April 23, 1957 S. R. HURSH ET AL 2,789,516

RAILWAY TRACK BALLAST TAMPING APPARATUS

Filed Feb. 3, 1953 6 Sheets-Sheet 1

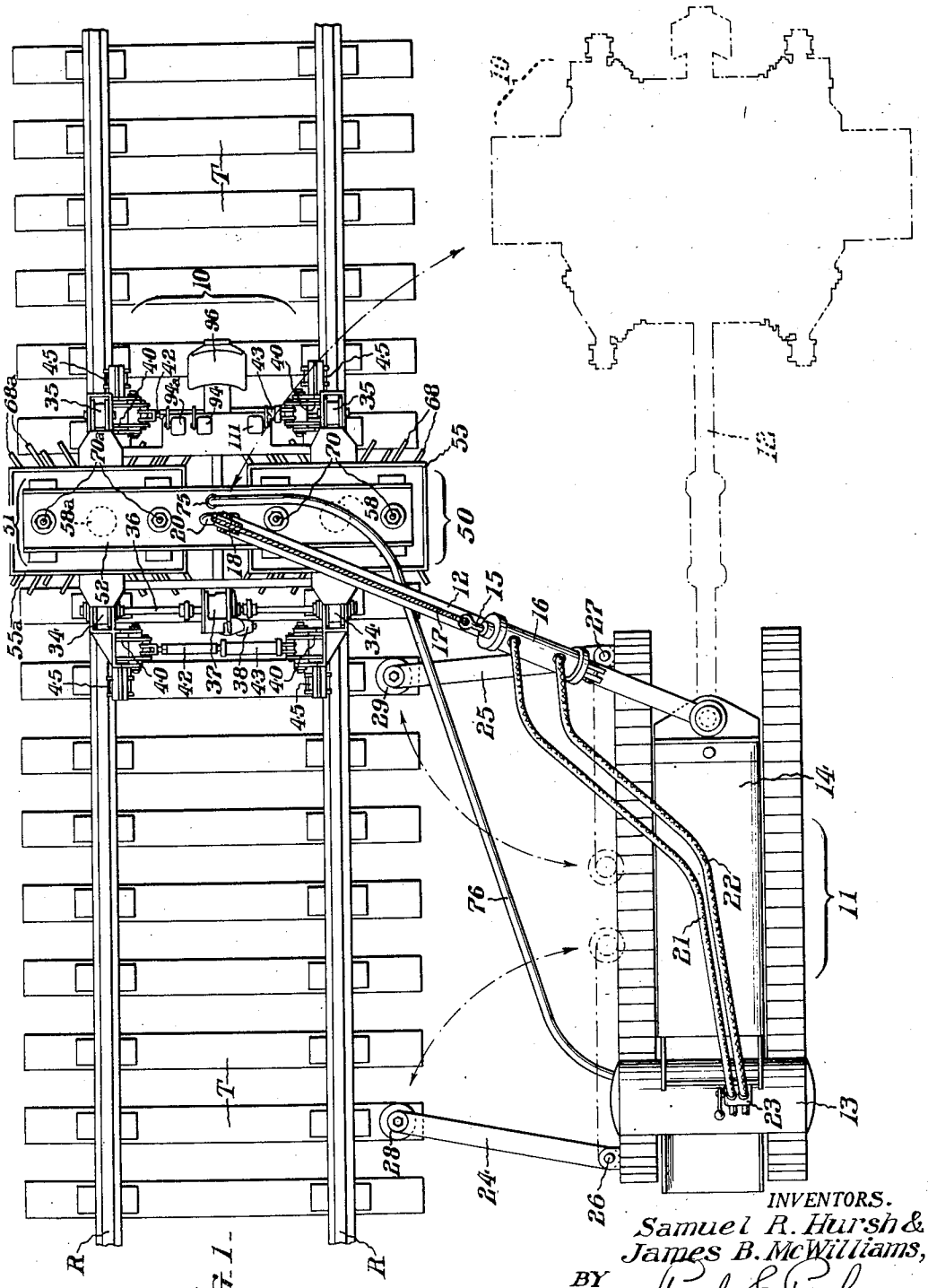


FIG. 1.

INVENTORS.
Samuel R. Hursh &
James B. McWilliams,
BY Paul & Paul
ATTORNEYS.

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RAILWAY TRACK BALLAST TAMPING APPARATUS

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FIG. 2.

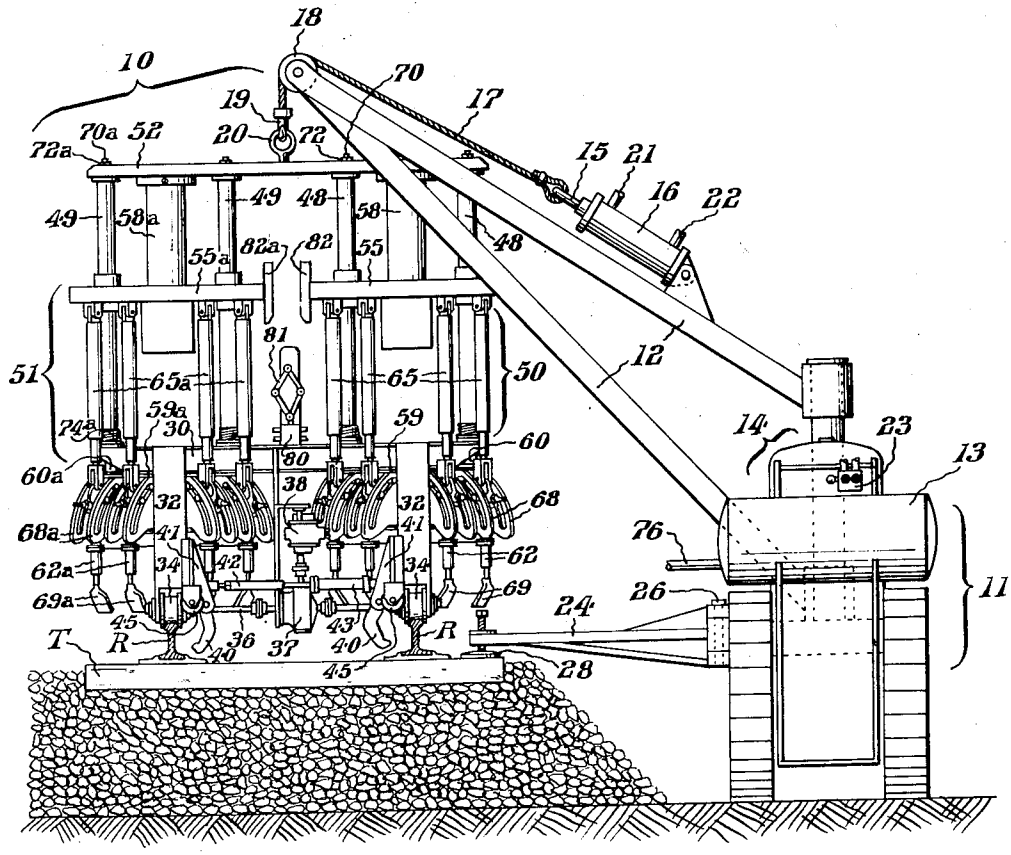
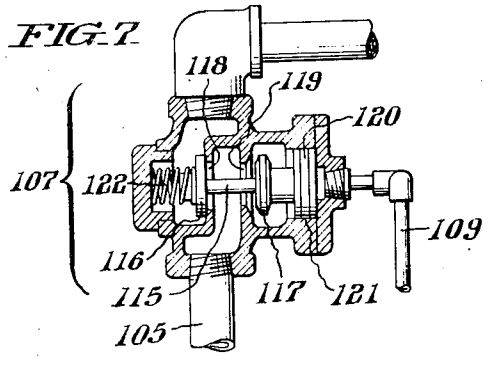


FIG. 7.



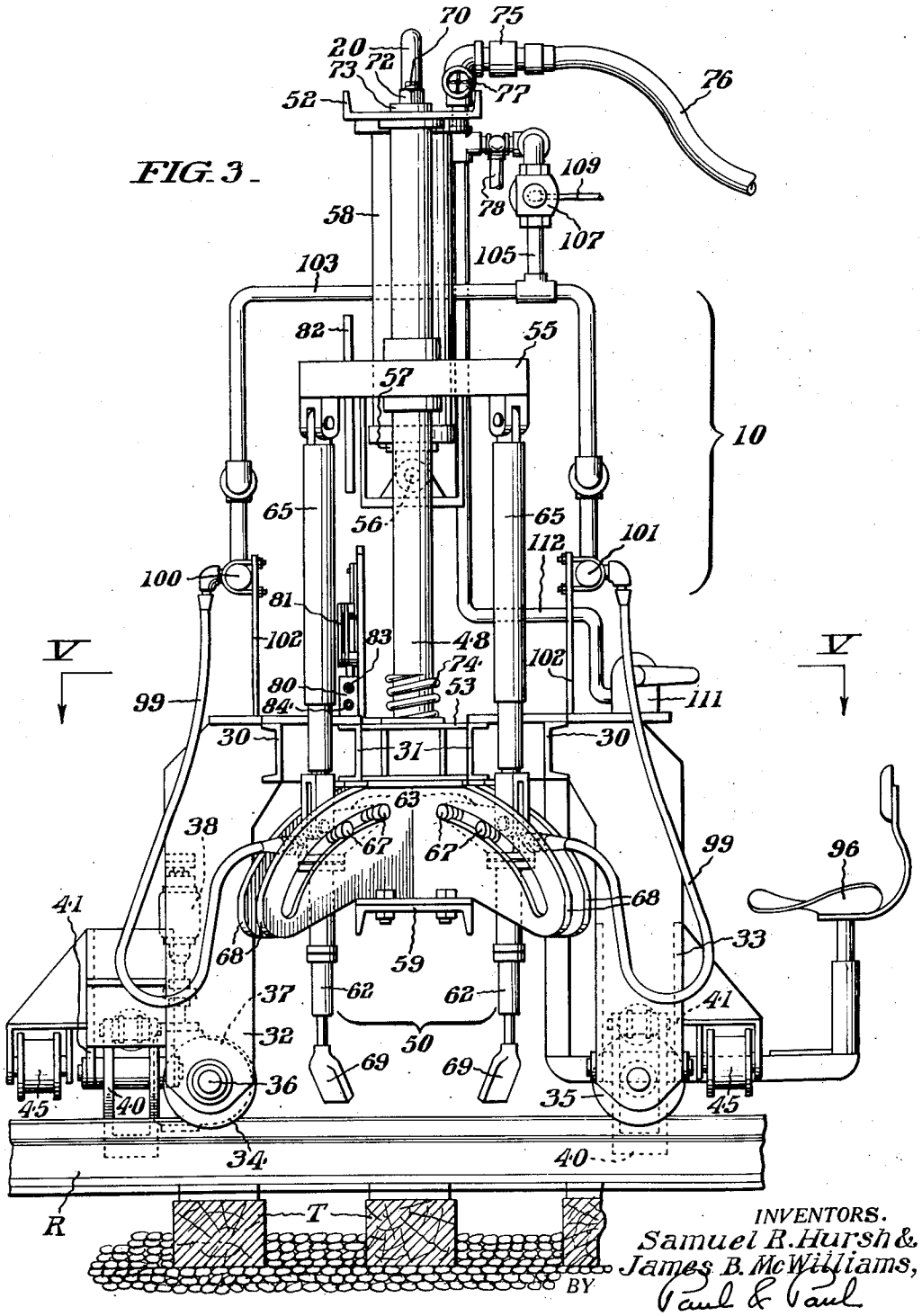
INVENTORS.
Samuel R. Hursh &
James B. McWilliams,
BY Paul & Paul
ATTORNEYS

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RAILWAY TRACK BALLAST TAMPING APPARATUS

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FIG. 3.



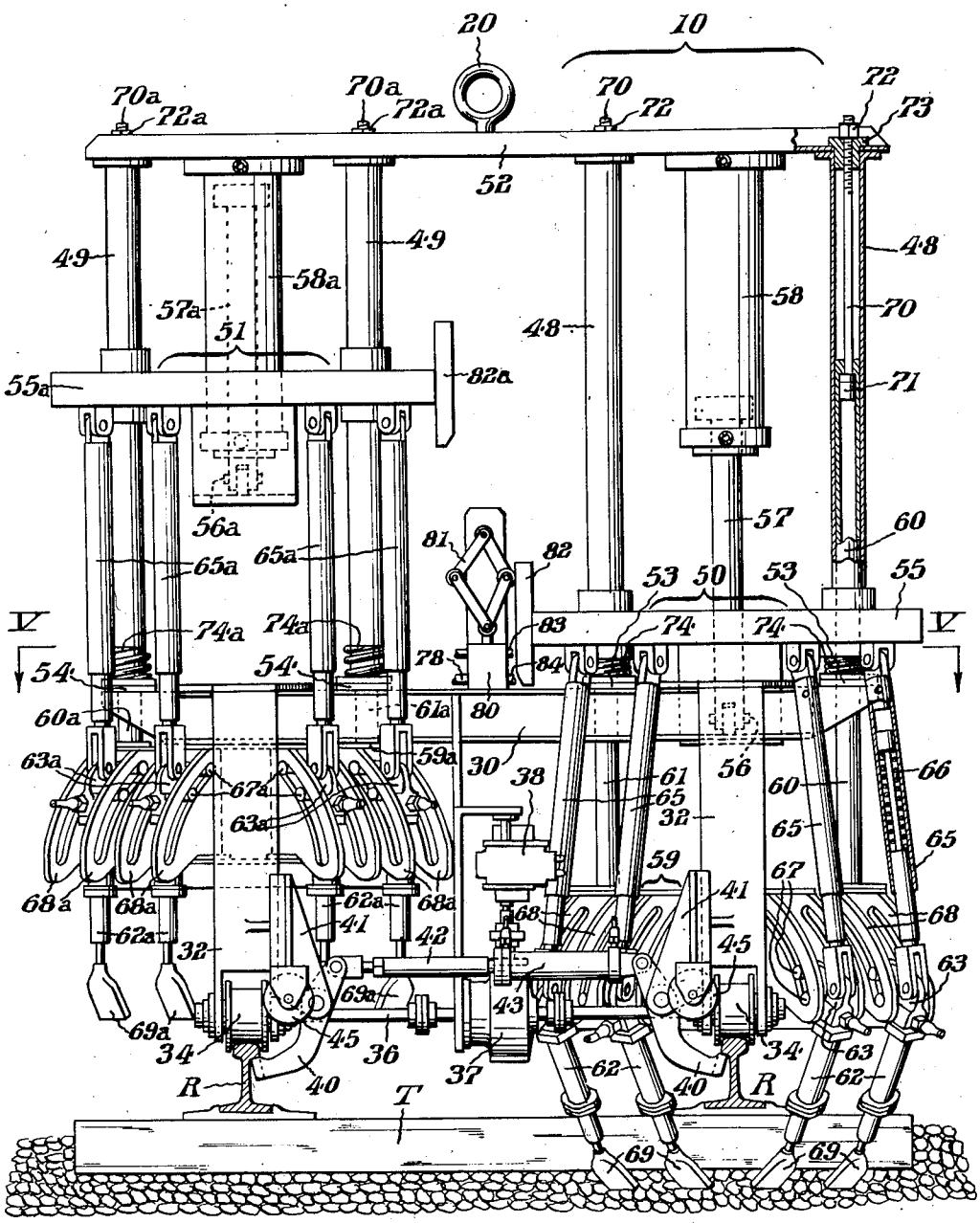
INVENTORS.
Samuel R. Hursh &
James B. McWilliams,
BY Paul & Paul
ATTORNEYS.

April 23, 1957 S. R. HURSH ET AL 2,789,516

RAILWAY TRACK BALLAST TAMPING APPARATUS

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FIG. 4



INVENTORS.
Samuel R. Hursh &
James B. McWilliams,
BY Paul & Paul
ATTORNEYS.

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RAILWAY TRACK BALLAST TAMPING APPARATUS

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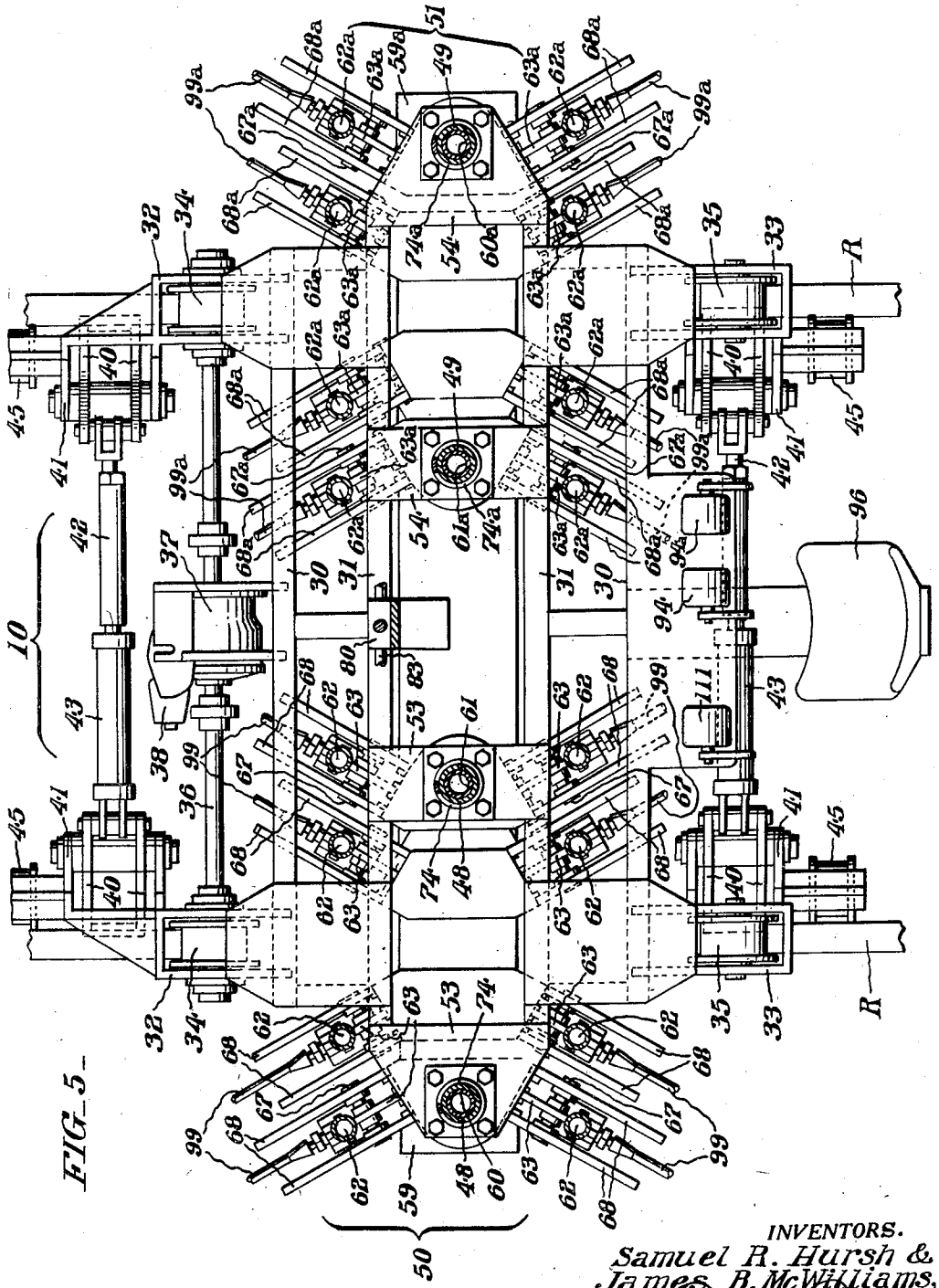


FIG. 5

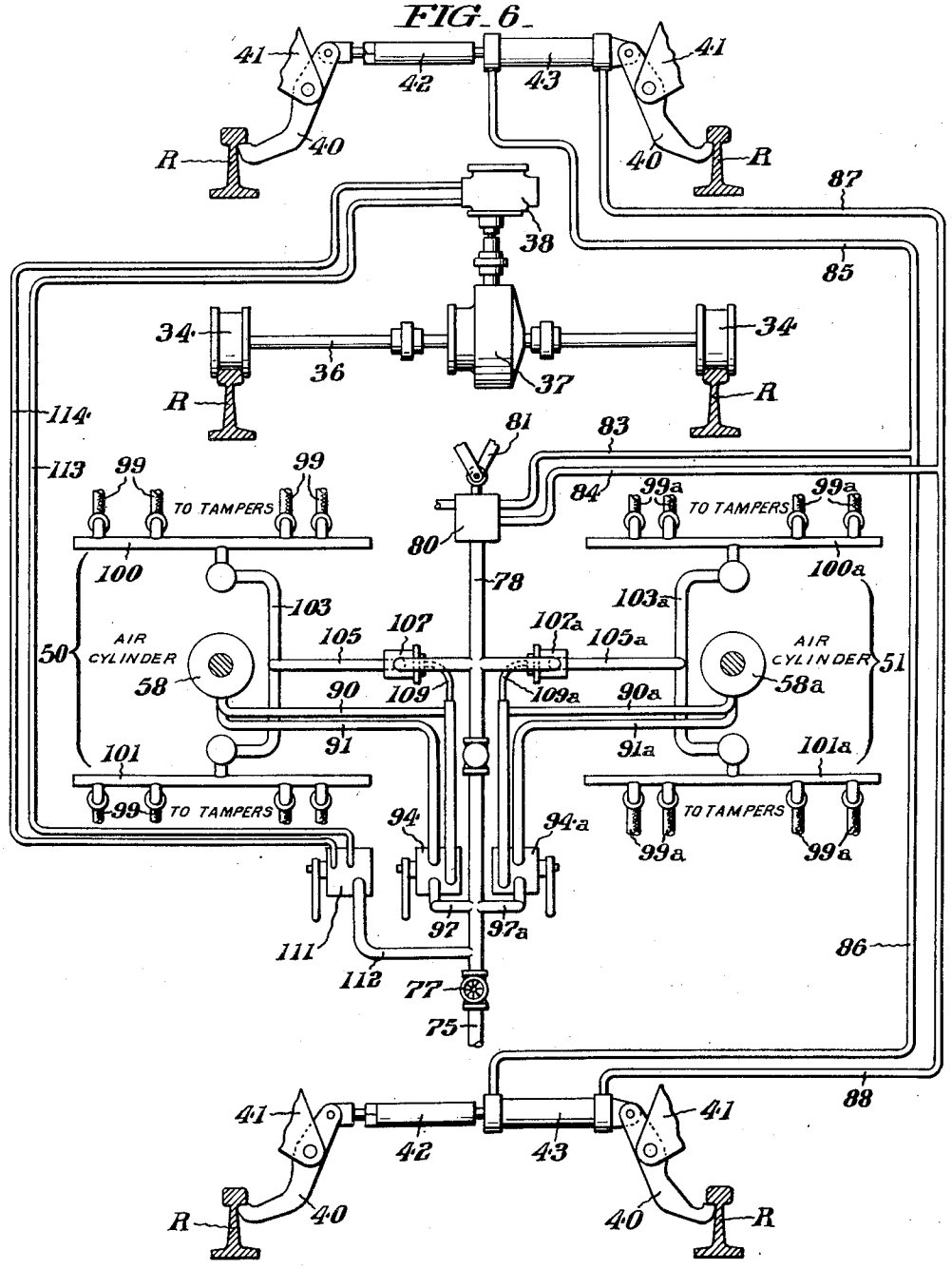
INVENTORS.
Samuel R. Hursh &
James B. McWilliams,
BY Paul & Paul
ATTORNEYS.

April 23, 1957 S. R. HURSH ET AL 2,789,516

RAILWAY TRACK BALLAST TAMPING APPARATUS

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FIG. 6.



INVENTORS.
Samuel R. Hursh &
James B. McWilliams,
BY Paul & Paul
ATTORNEYS.

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RAILWAY TRACK BALLAST TAMPING APPARATUS

Samuel R. Hursh, Bala Cynwyd, and James B. McWilliams, Pittsburgh, Pa.

Application February 3, 1953, Serrial No. 334,824

4 Claims. (Cl. 104—12)

This invention relates to railway track ballast tamping apparatus. More particularly, it is concerned with tamping apparatus generally of the type disclosed in Figs. 33 and 34 of a co-pending application, Serial No. 188,494 filed by us on October 5, 1950, in which groups of powered tampers are supported from a shiftable rail car with capacity to be raised and lowered and selectively or concurrently operated under manual control to pack ballast beneath the tie at and adjacent to the regions of rail support. In this prior apparatus, the equipment for powering the propelling, and brake actuating means, the means for raising and lowering the tamper groups and the tampers themselves is mounted on the car. This prior apparatus is thus in the nature of a self contained unit and, as such, is of considerable weight, and while capable of being removed from the track to permit passing of trains where exclusive use of track cannot be obtained, its removal is nevertheless time consuming and therefore detrimental to production.

The chief aim of our present invention is to overcome the above mentioned drawbacks. This objective is realized in practice, as hereinafter more fully set forth, through provision of a ballast tamping apparatus which is more versatile and permits of greater production on one or two track railways. Briefly described, our new apparatus includes a carriage which is relatively light in weight and which supports only the tampers and the actuating means therefor, the propelling means, and the brake or holding means therefor; and a self propelled tractor adapted to travel the right of way alongside the track, said tractor supporting a power plant for furnishing, through a flexible connecting means, the power for driving the carriage and actuating the tampers, and being equipped with a power operated boom whereby the carriage can be quickly removed laterally from the track to clear the track for passage of trains, and as quickly restored for resumption of the tamping after the trains have passed.

Other objects and attendant advantages will appear from the following detailed description of the attached drawings wherein:

Fig. 1 is a view in top plan of a railway ballast tamping apparatus conveniently embodying our invention with the tamping carriage shown in position on the railway track which is to be tamped.

Fig. 2 is a front elevation of the apparatus as seen when viewed from the left of Fig. 1.

Fig. 3 is a side view of the tamping carriage alone, drawn to a larger scale.

Fig. 4 is a front end view of the tamping unit or as it appears when viewed from the left of Fig. 3.

Fig. 5 is a horizontal sectional view taken as indicated by the angled arrows V—V in Figs. 3 and 4.

Fig. 6 is a diagrammatical view showing the tampers and the actuating means therefor, the propelling and holding means, the control means and the system provided on the carriage for distribution of the power to these various means; and

Fig. 7 is a sectional view of an automatically-operative instrumentality used in the power distribution system.

Referring first more particularly to Figs. 1 and 2 of these illustrations, it will be noted that our improved ballast tamping apparatus comprises tamper carriage **10** having wheels for shiftability on the track rails R; and a tractor **11** adapted to travel the right of way alongside the track, said tractor having a boom **12** for placing the tamping unit upon the track, or for removing it from the track onto the right of way as indicated in broken lines in Fig. 1 to clear the track for traffic thereover. The tractor **11** is preferably of a self propelling crawler or caterpillar type, and mounted upon it, as shown, is a power plant which, in this instance, includes a storage tank **13** for compressed air, and a housed motor compressor set **14**. Connected to the piston rod **15** of a double acting cylinder **16** on the boom **12** is a cable **17** which passes over a guide sheave **18** at the distal end of the boom, and which is provided at its free end with a hook **19** for engaging a lift eye **20** at the top of the tamper carriage **10**. Compressed air is conducted to opposite ends of the cylinder **16** from the storage tank **13** to raise and lower the tamper carriage **10**, through flexible hoses **21** and **22** under control of a hand valve **23** on the tractor **11**. Tipping or overturning of the tractor **11** during removal or placement of the tamper carriage **10** from or upon the track is prevented by a pair of horizontally swingable outrigger arms **24** and **25** which are pivotally connected to opposite ends of the tractor frame at **26** and **27** respectively. At their distal ends, the outrigger arms **24** and **25** are provided with vertically adjustable foot pads **28** and **29** arranged to be rested upon the ends of two of the track ties T.

As best shown in Figs. 3–5, the tamper carriage **10** has an open table-like frame of structural steel with spaced end and intermediate transverse beams **30** and **31**, and with front and rear legs **32** and **33** which afford journal support for the track engaging wheels **34** and **35**. The axle **36** of the front wheels **34** is arranged to be driven, through speed reducer **37**, by an air motor **38** supported in suspension from the frontal transverse beam **30** of the carriage frame.

In order to prevent carriage **10** from shifting on the rails R during the tamping, we have provided it at opposite ends with grippers **40**. These grippers are individually fulcrumed on brackets **41** secured to the legs **32** and **33** of the carriage frame and adapted to engage beneath the heads of the rails R as shown in Fig. 4, the upward arm of one gripper of each pair being pivotally connected to the piston rod **42** of a double acting air cylinder **43** which, in turn, is pivotally connected to the upwardly extending arm of the other gripper of such pair. Tamper carriage **10** is further provided at each end, for set-off purposes with a pair of auxiliary wheels **45** which are journalled for free rotation in the brackets **41**.

Upstanding from the top of the frame at opposite sides of the center of carriage **10** are pairs of hollow columns **48** and **49**, the columns of the respective pairs being equally spaced relative to the longitudinal planes of the corresponding rails R, and all four of them being connected together at the top by a channel beam **52** in which the lifting eye **20**, hereinbefore mentioned, is anchored at the center. As best seen in Fig. 3, the columns **48** and **49** are bolted fast at their bottoms to plates **53** and **54** respectively bridged between the intermediate cross beams **31** of the carriage frame. Arranged at one side of the carriage is a tamping unit **50** whereof the cross head designated **55** is guided for up and down movement by the columns **48**. Cross head **55**, see Fig. 4, is pivotally connected at **56** to the piston rod **57** of a double acting pressure fluid cylinder **58** hung from the beam **52** centrally between the columns **48**. Disposed between the frame legs **32** and **33** at the

corresponding side of carriage 10 below the beams 30 and 31 is a lower cross head 59 having, at opposite ends, upstanding plungers 60 and 61 which are slidably engaged upwardly into the hollow columns 48 for guidance thereby independently of the upper cross head 55. Associated with cross head 59 is a group of eight tampers 62, there being four such tampers at each side of the cross head, opposed pairs of which are symmetrically positioned at opposite sides of the vertical longitudinal axis plane of the corresponding track rail R. The tampers 62 are all of the pneumatic percussion type, the casing or body of each of them being provided at the top with a supporting fin 63 which is pivotally connected to the lower end of a thrust link 65, the upper end of each link being similarly connected to the cross head 55. Each link 65 is composed of two telescoping sections of which the lower one is slidably engaged in the upper one and yieldingly urged outward by a spring 66, as instanced at the right side of Fig. 4. Projecting from opposite sides of the fin 63 of each tamper 62 is a pair of spaced roller studs 67 which engage into arcuate slots in a pair of spaced wing-like guides 68 extending laterally from the lower cross head 59. As shown in Fig. 5, the guide plates 68 for the respective pairs of tampers 62 at each side of the lower cross head 59 are set at complementary acute angles to the longitudinal median plane of the rail, being thereby positioned more or less radial to the rail supporting area of the tie. The tool bar 69 of each tamper has a relatively wide blade end which is curved or inclined inwardly with respect to the cross head.

The lower cross head is limited in its descent by means including rods 70 which, as shown at the right of Fig. 4, extend axially downward through the columns 48 and into the plungers 60 and which have stop enlargements 71 at their bottom ends to react with the inner faces of the tops of said plungers. For the purpose of individual axial adjustment as may be necessary for operation of the apparatus upon tracks having rails of different heights, the stop rods 70 are threaded at their upper ends and provided with regulating nuts 72 which bear upon resilient plugs 73 engaged in the tops of the columns 48. The compression springs shown at 72 cushion the upper crosshead 55 in its descent as later on explained, and also tend to overcome any tendency of the plungers 60 to bind in the columns 48 at the initiation of upward movement of said head.

Similarly arranged at the opposite side of the carriage is an identical tamping unit 51 whereof the upper cross head 55*a* is guided for up and down movement by the columns 49. In order to dispense with the necessity for repetitive description, all of the component elements of the unit 51, having their counterparts in the unit 50, are identified by the same reference numerals previously employed with addition, however in each instance, of the letter "*a*" for convenience of more ready distinction.

Arranged on the tamper carriage is a piping system through which compressed air is conducted to the propelling motor 38, to the gripper actuating cylinder 43, to the cross head actuating cylinders 58 and 58*a* and to the tampers 62 and 62*a*. As best shown in the diagram of Fig. 6, this pipe system includes a main 75 which, by means of a hose 76 (Fig. 1), is connected to the compressed air storage tank 13 on tractor 11. Interposed in the main 75 is a shut off hand valve 77, and leading from said main is a pipe 78 which extends to a four-way plunger valve 80. As shown in Fig. 4, valve 80 is mounted on the top of the carriage frame and its plunger is vertically disposed for actuation, through a toggle means 81, by cam projections 82 and 82*a* respectively on the cross heads 55 and 55*a*. Leading from valve 80 are two pipes 83 and 84 with branches 85, 86 and 87, 88 extending to the gripper actuating cylinders 43 at opposite ends of the tamper carriage. Through pipes 90, 91 and 90*a*, 91*a*, the cylinders 58 and 58*a*

are connected respectively to manually operable control valves 94 and 94*a* mounted side by side on the transverse beam at the rear end of the tamper carriage convenient of access from an operator's chair 96 (Figs. 1, 3 and 5), said valves being in communication with the pipe 78 by way of branches 97 and 97*a*. Air is conducted to the tampers of the two groups through individual flexible tubes 99 and 99*a* leading down from manifolds 100, 100*a* and 101, 101*a* which extend transversely of opposite ends of the carriage, and which are rigidly supported by upstanding clamp brackets 102 at the top of the carriage frame, said manifolds being connected, in turn by branch pipes 103 and 103*a*, to branch pipes 105 and 105*a* extending laterally from pipe 78. Interposed in pipes 105 and 105*a* are relay valves 107 and 107*a* respectively which are automatically actuated by compressed air conducted through tubes 109 and 109*a* from the pipes 90 and 90*a* as presently explained. The propelling motor 38 is controlled by a separate manually operable reversing valve 111 mounted alongside the valve 94 on the transverse beam 30 at the rear end of the carriage frame, and connected with pipe 78 by way of a branch pipe 112, and with said motor by way of pipes 113 and 114.

As instanced in Fig. 7, each relay valve 107 or 107*a* has a slide stem 115 which is provided with closure disks 116 and 117 for controlling flow ports 118 and 119. Also on the stem 115 is a piston 120 which operates in a chamber 121 in communication, by way of pipe 109, with the manual control valve 94 as shown in Fig. 6. A spring 122 serves to keep the stem 115 of the relay valve normally positioned as in Fig. 7 with the port 118 closed and the port 119 open.

Operation

Assume that the carriage 10 is in place on the track rails as in Figs. 1 and 2, ready to be shifted forward or backward to spot the two tamper groups over a rail tie. Such shifting is accomplished by manipulating the hand valve 111 for drive of the propelling motor 38 in the proper direction. After the tampers have been properly spotted, control valve 94, for example, is manipulated to admit air into the upper end of the cylinder 58 at the left side of carriage 10. As a consequence, the cross heads 55 and 59 are lowered for a time together and the tampers 62 thereby moved into operative position relative to a tie T as shown at right of Fig. 4. Lower cross head 59 is arrested in its descent through engagement of the top closures of the plungers 60 with the heads 71 on the stop rods 70, after which upper cross head 55 continues downward somewhat further to the final position of Fig. 4, its descent being cushioned by the springs 74, with consequent avoidance of undue shock to the carriage frame. As cross head 55 is thus additionally lowered, valve 80 is automatically opened through actuation of the toggle means 81 by the cam projection 82, compressed air being thereby admitted to the cylinders 43 to move the grippers 40 into engagement with the rails to prevent carriage 10 from rising or shifting while the tamping takes place. Moreover, during the independent additional downward movement of the lower cross head 59 as just explained, the tampers 62 at opposite sides of the rail R are swung inwardly relative to the tie through influence of the arcuate slots of the wings 68 upon the studs 67 under the thrust of the links 65, while air is at the same time admitted to them as a consequence of automatic opening of the relay valve 107. In this way, ballast is forced by the tamper bars 69 beneath the tie T from opposite sides in the region of rail support due to the angular disposal of the tampers 62, as well as beneath the end and the inwardly adjacent portions of the tie. By repeated raising and lowering of the tampers through manipulation of control valve 94 and constant impact of the tamper bars, more and more

ballast is compacted by a combined pounding and pressing action beneath the tie to the desired firmness, incident to which the springs 65, acting between the telescoped components of the thrust links 65, will yield if excessive resistance is encountered by the tamper bars so that breakage of the latter is reduced to a minimum. After sufficient ballast has been compacted beneath the tie, control valve 94 is manipulated to admit compressed air into the lower end of cylinder 58 to fully lift the cross heads 55 and 59 for withdrawal of the tampers to clearing position above the track bed. In this action, lower cross head 59 moves alone for a time until the tampers assume a vertical position whereupon upper cross head 59 follows suit as will be readily understood. During the rise of the tampers as just explained, air flow through pipe 105 and tube 109 is cut off with consequent restoration of relay valve 107 to the normal position by the spring 122 (Fig. 7). Also at the same time, the valve 80 is permitted to resume its normal position as the cam 82 on cross head 55 clears the toggle means 81 for retraction of the rail grippers 40 in readiness for shifting the carriage 10. Air is thus supplied to the tampers only during the final downward movement of lower cross head 59 with consequent avoidance of wastage and corresponding enhancement in the efficiency of the apparatus.

The tampers 99*a* at the right side of the car can be independently raised and lowered in a like manner by manipulation of valve 94*a* or the tampers at both sides of the carriage may be operated concurrently by simultaneous manipulation of the valves 94 and 94*a* if tamping should be necessary beneath both rails. In either event, after the ballast has been compacted beneath one tie, the propelling motor 38 is utilized under control of valve 111 to move the carriage 10 for spotting the tampers over the next tie, whereupon the same procedure is followed to compact the ballast beneath such tie. After the carriage 10 has been shifted within the limits allowed by the cable 17, the tractor 11 is advanced to a new position on the track for continuation of the tamping as before.

When the track must be cleared to permit passing of trains, compressed air is admitted into the upper end of the cylinder 16 on the boom 12 of tractor 11 by manipulation of control valve 23, to lift the tamper carriage 10 through pull upon the cable 17, clear of the track rails. With this accomplished the boom is swung to the broken line position of Fig. 1 to deposit the carriage on the right of way alongside the track. After the train or trains have passed, the tamper carriage 11 is replaced upon the track by reversal of the above procedure for resumption of the tamping.

Having thus described our invention, we claim:

1. In railway track ballast tamping apparatus, a carriage shiftable on the track rails; a normally elevated crosshead guided for up and down movement on the carriage, a group of pneumatic tampers on the crosshead for packing ballast beneath the track ties; a double acting cylinder for lowering and raising the crosshead to bring the tampers into and out of operative relation to the track bed; normally-retracted self-releasing rail grippers on the carriage and pressure fluid actuating means therefor; manual valve means for selectively admitting pressure fluid into the opposite ends of the double acting cylinder to lower and raise the crosshead; an air supply line connected to said tampers to actuate said tampers, a valve in said line, and means connected to said valve for automatically actuating said valve during lowering of the crosshead to admit compressed air to the tampers, and to shut off the supply to the tampers as the crosshead is raised; a normally closed valve on the carriage for controlling admission of pressure fluid to the gripper-actuating means; and a cam means on the crosshead for opening the last mentioned valve as the crosshead is lowered to admit pressure fluid to the gripper actuating means for operation of the grippers to hold the carriage against shifting during tamping.

2. The tamping apparatus defined in claim 1 wherein said normally closed valve opening means includes a lazy-tong device connected to the operating member of the valve.

3. The tamping apparatus defined in claim 2, wherein said cam means is positioned to move up and down and to engage a side portion of said lazy-tong to cause the valve to be opened.

4. The tamping apparatus defined in claim 1 in combination with another tamping apparatus as defined in claim 1, mounted on opposite sides of a common carriage, and wherein said manual valve means of each said tamping apparatus is operable independently of the other whereby either of said crossheads may be moved up and down independently of the other.

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