United States Patent

Kershaw

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[54] APPARATUS FOR REPLACING OLD CROSS TIE WITH NEW CROSS TIE

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[51] Int. Cl. **E01b 29/06**

[58] Field of Search 104/6–9; 254/43, 254/44

[56] **References Cited**

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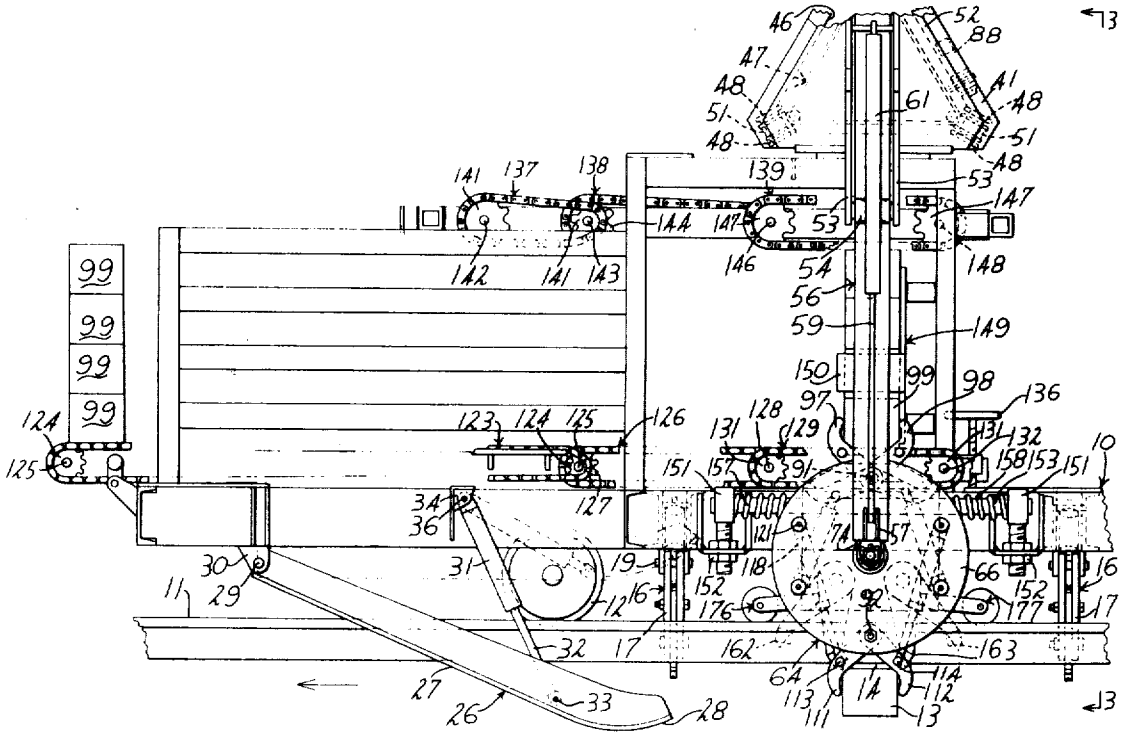
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[57] **ABSTRACT**

Rotatable turret carried by transverse frame adapted for lateral movement relative to supporting frame extending longitudinally of railroad track. Cross tie grippers on turret engage old and new ties concomitantly to extract old tie and extract new tie from source of supply while rails elevated. Turret rotated after old tie extracted to release old tie at location removed from point of extraction then rotated to position new tie at point of extraction of old tie. Transverse frame then moved inwardly to insert new tie and rails then lowered. Tie plate grippers engage opposite sides of tie plates while rails elevated and release tie plates upon lowering rails onto new tie.

9 Claims, 7 Drawing Figures



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SHEET 1 OF 5

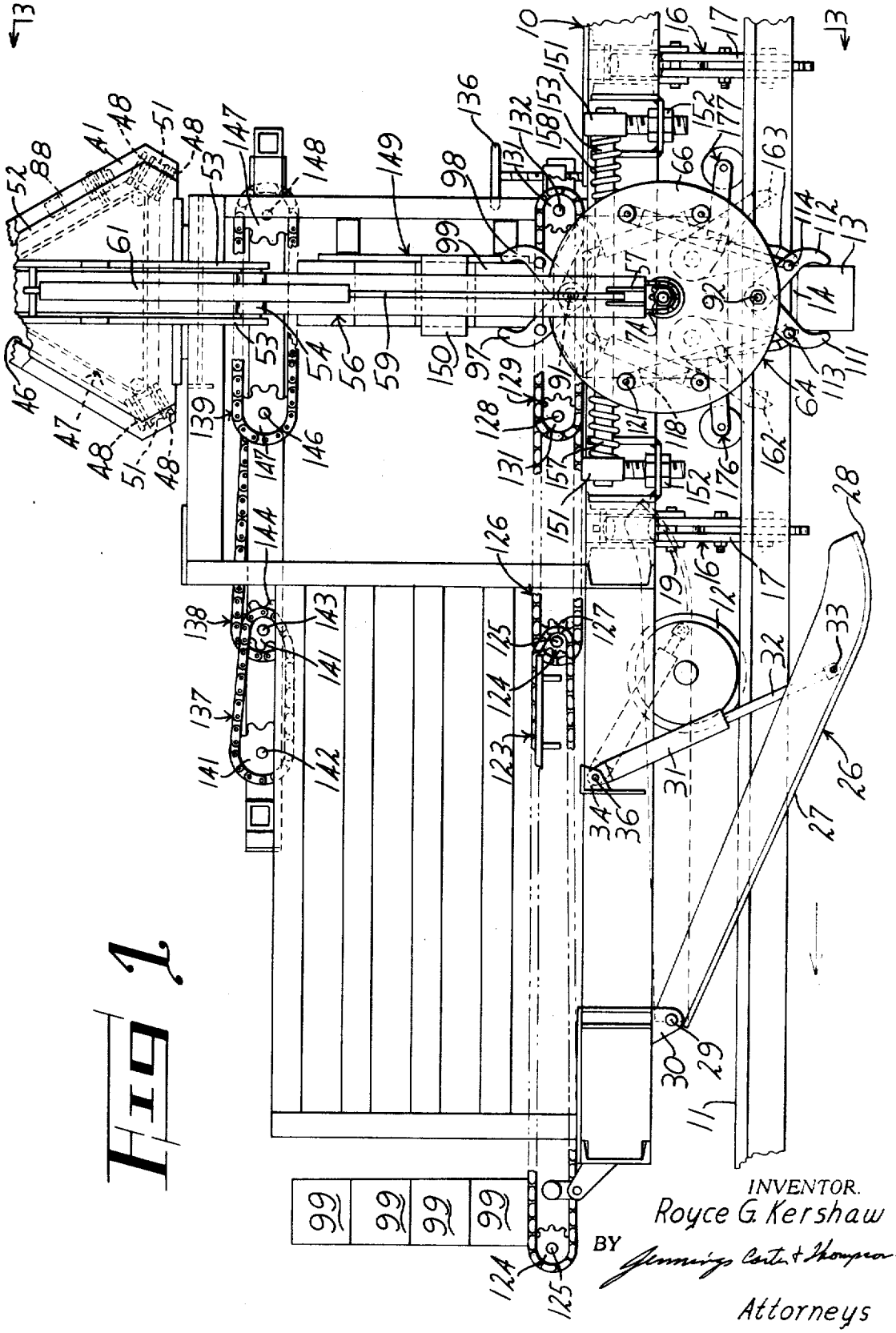


FIG 1

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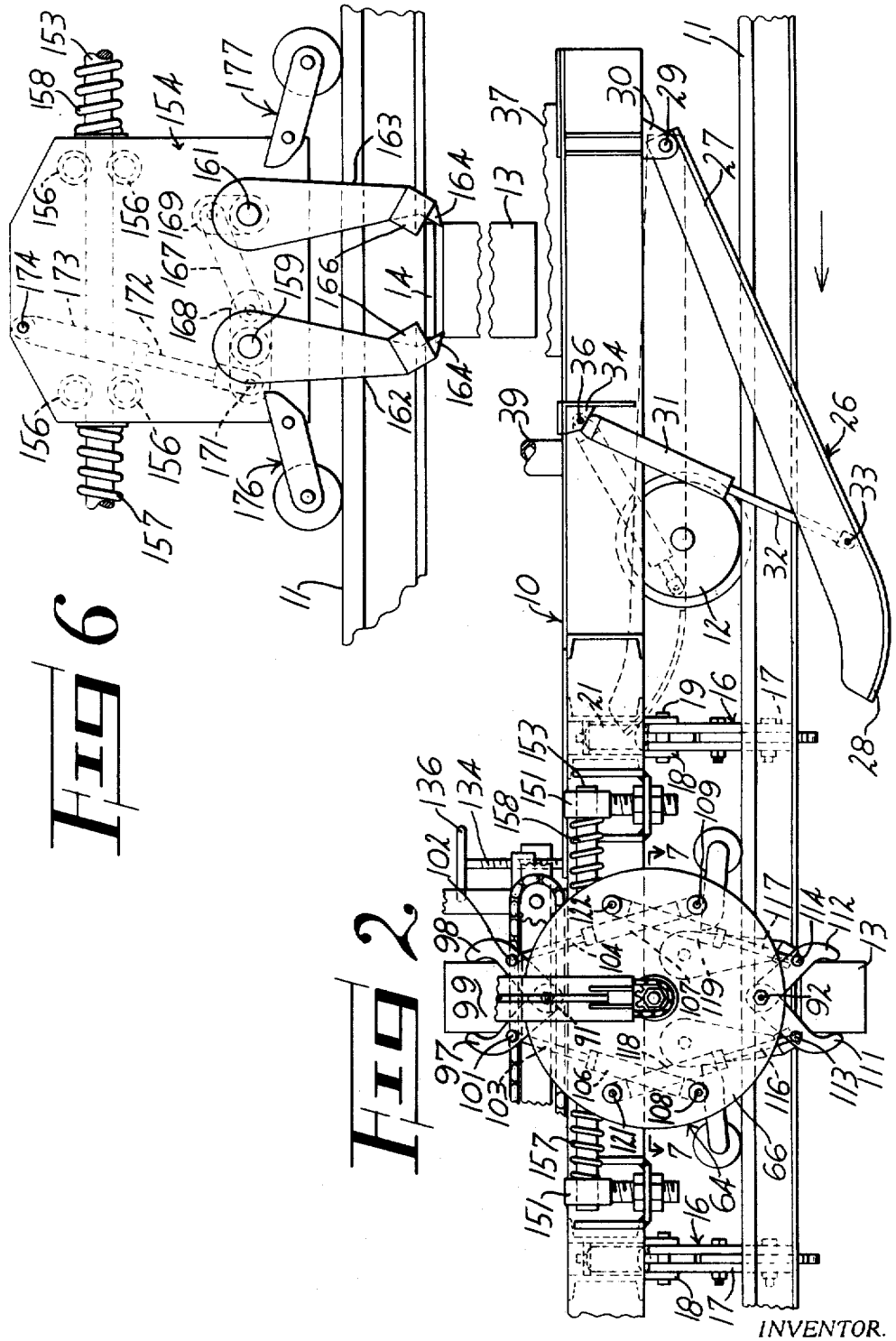


FIG 6

FIG 2

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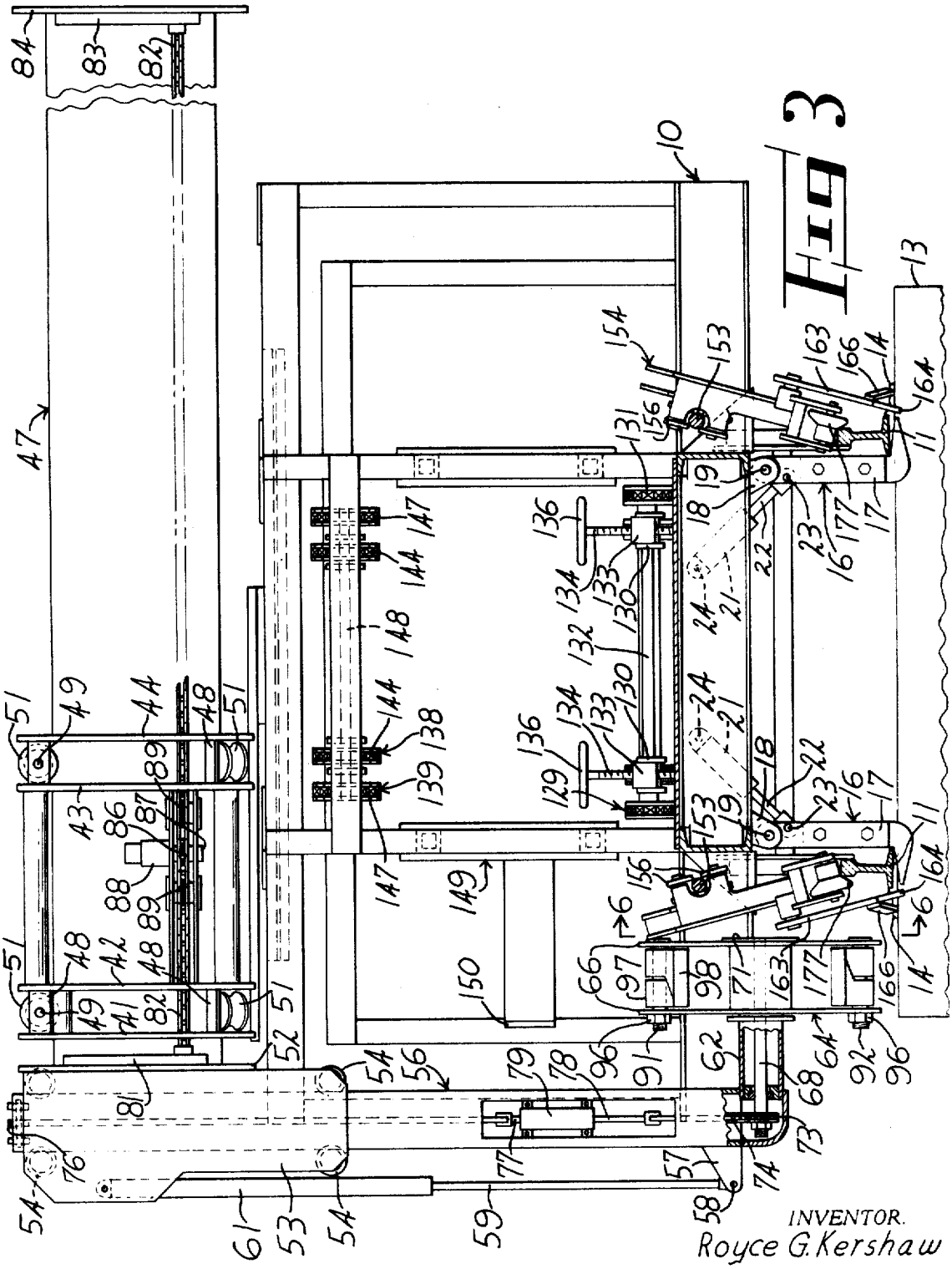


Fig 3

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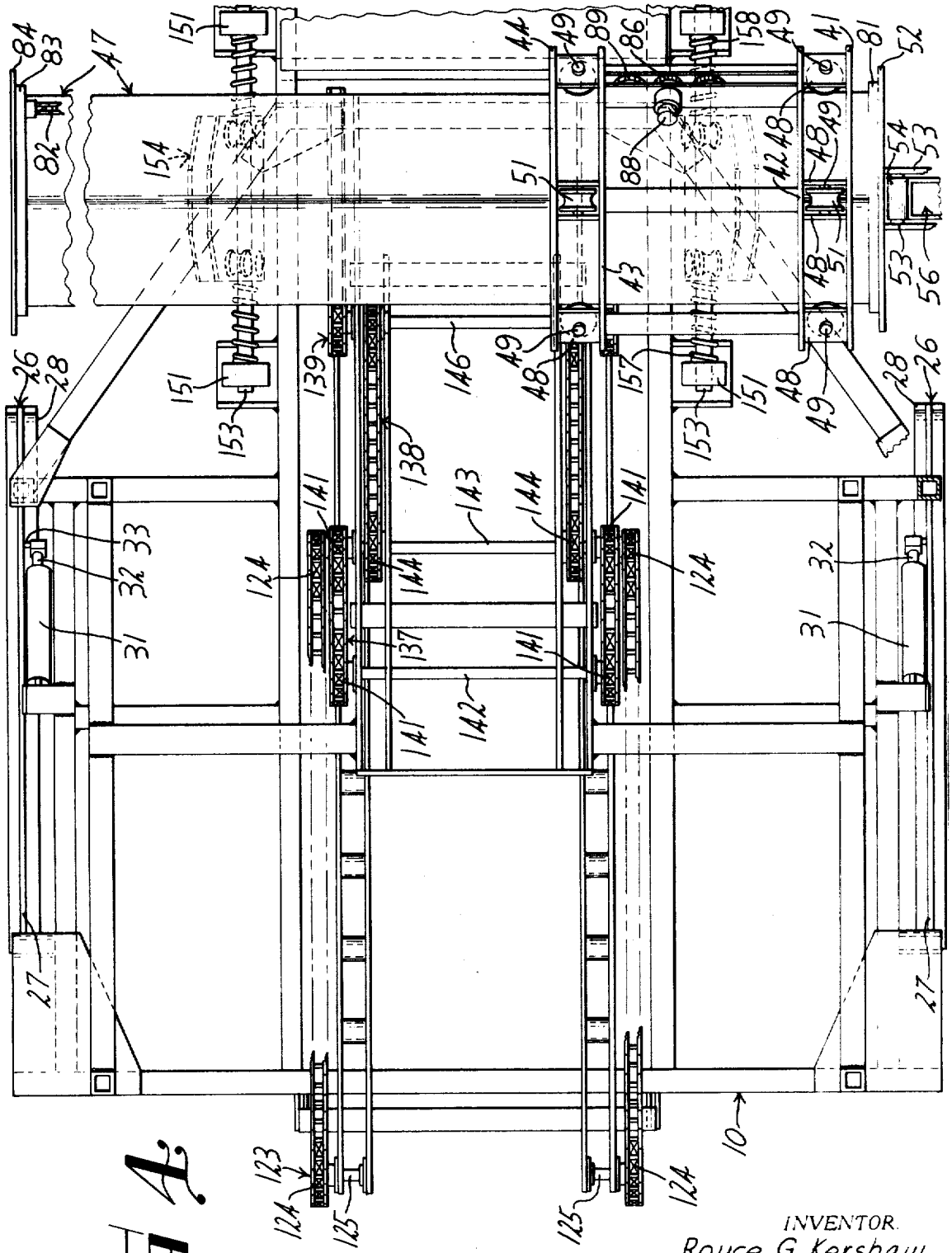


FIG. 4.

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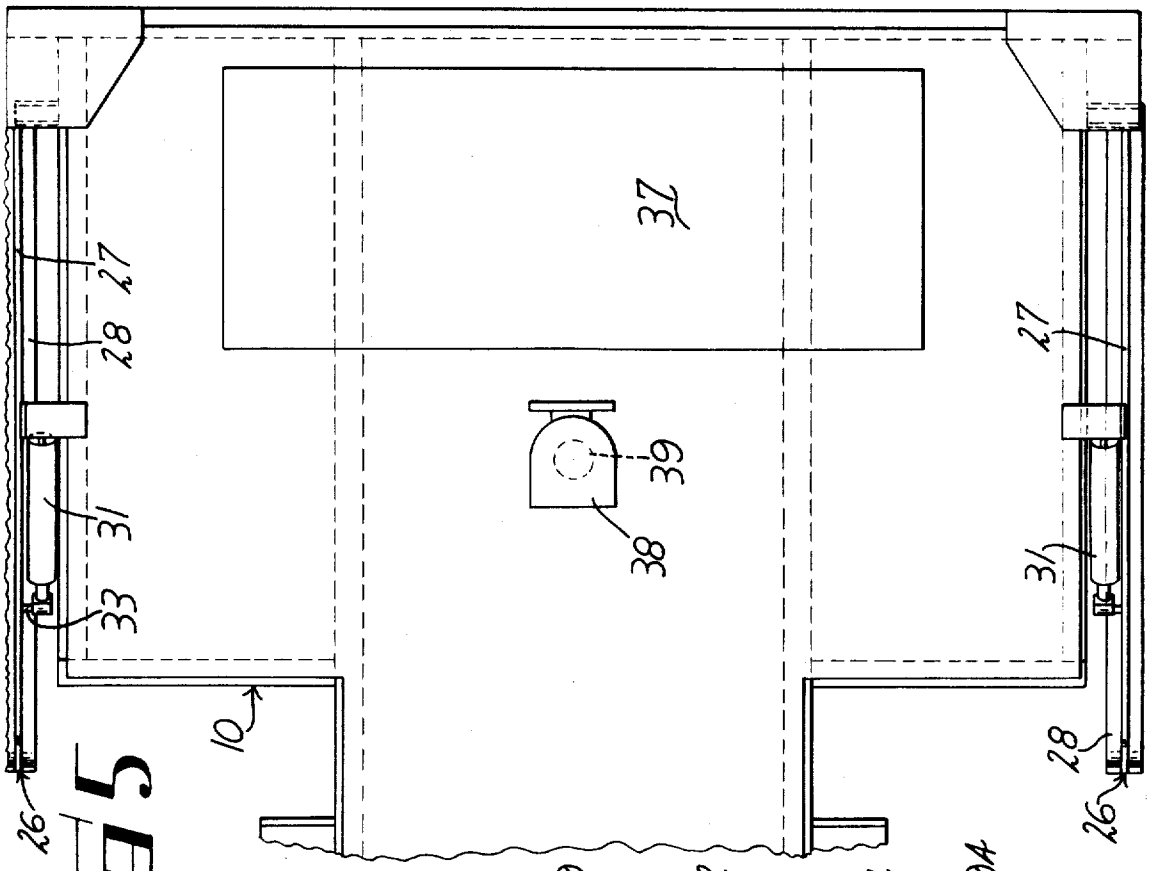


FIG 5

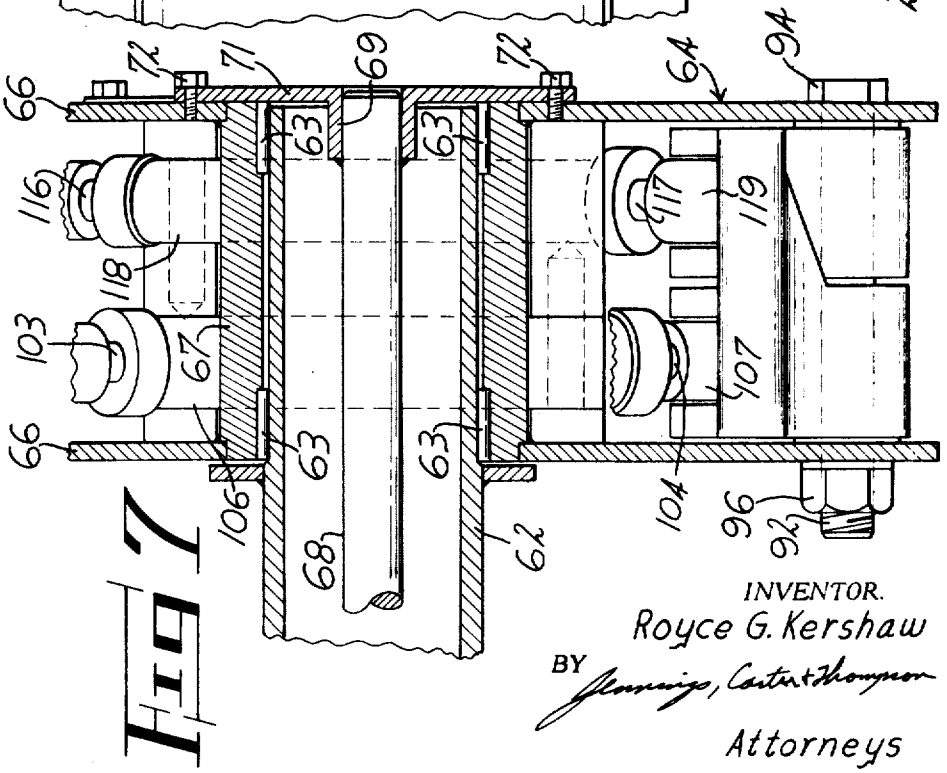


FIG 7

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APPARATUS FOR REPLACING OLD CROSS TIE WITH NEW CROSS TIE

BACKGROUND OF THE INVENTION

This invention relates to apparatus for replacing old cross ties with new cross ties and more particularly to apparatus which continuously supplies cross ties to a predetermined location and then replaces the old cross tie with a new cross tie from the source of supply.

Heretofore in the art to which my invention relates, difficulties have been encountered in removing old cross ties and then inserting new cross ties due to the fact that complicated mechanism has been required to remove the old cross ties or the cross ties have been sawed into several parts prior to being removed. Also, the removal of old cross ties has been a completely separate operation from the insertion of new cross ties beneath the railroad tracks, thus requiring considerable time and effort as well as complicated mechanism for extracting the old cross tie and inserting a new cross tie in its place.

BRIEF SUMMARY OF THE INVENTION

In accordance with my present invention, I provide apparatus wherein cross ties are continuously supplied to a predetermined location whereupon a rotatable turret extracts the old cross tie and removes a new cross tie from the source of supply concomitantly. After extraction of the old cross tie, the turret is rotated an angular distance to release the old tie in spaced relation to the point of removal thereof whereupon the turret is then rotated to position the new cross tie at the point of removal of the old cross tie. The turret is then moved inwardly to insert the new cross tie beneath the rails, the rails being elevated during extraction of the old cross tie and insertion of the new cross tie. Tie plate grippers engage opposite sides of the tie plates while the rails are elevated and release the tie plates upon lowering the rails onto a new cross tie.

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

FIG. 1 is a side elevational view, partly broken away, showing the forward portion of the apparatus and showing the cross tie gripper units in the operative position;

FIG. 2 is a side elevational view, partly broken away, showing the rear portion of the apparatus;

FIG. 3 is a sectional view taken generally along the line 3—3 of FIG. 1, partly broken away and showing the cross tie gripper units in the retracted position;

FIG. 4 is a top plan view, partly broken away, showing the forward portion of the apparatus;

FIG. 5 is a top plan view, partly broken away, showing the rear portion of the apparatus;

FIG. 6 is a fragmental view taken generally along the line 6—6 of FIG. 3 showing the tie plate grippers in the operative position; and,

FIG. 7 is an enlarged, sectional view taken generally along the line 7—7 of FIG. 2.

Referring now to the drawings for a better understanding of my invention, I show an elongated supporting frame 10 which is adapted for longitudinal movement along the rails 11 of a railroad track on supporting wheels 12. As shown in FIGS. 1, 2 and 3, the rails 11 are supported by cross ties 13 having the usual tie plates 14 interposed between the rails and the cross tie.

Mounted on the supporting frame 10 in longitudinally spaced relation to each other are pairs of rail gripper elements 16, as shown in FIGS. 1, 2 and 3. As clearly shown in FIG. 3, each gripper element comprises a depending member 17 which is pivotally connected at its upper end to a support bracket 18 by a pivot pin 19. The lower end of each member 17 is provided with an outturned hook-like portion which moves beneath the adjacent rail 11 whereby upon elevation of the frame 10, the rails 11 are elevated above the supporting surface therefor. The gripper elements 16 are moved to operative and inoperative positions by fluid pressure operated cylinders 21 having piston rods 22 pivotally connected to the depending member 17 by pivot pins 23. The upper ends of the cylinder 21 are pivotally connected to the frame 10 by pivot pins 24.

To raise and lower the supporting frame 10 and the rails 11 attached thereto by the rail gripper elements 16, I provide jack members 26 at opposite sides of the frame 10 adjacent the front and rear ends of the frame 10, as shown in FIGS. 1, 2, 4 and 5. Each jack member 26 comprises an elongated member 27 having a ground engaging shoe 28 adjacent the lower end thereof. The upper end of the elongated member 27 is pivotally connected to a support bracket 30 by a pivot pin 29. Each bracket 30 is carried by the supporting frame 10, as show. The jack members 26 are moved selectively to raised and lowered positions by a fluid pressure operated cylinder 31 having a piston rod 32. The piston rod is pivotally connected to the members 27 by a pivot pin 33 while the upper end of cylinder 31 is pivotally connected to a supporting bracket 34 by a pivot pin 36.

As shown in FIGS. 2 and 7, the supporting frame carries a suitable power unit 37 adjacent the rear end thereof for supplying fluid under pressure to the various fluid pressure operated cylinders employed in association with my improved apparatus. Also, mounted on the supporting frame 10 forwardly of the power unit 37 is an operator seat 38 which is supported by an upstanding member 39. In view of the fact that the power unit 37 is of the conventional type, no further description thereof is deemed necessary.

Secured rigidly to the upper portion of the supporting frame 10 are vertically extending frame members 41, 42, 43 and 44. Each of the frame members 41, 42, 43 and 44 are generally triangular, as viewed in elevation, as shown in FIG. 1, and are provided with a triangular opening 46 therein for receiving an elongated, transverse frame 47 which is triangular, as viewed in cross section. Extending between and secured to the triangular shaped members 41 and 42 at the corners thereof are spaced apart brackets 48. Mounted for rotation between each adjacent pair of brackets 48 on a supporting shaft 49 is a roller 51 which is adapted to engage the adjacent corner of the transverse frame 47 whereby the transverse frame 47 is adapted for lateral movement relative to the supporting frame 10. Support brackets 48 are also mounted between the triangular members 43 and 44 at the corners thereof for supporting shafts 49 which carry rollers 51 that engage the corners of the transverse frame 47 as described hereinabove. As shown in FIG. 1, the corners of the elongated, transverse frame 47 are rounded to a shape corresponding to a groove provided in the roller 51 whereby the transverse frame 47 is adapted for lateral movement in a horizontal plane.

Secured to the end of the transverse frame 47 which projects outwardly of the triangular members 41 and 42 is a vertical plate 52 which in turn is secured rigidly to spaced apart vertical plates 53, as shown in FIGS. 1, 3 and 4. Upper and lower pairs of guide rollers 54 are mounted for rotation between the plates 53 in position to engage opposite sides of an elongated, depending housing 56. The lower portion of the housing 56 carries an outwardly projecting bracket 57 which is secured by a pivot pin 58 to the lower end of the piston rod 59 of a fluid pressure operated cylinder 61. Accordingly, the depending housing 56 is moved to selected elevations by the fluid pressure operated cylinder 61. As shown in FIG. 3, the elongated housing 56 is hollow and the lower end thereof is secured rigidly to a horizontal, inwardly extending tubular housing 62.

Mounted for rotation on the inner portion of the tubular housing 62 by suitable bearings 63, as shown in FIG. 7, is a rotatable turret 64 which comprises spaced apart, vertically extending disc-like members 66. A hub member 67 is secured rigidly to the inner portion of the disc-like members 66 with the hub member 67 rotating about the bearings 63. Rotary motion is imparted to the turret 64 by a shaft 68 which is secured rigidly to and extends into a hub portion 69 of a disc member 71. The disc member 71 is secured rigidly to the adjacent disc-like members 66 by retaining elements 72.

Mounted on the shaft 68 inwardly of the depending housing 56 is a sprocket wheel 73 which is driven by a sprocket chain 74. The sprocket chain 74 extends upwardly around an upper sprocket 76 and one flight of the sprocket chain 74 is connected to oppositely disposed piston rods 77 and 78 of a fluid pressure operated cylinder 79, as shown in FIG. 3. Accordingly, upon introducing fluid under pressure into opposite ends of the cylinder 79, the chain 74 is driven in opposite directions to thus impart rotation to the rotary turret 64.

Secured to the vertical plate 54 carried by one end of the transverse frame 47 is a vertical support bracket 81 which is secured to one end of a sprocket chain 82, as shown in FIG. 3. The other end of the sprocket chain 82 is secured to a vertical support bracket 83 carried by the inner surface of a vertical, triangular plate 84 mounted at the opposite end of the transverse frame 47 from the end thereof carrying the vertical member 52. The sprocket chain 82 passes over a drive sprocket 86 carried by the shaft 87 of a fluid pressure operated motor 88. To hold the sprocket chain 82 in engagement with the sprocket 86, idler sprockets 89 are provided at opposite sides of the drive sprocket 86 and the sprocket chain 82 passes beneath the idler sprockets. Accordingly, the sprocket chain passes under one idler sprocket 89 and then over the drive sprocket 88 whereupon it then moves under the other idler sprocket 89.

Extending through suitable openings in the disc-like member 66 are oppositely disposed shaft members 91 and 92. As shown in FIG. 7, each shaft 91 and 92 is provided with a head 94 at one end thereof and the other end thereof is threaded for receiving a retaining nut 96. Mounted for pivotal movement between the disc-like member 66 on shaft 91 is a cross tie gripper unit comprising gripper elements 97 and 98 which are adapted to move to an outer, cross tie engaging position, as shown in FIGS. 1 and 2, the new cross tie being indicated at 99. Pivotally connected to the gripper elements 97 and 98 by pivot pins 101 and 102 are piston rods 103 and 104, respectively, of fluid pressure operated cylinders 106 and 107, respectively. Pivot pins 108 and 109 connect the fluid pressure operated cylinder 106 and 107 to the disc-like member 66. Mounted for rotation on the shaft 92 is a cross tie gripper unit having gripper elements 111 and 112. Pivot pins 113 and 114 pivotally connect the gripper elements 111 and 112 to piston rods 116 and 117 of fluid pressure operated cylinders 118 and 119, respectively. Pivot pins 121 and 122 connect the fluid pressure operated cylinders 118 and 119 to the disc-like members 66. Fluid under pressure is introduced into the fluid pressure operated cylinders 106, 107, 118 and 119 by suitable means whereby the gripper elements 97, 98, 111 and 112 are moved selectively to the extended, solid line positions to the retracted, dotted line positions shown in FIGS. 1 and 2, whereby the cross ties 13 and 99 are gripped and released.

The new cross ties 99 are delivered to the receiving end of an endless chain conveyor 123 with the cross ties extending transversely of the supporting frame 10, as shown in FIG. 1. As shown in FIG. 4, the chain conveyor 123 comprises a pair of oppositely disposed sprocket chains which pass around sprockets 124 mounted on shafts 125. From the conveyor 123, the cross ties pass onto an endless chain conveyor 126 which also comprises laterally sprocket chains which pass around sprockets 127 mounted on shaft 124 and a shaft 128. From the conveyor 126, the cross ties pass onto an endless chain conveyor 129 which also comprises spaced apart chains mounted on sprockets 131 carried by shaft 128 and a shaft 132. As shown in FIG. 3, the shaft 132 passes through suitable openings in elongated members 130 which carry support members 133 having threaded openings therethrough for receiving threaded shafts 134. The upper end of each shaft 134 carries a hand wheel 136 while the lower end thereof engages the supporting frame 10. Accordingly, upon rotation of the hand wheel 136, the elevation of the conveyor 129 is varied to position the cross tie 99 in proper alignment with the gripper elements 97 and 98. The endless conveyors 123, 126 and 129 are driven by suitable means whereby the speed is progressively increased to thus separate the stacks of cross ties from each other. That is, the conveyor 129 is driven at a speed faster than conveyor 126 and conveyor 126 is driven at a speed faster than conveyor 123. In FIG. 1 of the drawing I show the new cross ties 99 as being stacked four high. However, it will be apparent that the number of cross ties in each stack may be varied.

Endless stabilizer conveyor units 137, 138 and 139 are provided above the conveyors 123, 126 and 129 in position to engage the uppermost cross tie of the stack of cross ties to thus stabilize movement of the cross ties. The stabilizing conveyors are driven by their engagement with the upper surface of the cross ties. Stabilizer conveyor 137 comprises a pair of laterally spaced endless chains mounted for rotation on sprocket 141 which in turn are carried by shafts 142 and 143. Stabilizer conveyor 138 also comprises a pair of laterally spaced endless chains which are mounted on sprockets 144 which in turn are carried by shaft 143 and a transverse shaft 146. Stabilizer conveyor 139 also comprises a pair of transversely spaced endless chains which pass around sprockets 147 mounted on shaft 146 and a transverse shaft 148. Vertically extending stop members 149 are carried by the supporting frame 10, as shown in FIG. 1, to restrain movement of the stack of cross ties 99 after the stack moves into proper alignment with the gripper elements 97 and 98 of the turret 64. The stop member 149 adjacent the turret 64 is provided with a lateral projection 150 which engages the cross tie located above the cross tie being removed to limit longitudinal movement thereof.

Secured to the supporting frame 10 adjacent opposite sides of the turret 64 are upstanding support brackets 151 which are secured in place by lock nuts 152. Each support bracket 151 is provided with an opening therethrough for receiving the adjacent end of an elongated shaft 153 which extends parallel to the rails 11. As shown in FIG. 6, mounted for rotation at one side of a housing unit 154 are oppositely disposed guide rollers 156 which engage opposite sides of the shaft 153 to thus support the housing 154 from the shaft 153. Compression springs 157 and 158 are mounted at opposite sides of the housing 154 in position to engage the support brackets 151 and the housing 154 to thus retain the housing 154 in proper vertical alignment with the rotatable turret 64. Pivotally connected to the housing 154 by pivot pins 159 and 161 are depending tie plate gripper arms 162 and 163. Each of the arms 162 and 163 is provided with an inturned lower end portion 164 which is adapted to move between the old cross tie 13 and the tie plate 14 to thus retain the tie plate 14 adjacent the rail 11 while the rails are in the raised position and to release the tie plate 14 after the rails are lowered back onto the new cross tie. Upward movement of the tie plate 14 is limited by inwardly extending brackets 166 carried by the depending arms 162 and 163, as clearly shown in FIGS. 3 and 6. The pin 159 is operatively connected to the pin 161 by a link 167 which is connected to links 168 and 169, respectively, which are rigidly secured to the pins 159 and 161. The link 168 is pivotally connected by a pivot pin 171 to the piston rod 172 of the fluid pressure operated cylinder 173 having its upper end pivotally connected to the housing 154 by pivot pin 174. Fluid under pressure is introduced into the cylinder 173 by suitable means in a manner well understood in the art to cause the depending tie gripper elements 162 and 163 to move selectively from the tie plate gripping position shown in FIGS. 2, 3 and 6 to the released position, as shown in solid lines in FIG. 1. The lower end of the housing 154 is supported by wheel units 176 and 177 whereby the depending tie gripper arms 162 and 163 are positioned properly to engage the tie plate 14.

From the foregoing description, the operation of my improved apparatus for replacing old cross ties with new cross ties will be readily understood. The rail grippers 16 are moved into engagement with the under surface of the rails 11 by actuating fluid pressure cylinders 21 and the depending housing 56 is lowered by introducing fluid under pressure in the cylinder 61 to position the turret 64 in proper alignment with the new cross tie 99 and the old cross tie 13. The gripper elements 97 and 98 are moved inwardly into gripping engage-

ment with the new cross tie **99** by actuating cylinders **106** and **107** while gripper elements **111** and **112** are moved into engagement with the old cross tie **13** by actuating cylinders **118** and **119**. The tie plate grippers **162** and **163** are moved inwardly to engage the tie plate **14**, as shown in FIGS. **2** and **6**, whereby the tie plate is held adjacent the rail **11**. The jack members **26** are lowered whereby the shoe members **28** engage the supporting surface to thus elevate the supporting frame **10** and the rails **11** connected thereto by the rail grippers **16**.

With the rails **11** in raised position, the fluid motor **88** is energized to move the transverse frame **47** toward the left, as viewed in FIG. **3**, to thus extract the old cross tie **13** and concomitantly therewith extract the new cross tie **99** from the conveyor **129**. After removal of the new and old cross ties to a position outwardly of the supporting frame **10**, the turret **64** is lowered to a position out of engagement with the tie plate **14** by actuating cylinder **61**. The turret **64** is then rotated, by energizing cylinder **79**, an angular distance of approximately 35° whereupon the cylinders **118** and **119** are then actuated to release the cross tie grippers **111** and **112** from the old cross tie **13**, thus positioning the old cross tie at a location removed from the point of extraction. With the old cross tie **13** released, the turret **64** is rotated by again actuating cylinder **79** to position the cross tie grippers **97** and **98** carrying the new cross tie **99** at the point of extraction of the old cross tie. That is, the cross tie grippers **97** and **98** move a total of 180° whereby the new cross tie **99** assumes the same position as the old cross tie **13** assumed prior to its removal. With the new cross tie **99** in position for insertion, the fluid motor **88** is driven in the reverse direction to move the transverse frame **47** toward the right, as viewed in FIG. **3**, to thus insert the new cross tie beneath the rails. The cross tie gripper elements **97** and **98** are then retracted by actuating cylinder **106** and **107** whereby the grippers move to the dotted line position shown in FIGS. **1** and **2**. With the new cross tie in place beneath the rails **11**, the jack members **26** are elevated to the dotted line position shown in FIGS. **1** and **2** to thus lower the supporting frame **10** and the rail **11** onto the new cross tie. Since the tie plate **14** is retained in position by the tie plate gripper arms **162** and **163** as the old cross tie is extracted and the new cross tie is inserted, the tie plate is in proper position upon lowering the rails back onto the cross ties. The tie plate grippers **162** and **163** are then retracted by actuating cylinder **173** and the rail grippers **16** are retracted by actuating cylinders **21** to thus release the tie plates **14** and the rails **11** whereupon the apparatus is then ready for movement along the rails **11** to the next location.

From the foregoing, it will be seen that I have devised an improved apparatus for removing old cross ties and inserting new cross ties. By providing a rotatable turret which extracts the old cross tie at the same time the new cross tie is removed from the supply source, I not only reduce the time required to remove the old cross tie and insert the new cross tie but provide compact apparatus which requires a minimum of space for operation. Also, by providing tie plate gripper members which retain the tie plates adjacent the rails while the rails are lifted, I eliminate the necessity of handling the tie plates separately. Also, by continuously supplying vertically aligned stacks of cross ties into vertical alignment with the gripper elements of the rotatable turret, a continuous supply of cross ties is maintained automatically, thus assuring uninterrupted operation of the apparatus. Furthermore, by rotating the turret an angular distance to dispose of the old cross tie at a point removed from the point of extraction of the old tie, the new cross tie may be readily inserted without coming into contact with the old cross tie.

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 other changes and modifications without departing from the spirit thereof.

What I claim is:

1. Apparatus for replacing old cross ties with new cross ties comprising:

a. a supporting frame adapted for longitudinal movement along the rails of a railroad track,

b. rail gripper elements carried by said supporting frame disposed to move selectively to a first position in gripping engagement with said rails of the railroad track and a second position released from said rails,

c. jack means carried by said supporting frame engagable with the roadbed of said railroad track while said gripper elements are in said first position for moving said frame and said rails selectively to a raised position and a lowered position,

d. a transverse frame mounted on said supporting frame and adapted for lateral movement relative thereto,

e. a rotatable turret carried by said transverse frame and movable to a position along one side of said supporting frame,

f. means supplying new cross ties to said supporting frame at a position opposite said turret with said new cross ties extending transversely of said supporting frame and generally parallel to the old tie to be replaced,

g. oppositely disposed cross tie gripper units carried by said turret in position for one gripper unit to engage the old cross tie to be replaced and the other gripper unit in position to engage a new cross tie on said supporting frame,

h. power actuated means operatively connected to said cross tie grippers for moving each of said cross tie gripper units selectively to an engaged position and a released position relative to a cross tie,

i. means moving said transverse frame laterally in a direction to move said turret outwardly of said supporting frame upon engagement of said cross tie gripper units with said new and old ties to remove concomitantly said old tie from beneath said rails and said new tie from said supporting frame,

j. means to rotate said turret after removal of said old cross tie from beneath said rails an angular distance for release of said old cross tie at a location removed from the point of removal thereof and then to rotate said turret an angular distance to position said new cross tie for insertion at said point of removal of the old cross tie, and

k. means moving said transverse frame laterally in a direction to move said turret inwardly to insert said new cross tie beneath said rails after rotation of said turret to position said new cross tie for insertion at the point of removal of the old cross tie.

2. Apparatus for replacing old cross ties with new cross ties as defined in claim **1** in which said transverse frame is mounted adjacent the top of said supporting frame and carries a depending vertically adjustable frame at said one side of said supporting frame with said turret carried by said vertically adjustable frame.

3. Apparatus for replacing old cross ties with new cross ties as defined in claim **1** in which said means supplying new cross ties comprises:

a. at least one endless conveyor mounted on said supporting frame and adapted to move said transversely extending cross ties longitudinally of said supporting frame, and

b. stop means carried by said supporting frame limiting movement of said cross ties on said conveyor upon movement of said cross ties into alignment with said other gripper unit carried by said turret.

4. Apparatus for replacing old cross ties with new cross ties as defined in claim **1** in which said means supplying new cross ties comprises:

a. a plurality of endless conveyors mounted on said supporting frame in overlapping relationship to each other and adapted to engage the under surface of the lowermost transversely extending cross tie of a stack of cross ties carried by said conveyor to move said cross ties longitudinally of said supporting frame,

b. an endless stabilizer member mounted above each of said endless conveyors in position to engage the upper surface of an uppermost cross tie of a stack of cross ties carried by said conveyors so that movement is imparted to said

endless stabilizers by said cross ties as they move therebeneath, and

c. stop means carried by said supporting frame limiting movement of said stacks of cross ties on said conveyors upon movement of said cross ties into vertical alignment with said other gripper unit carried by said turret.

5. Apparatus for replacing old cross ties with new cross ties as defined in claim 1 in which said cross tie gripper units are each operatively connected to fluid pressure operated cylinder so that each cross tie gripper unit is operated independently of the other.

6. Apparatus for replacing old cross ties with new cross ties as defined in claim 1 in which tie plate gripper members are carried by opposite sides of said supporting frame and engage the tie plates to retain the same adjacent said rails while said rails are in raised position and release said tie plate after said rails are lowered onto new cross ties.

7. Apparatus for replacing old cross ties with new cross ties as defined in claim 6 in which each said tie plate gripper member comprises:

a. a pair of depending arms pivotally supported adjacent their upper ends with the lower ends of said arms disposed to engage opposite sides of a tie plate, and

b. power actuated means operatively connected to said arms for moving said arms selectively to tie plate engaging position and to a position to release said tie plate.

8. Apparatus for replacing old cross ties with new cross ties as defined in claim 1 in which said rotatable turret comprises:

a. spaced apart disc-like members secured rigidly to each other with said cross tie gripper units mounted therebetween and adapted to move from said cross tie released position within the confines of said disc-like member to said cross tie engaged position outwardly of said disc-like members.

9. Apparatus for replacing old cross ties with new cross ties as defined in claim 8 in which said means to rotate said turret comprises:

a. a horizontally extending power driven shaft carried by said transverse frame, and

b. means connecting said shaft to said disc-like members whereby said disc-like members rotate with said shaft.

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