Nov. 13, 1934. A. SCHEUCHZER 1,980,704

BALLAST TAMPING MACHINE

Filed Sept. 1, 1932 3 Sheets-Sheet 1

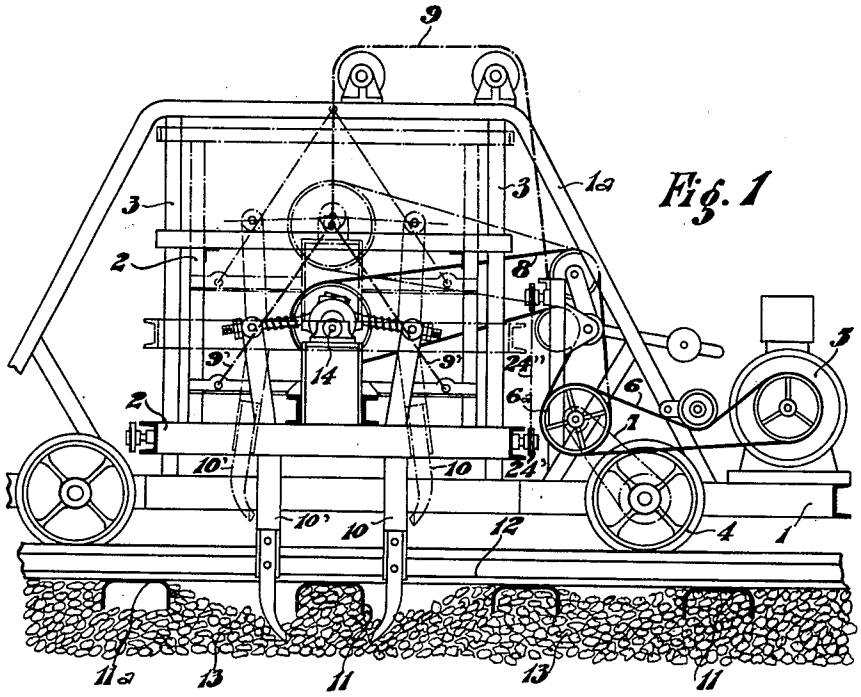

Fig. 1

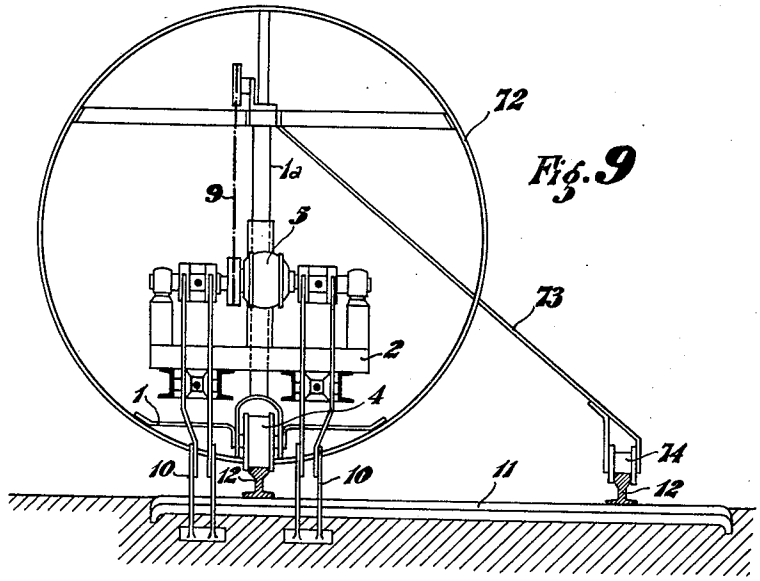

Fig. 9

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Fig. 2

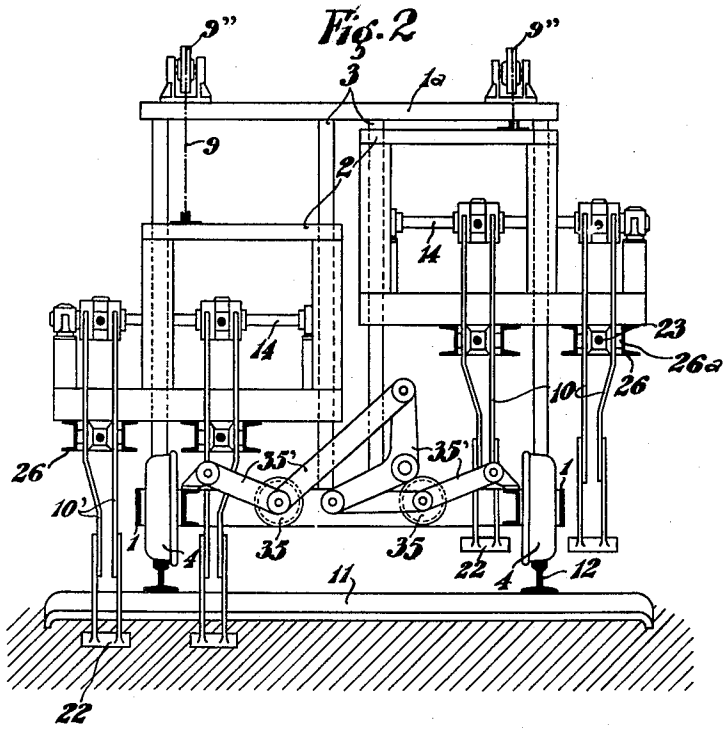


Fig. 3

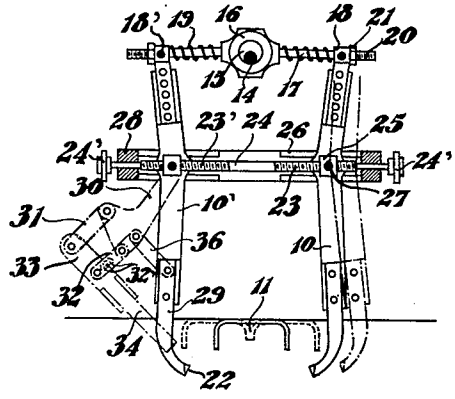
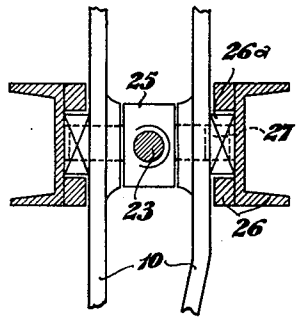


Fig. 4



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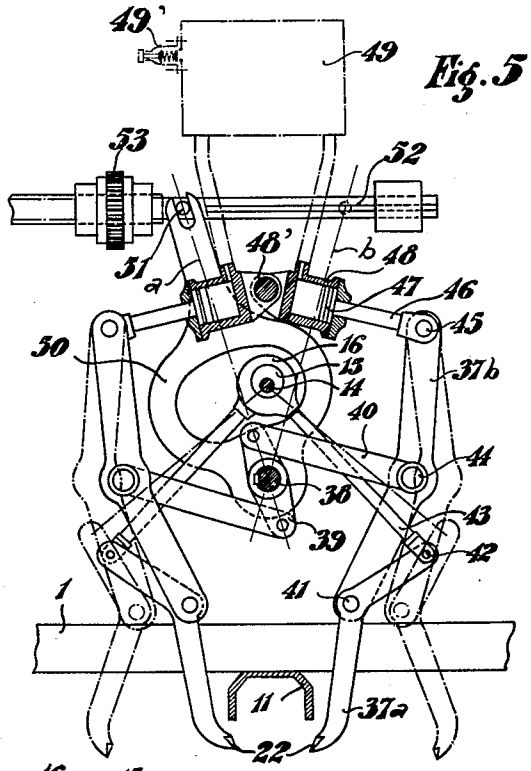

Fig. 5

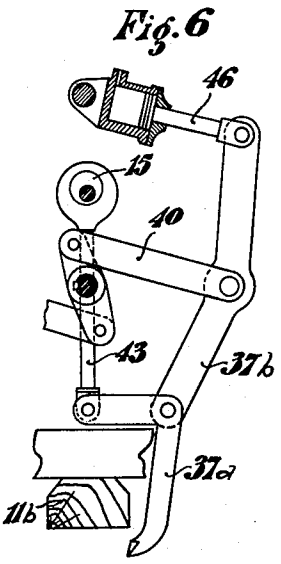

Fig. 6

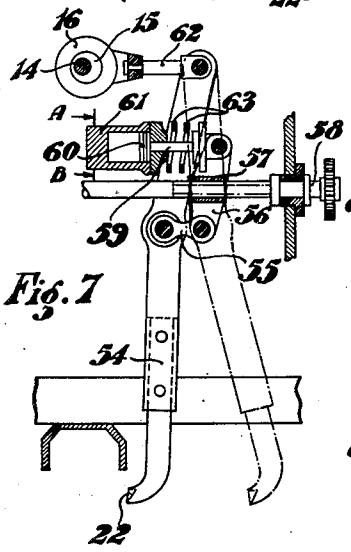

Fig. 7

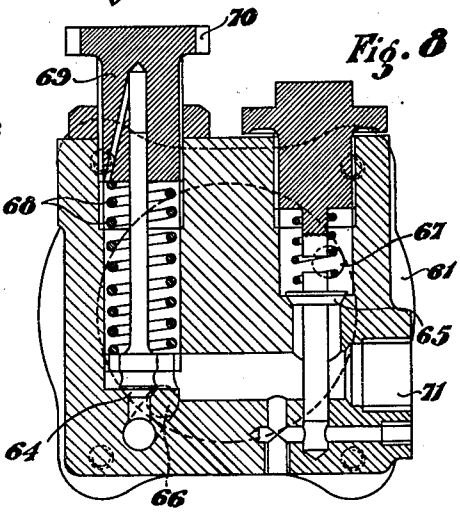

Fig. 8

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BALLAST TAMPING MACHINE

Auguste Scheuchzer, Renens, Switzerland

Application September 1, 1932, Serial No. 631,431
In Switzerland September 8, 1931

11 Claims. (Cl. 104—12)

The present invention relates to ballast tamping machines.

It is an object of the invention to provide an improved machine for tamping the ties of railroad tracks which is effective and speedy in operation.

A further object is the provision of a machine having vibratory tamping tools adapted to act on the ballast simultaneously on either side of the tie to be tamped.

A further object is the provision of improved means for adjusting the distance between cooperating tamping tools on either side of the tie.

A further object is the provision of means for preventing overstrain of the tamping mechanism when the tamping operation in respect to a tie is nearing its completion.

Other objects will appear from the following description, reference being had to the accompanying drawings in which,

Figure 1 is a lateral elevation of a ballast tamping machine.

Figure 2 is an end view of the machine.

Figure 3 is a detail view of the working tools of the machine.

Figure 4 shows a detail drawn to a larger scale.

Figure 5 is a modified arrangement of working tools.

Figure 6 is a further modification of a tool arrangement.

Figure 7 shows a still further modification of a tool arrangement.

Figure 8 is a section along the line A—B of Figure 7.

Figure 9 is an end view of a machine provided with means for moving the machine to the side of the track.

The machine as represented in Figures 1 and 2 comprises a truck 1 mounted on wheels 4 which travel on the rails 12 of the railroad and serve for the locomotion of the machine. On the truck 1 is mounted a fixed frame work 1*a* which comprises vertical standards 3 forming slide ways for a movable frame 2. The truck 1 carries a motor 5 driving a pulley 6*a* by means of a transmission 6. This pulley can be connected either to one of the axles of the wheels 4 by a transmission 7 or by means of a transmission 8 to the mechanism actuating the working tools.

Chains 9, 9′ running over pulleys 9″ which are carried by the frame 1 serve to raise or lower the movable frame 2. The operating means for the chains are not represented but such operation may be effected by the motor 5 by any known means, the pulley 6 being for instance connected to a chain 9 and which may be provided with the necessary brakes to maintain the movable frame at any desired position.

The chain could also be manipulated by a compressed air device, such air being furnished by the motor 5.

The transmission 8 serves to impart rotation to a shaft 14. The working tools are constituted by pairs of levers 10, 10′ rotatably mounted on pins 27 carried by the movable frame 2 and having jaw-shaped working ends 22. Each lever 10, 10′ is constituted by double bars and the pins 27 are carried by nuts 25 movable on a screw 24 rotatably supported in bearings 28 of the movable frame 2. When in working position, the two levers 10, 10′ of a pair of cooperating levers are disposed symmetrically to a vertical plane passing through a transverse axis of the tie. The pins 27 are longer than the width of the levers 10 (Fig. 4) and have their ends engaged in rectangular slide pieces 26*a* movable along rails 26. The screw 24 is provided with right and left hand screw threads 23, 23′ and carries on both ends a wheel 24′, one or the other of these wheels according to the particular disposition of the machine being driven by a chain 24″. The shaft 14 carries eccentrics 15 for imparting a to and fro movement to the heads 16 of the connecting rods 17. These connecting rods traverse freely sleeves 18 and have their ends 20 threaded so that nuts 21 can be used to adjust the tension of springs 19 interposed between the sleeves 18 and the heads 16. The sleeves 18 are provided with journals 18′ on which the upper ends of the levers 10 are mounted.

Each connecting rod 17 and head 16 has its particular eccentric 15, the two eccentrics of one pair of cooperating levers 10, 10′ being displaced 180°, so that cooperating levers move in opposite direction.

The described ballast working machine operates in the following manner. The machine is moved on the rails of the railroad to its working place while the tools 10 are in raised position as indicated in dotted lines in Fig. 1, above one of the ties 11 of the track which has to be tamped. The screws 24 are actuated so as to maintain the two levers 10 separated and then the frame 2 is lowered by suitably operating the chains 9, 9′. The working jaws 22 of two pairs of levers 10 situated on either side of the ties descend thus until they rest on the ballast 13. The jaws 22 then exert a force on the ballast according to the weight of the movable frame 2, which weight can be balanced to any desired degree by the

chains 9. The shaft 14 is then made to rotate and the eccentrics 15 will communicate a vibratory movement to the working jaws 22, this movement having an amplitude of from 1 to 2 centimeters. The movement is transmitted from the connecting rods 16 to the levers 10 by the intermediary of the springs 19; it is however also possible to rigidly connect the two members 16 and 10. This vibratory movement of the jaws resting with a certain weight on the track ballast has the effect that the jaws open themselves a passage down through the ballast to a level below the ties.

During the downward movement of the levers 10 the screw 24 is turned so that the jaws of a cooperating pair of levers 10, 10' approach each other. The vibratory movement of the jaws 22 of each pair of levers in opposite directions to each other and on either side of the ties acts on the ballast and urges the ballast to mount into the space left between top and side walls of the steel ties as is seen in Fig. 1, and a perfect tamping operation is thus effected. The quality of this tamping is such that the stones of the ballast occupy the smallest possible volume underneath the ties, as can be observed when removing a tie for which the tamping operation has been finished. The machine shown in Fig. 2 comprises two movable frames 2 each one carrying two pairs of tamping tools, and the frames can be operated simultaneously or successively to tamp the ballast for one tie. During the operation of the tools it is necessary, during the progress of the tamping effect, to raise the tools from time to time, to spread them apart by the screw 24 and to lower them again in the ballast, so that cooperating jaws 22 will grip fresh ballast between themselves and work it up against the tie. Raising and again lowering of the tools will be repeated until the tamping operation for one tie is finished and then the machine is moved to work on the next following tie 11*a*.

The machine can be used for tamping the ties of newly laid railroad tracks as well as for retamping ties of tracks after the ballast beneath the rails has been loosened owing to the vibrations of the rails caused by railway traffic. The screws 24 are sufficiently long so that the levers 10, 10' of a pair of tools can be spread apart far enough for operating also beneath double ties as have been shown in dotted lines in Fig. 3.

In Fig. 3 it is shown that the end pieces 29 carrying the tamping jaws are removably secured to the levers 10 and 10'. These end pieces can be removed if desired, and replaced by members 30, 31, 32, 33, and 34 shown in dotted lines. The tamping jaw carrying bar 34 of this optional tool arrangement is inclined instead of vertical as the lever 10, and is fixed to a support 33 connected by means of a link 31 to an arm 30 secured to the nut 25. A lever 32 is rotatably mounted on the arm 30 and has one of its ends connected to the support 33 and the other end by means of a link 36 to the lever 10', so that the vibratory movement of the lever 10' is transmitted to the bar 34. The lever 32 may be constructed to permit an adjustment of the degree of inclination of the bar 34, for example by providing a plurality of holes 32' and using one or the other of these holes for attaching the lever to the support 33, or by having the lever 32 constituted by a rod comprising opposed screw threads cooperating with two nuts which would be pivoted on the members 30 and 33, respectively. This described device with inclined tools is preferably used for tamping wooden ties in which case a pressure having vertical and horizontal components is to be exerted on the ballast. The operation of these inclined tools is the same as that before described.

The machine may be provided with means for moving it to the side of the track in order to let a train pass. In the machine according to Fig. 2 such means are constituted by a system of levers 35' connected to the truck 1 and carrying rollers 35. This system of levers can be operated by non-represented means to lower the rollers 35 on rails laid transversely to the main track 12 to roll the machine off the track.

Figure 9 shows another means to park the machine on the side of the track. In this case the truck 1 supporting the mechanism is mounted on a single row of wheels 4 moving on one rail 12 only of the track. A guide roller 74 is moving on the second rail 12 and is carried at the end of a strut 73 for stabilizing the machine. A number of steel rings 72 are surrounding the entire machine and when the main track has to be freed for the passage of a train, the machine will be rolled on the rings 72 to the side of the track.

A modified tool arrangement is shown in Fig. 5. The tool comprises here a pair of cooperating arms formed each by two levers 37*a* and 37*b*. The lever 37*a* carries the working jaw 22 and is rotatably mounted on the lever 37*b* by means of a pin 41. The upper end of the lever 37*a* is rotatably connected at 42 to a connecting rod 43 having its head 16 mounted on the eccentric 15 turning with the shaft 14 rotated by the motor of the machine. The lever 37*b* is rotatably carried by a slide moving along a horizontal rail parallel to the track; this slide and rail are not shown in the figure but are identical to the members 26, 26*a* in Figs. 2, 3 and 4. To the pivot 44 of the lever 37*b* is also connected one end of a link 40 having its other end connected to one end of a rocker lever 39 keyed to a shaft 38 which may be turned by means of a control lever 50. The upper end of each lever 37*b* is rotatably connected to the rod 46 of a piston 47 movable in a cylinder 48, which is pivoted at 48' on the movable frame.

This cylinder is in communication with a reservoir 49 containing compressed air which may be furnished by the motor of the machine. This reservoir is provided with an adjustable pressure regulating valve 49' permitting the pressure of the compressed air in the reservoir to be adjusted to a desired maximum degree. The control lever 50 is provided with a fork in which is engaged a pin 51 carried by a slidable screw 52 capable of being moved by a nut 53 which will be rotatably mounted on the movable frame of the machine.

The described tool arrangement operates in the following manner: At the end of a tamping operation the tools will occupy the position indicated in full lines in Fig. 5. By rotating the nut 53 the control lever 50 is made to turn so that its axis moves from the position *a* into the position *b*. This movement of the lever 50 is transmitted to the rocker arm 39 and the links 40 bring the tools into the position indicated in dotted lines. The movable frame of the machine is then raised and the whole machine moved until the tools arrive above the next following tie. The suspended movable frame of the machine is then released so that the tools descend in spread out position on the ballast. Now the

shaft 14 is rotated and at the same time the screw 52 is moved back so that the control arm 50 and the tools move again into the position shown in Fig. 5. The rotation of the shaft 14 and the eccentrics 15 causes a reciprocating motion of the rods 40 and these latter impart a vibratory motion to the levers 37*a*.

The tamping jaws 22 act on the ballast and in the case of steel ties 11 shown in Fig. 5 cause the ballast to be raised into the interior of the tie. After a certain time the resistance of the ballast against the action of the jaws 22 becomes greater than the force with which the lever 37*b* is held in its position by the piston 47 on which acts the air pressure of the container 49. The lever 37*b* starts then also to vibrate about the pivot 44, the fulcrum of the lever 37*a* passing from 41 to its lower end 22. Owing to the elasticity of the compressed air the piston 47 can move in the cylinder and the shaft 14 can continue its rotation and complete the tamping operation until to a limit depending on the pressure of air in the cylinders 48. As the pressure in the cylinders is maintained constant, the power necessary for approaching the levers of a pair of tools is not dependent upon the amount of separation of the levers. The time necessary for finishing a tamping operation in one position of the machine is less than twenty seconds.

The shaft 38 will preferably be disposed in such a manner that a single control arm 50 can simultaneously actuate the four pairs of tools working at one tie, while according to Figure 3 a control screw 24 was necessary for each pair of tools. Instead of providing a sliding screw 52, the control arm could be provided with a toothed sector meshing with a pinion or with a worm gear.

In the modification shown in Fig. 6, the lever 37*a* has its upper end which is connected to the eccentric 15 bent inwardly towards the median symmetry axis of a pair of cooperating tools. This tool is preferably used with wooden ties 11*b* since it has the advantage that the median direction of movement of the jaw 22 does not vary with the amount of separation of the two cooperating levers, while according to Fig. 5 the shape of the lever 37*a* causes the direction of movement of the jaw 22 to form an angle with the horizontal which angle increases when the lever is approaching the tie, what is advantageous for filling steel ties.

In the modification according to Fig. 7 the tamping jaw 22 is carried by a lever 54 which is connected by a link 55 to one end of a rocker arm 56. This rocker arm is rotatably carried by its median part by a nut 57 movable along a control screw 58. The other end of the arm 56 is connected to the rod 59 of a piston 60 reciprocable in a cylinder 61. The upper end of the lever 54 is connected to a connecting rod 62 of which the head 16 forms the bearing for the eccentric 15 of a shaft 14. A spring 63 is interposed between a shoulder on the piston rod 59 and the cylinder to urge the piston against one end of the cylinder.

Figure 8 shows an arrangement of valves with which the cylinder 61 is provided. In the back of the cylinder are provided two perforations 66 and 67, of which the first communicates with the lower side of a valve 64 and the second communicates with the upper side of a valve 65. The valve 64 is acted upon by a strong spring 68 of which the force can be adjusted by a screw plug 69 provided with a toothing 70. The space above the valve 64 and the space below the valve 65 open into a common conduit 71 connected to a liquid tank containing for example glycerine.

The operation of this device is the following: As long as the ballast may be compressed by the vibrations of the lever 54, the piston 60 is furnishing a reaction which is communicated by the members 56 and 55 to the pivot of the lever 54 permitting the lever to vibrate as if it were pivoted on a fixed member. The spring 68 is adjusted in such a manner that after a certain degree of tamping of the ballast has been reached and the pressure exerted by the piston on the glycerine exceeds a predetermined degree, the valve 64 is lifted and the liquid from the cylinder can pass into the tank. Owing to the spring 63 a vibratory movement of the lever 54 with its working end as a fulcrum is then possible, the spring 63 urging the piston back into its original position at the cylinder end as soon as the eccentric 15 exerts a pull on the upper end of the lever 54. When the piston returns it creates a suction in the passage 67, the valve 65 opens and liquid from the tank flows into the cylinder, this latter being thus always filled with liquid.

I claim:

1. A ballast tamping machine comprising a truck adapted to travel on the railroad track, a vertically movable frame mounted on the truck, a motor on the truck, pairs of cooperating tamping tools carried by said movable frame, each pair of tools including two spaced levers pivoted on the movable frame intermediate their ends, a tamping jaw carried by one end of each lever, a shaft mounted on the movable frame, means for connecting said shaft to the motor to impart rotation to the shaft, eccentrics mounted on the shaft, means for yieldably connecting the other end of each of said levers to one eccentric on the shaft whereby an oscillatory movement is imparted to said levers upon rotation of the shaft, and means for varying the distance between the two levers of the pairs of cooperating tamping tools.

2. A ballast tamping machine comprising a truck adapted to travel on a railroad track on which the ties are to be tamped, a vertically movable frame on the truck, a motor on the truck, pairs of cooperating tamping tools carried by said movable frame each pair of tamping tools including two levers pivoted on the movable frame intermediate upper and lower ends of the levers, a tamping jaw carried by the lower end of each lever, means for lowering and raising said movable frame, to bring the tamping jaws of a pair of cooperating tools into operating position in the ballast at either side of a tie of the track or to remove the jaws out of the ballast, a shaft carried by the movable frame and adapted to be rotated by said motor, eccentrics on said shaft spring means yieldably connecting the upper end of each said lever to one eccentric on said shaft whereby a vibratory movement is imparted to said levers upon rotation of said shaft, means for adjusting the tension of said spring means, and means for varying the distance between the two levers of the pairs of cooperating tamping tools.

3. A ballast tamping machine comprising a truck adapted to travel on a railroad track, two vertically and independently movable frames on the truck, two pairs of cooperating tamping tools pivoted on each of said movable frames, each pair of tamping tools including two tamping jaws adapted to be lowered into the ballast on either

side of a tie of the track, the two pairs of tamping tools on one of said frames being arranged to operate on either side of one of the rails of the track and the two pairs of tamping tools on the other of said frames being arranged to operate on either side of the other rail, a motor on said truck, a rotatable shaft on either of said frames, means for operatively connecting said shafts to the motor to impart rotation to the shafts, and means for connecting the tamping tools of either frame to the shaft carried by said frame to impart a vibratory movement to the tools upon rotation of the shafts.

4. A ballast tamping machine comprising a truck adapted to travel on a railroad track, a vertically movable frame on the truck, a motor on the truck, pairs of cooperating tamping tools mounted by said movable frame to oscillate in vertical planes and provided with tamping jaws on their lower ends, a horizontally movable rocker arm pivoted on said movable frame for each tamping tool, a link connecting one end of said rocker arm to the tool, spring means acting on the other end of said rocker arm, a shaft carried by said movable frame, means for operatively connecting the shaft to said motor to impart rotation thereto, eccentrics mounted on said shaft, the upper end of each tamping tool being connected to one eccentric on the shaft whereby a vibratory movement is imparted to the tamping tools upon rotation of said shafts, and means for horizontally moving said rocker arms to vary the distance between the tamping jaws of cooperating tamping tools.

5. A ballast tamping machine comprising a truck adapted to travel on a railroad track, a vertically movable frame on the truck, a motor on the truck, tamping tools including pairs of cooperating tamping jaws mounted on said movable frame for oscillation in a vertical plane, each pair of cooperating tamping tools being constituted by two levers adapted to be lowered with said movable frame for operation in the ballast on either side of a tie of the track, a rocker arm for each lever and pivoted on the movable frame, a link connecting one end of said rocker arm to the lever, a fluid containing cylinder for each lever, a piston movable in the cylinder and connected to the other end of said rocker arm, a spring urging said piston towards one end of the cylinder, motor operated means for imparting a vibratory movement to said levers, a fluid container, and two valved conduits between said cylinder and container whereby fluid may be expelled from said cylinder when said piston exerts pressure on the fluid and fed into the cylinder when the piston moves towards the cylinder end by the action of said spring.

6. A ballast tamping machine comprising a truck adapted to travel on a railway track, a vertically movable frame on the truck, a motor on the truck, pairs of tamping tools mounted on said movable frame, each pair of tools including two cooperating two-armed levers adapted to be lowered into the ballast on either side of a tie of the track and having their lower ends provided with tamping jaws, a shaft carried by said movable frame and adapted to be rotated by said motor, eccentric means for connecting the upper end of said levers to said shaft to impart a vibratory movement to the levers upon rotation of the shaft, each pair of tamping tools comprising two further levers, each tamping jaw carrying lever being pivotally carried by one end of one of said second mentioned levers, a pair of pressure cylinders pivoted on said movable frame, a piston movable in each cylinder and connected each to the upper end of one said second mentioned levers, a rocker shaft carried by said movable frame, a rocker arm on said rocker shaft for each pair of tamping tools and having its two ends connected each to one of said second mentioned levers, an operating lever connected to said rocker shaft, and means for moving said operating lever to rotate said rocker shaft and rocker arms to increase or diminish the distance between said cooperating tamping levers.

7. A tamping machine as defined in claim 6 wherein a common rocker shaft is provided for controlling the distance between the tamping levers of all the pairs of tamping tools carried by said movable frame.

8. A tamping machine as defined in claim 6 and comprising an axially slidable screw, a rotatable nut for moving said screw, a pin on said screw, said operating lever being provided with a fork engaging said pin on the slidable screw.

9. A tamping machine as defined in claim 6 and wherein said pressure cylinders are in communication with a fluid pressure reservoir, and pressure regulating means on said reservoir permitting adjustment of the pressure acting on the pistons in said cylinders.

10. A tamping machine as defined in claim 6 in which said cooperating two-armed levers carrying the tamping jaws are curved so that movement of the tamping jaws against the tie is obtained by a pushing action of said eccentric means against the upper end of the lever.

11. A tamping machine as defined in claim 6 in which said cooperating two-armed levers carrying the tamping jaws are curved so that movement of the tamping jaws against the tie is obtained by a pulling action of said eccentric means upon the upper end of the lever.

AUGUSTE SCHEUCHZER.