifting the rails and removing a cross tie in one operation and then placing a new cross tie beneath the rail in another operation, I have greatly reduced the time and labor required in the timbering operation. In actual practice, I have found that my apparatus accomplishes the work of from 8 to 12 men and does it in a far more efficient manner.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various 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 removing and replacing cross ties in a railway track, a vehicle having wheels to run upon the rails of the track, lifting means on the vehicle engageable with a pair of subjacent cross ties and thereby effective to elevate said vehicle, rail gripping means mounted on the vehicle and movable into engagement with the rails in response to upward movement of the vehicle, a pair of transversely extending parallel channels mounted on said vehicle and spaced longitudinally thereon with the webs thereof extending in vertical planes and constructed and arranged to lie directly above a cross tie positioned adjacent said pair of cross ties, a transversely extending frame mounted for movement along said channels, rollers mounted on said transversely extending frame and disposed to engage the lower flanges of said channels, fluid pressure actuated means operatively connected to said transversely extending frame for moving the same along said channels, and gripping elements mounted adjacent opposite ends of said transversely extending frame and constructed and arranged to engage the cross tie beneath the same whereby the cross tie is moved transversely beneath the rails.

2. In apparatus for removing and replacing ties in a railway track, a vehicle having wheels to run upon the rails of the track, lifting means mounted on the vehicle and having a lower support member engageable with a pair of subjacent cross ties and thereby effective to elevate the vehicle relative to said pair of cross ties, rail gripping means mounted on the vehicle disposed to engage the rails and lift same in response to upward movement of the vehicle by said lifting means, a movable frame mounted for transverse movement on said vehicle and disposed directly above a cross tie to be removed which lies adjacent said pair of cross ties, pairs of gripping elements mounted adjacent opposite ends of said movable frame for pivotal movement at right angles to the cross tie to be removed, fluid pressure actuated means operatively connected to the gripping elements of said pairs for moving the same into engagement with said cross tie, and means mounted on said vehicle to move said movable frame transversely of the vehicle whereby the cross tie is moved transversely beneath the rails after it is gripped by the gripping elements.

3. In apparatus for removing a cross tie of a railroad track, a vehicle embodying a frame and having wheels to run upon the rails of the track, a lifting frame mounted for vertical movement on the vehicle frame, means on the lifting frame engageable with the roadbed and thereby effective to move the lifting frame relative to the vehicle frame, rail gripping means connected to the lifting frame and movable into engagement with the rails in response to upward movement of the lifting frame whereby the lifting forces are transmitted substantially directly from the lifting frame to the rails to lift the rails, a first pair of cross tie gripping elements mounted on said vehicle inwardly of and adjacent one rail and over a cross tie to be removed, a second pair of cross tie gripping elements mounted on said vehicle outwardly of and adjacent the other rail and over said cross tie, means mounted on said vehicle and operatively connected to the gripping elements to move same into gripping engagement with the cross tie to be removed, and means mounted on said vehicle to move said gripping elements transversely of the rails whereby the cross tie is moved transversely beneath the rails while engaged by the gripping elements.

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