This invention relates to a novel mobile rail spike puller.

The disclosed machine consists of a rail traveling carriage equipped with spike engaging shoes which are jerked upwardly by air pressure responsive to either manual or automatic control. It utilizes the existing rails as guides and slides the shoes along the base of the track under the head of the spike. Therefore the shoes are automatically positioned as the carriage travels along the track.

It is an object of this invention to provide an automatic control for a spike puller activated in response to pressure caused by engagement of the puller and spike.

It is a further object of this invention to provide a spike puller which has a sudden jarring motion to remove the spikes from the ties.

These and further objects will become evident from the following disclosure and the accompanying drawings which illustrate one specific form of my invention. It is to be emphasized that this specific arrangement is not exhaustive of the possible applications of this invention and is not meant to limit the scope of his invention except as defined in the claims.

In the drawings:

FIGURE 1 is a sectional view through a rail showing the rail and tie plate with one spike previously removed for clarity and with the shanks of the spike pulling shoes broken away;

FIGURE 2 is a sectional view taken along line 2—2 in FIGURE 1 with the rail and tie broken away;

FIGURE 3 is a sectional view taken along line 3—3 of FIGURE 1 with the rail and tie broken away;

FIGURE 4 is a front view of the carriage assembly with portions removed or broken away for clarity and with the rails shown in section;

FIGURE 5 is an enlarged partial sectional view taken along line 5—5 in FIGURE 4;

FIGURE 6 is a top plan view of the complete assembly with the rails broken away;

FIGURE 7 is a side view of the assembly substantially corresponding to FIGURE 6 with the spike pulling assembly in retracted position;

FIGURE 8 is an enlarged sectional view taken along line 8—8 in FIGURE 7;

FIGURE 9 is an enlarged sectional view taken along line 9—9 in FIGURE 4;

FIGURE 10 is a schematic wiring diagram and pneumatic control circuit for the spike puller; and

FIGURE 11 is a fragmentary sectional view taken along line 11—11 in FIGURE 6 showing one guide assembly.

Referring now to the drawings, and to FIGURES 6 and 7 in particular, the spike puller is shown on a mobile mounting consisting of a flat bed 10 mounted upon front and rear railway wheels 11 and 12 respectively. Since the structure of such assemblies is quite common, no further specific details are deemed necessary. Power is supplied by an engine 13 mounted on bed 10, which might be an internal combustion engine, diesel engine or any other type desired. Engine 13 drives a double pulley 14 upon which are mounted two belts 15 and 16. Belt 15 in turn drives a pulley 17 connected to the input shaft 18 of a step-down transmission 19 of common construction. The output shaft 20 of transmission 19 is connected to a control transmission 21 which has a handle 22 and is manually operable to be set in any of four alternate positions two speeds forward, neutral or reverse.

Connecting transmission 21 and the final pulley 23 is a shaft 24. Pulley 23 drives a wide belt 25 which extends through bed 10 to a similar pulley 26 mounted on the axle for the front driving wheels 11. An idler pulley 27 is mounted above belt 25 and is pivotally supported upon bed 10 by depending struts 28. The pulley 27 maintains a constant tension in belt 25 due to its weight.

Belt 16 drives a pulley 29 which is fixed to the input shaft 30 of an air compressor 31 mounted upon bed 10. The outlet air connection comprises a pipe 32 which feeds to a reservoir 33 that stands vertically at the front of bed 10 and a connecting hollow air-tight front beam 33a. The reservoir 33 has mounted at its top a control panel 34 which is equipped with a pressure gauge 35 and four control buttons 36—39 whose functions will be fully explained later. Reservoir 33 is equipped with a pressure relief valve 40 which maintains a predetermined maximum pressure in the reservoir 33 and beam 33a.

The spike pulling mechanism is mounted at the forward end of bed 10 and is best shown in the sectional views of FIGURES 8 and 9.

The spike pulling assemblies are mounted in pairs which straddle each rail 76. The mounting fixtures at each side of bed 10 are identical and comprise a first bearing mount 42 fixed to the side of bed 10 and a second bearing mount 43 fixed to the front surface of beam 33a. The bearing mounts 42, 43 retainably carry a tubular shaft 44 which is provided with a plurality of holes 45. Each shaft 44 carries two spike pulling assemblies 46, 47 which are identical in construction. One of the spike pulling assemblies 46 will now be specifically described.

The spike pulling assembly 46 is journaled upon shaft 44 by means of a tubular stub shaft 48 which extends through a channel backing member 49. Member 49 extends downwardly and is adjacent to the front of beam 33a in its operative position. Member 49 and the abutting surface of beam 33a constitute means to restrain the spike pulling assembly 46 against rearward motion of its lower portion relative to the bed 10. While the central portion of member 49 is an enclosure 50 which extends upwardly from the top of member 49 as a rectangular channel. Openings 51 are provided at the lower portion of enclosure 50 for maintenance purposes. A pneumatic cylinder 52 is fixed to the front lower portion of enclosure 50 and is positioned parallel to both enclosure 50 and member 49. A guard 53 is fixed to enclosure 50 at its upper portion and comprises a square cross-sectioned protective cover for the enclosed moving parts.

Sildably mounted within enclosure 50 is a hammer 54 which is rectangular in cross-section, has a slot 55 cut out of its lower end and has a perpendicular lug 56 at its upper end which protrudes through a slot 67 cut in the front wall of enclosure 50. A bolt hole 57 extends through hammer 54 at its lower portion through slot 55. The pneumatic cylinder 52 is air-tight and has an inlet at 58 connected to a flexible air hose 59 which is connected to the control box 60 mounted on bed 10. A piston 61 in cylinder 52 is mounted for upward movement and carries an upwardly extending rod 62 which extends through a sealed opening 63 in cylinder 52 and protrudes into guard 53. The upper end of rod 63 has formed thereon a yoke 64 having legs 65 which are spaced so as to receive the lug 56 on hammer 54. Lug 56 and yoke 64 are maintained in engagement while sliding along the confining walls of guard 53.

A spike pulling shoe 69 having a shank 68 is connected to hammer 54 by means of a bolt 75 inserted in holes 57 and an elongated slot 76 in shank 68. The slot 76 provides a lost motion connection to hammer 54. Shank
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The control unit comprises a cylinder 106 having three openings 101, 103 therein. Opening 101 opens to an exhaust region maintained at atmospheric pressure. Opening 102 is connected by line 104 to reservoir 33, 33a. Opening 103 is connected to the flexible air hose 59, previously described, which runs to the controlled spike pulling assembly.

A piston 165 is inserted within cylinder 100 and has an air-tight sliding relationship within the inner cylinder walls. The vertical thickness of piston 105 slightly exceeds the diameter of openings 101-103. A piston rod 166 rigidly attached to piston 105 extends to a solenoid 168 which is operative to move the piston between the position shown in full line in FIGURE 10 and the dashed line position. The first position is the normal rest position and is maintained by the biasing force of spring 107. The piston 165 blocks opening 102 and allows the line 59 to exhaust through opening 101. The second position is the operating position and is obtained by activating solenoid 106. In this position, exhaust opening 101 is blocked, and line 59 is connected to reservoir 33.

A control switch 118 is shown in FIGURE 9 mounted upon the front of bed 10 adjacent the supporting members 49 for bed 10. The control switch 118 is integral with member 109 and outer member 110 houses a compression spring 111 and a rod 112 fixed to members 49 for movement with it. Switch 108 is a pressure responsive switch having a control element 113 which is spring biased to a normally open position. The rod 112 is positioned so as to contact element 113 when member 49 moves backwards due to the contacting of a spike shank. This results in the closing of switch 108. One terminal of switch 108 is connected to ground at 114. The remaining terminal is connected to one terminal of solenoid 106 by wire 115. The second terminal of solenoid 106 is connected to a battery 116, which is grounded at 116a.

To allow manual operation a control switch 117 is mounted on control panel 34 and is controlled by the first button 36 previously described. Switch 117 is a pressure responsive and is closed by pressure on button 36. One terminal of switch 117 is connected to ground at 118 and the other terminal is connected by wire 119 to the wire 115 leading to solenoid 106. Thus the switches 108, 109 and 117 are wired in parallel and either switch will energize solenoid 106 when activated.

Each spike pulling assembly is wired and controlled independently, having the same manual or automatic control as just described. A four pole switch 120 is inserted between switches 108 and the ground connection at 114. Switch 120 is normally closed, but may be manually opened to prohibit automatic operation and allow only manual control when desired.

Since the flanges of wheels and 12 are not positively positioned upon the rails 76, the bed 10 must be centered accurately to insure engagement of each spike 71 as bed 10 travels along the right of way. This is accomplished by a guide unit 120 mounted at the outer edge of each rail 76 at the forward end of bed 10. One unit will be described (see FIGURES 7 and 11).

The guide unit 120 is suspended by two ears 121 fixed to the lower surface of beam 33a. A solid shaft 122 is rotatably mounted by ears 121 and is locked against lateral movement by washers 123. A collar 124 is journaled on shaft 122 and has a depending plate 125 attached to it which is positioned parallel to the rail 76. A gusset 126 is fixed to collar 124 and plate 125 to rigidly support the plate 125. The collar 124 is laterally positioned on shaft 122 by means of pins 127 which extend through both the collar 124 and shaft 122. The edge of plate 125 facing the bend 79 of rail 76 is provided with two ears 128, 129 mounted vertically one above the other. These ears carry a shaft 130 which rotatably journals a roller 131. Roller 131 rolls along the outer edge of head 79.

The control unit comprises a cylinder 106 having three openings 101, 103 therein. Opening 101 opens to an exhaust region maintained at atmospheric pressure. Opening 102 is connected by line 104 to reservoir 33, 33a. Opening 103 is connected to the flexible air hose 59, previously described, which runs to the controlled spike pulling assembly.

A piston 165 is inserted within cylinder 100 and has an air-tight sliding relationship within the inner cylinder walls. The vertical thickness of piston 105 slightly exceeds the diameter of openings 101-103. A piston rod 166 rigidly attached to piston 105 extends to a solenoid 168 which is operative to move the piston between the position shown in full line in FIGURE 10 and the dashed line position. The first position is the normal rest position and is maintained by the biasing force of spring 107. The piston 165 blocks opening 102 and allows the line 59 to exhaust through opening 101. The second position is the operating position and is obtained by activating solenoid 106. In this position, exhaust opening 101 is blocked, and line 59 is connected to reservoir 33.

A control switch 118 is shown in FIGURE 9 mounted upon the front of bed 10 adjacent the supporting members 49 for bed 10. The control switch 118 is integral with member 109 and outer member 110 houses a compression spring 111 and a rod 112 fixed to members 49 for movement with it. Switch 108 is a pressure responsive switch having a control element 113 which is spring biased to a normally open position. The rod 112 is positioned so as to contact element 113 when member 49 moves backwards due to the contacting of a spike shank. This results in the closing of switch 108. One terminal of switch 108 is connected to ground at 114. The remaining terminal is connected to one terminal of solenoid 106 by wire 115. The second terminal of solenoid 106 is connected to a battery 116, which is grounded at 116a.

To allow manual operation a control switch 117 is mounted on control panel 34 and is controlled by the first button 36 previously described. Switch 117 is a pressure responsive and is closed by pressure on button 36. One terminal of switch 117 is connected to ground at 118 and the other terminal is connected by wire 119 to the wire 115 leading to solenoid 106. Thus the switches 108, 109 and 117 are wired in parallel and either switch will energize solenoid 106 when activated.

Each spike pulling assembly is wired and controlled independently, having the same manual or automatic control as just described. A four pole switch 120 is inserted between switches 108 and the ground connection at 114. Switch 120 is normally closed, but may be manually opened to prohibit automatic operation and allow only manual control when desired.

Since the flanges of wheels and 12 are not positively positioned upon the rails 76, the bed 10 must be centered accurately to insure engagement of each spike 71 as bed 10 travels along the right of way. This is accomplished by a guide unit 120 mounted at the outer edge of each rail 76 at the forward end of bed 10. One unit will be described (see FIGURES 7 and 11).

The guide unit 120 is suspended by two ears 121 fixed to the lower surface of beam 33a. A solid shaft 122 is rotatably mounted by ears 121 and is locked against lateral movement by washers 123. A collar 124 is journaled on shaft 122 and has a depending plate 125 attached to it which is positioned parallel to the rail 76. A gusset 126 is fixed to collar 124 and plate 125 to rigidly support the plate 125. The collar 124 is laterally positioned on shaft 122 by means of pins 127 which extend through both the collar 124 and shaft 122. The edge of plate 125 facing the bend 79 of rail 76 is provided with two ears 128, 129 mounted vertically one above the other. These ears carry a shaft 130 which rotatably journals a roller 131. Roller 131 rolls along the outer edge of head 79.
to thereby position the bed 10 to prevent sideward drifting during travel. A chain 132 is attached between plate 125 and support member 49 of the outer spike pulling assembly 46. This chain lifts the guide unit 120 for fast travel along the tracks between operations. Chain 132 pulls unit 120 upward when assembly 46 is pivoted so as to lie on bed 10.

In traveling from one operating area to another, the spike pulling assemblies 46 are pulled back over shafts 44 and guide units 120 are thereby retracted. Transmission 21 is set in a high speed forward speed to propel bed 10 along rails 76.

When operation is resumed, the assemblies 46 are lowered into contact with rails 76 and the rollers 131 are engaged with outer beads 79 to position the entire mechanism. Transmission 21 is then set at a very slow forward speed. The bed 10 is thus moved between the rails 76 until a spike 71 is contacted by one of the claws 70. This will trigger the automatic switch 105 and one of the pistons 105. Air will be forced into the cylinder 52, moving piston 61 upward. Yoke 64 will then carry lug 56 upward at a high rate of speed to move hammer 54. When the last motion in slot 76 is taken up, the momentum of hammer 54 will suddenly yank shoe 69 and claw 70 to extract the spike 71. This motion will be almost instantaneous, although any stoppage of bed 10 can be accommodated by slippage in belt 25. If manual control is desired switch 120 is opened and the buttons 36–39 must be manually manipulated. This action is desirable should switch plates or other irregular configurations of spikes be encountered.

Holes 133 in shaft 44 laterally position the stub shafts 48 to accommodate various spacings of spikes which might be encountered. Pins 134 inserted through the holes 133 positively space the spike pulling assemblies 46.

Various modifications will present themselves within the scope of this invention, which is not intended to be limited by this disclosure except as defined in the following claims.

Having thus described my invention, I claim:

1. In a mobile rail spike puller for intermittently pulling spikes along a railroad right of way, the combination with a bed supported by a plurality of rail engaging wheels, guide means depending from said bed to the rails adapted to center said bed with respect to the rails and air supply means fixed to said bed; of a lateral bar supported forward of said bed parallel to the forward end of said bed, a support structure pivotally journaled upon said bar and adapted to abut the forward end of said bed in its operative position, air cylinder means mounted on said support structure operatively connected to said air supply means, piston means slidably mounted within said air cylinder means, spike engaging shoe means slidably carried by said support structure adapted to slide along the rail flange, and means operatively connecting said spike engaging shoe means and said piston means whereby the application of pressure from said air supply means to said air cylinder means causes said piston means to lift said spike engaging shoe means from sliding contact with the rail flange.

2. The device as defined in claim 1 wherein control means is included between said air cylinder means and said air supply means and comprises solenoid-controlled valve means adapted to alternately connect said air cylinder means to said air supply means or to an exhaust means, a spring-biased control switch mount between said support structure and the front of said bed wired to said solenoid, a manual control switch wired in parallel with said spring-biased control switch and a second manual switch wired in series with said spring-biased switch to render said spring-biased switch inoperative.

3. In a mobile rail spike puller for intermittently pulling spikes along a railroad right of way; the combination with a wheeled supporting bed adapted to travel along a rail, and means to laterally position said bed with respect to said rail; of a support structure mounted on the bed, means to restrain the lower end of said structure against rearward motion relative to the bed, spike engaging shoe means slidably mounted by said support structure for limited free movement up and down relative to the support structure whereby it is adapted to slide along the rail flange, said shoe means having an open claw at its lower end adapted to be engaged under a spike head overlapping the rail flange during travel of the bed along the rail, and impact power means carried by said support structure operably connected to the shoe means adapted to lift the shoe means after engagement of the shoe means under a spike head.

4. A spike puller as defined in claim 3 wherein said claw comprises an integral horizontal extension of said shoe means, a portion of the lower surface of said claw being contoured complementary to the top surface of the rail flange along which said shoe slides, said claw further including an aperture opening toward the front edge thereof in the intended direction of motion of said bed on the rail, said aperture comprising a ledge adapted to fit beneath the flange of a spike engaged by said claw.

5. A spike puller as defined in claim 3 wherein said impact power means comprises a pneumatic cylinder mounted on said support structure, a piston slidably mounted within said cylinder, a lost motion connection operatively connected between said shoe means and said piston adapted to jar said shoe means upwardly after initial upward movement of said piston within said cylinder, said lost motion connection further providing the limited free movement of said shoe means relative to the rail flange, a source of pressurized air mounted on said bed, and control means operatively connecting said source of pressurized air and the interior of said cylinder at its lower end adapted to selectively supply a charge of pressurized air to the lower end of said cylinder to thereby raise said piston.

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