Feb. 4, 1964 J. B. McWILLIAMS 3,120,195

RAILWAY TRACK SPIKING MACHINE

Filed Oct. 20, 1958 10 Sheets-Sheet 1

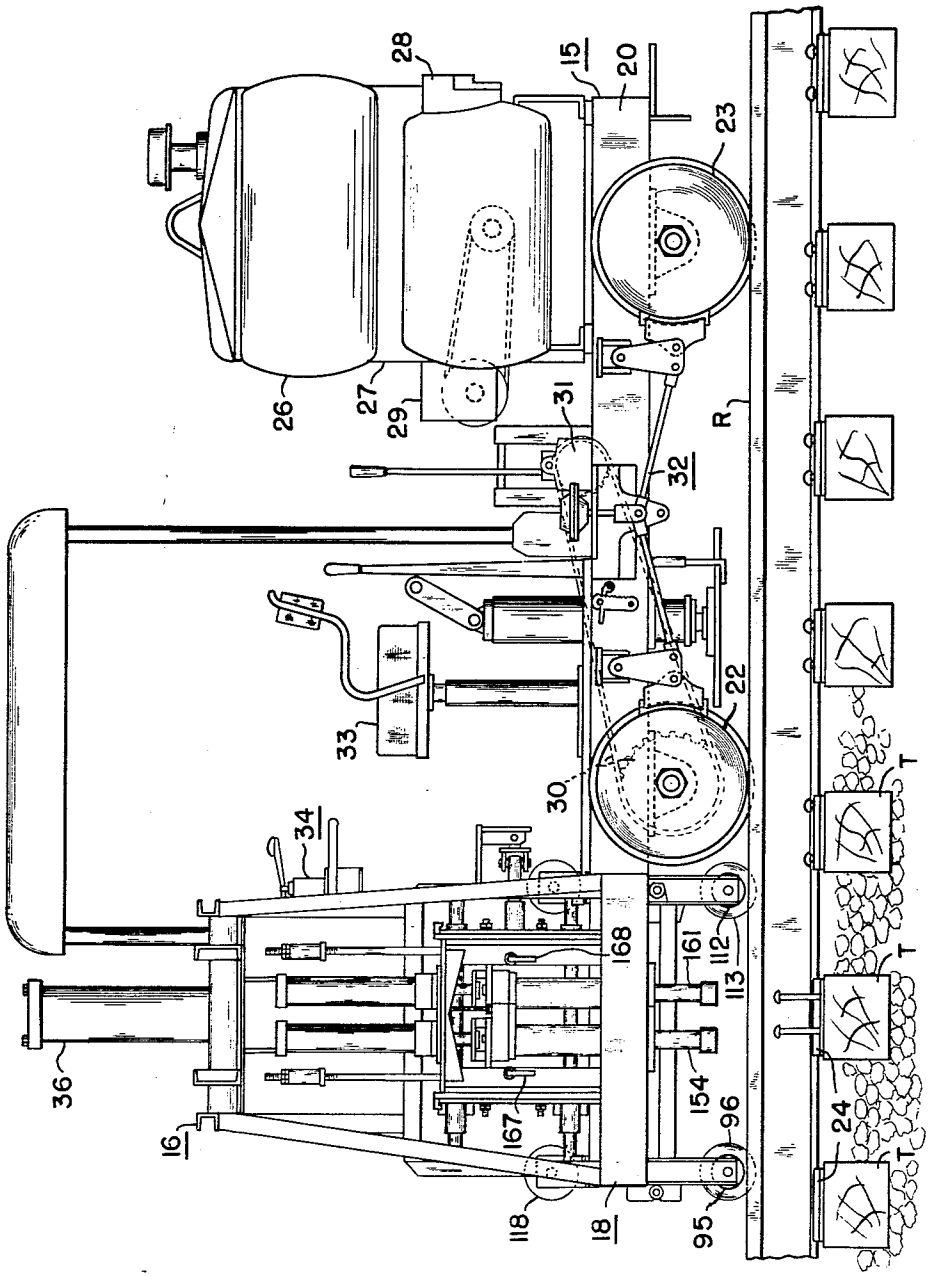


Fig. 1

INVENTOR.
James B. McWilliams
BY Webb, Mackey & Burden
HIS ATTORNEYS

Feb. 4, 1964 J. B. McWILLIAMS 3,120,195

RAILWAY TRACK SPIKING MACHINE

Filed Oct. 20, 1958 10 Sheets-Sheet 2

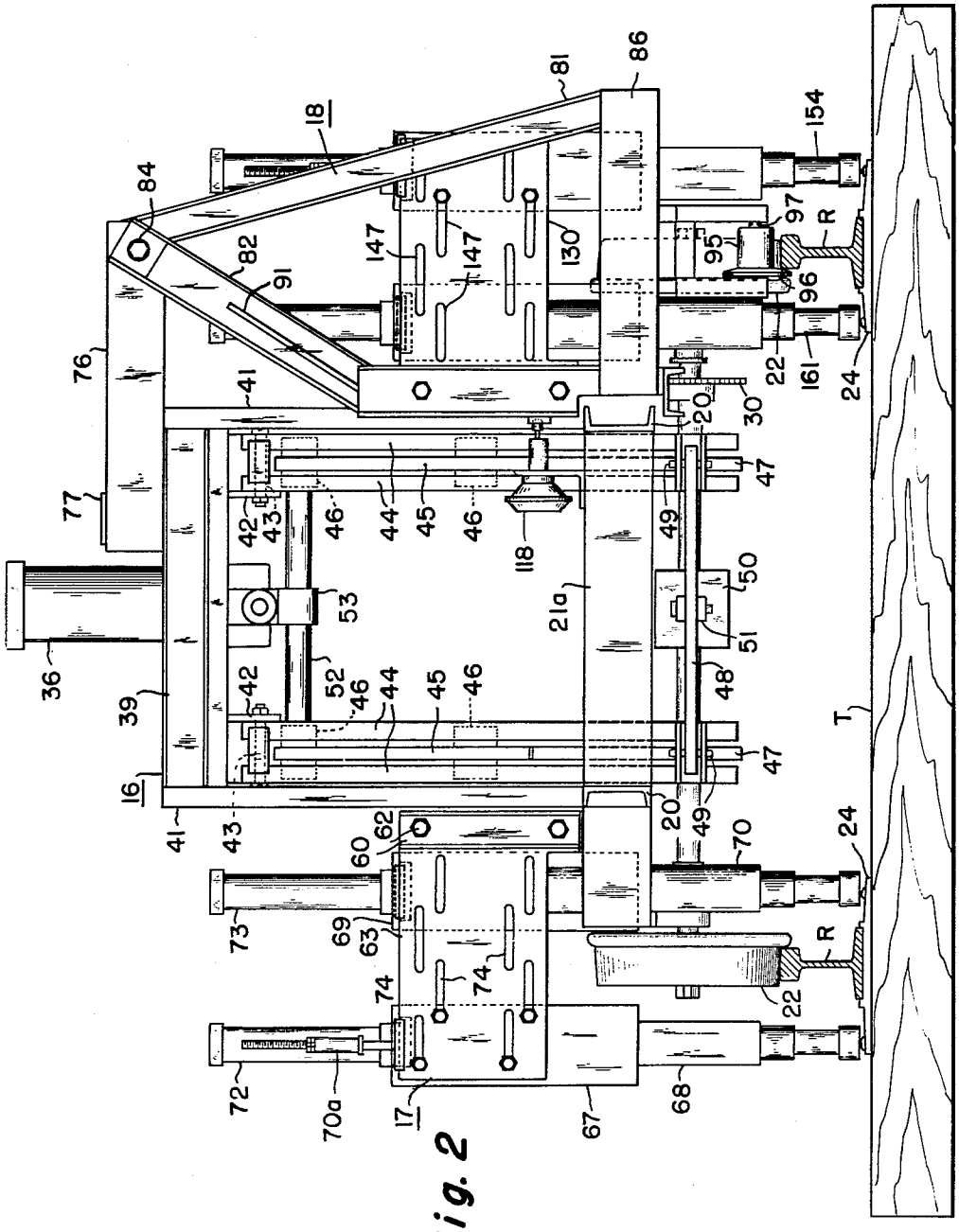


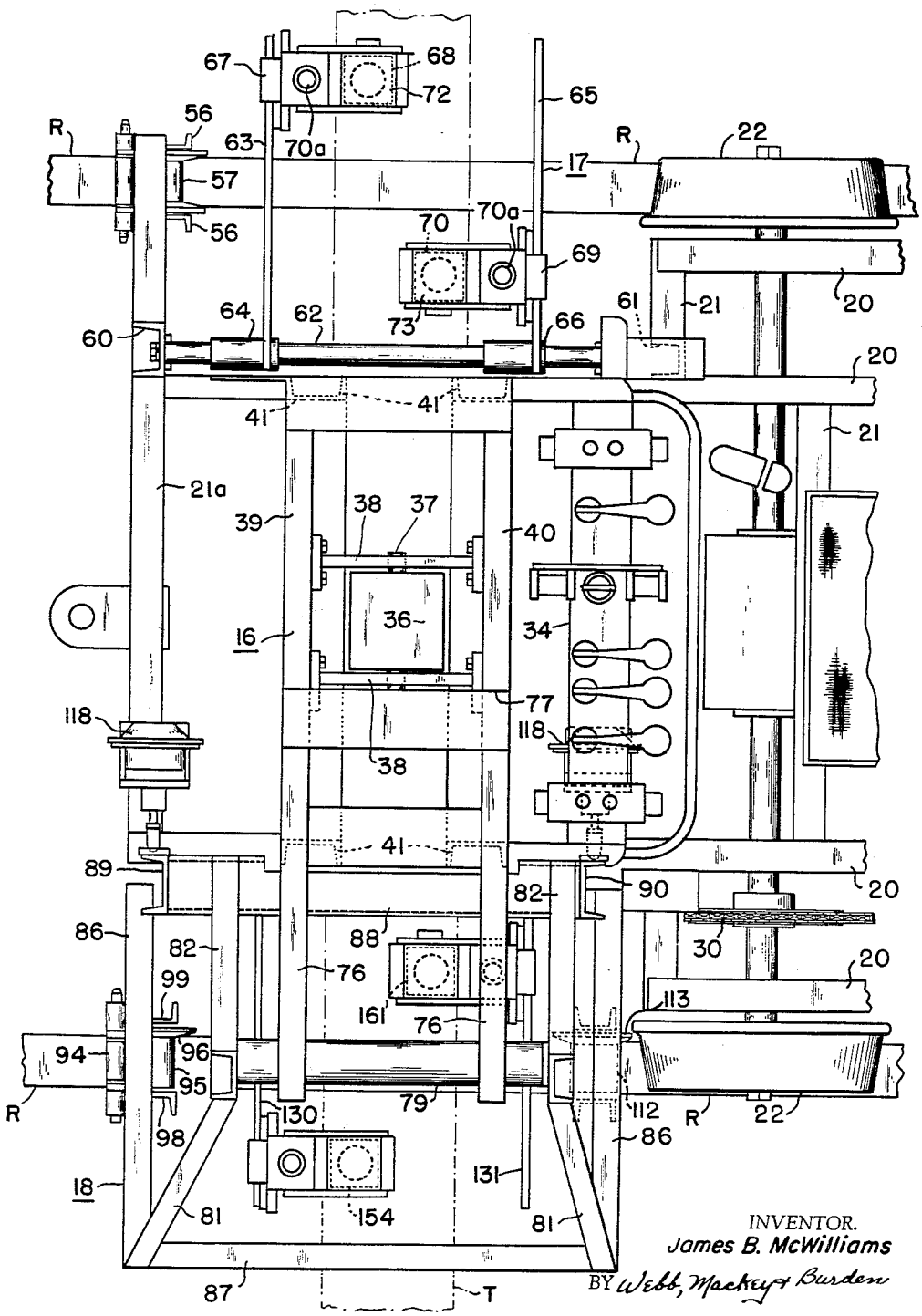
Fig. 2

INVENTOR.
James B. McWilliams
BY Webb, Mackey & Burden
HIS ATTORNEYS

Feb. 4, 1964 J. B. McWILLIAMS 3,120,195

RAILWAY TRACK SPIKING MACHINE

Filed Oct. 20, 1958 10 Sheets-Sheet 3



INVENTOR.
James B. McWilliams
BY Webb, Mackey & Burden
HIS ATTORNEYS

Fig. 3

Feb. 4, 1964 J. B. McWILLIAMS 3,120,195

RAILWAY TRACK SPIKING MACHINE

Filed Oct. 20, 1958 10 Sheets-Sheet 4

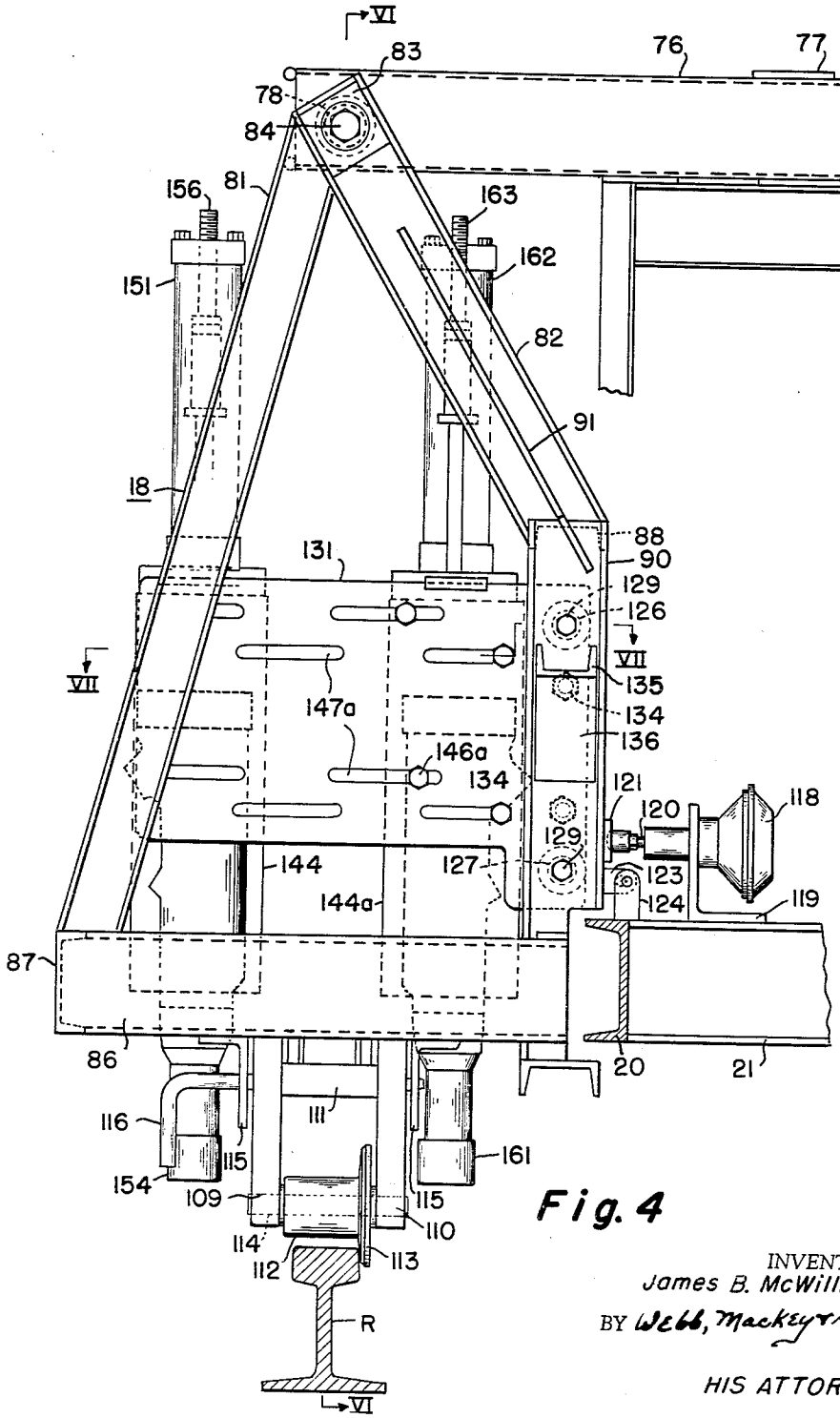


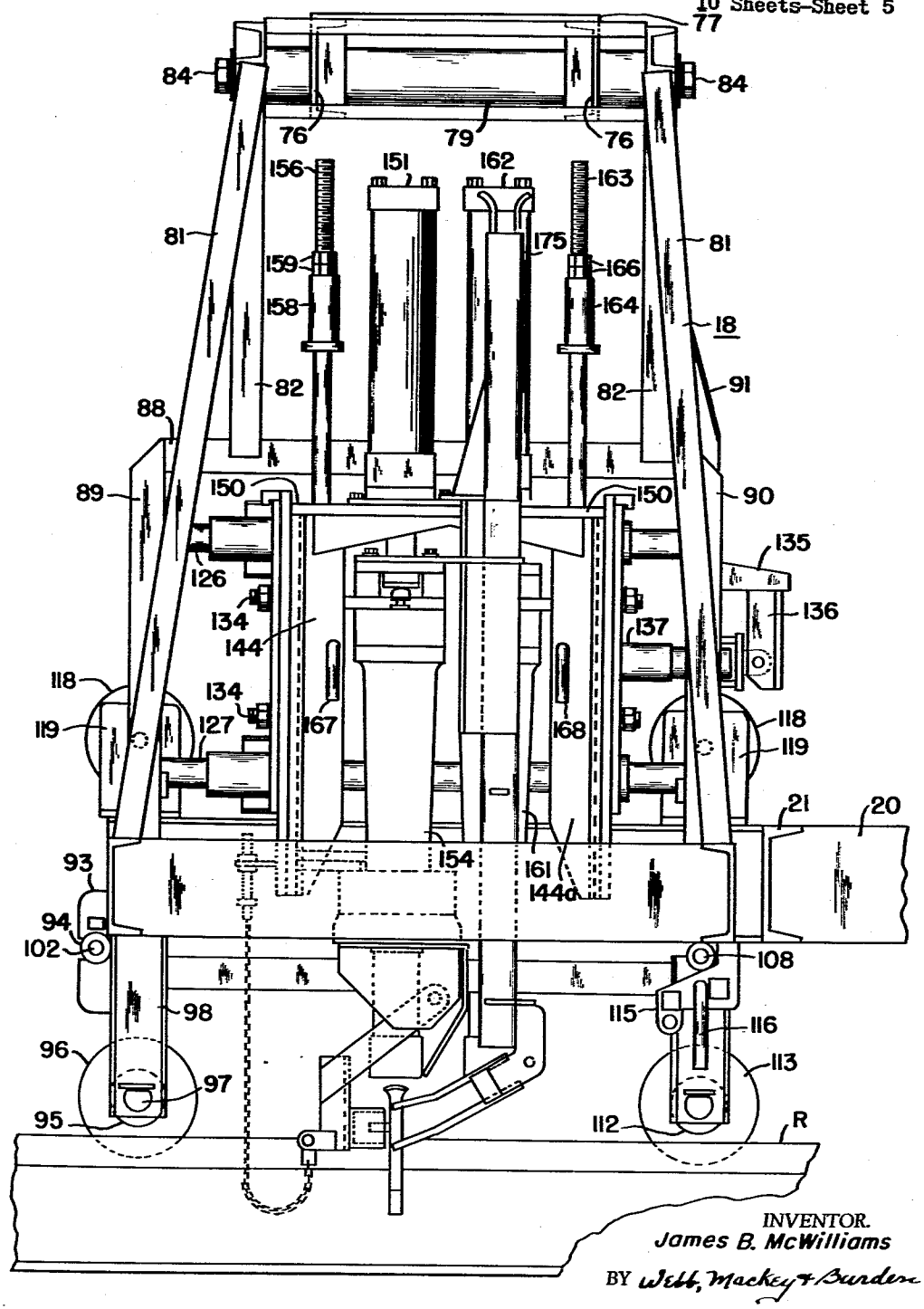
Fig. 4

INVENTOR.
James B. McWilliams
BY Webb, Mackey & Burden
HIS ATTORNEYS

Feb. 4, 1964 J. B. McWILLIAMS 3,120,195

RAILWAY TRACK SPIKING MACHINE

Filed Oct. 20, 1958 10 Sheets-Sheet 5



INVENTOR.
James B. McWilliams
BY Webb, Mackey & Burden
HIS ATTORNEYS

Fig. 5

Feb. 4, 1964 J. B. McWILLIAMS 3,120,195

RAILWAY TRACK SPIKING MACHINE

Filed Oct. 20, 1958 10 Sheets-Sheet 6

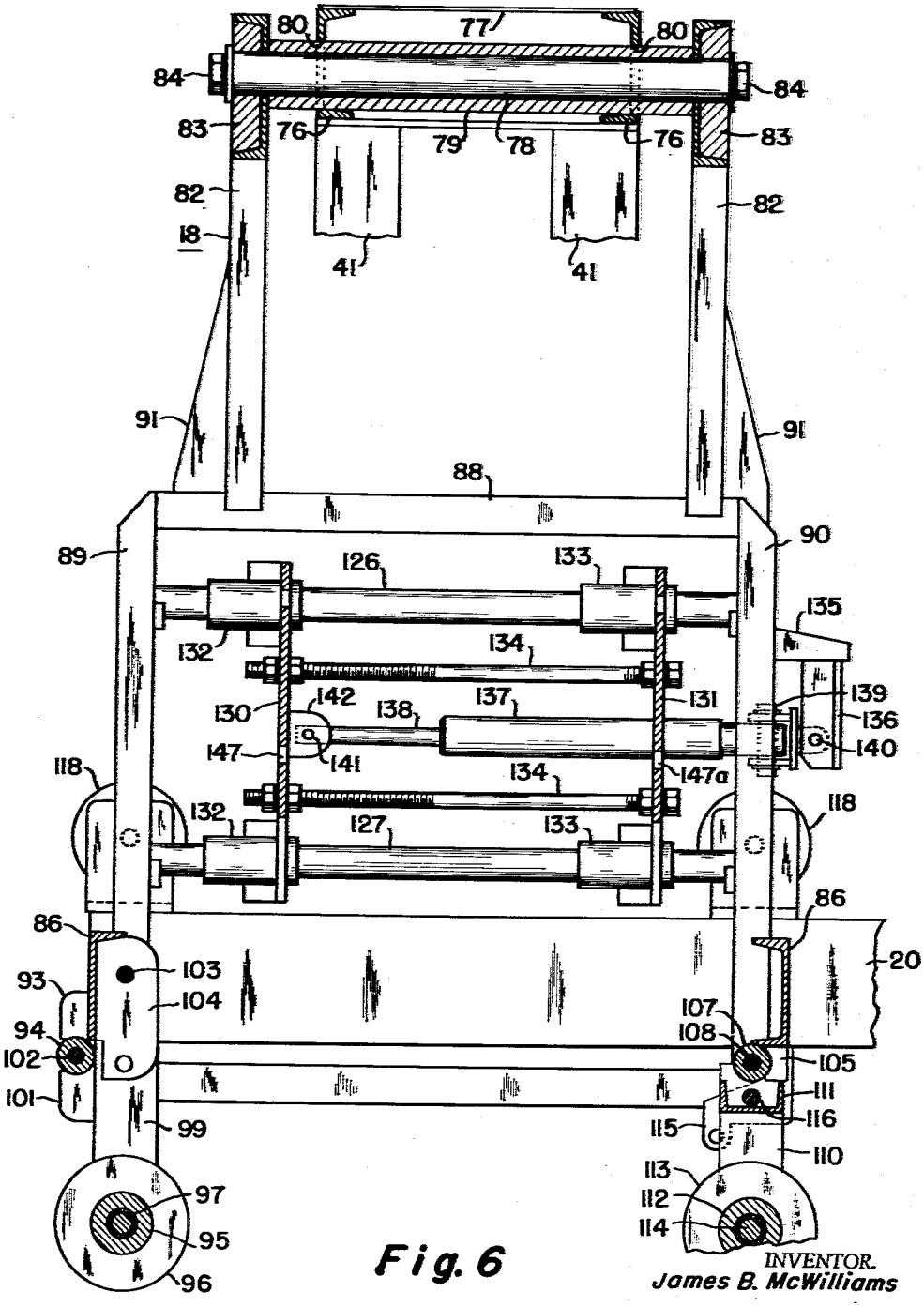


Fig. 6

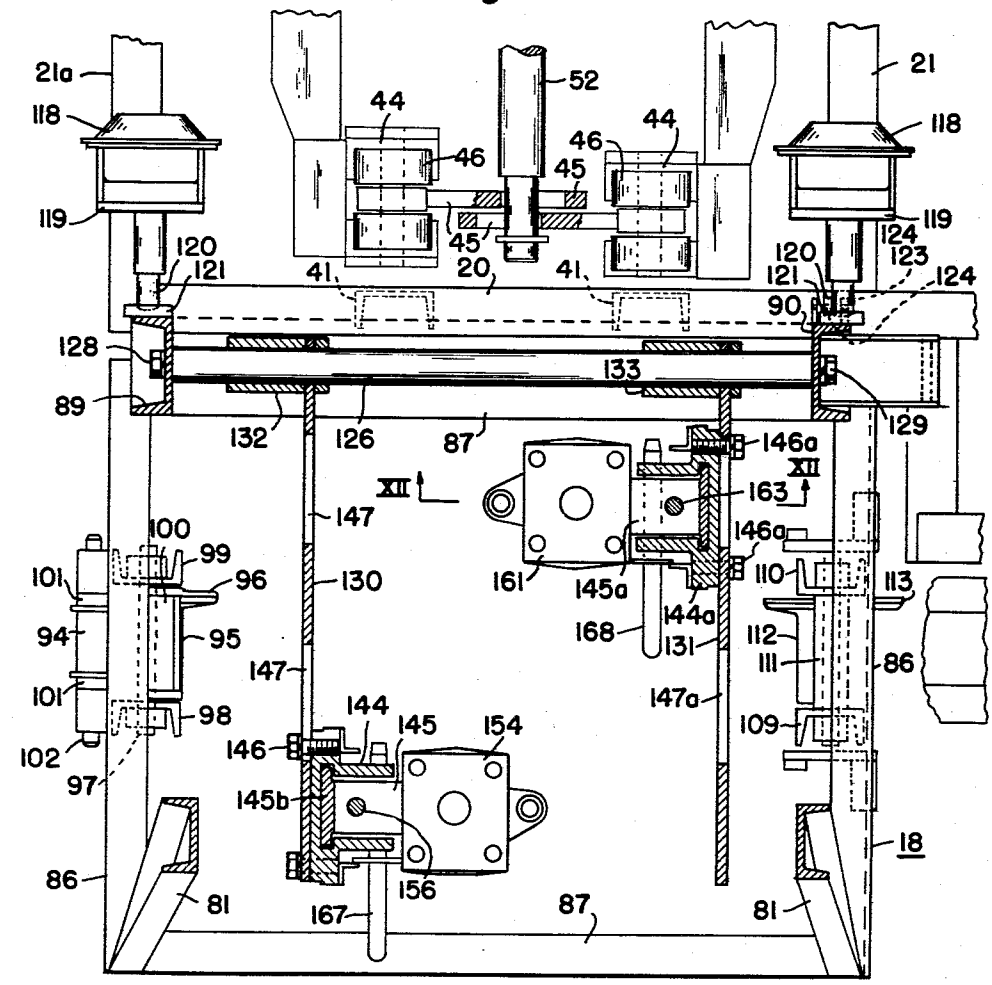
INVENTOR.
James B. McWilliams
BY Webb, Mackey & Burden
HIS ATTORNEYS

Feb. 4, 1964 J. B. McWILLIAMS 3,120,195

RAILWAY TRACK SPIKING MACHINE

Filed Oct. 20, 1958 10 Sheets-Sheet 7

Fig. 7



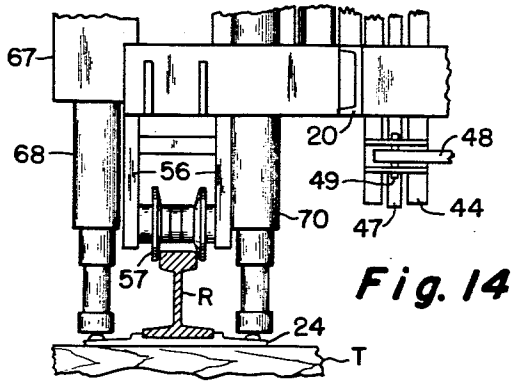


Fig. 14

INVENTOR.
James B. McWilliams
BY Webb, Mackey & Burden
HIS ATTORNEYS

Feb. 4, 1964 J. B. McWILLIAMS 3,120,195

RAILWAY TRACK SPIKING MACHINE

Filed Oct. 20, 1958 10 Sheets-Sheet 8

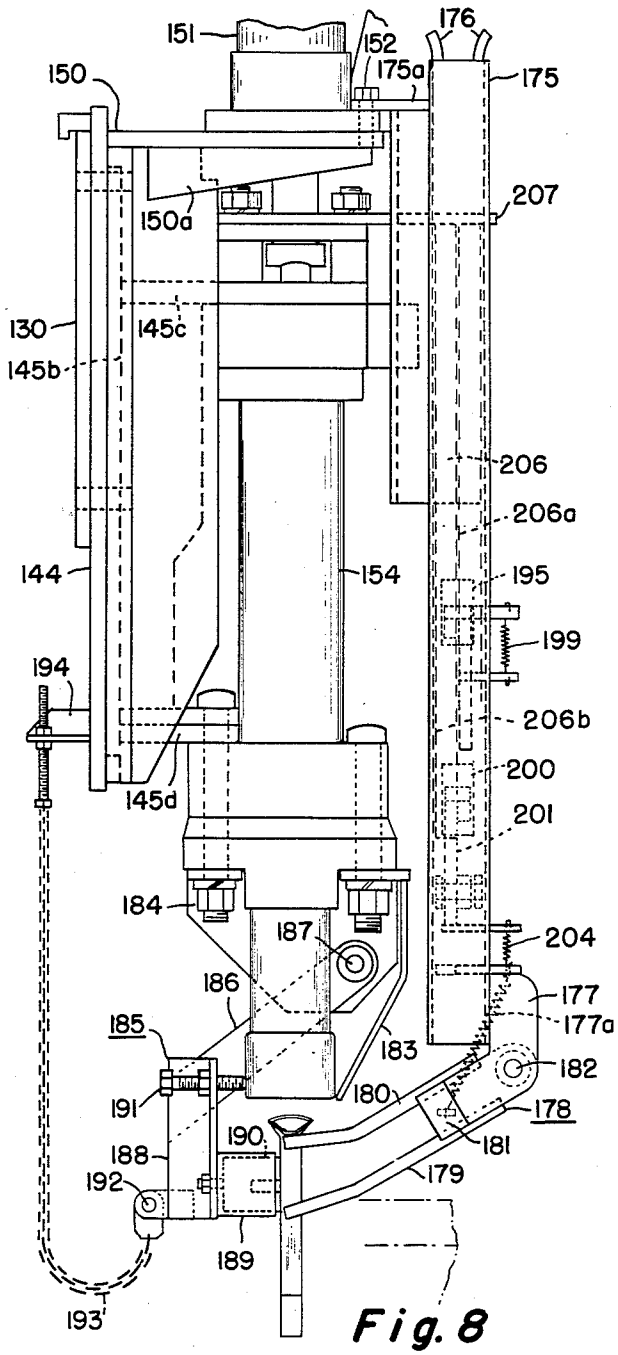
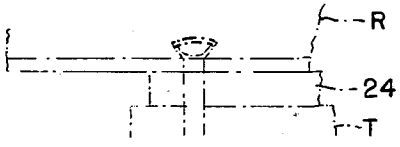


Fig. 8



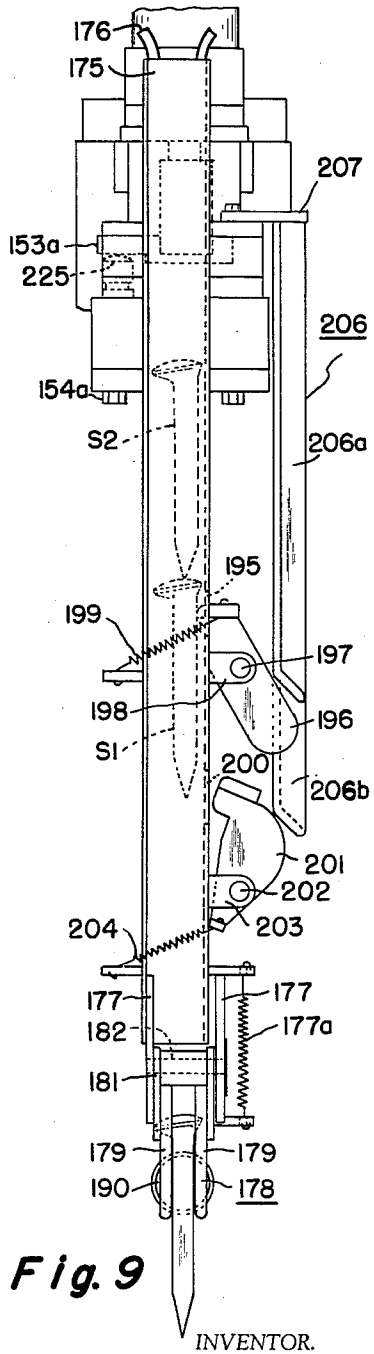


Fig. 9

INVENTOR.
James B. McWilliams
BY Webb, Mackey & Burden
HIS ATTORNEYS

Feb. 4, 1964 J. B. McWILLIAMS 3,120,195

RAILWAY TRACK SPIKING MACHINE

Filed Oct. 20, 1958 10 Sheets-Sheet 9

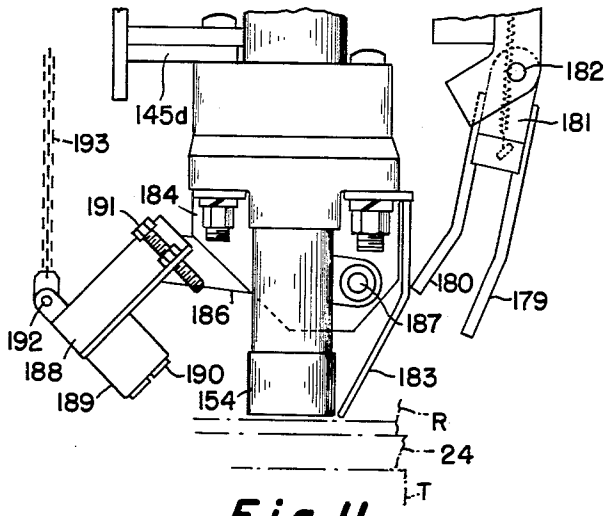


Fig. 11

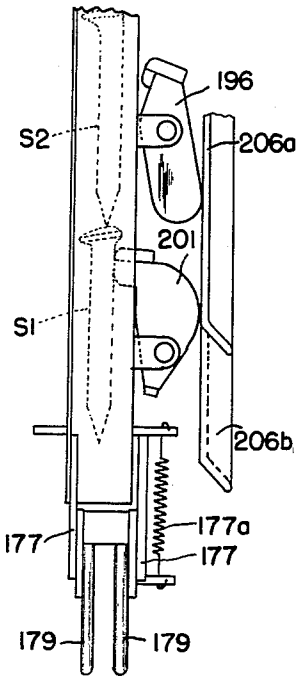


Fig. 10

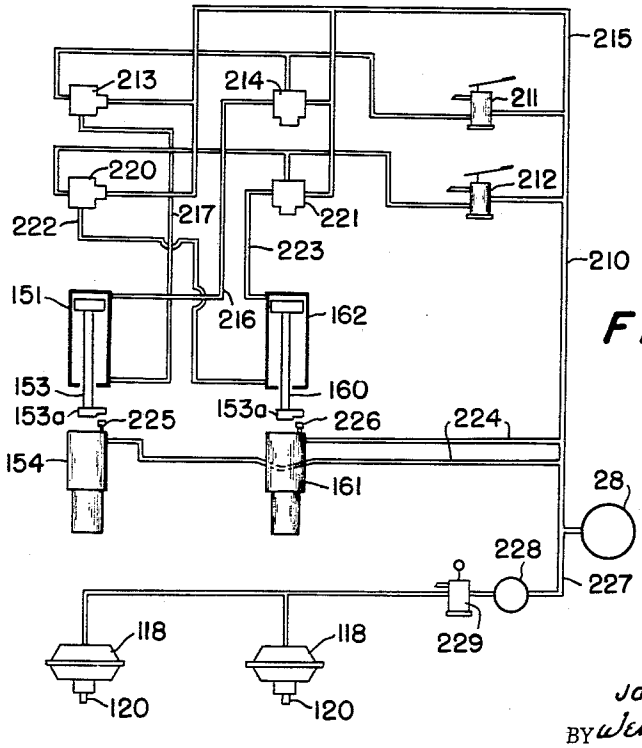


Fig. 13

INVENTOR.
James B. McWilliams
BY Webb, Mackey & Burden

HIS ATTORNEYS

Feb. 4, 1964 J. B. McWILLIAMS 3,120,195

RAILWAY TRACK SPIKING MACHINE

Filed Oct. 20, 1958 10 Sheets-Sheet 10

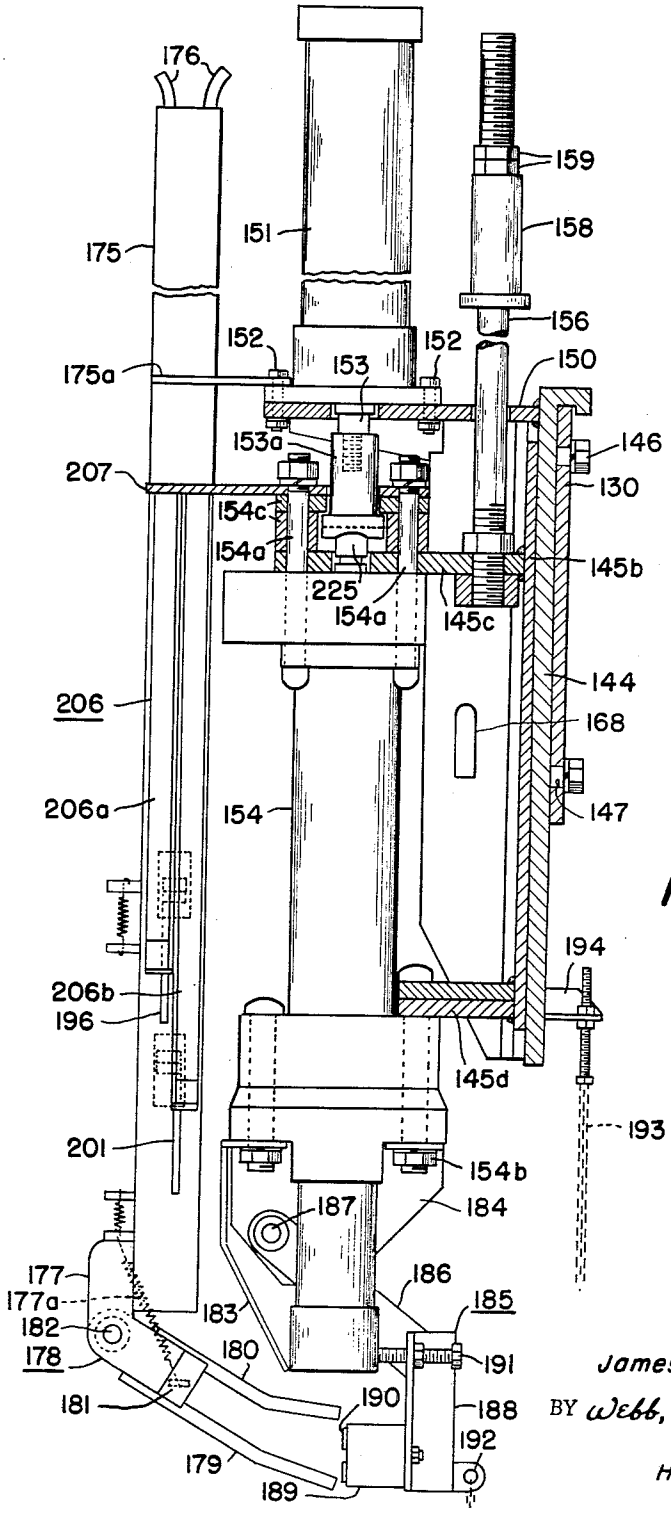


Fig. 12

INVENTOR.
James B. McWilliams
BY Webb, Mackey & Burden
HIS ATTORNEYS

United States Patent Office 3,120,195 Patented Feb. 4, 1964

3,120,195

RAILWAY TRACK SPIKING MACHINE

James B. McWilliams, Pittsburgh, Pa., assignor to Railway Maintenance Corporation, Pittsburgh, Pa., a corporation of Pennsylvania

Filed Oct. 20, 1958, Ser. No. 768,453
4 Claims. (Cl. 104—17)

This invention relates to a railway track spiking machine and, specifically, to a machine which operates to raise ties into contact with the bases of rails and drives spikes into tie plates and ties underlying the rails. This invention is an improvement on the machine disclosed in application Serial No. 555,496, filed December 27, 1955, now Patent No. 2,925,048, which includes a truck adapted to run on rails, a carriage supported by and located at each side of the truck and adjustable fore and aft of the truck, and a plurality of vertically movable power driven hammers supported by each of the carriages. This prior machine is efficient in driving spikes so long as the gauge of the track does not vary greatly. If such gauge variations do occur the spikes cannot be mechanically fed to the holes in the tie plates and ties and thus must be properly placed by hand; and the power driven hammers cannot be properly positioned over the spikes to be driven because the carriages supporting the hammers cannot move transversely of the track. It is desirable, however, to automatically and mechanically feed the spikes to a position directly below the hammers to accurately drive the spikes into holes in the tie plates. A reduction in labor costs is thereby effected.

The present invention obviates any difficulties in aligning the hammers properly over the spikes to be driven or in automatically and mechanically feeding the spikes into the holes in the tie plates and ties. The present invention includes a vehicle movable along the track and having hammer supporting carriages on each side of the vehicle; one of the carriages being movable transversely of the vehicle and track, thereby permitting variation of the distance between the hammer supporting carriages and accurate positioning of the spike feeders and hammers over the holes in the tie plates and ties even though the gauge of the track varies.

This invention further includes a spike feeding mechanism affixed to the carriages on each side of the vehicle. The spike feeding mechanism automatically feeds spikes to a position directly below the hammers and the spikes are accurately placed into the holes in the tie plates and ties.

In the accompanying drawings, I have illustrated a present preferred embodiment of my invention in which,

FIGURE 1 is a side elevation of the machine with the hammers in raised position and the spike feeders removed for clarity;

FIGURE 2 is a front elevation of the machine with the hammers in lowered position and the spike feeders and a front carriage wheel removed for clarity;

FIGURE 3 is a plan view of the machine of FIGURE 1 with a portion of the vehicle excluded;

FIGURE 4 is an enlarged rear view of the left hammer carriage and frame with the hammers in raised position and the spike feeders removed for clarity;

FIGURE 5 is an enlarged side view of the left hammer carriage and frame with one spike feeder removed for clarity;

FIGURE 6 is a cross section of the left hammer carriage and frame taken on line VI—VI of FIGURE 4, with parts removed for clarity;

FIGURE 7 is a horizontal cross section of the left hammer carriage and frame taken on line VII—VII of FIGURE 4;

FIGURE 8 is an enlarged side view of the spike feeder and hammer in raised position, with parts removed for clarity;

FIGURE 9 is an enlarged end view of the spike feeder and hammer in raised position;

FIGURE 10 is an enlarged end view of a portion of the spike feeder;

FIGURE 11 is an enlarged side view of the spike feeder and hammer in lowered position;

FIGURE 12 is a vertical cross section view of the spike feeder and hammer taken on line XII—XII of FIGURE 7;

FIGURE 13 is a schematic of the pressure system of the machine; and

FIGURE 14 is a front elevation of a portion of the machine showing the front carriage wheel.

Briefly, the present invention consists of a vehicle **15** adapted to move along rails, having an upstanding frame **16** which supports tie nippers, a hammer carriage **17** affixed to the right side of the frame, and a second carriage **18** swingably mounted at the left side of the frame. The carriages **17** and **18** support power driven spiking hammers and spike feeders.

Referring more particularly to the accompanying drawings, the vehicle **15** has a rectangular frame including longitudinally extending, transversely spaced channels **20** and transverse channels **21** rigidly interconnecting channels **20**. The vehicle is mounted on front wheels **22** and rear wheels **23** adapted to run on rails R of a previously laid portion of track. The rails rest on tie plates **24** supported by ties T and ballast in the conventional manner.

The rear of the vehicle supports a fuel tank **26**, an air compressor **27**, and a compressed air storage tank **28**. A hydraulic pump **29** pressurizes hydraulic fluid for use by parts of the vehicle to be described hereinafter. These structures are of conventional design and operation.

The front wheels **22** of the vehicle are driven in a conventional manner by a chain and sprocket drive **30** operated by a reversible motor and transmission **31**.

Any well-known braking mechanism **32**, such as shown in FIGURE 1, is provided for the vehicle. Preferably, the brake shoes directly contact the wheels **22** and **23** and are pneumatically operated.

An operator's seat **33** is provided at a forward point on the vehicle convenient for observation of the spiking operation by the operator. A control desk **34** is within easy reach of the seated operator.

The centermost pair of channels **20** extend beyond the front wheels **22** of the vehicle such that the channels overhang the front of the vehicle and are interconnected by a front cross channel **21***a*. An upstanding frame **16** is rigidly affixed to the channels **20** in the front extremity of the vehicle. The upstanding frame **16** supports tie nippers including tong means for grasping a tie, raising the tie against the bases of the rails and holding the tie stationary while spikes are being driven. The tie nippers and frame are described in the aforementioned application, Serial No. 555,496, now Patent No. 2,925,048, but for clarity, will be briefly described herein.

An air cylinder **36** is centrally located transversely of the vehicle and frame **16** and pivotally mounted adjacent its lower end on transverse pivots **37** mounted in longitudinally extending beams **38**. The beams **38** are supported by spaced front and rear cross beams **39** and **40**, respectively, from four vertical channels **41** which at their lower ends are rigidly secured to the longitudinally extending channels **20**. The beams **38**, **39** and **40** provide an upper platform on which the cylinder **36** is pivotally supported.

The front and rear cross beams **39** and **40**, respectively, in the upper platform each support two pairs of spaced front lugs **42** and rear lugs not shown. The front and rear lugs are located at the corners of frame **16** and each

pair carries a pivot 43 between the lugs slightly below the upper platform. Each of the pivots 43 carries a pair of depending confronting channel-shaped guide rails 44, two pairs of which are adapted to swing about a transversely extending front axis and two pairs of which are adapted to swing about a transversely extending rear axis. A bell crank, indicated generally by reference numeral 45, is located between each pair of guide rails 44. Each bell crank 45 has a vertically extending leg and a horizontally extending leg which are received by and move in a corresponding pair of guide rails 44. Each vertical leg of the bell crank 45 carries a set of four rollers 46 received and movable in a pair of guide rails 44. The vertical legs of the bell crank also each carry a tong 47 having a claw portion on the lower ends whereby the tong 47 can grasp a tie by insertion of a hook portion of the tong under the tie. The lower ends of front pairs of guide rails 44 are rigidly secured together by a front cross arm 48 which is pivotally connected at each of its ends to the guide rails 44 by pivot pins 49. The front end of a piston rod of an air cylinder 50 is pivotally connected at 51 to the front cross arm 48. The rear of air cylinder 50 is connected to a rear cross arm (not shown) extending between the rear guide rails 44. The retraction of the piston rod into cylinder 50 operates through the cross arm 48 and rear cross arm to move the guide rails 44 and the bell cranks 45 toward each other so that the tongs 47 can grasp a tie located between them. Extension of the piston rod from cylinder 50 opens the tongs.

The horizontal legs of the bell crank 45 extend toward each other and overlap and are provided with openings which receive the ends of a transversely extending pin 52. The pin 52 is supported in a U-shaped bracket 53 which is pivotally connected to the lower end of a piston rod extending downwardly from cylinder 36. Raising and lowering of the piston rod of cylinder 36 moves the bell cranks 45 upwardly and downwardly in the guide rails 44 to bring the tongs 47 into inoperative raised position (as shown in FIGURE 2) or to operative lowered position in which they can grasp a tie.

Referring specifically to FIGURES 3 and 14, the front cross channel 21*a* protrudes laterally a short distance beyond the longitudinally extending channel 20 on the right side of the vehicle. A pair of downwardly extending channels 56 are fixed to the extreme right-hand end of the front cross channel 21*a*. The channels 56 are spaced apart to straddle the right rail R. Rotatably mounted between the channels 56 is a wheel 57 which has peripheral flanges straddling the rail R. The wheel 57 and channels 56 are swingably mounted on channel 21*a* so that the wheel and channels may be swung upward out of contact with the rail when not in use. The wheel 57 and channels 56 are normally not included on the machine since in most spiking operations, they are not necessary to maintain the carriages centered over the rail.

The carriage 17 on the right side of the vehicle is constructed substantially similar to the carriage 18 on the left side of the vehicle with the exception that the left carriage is swingably mounted on the vehicle such that it can move transversely of the vehicle while the right carriage 17 cannot move transversely of the vehicle. Consequently, the right carriage 17 will be only briefly described herein, it being understood that its construction is similar to the left carriage 18.

A channel 60 is affixed to and extends vertically upward from the front cross channel 21*a* a short distance to the right of the upstanding channels 41, in a manner shown in FIGURE 3. A second channel 61 is affixed to and extends upwardly from the cross channel 21 which is immediately forward of the front axle of the vehicle. The channels 60 and 61 support opposite ends of a lower, longitudinally extending rod (not shown) for slidably mounting a hammer carriage, indicated generally by the reference numeral 17, at the right side of the vehicle. An upper rod 62 is mounted at its ends to channels 60 and 61 in the same manner as the lower rod and extends parallel to and in the same vertical plane with the lower rod. The rear of a hydraulic cylinder (not shown) is affixed to the channel 61 equally spaced between the lower rod and the upper rod 62 and its piston rod is affixed to a vertically disposed front plate 63 which carries a pair of sleeve bearings 64 received on the lower rod and the upper rod 62. A rear plate 65 is vertically disposed parallel to plate 63 and carries a pair of sleeve bearings 66 which likewise slidably receive the lower rod and the upper rod 62. The plates 63 and 65 are maintained in spaced relationship by a threaded screw means (not shown). As the hydraulic cylinder interposed between the lower rod and the upper rod 62 is activated, the plates 63 and 65 are moved fore or aft of the vehicle. The front plate 63 carries a vertically disposed trackway or guide 67 wherein a mounting for a hammer 68 is slidably received. The rear plate 65 carries a vertically disposed trackway 69, similar to trackway 67, wherein a mounting for a hammer 70 is slidably received. The hammers 68 and 70 are moved vertically with respect to the vehicle by cylinders 72 and 73 respectively and the downward movement of the hammers is arrested by stops 70*a*. The construction and operation of the hammer carriages will be more completely described hereinafter with respect to the left-hand carriage 18 of the vehicle. It being understood that the hammers in both carriages 17 and 18 are movable vertically and longitudinally in substantially the same manner.

Each of the plates 63 and 65 have transversely extending slots to which the trackways 67 and 69 are bolted. These slots 74 permit adjustment of the trackways 67 and 69 inwardly and outwardly with relation to the vertical plane of the rail R to bring the hammers 68 and 70 into proper spaced relationship with the rail. The manner of use of slots 74 will be described hereinafter with respect to the left-hand carriage 18, it being understood that carriages 17 and 18 are similar in this respect.

A pair of spaced channels 76 are welded to the top of channels 39 and 40 and extend transversely of the vehicle in a cantilever-like manner. A reinforcing plate 77 is welded transversely across the top of channels 76. A hammer frame and carriage 18 is swingably mounted on a pin 78 enclosed within a sleeve 79 passing through holes 80 in the channels 76. The upper end of hammer frame 18 consists of an outer pair of spaced channels 81 extending downwardly and angularly outward from the vehicle and an inner pair of spaced channels 82 extending downwardly and angularly inward of the vehicle. Each channel 81 is welded in angular relationship to a channel 82 at their upper ends and a plate 83 is welded within the channel portion of channel 82. Each pair of channels 81, 82 is pivotally mounted on opposite ends of pin 78 which passes longitudinally through channels 82 and plates 83. Pin 78 is locked in position by screw means 84. The pairs of channels 81 and 82 are mounted on pin 78 outside channels 76.

The bottom of frame 18 includes a horizontal rectangular structure formed by transversely extending longitudinally spaced channels 86 and longitudinally extending transversely spaced channels 87 which are maintained in spaced relationship and rigidly welded to each other at their corners. Channels 82 extend inwardly downward from pin 78 to a horizontal longitudinally extending channel 88 to which they are welded. Channel 88 is welded at its longitudinal ends to a pair of spaced channels 89 and 90 which extend vertically downward and are welded to channel 86 on the inside and at the corners of the bottom rectangular structure of frame 18. The frame 18 is braced by gusset plates 91 extending between channels 82, 88 and 90 and between channels 82, 88 and 89. Channels 81 extend downwardly from pin 78 and their lower ends are welded to the jointure of channels

86 and 87 at the outside corners of the rectangular bottom structure of frame 18.

A pair of ears 93 is welded to the front of channel 86 and has a sleeve 94 welded to its lower ends. A wheel 95 having a single flange 96, positionable on the gauge side of the rail, is rotatably mounted on axle 97 between spaced channels 98 and 99, which are maintained in spaced relationship by plate 100 welded therebetween. A pair of spaced plates 101 are welded to the inside faces of channels 98 and 99 and contain an opening through which a pin 102 passes. The plates 101 are positioned on each side of the sleeve 94 through which the pin 102 also passes.

The wheel 95, channels 98 and 99, and plates 101 are thereby swingable upwardly and forwardly of the frame 18 to move the wheel 95 out of contact with the rail R. The wheel 95 may be swung downwardly to the position shown in FIGURES 4, 5 and 6 and locked in this position by a pin 103 which passes through aligned openings in plates 104 welded to the inside face of channel 86 and through openings in channels 98 and 99. The wheel 95 and channels 98 and 99 may also be locked in an upward position when not in use by passing pin 103 through second lower openings in plates 104 which are aligned with the openings in channels 98 and 99.

A pair of spaced ears 105 are welded to the lower side of the rear channel 86 of the frame 18. A sleeve 107 is welded to the tabs and a pin 108 passes transversely through the sleeve. A pair of channels 109 and 110 are maintained in spaced relationship by a channel 111 welded therebetween and the pin 108 passes through openings in the upper end of the channels 109 and 110. A wheel 112, having a flange 113 located on the gauge side of the rail is rotatably mounted between the lower ends of channels 109 and 110 by an axle 114. Thus, the channels 109, 110, 111 and wheel 112 are pivotally mounted on pin 108 and may be swung upwardly until the wheel 112 is out of contact with the rail R. A pair of downwardly directed angles 115 are welded to the underside of channel 86 and immediately outside the channels 109 and 110. The angles 115 and the channels 109 and 110 contain aligned openings through which a removable pin 116 passes which thereby locks the wheel 112 in downward position as shown in FIGURES 4, 5 and 6. The lower ends of angles 115 contain a second pair of aligned holes through which pin 116 passes to maintain wheel 112 in an upward position when not in use.

It has been found in practice that under certain operating conditions both wheels 95 and 112 are not necessary and one wheel may be eliminated from the machine. The purpose and function of wheels 95 and 112 will be explained hereinafter.

A pair of spaced pneumatically-operated diaphragm pressure mechanisms 118 are rigidly affixed to upstanding angles 119 which are welded to cross channels 21 of the frame. The pressure mechanisms 118 are of well-known construction and include a diaphragm which moves a rod 120 outwardly and inwardly of the mechanisms 118 upon the application and release respectively of the pressure on one side of the diaphragm. The rods 120 of the pressure mechanisms 118 extend transversely of the vehicle and the outer end of the rods contact plates 121 which are welded to the upstanding channels 89 and 90. The mechanisms 118 are supplied with pressurized air and upon application of pressure to the right-hand side of the diaphragm, as viewed in FIGURE 4, of the pressure mechanism 118, the rod 120 moves in the left-hand direction and exerts a transverse pressure on the frame 18 through the channels 89 and 90. Since the frame 18 is swingably mounted on pin 78, upon actuation of rods 120 transversely of the vehicle, the flanges 96 and/or 113 of wheels 95 and 112 are moved into contact with the gauge side of the rail R. This operation of the pressure mechanisms 118 accurately aligns the spiking hammers which are affixed to frame 18 directly over the holes in the tie plates into which the spikes are to be driven; and exerts a force against the entire frame of the vehicle to cause the flange of right wheel 22 to engage the gauge side of the right rail R. In some instances, it is necessary to move the vehicle forward several feet while activating pressure mechanisms 118 to insure that the flange on right wheel 22 properly engages the right rail R. The spiking hammers on frame 17 are thereby accurately centered over right rail R. The above described operation does not require the use of wheel 57, but in some operations, it is desirable to use this wheel.

An ear 123 is welded to the rear of channel 90 and a pair of spaced ears 124 are welded to the upper side of channel 20 of the frame. The ears 124 straddle ear 123 and ears 123 and 124 have openings therein through which a pin may pass. When the spiking machine is not in use, the frame 18 is swung inwardly until the opening in ear 123 is in alignment with the opening in ears 124 so that a pin may be inserted through the openings, thereby avoiding outward swinging motion of the frame 18.

An upper rod 126 and a lower rod 127 extend longitudinally of the vehicle and frame 18 and are maintained in spaced relationship and in vertical alignment at their front ends by being affixed with screw means 128 to channel 89 and at their rearward ends by being affixed with screw means 129 to channel 90. Each of the rods 126 and 127 slidably supports a hammer carriage consisting of a front vertically disposed plate 130 and a rear vertically disposed plate 131. The front plate 130 carries a pair of sleeve bearings 132 received on rods 126 and 127. The rear plate 131 carries a pair of sleeve bearings 133 received on rods 126 and 127. The plates 130 and 131 are maintained in spaced relationship by a pair of longitudinally extending bolts 134, the bolts having clamping nuts threadably received thereon at each of the opposite sides of the two plates. The plates 130 and 131 may be manually adjusted toward or away from each other as the spacing between the holes in the tie plates varies.

A channel 135 is welded to the rear side of channel 90 in horizontal perpendicular relationship thereto. A downwardly directed T-plate 136 is welded to the underside of channel 135. A hydraulic cylinder 137 and piston rod 138 are pivotally mounted to a T-plate 136. The cylinder 137 has a vertical pivot 139 and a transverse pivot 140 which is supported by T-plate 136. The piston rod 138 is pivotally connected at 141 to an ear 142 welded to the rear side of plate 130. Extension or retraction of piston rod 138 in cylinder 137 adjusts the interconnected plates 130 and 131 fore and aft of the vehicle so that the hammers are in direct vertical alignment with the holes in the tie plates into which spikes are to be driven.

The plate 130 carries a U-shaped trackway or guide 144 for a vertically disposed hammer support head 145 which is slidably mounted in the trackway. The trackway 144 is affixed to plate 130 by bolts 146 which pass through slots 147 in the plate. The slots 147 are horizontally disposed to permit horizontal adjustment of the trackway for proper alignment of the hammers over the holes in the tie plates into which the spikes are to be driven. The plate 131 also supports a U-shaped trackway or guide 144*a* in which a hammer support head 145*a* is slidably mounted. The trackway 144*a* is rigidly affixed to plate 131 by bolts 146*a* which pass through slots 147*a* in plate 131. The slots 147*a* are horizontally disposed to permit horizontal adjustment of the trackway as stated above.

The hammer support heads 145 and 145*a* are identical in construction and consist of a vertically disposed flat plate 145*b* slidably disposed in trackway 144, an upper horizontal plate 145*c* welded to the upper end of plate 145*b* and a lower horizontal plate 145*d* welded to the lower end of plate 145*b*. The plates 145*c* and 145*d* are affixed to the hammer.

All of the hammers are mounted and constructed identically, therefore only one will be described herein. A plate **150** is disposed horizontally perpendicular to and welded at its one side to trackway **144**. Plate **150** is affixed to the upper end of trackway **144** and is reinforced by gusset plates **150***a*. Plate **150** supports a vertically positioned pneumatic cylinder **151** which is affixed to plate **150** by bolts **152**. Cylinder **151** is disposed directly above hammer support head **145** and has a downwardly directed piston rod **153** which passes through an opening in plate **150** and has an L-shaped contact plate **153***a* affixed to its lower end.

A conventional pneumatic spiking hammer **154** is mounted directly below cylinder **151**. The hammer is affixed to plate **145***c* by nuts and bolts **154***a* and to plate **145***d* by nut and bolt **154***b*. The hammer is movable vertically as plate **145***b* slides in trackway **144**. A housing is mounted on the upper end of hammer **154** by nuts and bolts **154***a*. The housing consists of a plurality of horizontal U-shaped plates **154***c* which form an enclosure for the contact plate **153***a*. The plate **153***a* has a vertical leg which is affixed to piston rod **153** and a horizontal leg, of greater width than the vertical leg, which is received within the enclosure of plates **154***c*. The uppermost plate **154***c* has an opening of a size only sufficient to permit passage of the vertical leg therethrough but not the horizontal leg. The horizontal leg is enclosed on three sides by the lowermost plate **154***c* and the leg is freely movable vertically relative to this plate and the top of the hammer. The horizontal leg overlies a vertically movable button valve **225** which is built into hammer **154**. As piston rod **153** is actuated downwardly, hammer **154** likewise moves downwardly of its weight. Upon the hammer encountering resistance to its downward movement, plate **153***a* pushes button valve **225** into hammer **154** thereby admitting pressurized air into the hammer chamber to activate the hammer head for driving a spike.

A rod **156** is affixed to and extends upwardly from plate **145***c* of the hammer support head **145** and passes through an opening in plate **150**. A spacer sleeve **158** is rigidly affixed to the upper end of rod **156** by lock nuts **159**. Upon downward movement of the hammer support head **145** and hammer **154**, the lower end of sleeve **158** will contact the upper surface of plate **150** thereby limiting the maximum downward movement of the hammer **154**. A spring may be interposed around rod **156** between plate **150** and sleeve **158** to exert an upward biasing pressure against sleeve **158**; however, in most operations the spring is unnecessary.

The second hammer and actuating mechanism on the left-hand frame and carriage are identical in construction to the apparatus described above; and include a pneumatic cylinder **162** having a downwardly directed piston rod **160** which abuts against the upper end of a spiking hammer **161**. The hammer **161** is affixed to hammer support head **145***a* which is slidably mounted in trackway **144***a* affixed to plate **131**. Upon downward movement of the rod **160**, the hammer **161** and hammer support head **145***a* are moved downwardly until the hammer **161** drives a spike into the hole in the tie plates and tie. The hammer **161** is of conventional construction. A rod **163** is affixed to the hammer support head **145***a* and extends upwardly therefrom passing through an opening in the plate **150**. A spacer sleeve **164** is affixed to the rod by lock nuts **166**. The rod **163** functions in the same manner as the aforedescribed rod **156** in limiting the downward movement of the hammer **161**.

A pin **167** is inserted transversely through aligned openings in the trackway **144** and hammer support head **145** to maintain the hammer **154** in the upward position when not in use. A similar pin **168** passes through aligned openings in the trackway **144***a* and hammer support head **145***a* to maintain hammer **161** in an upward position when not in use.

Mounted in conjunction with each hammer is a spike feeder mechanism. A spike feeder magazine **175** is rigidly affixed to a plate **175***a* which is bolted to plate **150** by bolts **152**. The spike feeder magazine consists of an elongated hollow tube, rectangular in cross-section, disposed vertically such that spikes may be fed into the top of the tube whereby they travel the whole length of the tube and are deposited from the bottom thereof. Preferably, the spike feeder magazine has metal rods **176** disposed in the corners of the tube to insure proper positioning of the spikes in the tube with the protruding head portion of the spike disposed transversely outward of the machine as shown in FIGURE 9. Welded to the side of the lower end of the spike feeder magazine **175** is a pair of downwardly divided brackets **177** to which is pivotally mounted a hinged fork **178**. The hinged fork consists of a pair of lower prongs **179** and a pair of upper prongs **180**. The prongs of each pair are spaced from each other a sufficient distance to permit passage of the head of the spike. The pairs of prongs are welded to a fork plate **181** which is pivotally mounted by pin **182** to bracket **177**. The hinged fork is biased upward by a spring **177***a* connected between the fork and magazine. A spike is deposited from the lower opening in the magazine **175** onto the upper surface of prongs **180** and slides downwardly along prongs **180** to a position directly below hammer **154**, as shown in FIGURE 8. The upper prongs **180** provide a surface along which the spike slides while lower prongs **179** steadies the spike and maintains it in alignment during the downward movement and when contacting magnet **190**. The spike is now in position preparatory to driving the spike.

Affixed to the lower end of hammer **154** is a plate **183** having a downward and inward sloping configuration such that upon downward movement of the hammer, as shown in FIGURE 11, the plate **183** contacts the upper prongs **180** of the hinged fork and pivots the hinged fork away from the downwardly moving hammer. The hinged fork is thus moved away from the path of the downwardly moving hammer and the spike is simultaneously released by prongs **180**.

A plate **184** is affixed to the lower end of hammer **154** and pivotally supports a magnetic spike holder **185**. The magnetic spike holder consists of a pivot arm **186** which is pivotally mounted by pin **187** to the plate **184**; a magnet holding plate **188** affixed to arm **186**; and a magnet shield **189** containing a magnet **190**. The magnet shield **189** is welded to the lower end of plate **188**. A nut and bolt hold the magnet **190** rigidly to plate **188**. The plate **188** threadably receives a screw means **191** which abuts against the hammer to adjust the magnet **190** in proper relationship to the spike. Screw means **191** has lock nuts to maintain the adjustment. The plate **188** is also pivotally connected by pin **192** to a pull-out chain **193** which is adjustably affixed to a plate **194** which is welded to trackway **144**.

Upon downward movement of the hammer **154**, the magnetic spike holder **185** is likewise moved downwardly until the pull-out chain **193** reaches its maximum length and then the magnetic spike holder is swung outwardly from beneath the path of the hammer in the manner shown in FIGURE 11. The spike is thereby released from magnet **190**.

The spike feeder magazine contains an upper opening **195** through which passes the upper end of a trigger **196** which is pivotally mounted by pin **197** to ears **198** welded to the side of the magazine. The trigger **196** is normally pulled inwardly to the position shown in FIGURE 9 by a spring **199** which is affixed at its one end to the upper end of the trigger **196** and at its other end to the magazine **175**.

The spike feeder magazine **175** has a lower opening **200** through which passes a second trigger **201** which is pivotally mounted by a pin **202** to a pair of spaced ears **203** welded to the side of magazine **175**. The trigger

201 is normally pulled to an outward position shown in Figure 9 by a spring 204 which is affixed at its one end to the lower end of trigger 201 and affixed at its other end to the magazine 175.

A trigger actuator plate 206 is rigidly affixed to and extends downwardly from a plate 207 which is movable downwardly with and affixed to the hammer 154 by nuts and bolts 154*a*. The actuator plate 206 has two parallel downwardly extending fingers 206*a* and 206*b*. Trigger 196 is located to the left side of the center line of magazine 175 as viewed in FIGURE 12, and finger 206*a* is affixed to plate 207 such that it can only engage trigger 196 upon downward movement. Trigger 201 is located to the right side of the center line of magazine 175 and finger 206*b* is affixed to plate 207 such that it can only engage trigger 201 upon downward movement. Finger 206*a* is shorter than finger 206*b* so that upon downward movement of actuator plate 206, finger 206*a* contacts trigger 196 simultaneously with finger 206*b* contacting trigger 201 for a purpose to be described hereinafter.

The spikes are manually loaded into the top of spike feeder magazine 175 and will assume the positions shown in FIGURE 9 with the bottom-most spike S_1 in the magazine being held stationary therein by trigger 196, and a second spike being in driving position below the hammer as shown in FIGURE 8. Upon the hammer starting its downward movement, the actuator plate 206 is likewise moved downwardly to bring finger 206*a* into contact with the outer end of trigger 196 and finger 206*b* into contact with the outermost part of trigger 201, as shown in FIGURE 9. The upper end of trigger 196 is thereby pivoted outwardly away from spike S_1 thereby releasing the same. Simultaneously, trigger 201 is moved inwardly thereby causing the inner end of trigger 201 to come into contact with spike S_1 which has dropped in the magazine to a position opposite trigger 201 as shown in FIGURE 10. The fingers of actuator plate 206 maintain the triggers 196 and 201 in the positions shown in FIGURE 10 during the completion of the downward movement of the hammer. The spike S_2 and any spike above it in the magazine have now dropped downwardly until spike S_2 is opposite trigger 196. The hammer continues its downward movement until the spike is driven. The hinged fork 178 and magnetic spike holder 185 are in positions shown in FIGURE 11 at the bottom of the hammer stroke. The hammer then begins its upward movement. The fingers of the actuator plate 206 likewise move upwardly until finger 206*a* releases trigger 196 thereby permitting it to move inwardly into contact with spike S_2; and finger 206*b* releases trigger 201 thereby permitting it to move outwardly out of contact with spike S_1. Spike S_1 falls downwardly and out the bottom of the magazine into contact with prongs 180 of the hinged fork 178. Due to the downward inclination of prongs 180, spike S_1 slides to the left, as viewed in FIGURE 8, until magnet 190 attracts it and maintains the spike in proper driving position below hammer 154. The hinged fork has been moved from its lowermost position, as shown in FIGURE 11, to the position shown in FIGURE 8, by spring 177*a*. Magnetic spike holder 185 likewise has returned to the position shown in FIGURE 8 due to its own weight upon pull up chain 193 being relaxed. The hammer moves to its uppermost position and begins the spike driving cycle over again.

All of the hammers have spike feeder mechanisms as above described mounted to feed spike to the individual hammers.

FIGURE 13 shows a portion of the pressure system of the machine. An air storage tank 28 admits pressurized air through line 210 to hand-operated pilot valves 211 and 212 which are conveniently located on control desk 34. Valves 211 and 212 are conventional valves having exhaust ports. Line 210 also admits pressurized air through line 215 to pilot relay valves 213 and 214. Valve 213 is a normally open pilot relay valve of conventional construction and normally admits pressurized air from line 215 through line 217 to the lower end of hammer lift cylinder 151. Upon actuation of valve 211, pilot relay valve 213 is closed thereby stopping the supply of pressurized air to the lower end of cylinder 151 and exhausting line 217 and the lower end of cylinder 151. Valve 214 is a normally closed pilot relay valve of conventional construction and normally exhausts a line 216 leading from valve 214 to the upper end of cylinder 151. Upon actuation of valve 211, pilot relay valve 214 is opened, thereby closing the exhaust connection between line 216 and the atmosphere, and admits pressurized air from line 215 through line 216 to the upper end of hammer lift cylinder 151. Thus, normally the lower end of cylinder 151 is subjected to pressurized air while the upper end is exhausted to the atmosphere. However, when valve 211 is actuated, the lower end of cylinder 151 is exhausted to the atmosphere and pressurized air admitted to the upper end of cylinder 151. The actuation of valve 211 thereby moves spiking gun 154 downward until its hammer head drives a spike.

Line 210 also admits pressurized air through line 215 to pilot relay valves 220 and 221. Valve 220 is a normally open valve of identical operation and construction to that described above with respect to valve 213. Normally, valve 220 admits pressurized air from line 215 through line 222 to the lower end of hammer lift cylinder 162. Upon actuation of valve 212, pilot valve 220 is closed, thereby stopping the supply of pressurized air to the lower end of cylinder 162 and exhausting line 222 and the lower end of cylinder 162. Valve 221 is a normally closed pilot relay valve of conventional construction identical in function to that disclosed above with reference to valve 214. Valve 221 normally exhausts a line 223 leading from the valve to the upper end of hammer lift cylinder 162. Upon actuation of valve 212, valve 221 is opened, thereby closing the exhaust connection between line 223 and the atmosphere and admitting pressurized air from line 215 through line 223 to the upper end of cylinder 162. Thus, normally the lower end of cylinder 162 is subjected to pressurized air while the upper end is opened to the atmosphere. Upon actuation of valve 212, the lower end of the cylinder is exhausted to the atmosphere and pressurized air admitted to the upper end of cylinder 162, thereby moving spiking gun 161 downward to drive a spike.

Lines 224 admit pressurized air from line 210 to pneumatic spiking hammers 154 and 161. These hammers are actuated by the button valves 225 and 226, respectively, being moved downwardly into the spiking guns.

It is understood that both carriages of the machine are actuated by a valve and cylinder system as above described for operation of the hammer lift cylinders and spiking guns. It is further understood that the motor 31, brakes 32, tie nippers 16, and the cylinders for moving the hammer-carrying carriages fore and aft of the vehicle have appropriate well-known control systems for their actuation.

The left-hand carriage of the vehicle has pressure mechanisms 118 which are supplied pressurized air from air storage tank 28 through a line 227. The pressurized air passes through pressure regulator 228 and hand toggle valve 229. Upon actuation of hand toggle valve 229, the pressure mechanisms 118 are activated to move their respective piston rods 120 into contact with plates 121, thereby swinging the left-hand hammer carriage frame and hammers transversely of the vehicle and bringing the flanges 96 and 113 into contact with the gauge side of the rail R.

Operation

Assuming that the spiking hammers are all in the up position, the pivotally mounted wheels are in the up position and the proper locking pins have been inserted to permit travel of the spiking machine, the operation is as follows: The vehicle is moved under its own power to the

location where it is desired to drive spikes. The locking pin is removed from ears **123** and **124** to permit free transverse movement of the left-hand frame and carriage **18**. Wheels **95** and **112** are dropped to their downward position and locking pins **103** and **116** are inserted through the appropriate openings in the wheel mountings to lock the wheels in lowered position. Pins **167** and **168** are withdrawn from the hammer support heads and trackways to free the spiking hammers for vertical movement. Hand toggle valve **229** is actuated to admit pressurized fluid into the rear of pressure mechanisms **118** thereby moving frame carriage **18** transversely of the vehicle until the flanges of wheels **95** and **112** contact the gauge side of the left-hand rail. The vehicle is now moved forward several feet to bring the flange on right wheel **22** into contact with the gauge side of right rail R; thereby centering the hammers on the right carriage over right rail R. Brakes **32** are applied to maintain the vehicle stationary.

The spiking guns are now adjusted to the spike hole pattern desired by proper manipulation of longitudinal adjustment screw means **134** and transverse adjustment screw means **146** and **146***a*. Spikes are now fed down the four magazines **175** and the triggers **196** and **201** are manipulated until a spike appears in proper position below each of the hammers. During the following operation, spikes are continuously fed into the magazines **175**. The two hammer supporting carriages are moved fore and aft of the carriage by actuation of the carriage moving cylinders such as cylinder **137** until the hammers are directly located over the holes in the tie plates. The operator then actuates valves **211** and **212** which admits pressurized fluid into the tops of the two left hammer lift cylinders. Similar valves are actuated to move the right hammers downward. The hammers thereby move downward and ultimately engage the spike to be driven. Upon the hammers meeting this resistance, the contact plate **153***a* is moved a short additional distance downward by piston rods **153** and **160**, thereby depressing the button valves on the spiking hammers, such as **225** and **226** respectively, which admits pressurized air to the hammers to begin their driving acion against the spikes. At the completion of the spike driving, the hinged fork **178** and magnetic spike holder **185** have been moved to the positions shown in FIGURE 11. The actuator plate **206** has engaged the triggers **196** and **201** to position a spike for release from the bottom of magazine **175**. After the hammers have completed the driving of the spikes, the operator releases valves **211** and **212**, thereby immediately exhausting the upper ends of the hammer lift cylinders and admitting pressurized fluid into the lower ends of the cylinders. The hammers are thereby lifted, actuator plate **206** assumes the position shown in FIGURE 9, and a spike is released from magazine **175** and slides to proper position below the hammers. The machine is then moved to the next spiking position and the cycle repeated.

While I have described a preferred embodiment of my invention herein, it is understood that it may be embodied within the scope of the following claims.

I claim:

1. A railway track spiking machine, comprising a truck having truck wheels adapted to run on a first and a second rail of a track, each of said truck wheels having an integral flange thereon positioned on the gauge side of its rail, a first and a second frame supported by and extending from opposite sides of said truck and located over the rails, a first carriage supported by said first frame and adjustable fore and aft of said first frame, a plurality of power driven hammers rigidly supported by said first carriage, power means for driving said hammers, a second carriage supported by said second frame and adjustable fore and aft of said second frame, a plurality of power driven hammers rigidly supported by said second carriage, power means for driving said hammers, said second frame being pivotally mounted on said truck on a horizontal axis extending longitudinally of the truck so that said second frame is swingable transversely of the rails, gauge means rigidly mounted on said second frame on a level to be engageable with said second rail, and power means mounted on said truck and engageable with said second frame to move said second frame transversely of said rails toward said second rail to bring said gauge means into contact with said second rail and to move said truck transversely of said rails toward said first rail until the integral flange on said truck wheel adjacent said first rail engages the gauge side of said first rail; thereby positioning each of said frames over a rail to properly align said hammers over spike holes in tie-plates.

2. A machine according to claim 1, wherein said gauge means is a wheel rotatable on a shaft.

3. A machine according to claim 1, wherein said gauge means is a wheel rotatable on a shaft and having a peripheral flange adapted to contact the inner side of the adjacent rail.

4. A machine according to claim 1, wherein the power means for moving said second frame transversely of said rails is a pneumatically operated pressure mechanism.

References Cited in the file of this patent

UNITED STATES PATENTS

742,624	Fuller	Oct. 27, 1903
976,513	Smith	Nov. 22, 1910
1,198,575	Polach	Sept. 19, 1916
1,321,909	Hastings	Nov. 18, 1919
1,347,943	Forsyth	July 27, 1920
1,395,703	Ekberg	Nov. 1, 1921
1,448,264	Doak	Mar. 13, 1923
2,018,129	Jackson	Oct. 22, 1935
2,910,010	Godfrey et al.	Oct. 27, 1959
2,925,048	McWilliams et al.	Feb. 16, 1960

OTHER REFERENCES

Otta et al.: German application Serial No. A 21,228, printed October 31, 1956 (Kl. 19*a* 28_{14}), 4 pages spec., 1 sheet drawing.

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,120,195 February 4, 1964

James B. McWilliams

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 3, line 31, for "crank 45" read -- cranks 45 --; column 11, line 12, after "frame" insert -- and --; line 41, for "acion" read -- action --.

Signed and sealed this 30th day of June 1964.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents