July 16, 1957 C. K. JENSCH 2,799,230

RAIL SPIKE DRIVING MACHINE

Filed July 6, 1954 4 Sheets-Sheet 1

Fig. 1

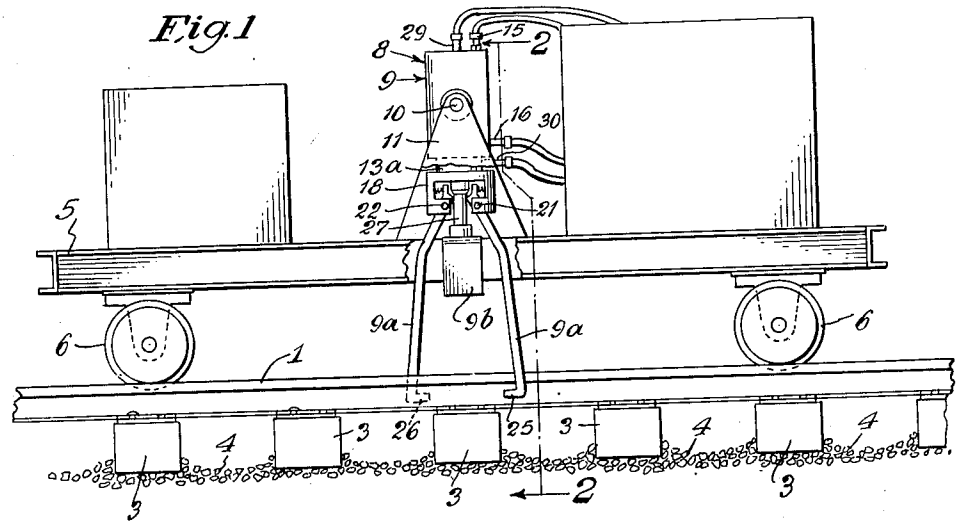


Fig. 8

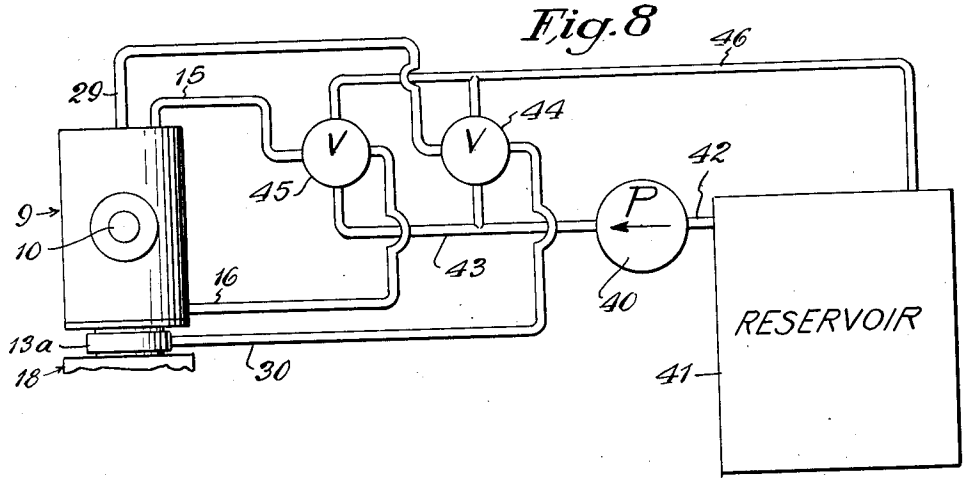
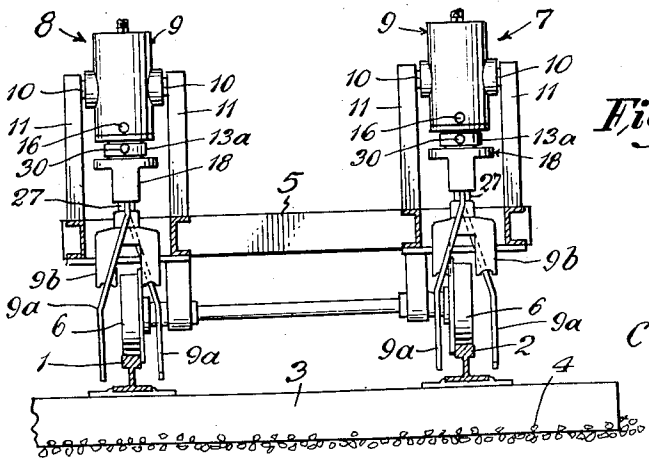


Fig. 2



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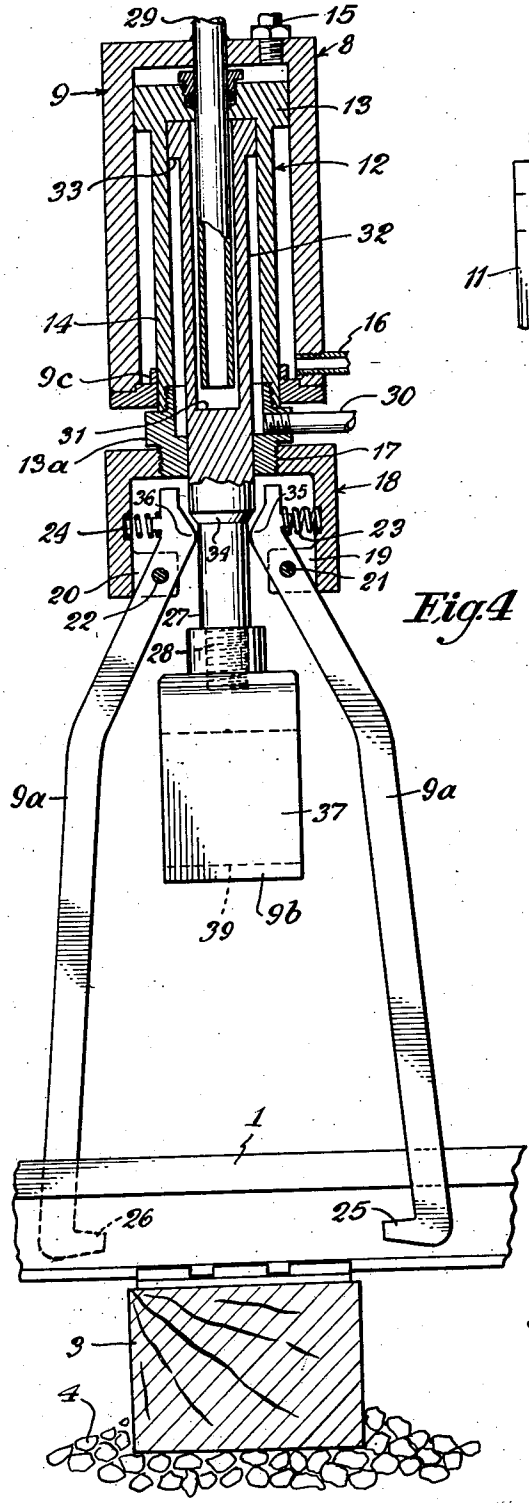


Fig. 4

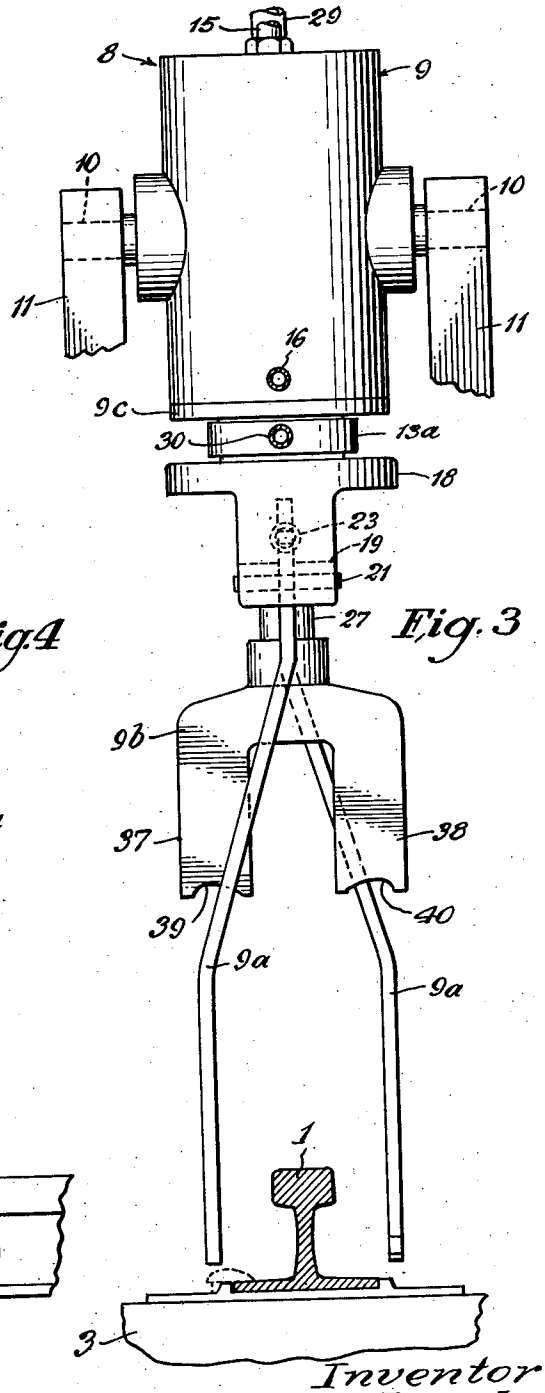


Fig. 3

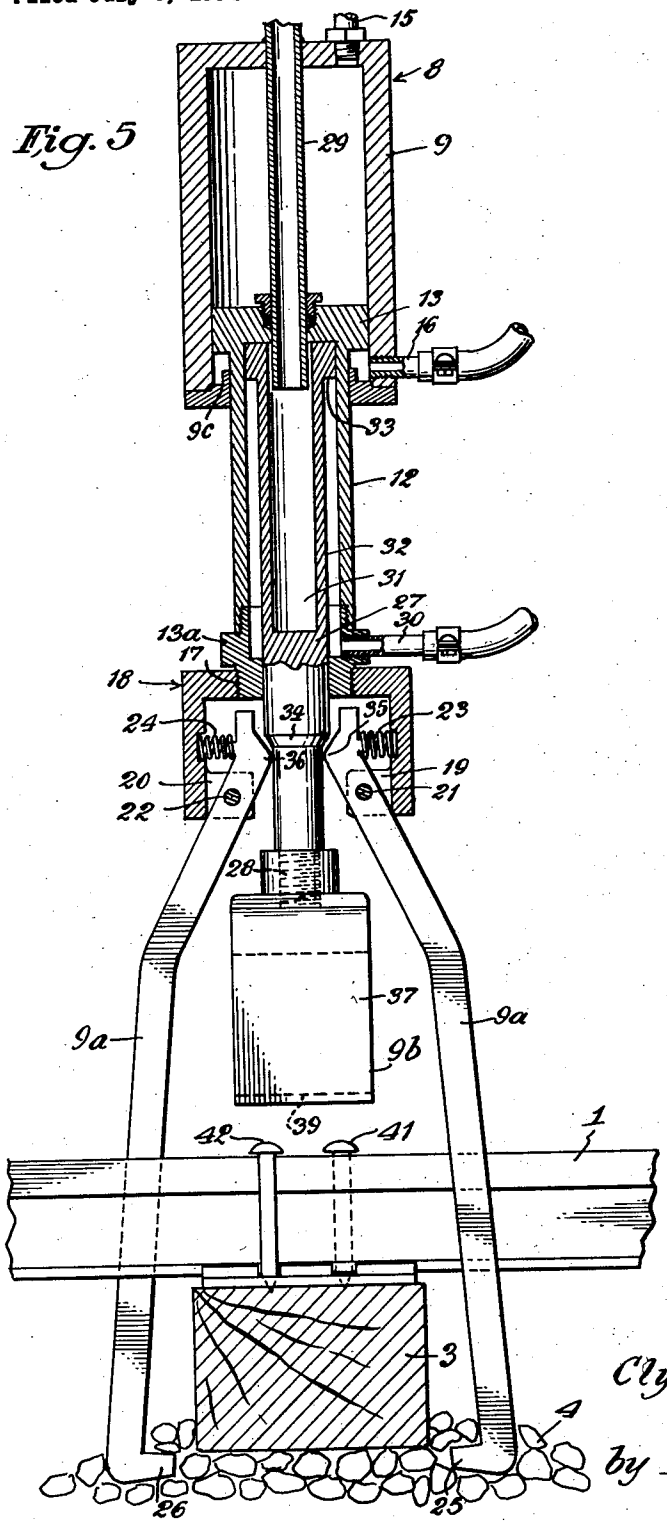
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Fig. 5



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RAIL SPIKE DRIVING MACHINE

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Fig. 9

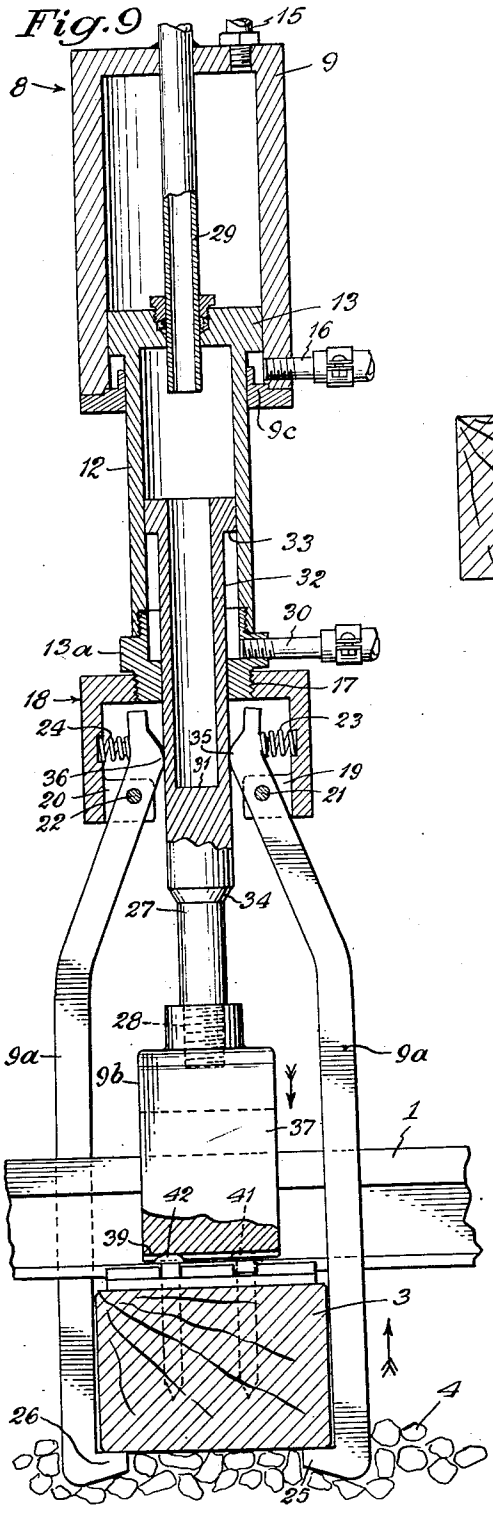


Fig. 6

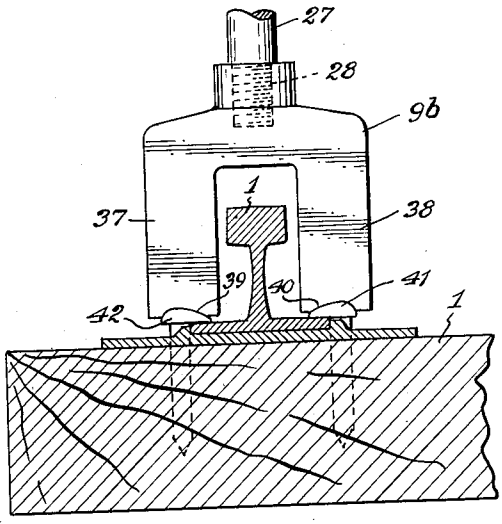
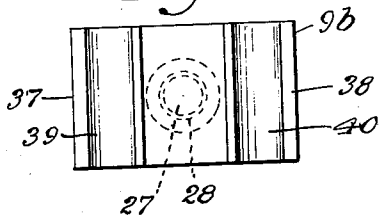


Fig. 7



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2,799,230

RAIL SPIKE DRIVING MACHINE

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Application July 6, 1954, Serial No. 441,545

5 Claims. (Cl. 104—17)

This invention is directed to a new and improved spike driving machine for railroads. In the tie renewal operation for railway tracks, one of the more serious difficulties encountered resides in what is known as "hanging ties." This problem arises where the supporting ballast for the ties is at unequal height along a portion of the track with the result that certain ties support the rails and other ties are spaced from the rails. When it is desired to spike the rails to these ties which are spaced from the rails some means must be provided to raise the tie and hold it snugly against the rail during the spike driving operation.

In conventional practice, these ties are pried up against the base of the rail during the spike driving operation. This requires a workman who usually uses a lining bar to pry up the tie, while another workman drives the spike. The hammering force exerted against the spike tends to jar the prying tool with the result that the tie tends to move away from the base of the rail as the spike driving hammer hits the spike. The practice requires approximately twice as much time for the spike driving operation as the time required in the case of a normally positioned tie. The present invention avoids this difficulty or problem residing in the case of "hanging ties" and does not require a workman to pry up the tie during the spike driving operation.

One purpose of the present invention is to provide an improved rail spike driving machine which accomplishes a three-fold purpose, namely: anchoring of the machine to the track structure during the spike driving operation, the exertion of what is, in effect, a compressive action exerted on both a rail spike and the tie during the spike driving operation, and the maintenance of a co-linear thrust on the tie and the spike during the driving operation.

Another purpose of the present invention is the provision of an improved spike driving machine in which a tie gripping element or elements and a spike driving element are actuated and positioned automatically.

Another purpose is the provision of an improved hydraulic spike driving mechanism.

Other purposes will appear from time to time in the course of the ensuing specification and claims.

Referring generally now to the drawings,

Figure 1 is a side view of a machine embodying the principles of the present invention;

Figure 2 is a sectional view taken along the section lines 2—2 of Figure 1;

Figure 3 is an enlarged view of a sub-assembly shown in Figure 1;

Figure 4 is a detail view in section of a typical spike driving and tie engaging assembly utilized in the invention;

Figure 5 is a view similar to Figure 4 but illustrating another operative position of the elements shown in Figure 4;

Figure 6 is an enlarged detail view of an element shown in Figures 4 and 5;

Figure 7 is a bottom plan view of the anvil or hammer shown in Figure 6;

Figure 8 is a diagrammatic showing of the hydraulic system employed in the invention; and

Figure 9 is a sectional view similar to Figures 4 and 5 but illustrating another operative position of the elements.

Like characters designate like elements throughout the specification and drawings.

Referring specifically now to the drawings and in the first instance to Figure 1, I illustrate a railroad track comprised of the usual rails 1 and 2 positioned on ties 3 which are, in turn, supported on the customary bed of ballast 4.

5 designates a machine frame supported on rail engaging wheels 6. The frame may be provided with its own system of propulsion, if desired, or it may be merely connected to a train of implements for movement along the track.

Designated generally at 7 and 8 are a plurality of spike driving assemblies. Each of these assemblies is positioned on the frame so it is generally directly above one of the track rails 1 or 2, there being an assembly at each side of the machine frame. Each of the assemblies is identical in structure and operation and for this reason only one will be described in detail. Each assembly includes an outer cylinder 9, a plurality of tie engaging elements 9*a* and an anvil 9*b*. The tie engaging elements 9*a* are adapted to exert an upward thrust on the ties 3 while the anvil or hammer 9*b* is exerting a downward thrust on a spike. The tie engaging elements 9*a* and the anvil 9*b* are supported and actuated in a predetermined relation as will be pointed out in ensuing portions of this specification. As will be seen best in Figure 3, the elements 9*a* have offset lower end portions so as to extend on opposite sides of the rail. Their upper ends are diametrically opposed with respect to the axis of the outer cylinder.

Each of the assemblies includes an outer cylinder 9 which is supported on trunnions 10 mounted on any suitable upstanding frame elements 11. The axis of the trunnions is transverse to the rails as will be seen best in Figure 2.

An inner cylinder 12 is mounted within the cylinder 9. The inner cylinder includes a piston portion 13 at the upper end thereof and a reduced body portion 14. The wall of the body portion 14 is spaced from the inner wall of the outer cylinder so as to provide space for the passage of hydraulic fluid. A conduit 15 is adapted to supply hydraulic fluid under pressure to the upper end of the outer cylinder 9, and thus force the inner cylinder 12 downwardly. A second conduit 16 is adapted to admit fluid under pressure beneath the piston portion 13 and thus force the inner cylinder 12 upwardly.

Downward movement of the inner cylinder is limited by the engagement of the portion 13 with the lower end 9*c* of the outer cylinder. Upward movement is limited by the engagement of a boss 13*a* with the lower end 9*c*. The lower limit of movement is designed so that, at this limit, the lower ends of the members 9*a* are positioned below the tie as will be seen in Figure 5. At the upper limit, they are above the tie, as will be seen in Figure 4.

The lower end of the inner cylinder is threaded as at 17 and receives a supporting member 18 for the tie engaging elements 9*a*. The supporting member 18 includes inwardly extending projections 19 and 20, upon which the tie engaging elements 9*a* are pivotally mounted by means of any suitable pivot pins or the like 21 and 22. A spring 23 and a spring 24 are positioned between the upper end of the elements 9*a* and the supporting member 18 above the pivots 21 and 22 and serve to bias the elements 9*a* outwardly to a position where their lower extremities are spaced apart a distance greater than the width of the usual tie. The elements 9*a* have inwardly extending hook portions 25 and 26 which are adapted to be positioned beneath a tie so that, if the elements 9*a*

are moved upwardly when they are thus positioned, an upward thrust will be directed against the tie.

The anvil **9***b* is attached to the lower end of a piston **27** as by means of any suitable connection such as screw threads or the like indicated generally at **28**. The piston **27** is received within the inner cylinder **12** and is adapted to be reciprocated by the pressure of hydraulic fluid selectively directed through a fixed tube **29** and a conduit **30**. The tube **29** is positioned centrally of the outer cylinder **9** and extends through the piston portion **13** of the inner cylinder. The conduit **30** communicates with the interior of the inner cylinder through the lower end of the inner cylinder. The piston **27** includes a bore **31** at the upper end thereof. The wall of this bore is spaced from the tube so as to allow the passage of fluid from the lower end of the tube to the upper portion of the inner cylinder **12** behind the piston. The piston **27** has a reduced outer diameter intermediate the ends thereof as at **32** so as to allow hydraulic fluid delivered through the conduit **30** to bear against the upper portion **33** of the piston to thereby move the piston upwardly within the inner cylinder.

Admitting fluid through the conduit **29** serves to force the piston and the anvil **9***b* downwardly, so as to drive a spike into the tie. Delivering fluid through the conduit **30** serves to force the piston **27** upwardly. As will be seen in Figure 4, the parts are so dimensioned and proportioned that the anvil or hammer **9***b* is positioned away from the tie a distance greater than the length of the usual spike when the piston is at its upper limit of movement. At its lower limit of movement, the hammer or anvil **9***b* will occupy a position where the lower surface of the anvil is generally aligned with the upper surface of the tie.

At its lower end portion, the piston **27** has a diameter smaller than that of the portion **32**. This reduced portion of the piston terminates at its upper end in an inclined camming surface **34** which merges with the portion **32**. The camming surface **34** is adapted to contact cooperating camming surfaces **35** and **36** which are formed on the upper ends of the tie engaging members **9***a* above the pivots **21** and **22**. This reduced portion is made sufficiently small so that the springs **23** and **24** may bias the lower ends of the tie engaging members **9***a* to an outward position where they may straddle a tie. Whenever the piston **27** is moved downwardly relative to the inner cylinder **12**, the camming surface **34** engages the surfaces **35** and **36** and forces the tie engaging members **9***a* inwardly. As will be seen in Figure 9, they are forced inwardly to a position where the hooks **25** and **26** are positioned beneath the tie and are held in that position when the piston **27** continues its downward movement.

The anvil **9***b* is generally U-shaped, as will be seen in Figure 6. It includes spaced legs **37** and **38** adapted to straddle the rail **1**. The lower end faces of each of the legs **37** and **38** are "dished out" as at **39** and **40** to conform generally to the curvature of the rail spike heads **41** and **42**. The "dished out" portions of the legs may continue throughout the length of the legs, as will be seen in Figure 7.

I preferably employ a hydraulic system for actuating the spike driving assembly. This system is shown diagrammatically in Figure 8. I may employ, for example, any suitable pump **40** which may be driven by an internal combustion engine. The pump **40** receives hydraulic fluid from a reservoir **41** through a conduit **42** and delivers fluid under pressure through a conduit **43** to a first valve **44** for controlling the flow of fluid to and from the inner cylinder **12**, and a second valve **45** for controlling the flow of fluid to and from the outer cylinder **9**. Any suitable conduit **46** may be connected to the valves for exhausting fluid to the reservoir **41**.

The valves **44** and **45** are preferably four-way valves so that they may be set to deliver fluid to either end of their associated cylinders. They may take the form of rotary valves or sliding plunger valves. They may include foot actuated control levers or manually actuated control levers. No particular form of valve is critical and for this reason I have shown the valves **44** and **45** diagrammatically in the drawings. I wish it to be understood that the pump **40**, reservoir **41** and valve assemblies **44** and **45** are preferably carried on the frame of the machine.

Whereas I have shown and described the preferred form of my invention it should be understood that numerous modifications, alterations, substitutions, and changes could be made without departing from the invention's fundamental theme. For example, if desired, a spring return could be provided for the inner cylinder in lieu of the hydraulic fluid admitted through the conduit **16**. The description and illustration should be taken as diagrammatic or illustrative. The scope of the invention should be limited only by the scope of the hereinafter appended claims.

The use and operation of my invention are as follows:

The machine may be moved along the track rails to any position it is desired for use. The machine is positioned on the rails so that the assemblies are positioned generally centrally of a tie. At this position the anvil carried by the assembly is positioned for the spike driving operation. The operator then actuates the valve **45** to admit fluid behind the inner cylinder **12**. This forces the inner cylinder, piston and tie engaging members **9***a* downwardly to a position where the hammer **9***b* is spaced from the ties. With this same movement the tie engaging members **9**a are forced downwardly and are positioned outwardly of the tie, as will be seen in Figure 5.

A rail spike is positioned between the tie and the hammer. It may have its pointed end inserted through the customary aperture in the tie plate and started into a drilled hole in the tie. The operator then actuates the valve **44** to admit fluid through the tube **29** and behind the piston **27**. As a result of this fluid pressure the piston starts its downward movement and the camming portion **34** on the piston rod engages the cooperative camming portions **35** and **36** on the members **9***a* to force the members **9***a* inwardly to a position where the hooked portions **25** and **26** are disposed beneath the tie. Valve **45** is then reversed to force the inner cylinder and hooks upwardly to a position where they snugly engage the tie. In the case of a hanging tie, the tie is actually lifted into snug engagement with the base of the rail. Further upward movement is precluded by the rail. Fluid is then again delivered through the conduit **29** and as the movement of the piston **27** continues, the anvil engages the head of the spikes and the spikes are driven home. At the same time that the fluid pressure behind the piston **27** forces the hammer **9***b* downwardly, the fluid pressure will be exerting an upward thrust on the inner cylinder **12**, thus tending to pull the tie upwardly and bringing about what is, in effect, a compressive force between the tie and the spike. The tie, tie engaging members, inner cylinder, outer cylinder, and frame are at that time what is, in effect, a unitary structure receiving the reactive thrust of the anvil **9***b*.

After the spike is driven home, the valve **44** is reversed to thereby raise the piston **27** to a point where the springs **23** and **24** are effective to force the tie engaging members **9**a outwardly to the position shown in Figure 2.

With the hooks free from the tie, the fluid through the conduit **16** forces the inner cylinder and piston **27** carried thereby upwardly to the position where the tie engaging members are clear of the ties. The machine is then ready for movement along the rails to the next spike driving position.

Due to the particular disposition of the fluid pressure means for the hammer and the tie engaging mechanism, the thrust of both of these mechanisms is co-axial thus

eliminating, to a large extent, any tendency of the hammer to drive a spike into the tie at an angle to the perpendicular.

The pivotal mount for the assemblies provides a dual function. It allows the assemblies to be swung upwardly to clear a switch or other obstruction. It also provides movement of the frame relative to the assemblies, thereby tending to move the axis of the trunnions and assemblies to a position centrally of a tie when the hooks exert an upward thrust against the tie.

I claim:

1. A railway spike driving machine for use with tie supported rails, including a frame movable along the rails of a track, and a spike driving assembly carried by said frame over one rail of said track, said assembly including a reciprocal spike anvil, a hydraulic ram and cylinder for forcing said anvil downwardly, said assembly also including a plurality of tie engaging members movably mounted on said cylinder, said members being adapted for movement between a first position where they are spaced to straddle a tie and a second position wherein said members are effective to grip a tie therebetween, and cooperating means between said piston and said members for moving said members between said two positions.

2. The structure of claim 1 characterized by and including resilient means for forcing said members outwardly.

3. A rail spike driving machine for use with tie supported rails, including a frame movable along the rails of a track, and a spike driving assembly carried by said frame over one rail of said track, said assembly including an outer cylinder and an inner cylinder movably mounted therein, a plurality of generally elongated tie engaging hooks movably mounted on said inner cylinder, means for admitting fluid to said outer cylinder to thereby force said inner cylinder and hooks downwardly sufficiently to dispose the lower ends of said hooks beneath a tie, stop means for limiting movement of said inner cylinder to said position, a piston movably mounted in said inner cylinder and means for admitting fluid to said second cylinder to force said piston downwardly, a spike engaging anvil carried by said piston for forcing a spike positioned between said tie and said anvil into said tie, and means for moving said hooks inwardly toward one another prior to the engagement of said anvil with said spike.

4. The structure of claim 3 characterized by and including cooperating camming surfaces carried by said piston and said hooks, said surfaces being operable to move said hooks inwardly subsequent to the start of the downward movement of said piston.

5. The structure of claim 3 characterized by and including co-operating camming surfaces on said piston and said hooks for forcing said hooks inwardly, and resilient means for forcing said hooks outwardly when said camming surfaces are out of engagement with one another.

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