

C. A. HELFER.
TELEMOTOR.

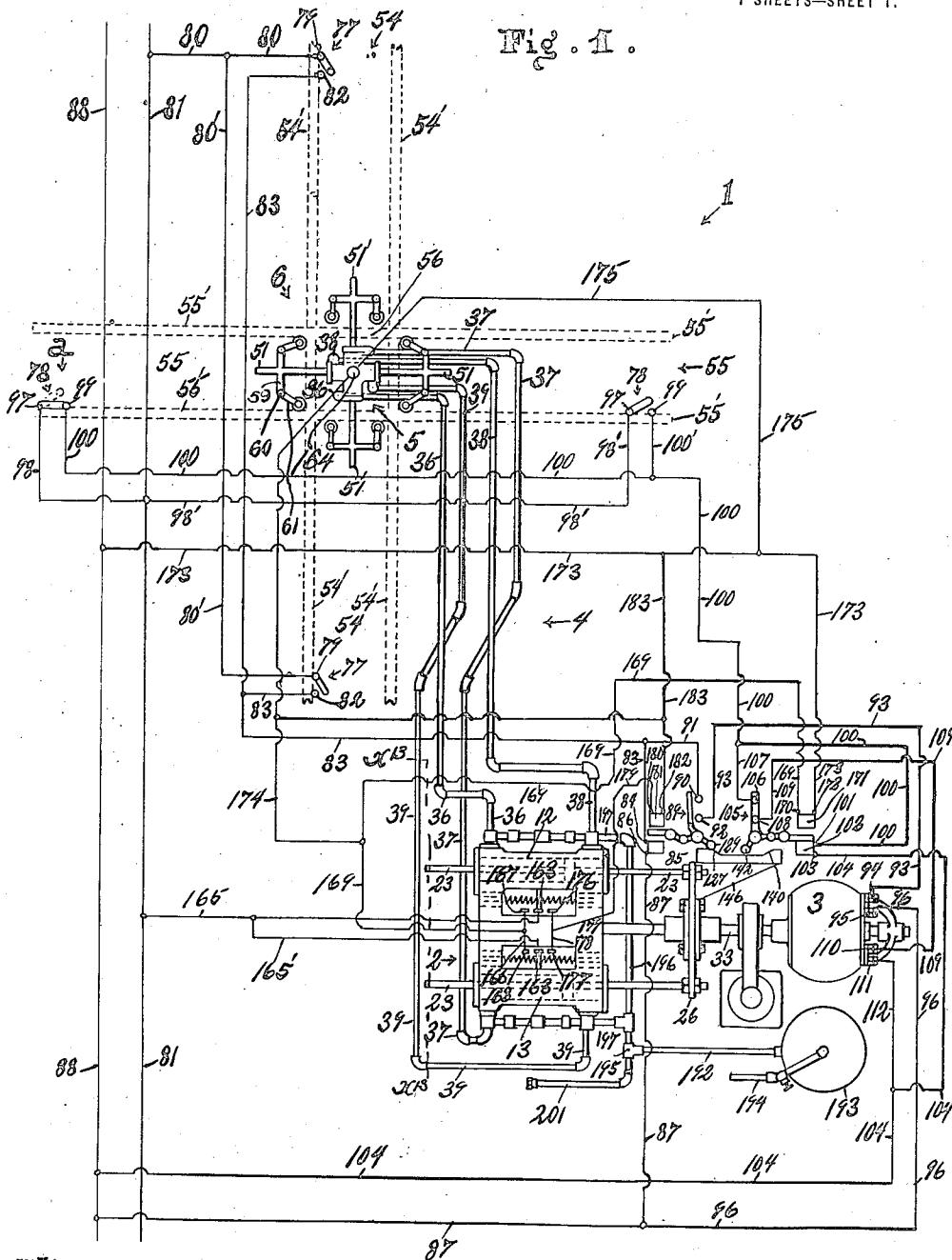
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Patented July 11, 1922.

7 SHEETS—SHEET 1.

1,422,705.

Fig. 1.



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Fig. 2.

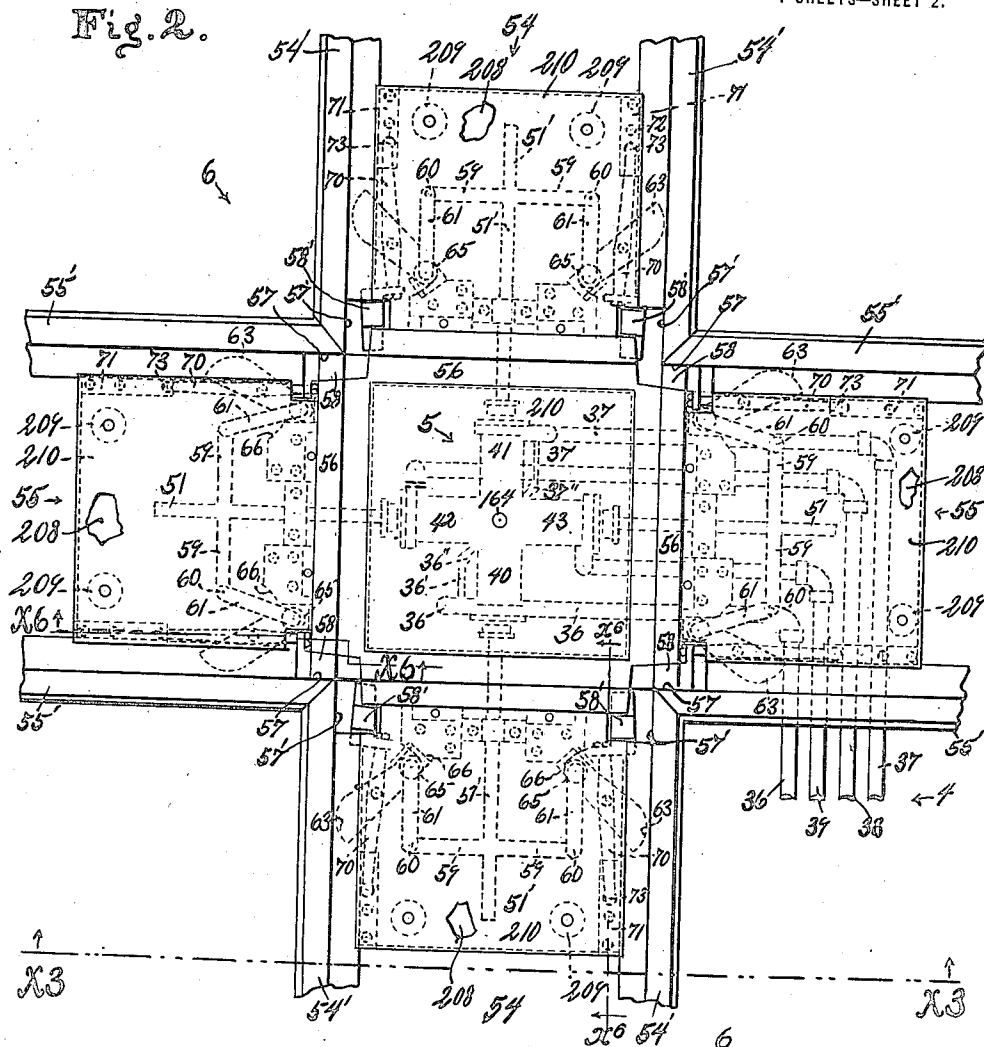
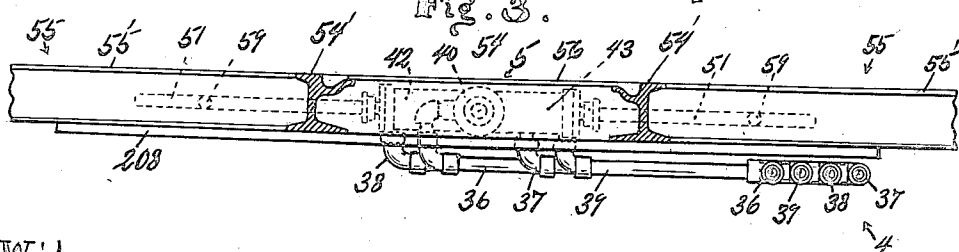


Fig. 3.



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Fig. 4.

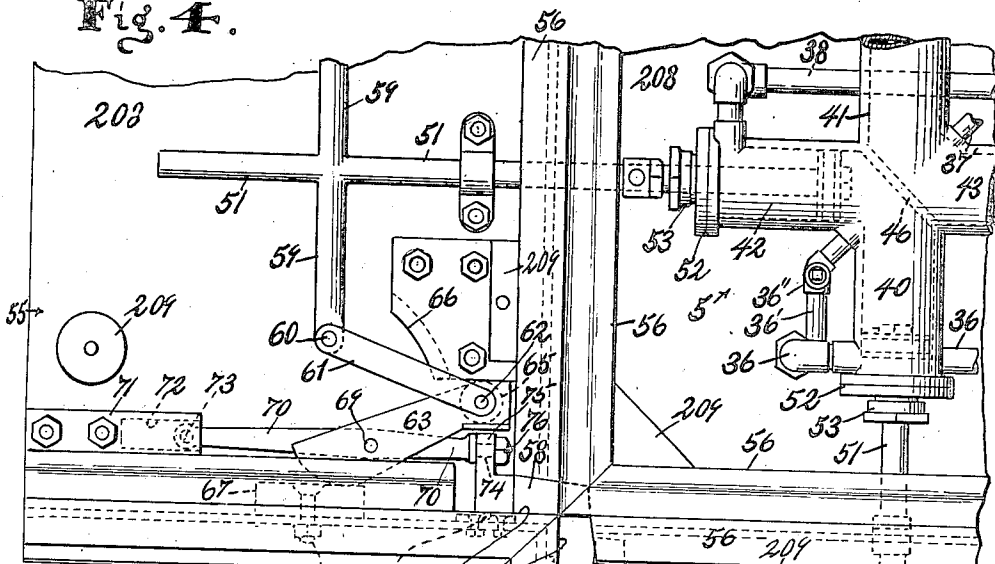


Fig. 5.

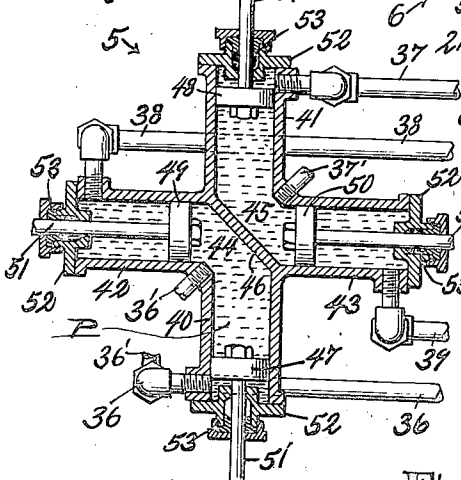
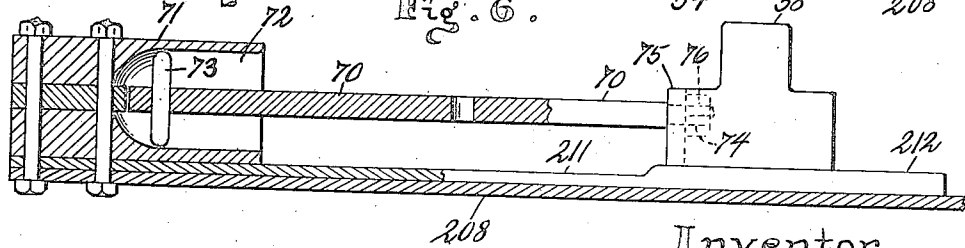


Fig. 6.



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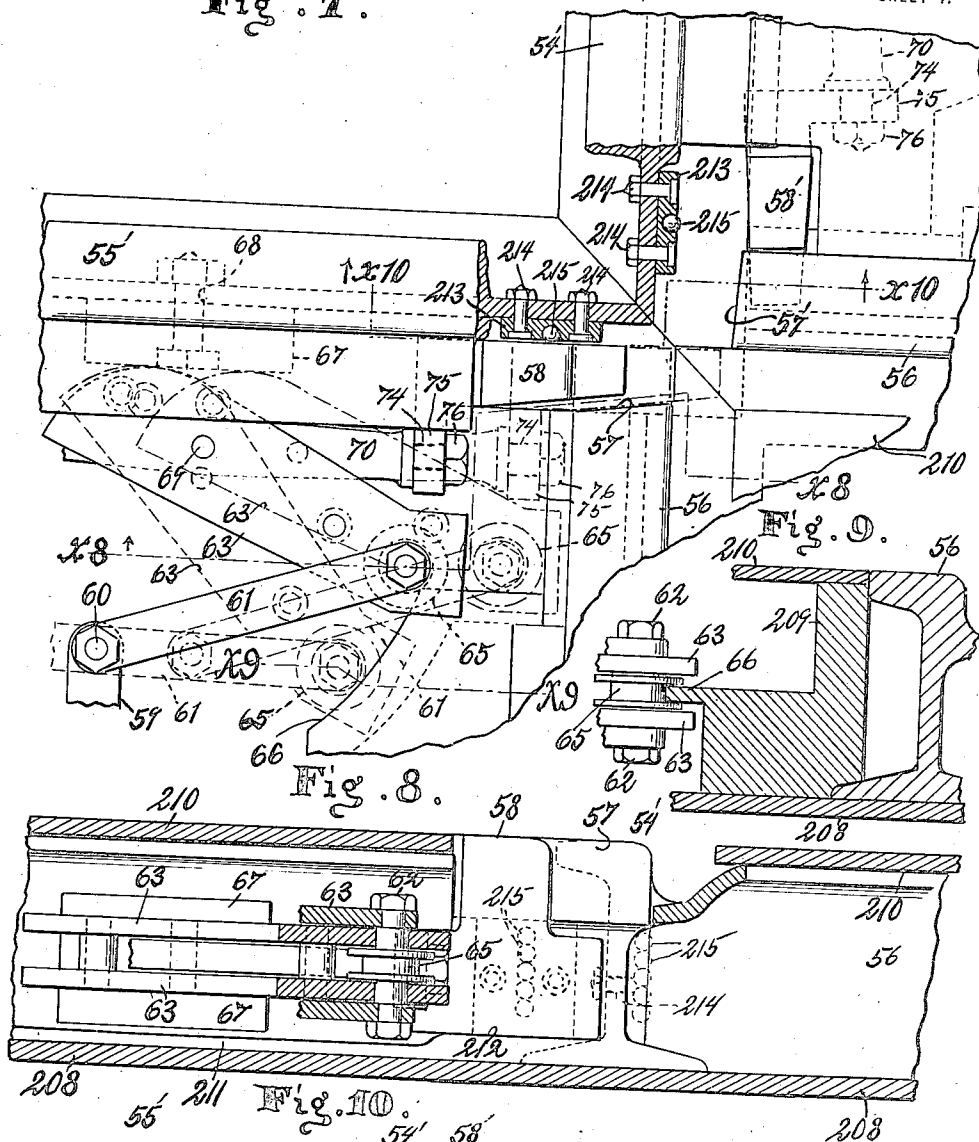
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Fig. 7.



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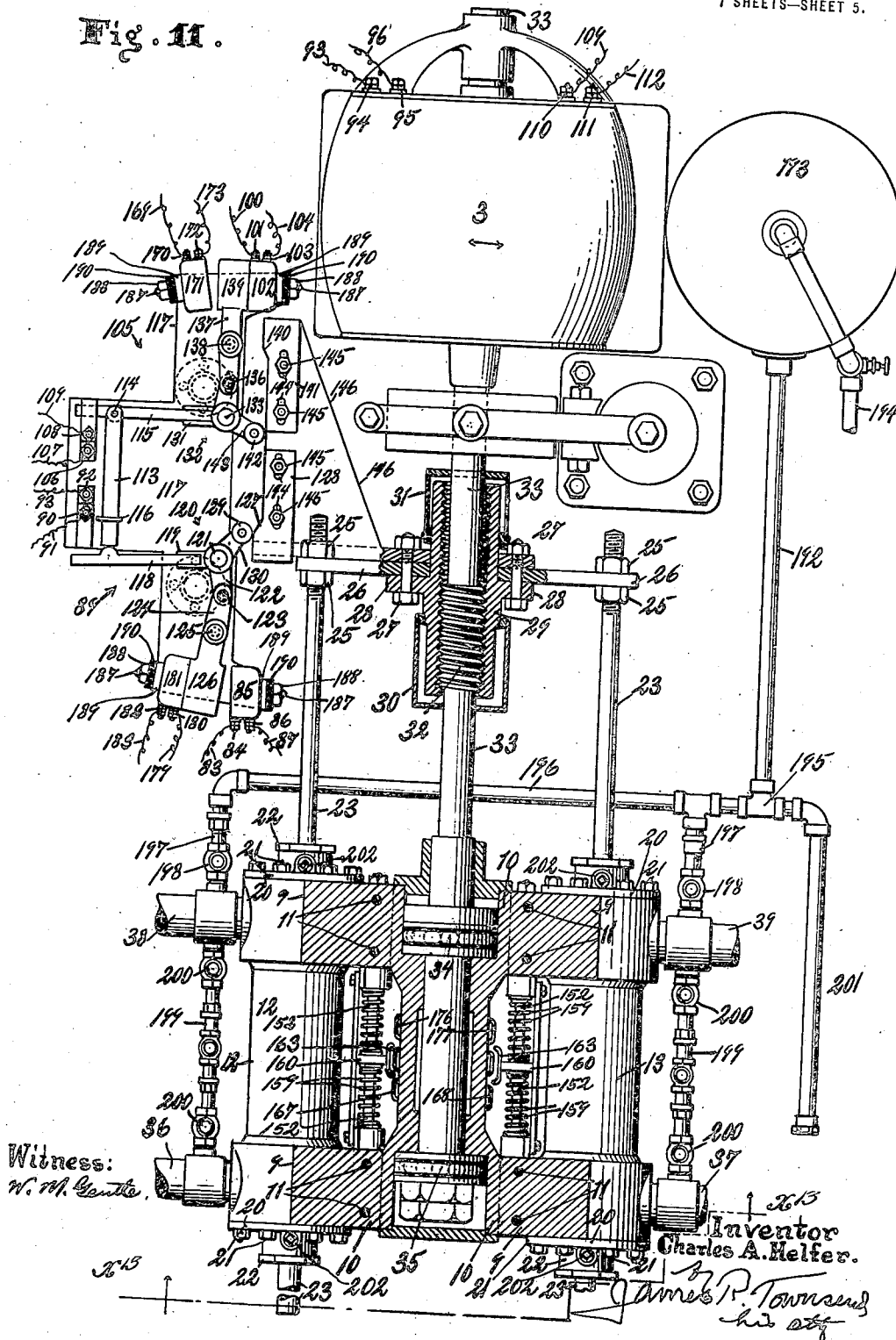
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Fig. 11.



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Fig. 12.

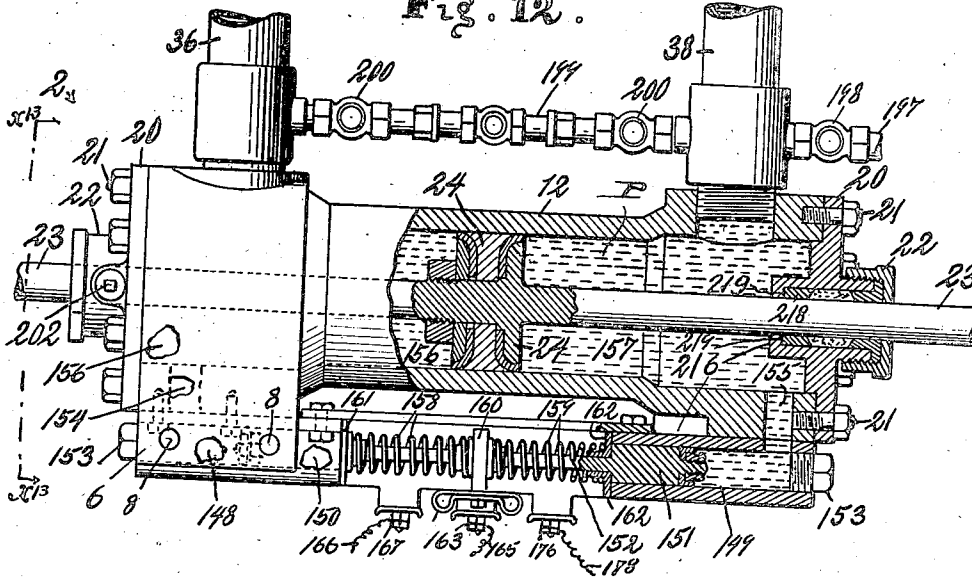


Fig. 13.

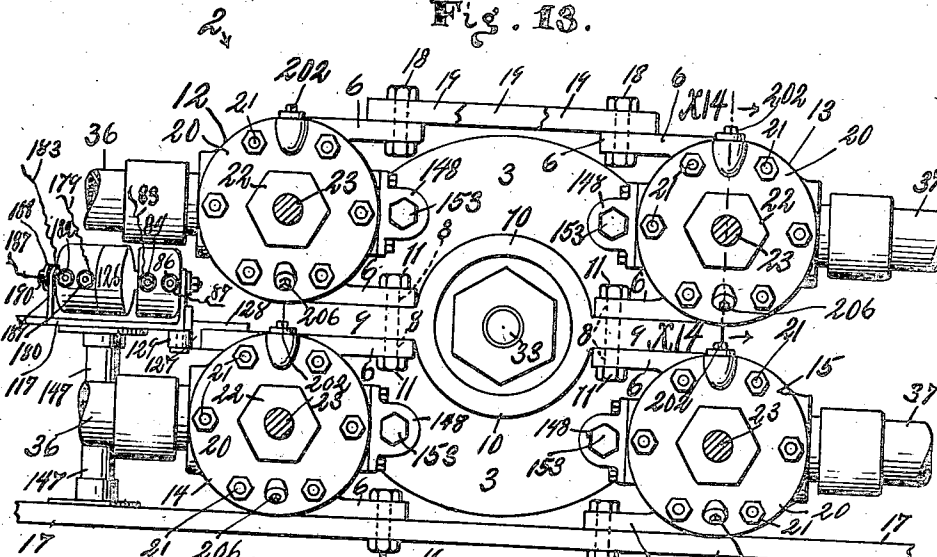
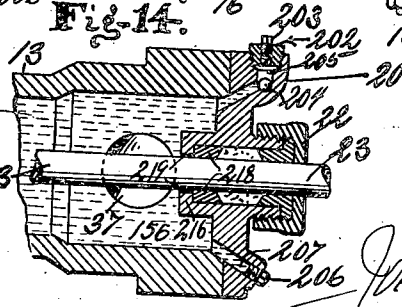


Fig. 14.



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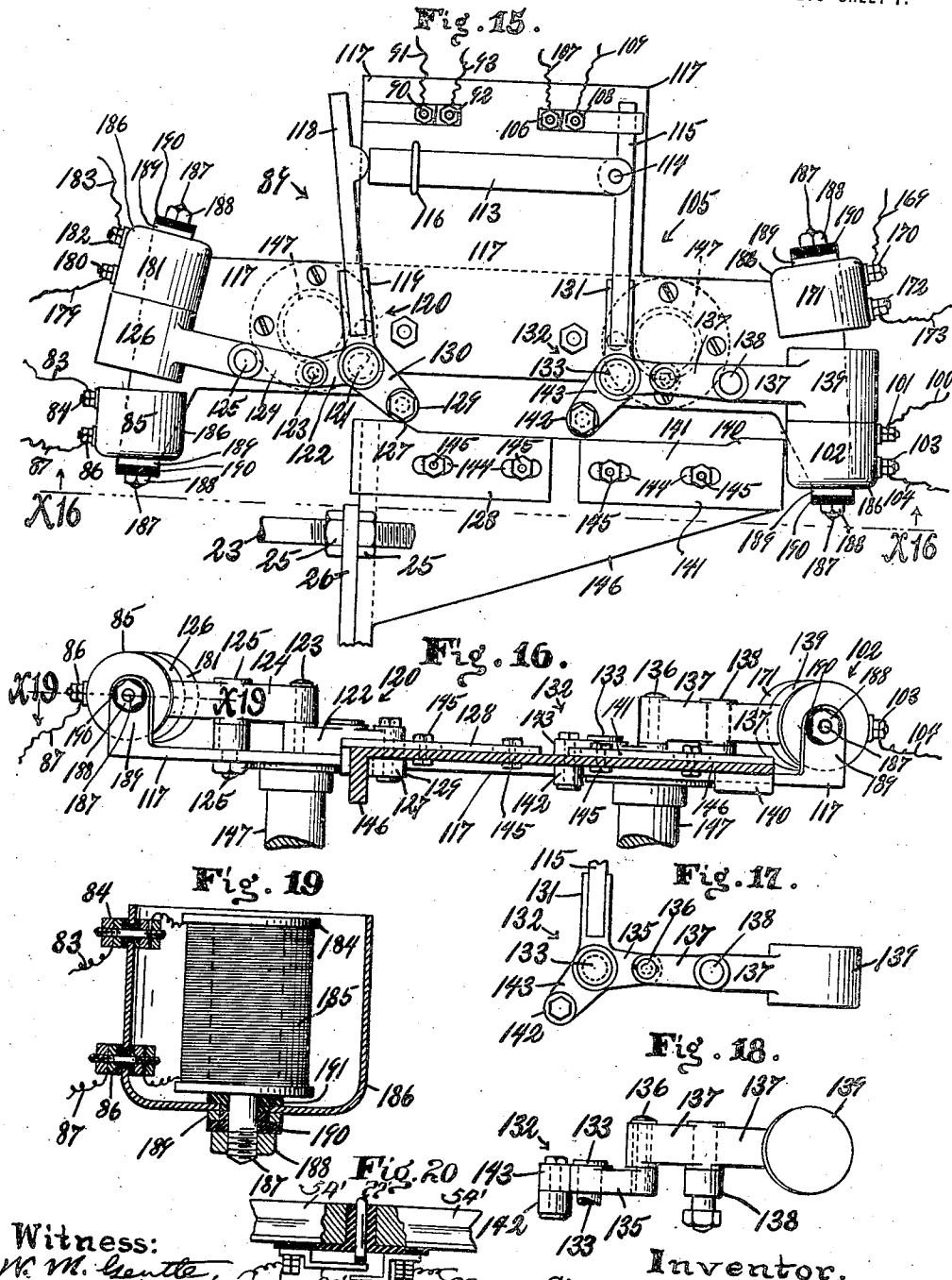
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7 SHEETS—SHEET 7.



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UNITED STATES PATENT OFFICE.

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1,422,705.

Specification of Letters Patent.

Patented July 11, 1922.

Application filed July 29, 1919. Serial No. 314,173.

To all whom it may concern:

Be it known that I, CHARLES A. HELFER, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Telemotor, of which the following is a specification.

This invention relates to a motor adapted, amongst other uses to apply power from a unitary source, in different directions for various purposes, as for instance to shift tread blocks at railroad crossings in which the gaps usually formed for the passage of the car wheel flanges are filled by tread blocks that are shiftable into and out of the gaps as desired to form a continuous track in one or the other direction, through the crossing; and this invention may be said to consist in the novel motor, and various features of construction, and in combinations and arrangements of parts, the purposes of which will be apparent to those skilled in the art from a consideration of the preferred form of structure herein shown, described and claimed.

One of the principal objects of this invention is to provide means in a motor of the character stated which is relatively simple and cheap in construction, and which will be strong and durable in operation; which can be easily assembled and installed; and which can be easily repaired when out of order.

An object is to provide a novel and superior motor by which blocks may be automatically operated whenever the prime mover of the apparatus is set in motion.

Another object is to provide a motor of the character stated that will automatically stop so as to prevent breakage whenever the movement of connected parts is obstructed.

Another feature of the invention resides in an automatic means for maintaining the power and shifting cylinders full of oil.

The number of final elements such as the tread blocks required at a railroad crossing of the character described may be only eight in the case of a single track crossing, while in the case of double track crossing thirty-two tread blocks are required, and an object of this invention is to provide a telemotor that is adapted to simultaneously operate all of the tread blocks at any railway crossing and to do this by simply applying power to drive a prime mover in one or the other direction depending upon the position of the tread block at rest.

The invention includes a prime mover in the form of a reversible electric motor, a shaft rotatable by said prime mover and provided with a worm, a nut on said worm, cylinders, pistons in the cylinders connected to and movable by, the nut, second cylinders, pistons in the second cylinders, pipes by which the second cylinders are connected with the first cylinders, a liquid medium in the pipes and cylinders, and connections adapted to transmit motion from the pistons of the second cylinders to perform a required work.

Objects of the invention are simplicity, freedom from getting out of order, certainty of action, and ease of construction, installation, repair and operation.

Other objects, advantages and features of invention may appear from the accompanying drawings, the subjoined detailed description and the appended claims.

For convenience I shall describe the invention as applied for moving tread blocks at a railway crossing.

Figure 1 is a diagrammatic plan of the invention applied in apparatus adapted to operate the movable tread blocks of a single track railroad crossing, which is indicated by dotted lines.

Fig. 2 is a plan illustrating the invention as applied beneath the surface at a railroad crossing provided with movable blocks and arranged for moving the blocks in or out of the flange gaps; the ends of the rails being broken away and the sub-surface parts being shown by dotted lines.

Fig. 3 is a fragmental side elevation of the motor mounted in a crossing shown in section on line $\alpha 3$, Fig. 2; one track being in cross-sectional, and the other in side, elevation.

Fig. 4 is an enlarged fragmental plan of the lower left hand portion of Fig. 2, omitting the cover plates to show in full lines certain parts of the apparatus shown by dotted lines in Fig. 1.

Fig. 5 is a sectional view through the opposing cylinders of the motor as adapted for operating the tread block mechanism referred to.

Fig. 6 is an enlarged fragmental section on lines $\alpha 6$, Fig. 2, showing a detail of one of the movable blocks and its mounting.

Fig. 7 is an enlarged fragmental plan of the upper left hand corner of the crossing shown in Fig. 2; parts being broken away

to show a detail of the connections for moving tread blocks; and the means for moving said connections.

Fig. 8 is an enlarged fragmental sectional view on line $\alpha 8$, Fig. 7 showing part of the motor adapted for moving a tread block which is shown in elevation.

Fig. 9 is an enlarged fragmental sectional view on line $\alpha 9$, Fig. 7, showing a detail of the connection for moving a tread block.

Fig. 10 is an enlarged section on irregular line $\alpha 10$, Fig. 7, showing a detail of the ball bearing plates shown in dotted lines in Fig. 7.

Fig. 11 is an enlarged fragmental plan of the prime mover and its connections for shifting the tread blocks, portions being in cross section to show internal construction.

Fig. 12 is an enlarged fragmental plan, partly in section, of the cylinder shown in the lower left hand corner of Fig. 11.

Fig. 13 is an enlarged fragmental elevation in section on line $\alpha 13$, Figs. 1, 11 and 12 looking in the direction of the arrow toward the reversible electric motor and showing in detail, the arrangement of a plurality of cylinders in a motor for operating eight pistons for actuating sixteen tread blocks at a railroad crossing.

Fig. 14 is a section on line $\alpha 14$, Fig. 13, showing a detail of one end of the power cylinders.

Fig. 15 is an enlarged plan of the switch mechanism shown in the upper left hand corner of Fig. 11.

Fig. 16 is a section on line $\alpha 16$, Fig. 15, showing the switch mechanism in side elevation.

Fig. 17 is a plan view of one of the switch arms and associated parts separated from the other mechanism.

Fig. 18 is a side elevation of the parts shown in Fig. 17.

Fig. 19 is a section through one of the magnets on line $\alpha 19$ of Fig. 16.

Fig. 20 is a sectional detail elevation of a circuit switch.

The apparatus 1 which as shown, comprises the first power cylinders 2 the pistons 24 of which are operated by a prime mover 3. The power cylinders 2 are connected by pipes 4 to the second, or compound cylinders 5, that are coordinate in action with power cylinders 2 which are shown as being positioned centrally in a railroad crossing 6, shown by dotted lines in Fig. 1. The power cylinders 2 are so constructed that a plurality of them can be joined together and operated by the prime mover 3 to move widely separated elements and said elements are shown as the tread blocks in a plurality of rail crossings. For the sake of clearness in the drawings the apparatus is shown in connection with only one railroad crossing.

The power cylinders 2 are preferably formed with four legs which are shown as flanges 6, each of which has a surface that is tangent to the exterior periphery of the cylinder; and through each of these flanges 6 are bolt holes 8 that are adapted to register with similar holes in the flanges 9 of the shaft boxing 10; and by means of the bolts 11 one flange of each of the cylinders 12, 13, 14 and 15 is secured to a flange 9 of the boxing 10. The lower flanges 6 of the cylinders 14 and 15 are secured by the bolts 16 to a bed plate 17; and the upper flanges 6 of the cylinders 12 and 13 are secured by the bolts 18 to cross plates 19, see Fig. 13. The cylinders 12 and 13 are adapted to operate the tread blocks at the railroad crossing shown in the drawings; and the cylinders 14 and 15 are adapted to operate tread blocks at another crossing not shown. In the event that an additional railroad crossing is to be operated, additional cylinders can be secured by the bolts 18 to the flanges 6, instead of the cross plates 19; and also from the drawings it can readily be seen that any number of power cylinders can be joined together to operate pistons corresponding to the pistons 47, 48, 49 and 50, shown in Fig. 5.

As only one railroad crossing is shown in detail, only one set of power cylinders and their connection to the tread blocks will be described; and for convenience the cylinders 12 and 13 are connected to the crossing and described in detail. Each of these cylinders 12 and 13 is provided with cylinder heads 20 that are secured to the cylinders by stud bolts 21; and these cylinder heads are provided with stuffing boxes 22 that are adapted to prevent leakage around the piston rods 23.

The piston rods 23 extend entirely through their respective cylinders 12 and 13 and have the pistons 24 which are adapted to move from end to end of the reduced portion of their cylinders; that is the movement of the pistons in the cylinders is limited as will be hereinafter set forth.

One end of the piston rods 23 is secured by the nuts 25 to the cross head 26; and the cross head 26 is secured by the bolts 27 to the flange 28 of a nut or internally threaded block 29 within a dust proof enclosures 30 and 31; see Fig. 11. Within the block 29 there is mounted a worm or screw 32 which is adapted to mesh with the threads of the block 29; also the screw 32 is integral with the motor shaft 33; and as seen in Fig. 11 this shaft 33 has one end mounted in the motor 3, and the other end mounted in the ball bearings 34 and 35 in the boxing 10.

From the foregoing it can readily be seen that when the motor 3 is driven to rotate the shaft 33, the block 29 will be moved by the screw 32, which movement will be trans-

mitted through the cross head 26 to move the piston rods 23 and thereby actuate the piston heads 24.

The cylinders 12 and 13 and also the compound cylinder 5 are maintained constantly filled with a liquid power transmitting medium P such as oil; so that when the pistons 24 move in the cylinders 12 and 13 they will move the liquid medium through the pipe connection to the compound cylinders 5 and thereby move the pistons in the latter.

Bypass pipes 36' and 37' are provided for by passing oil from the pipes 36 and 37 to the chamber of the compound cylinders at the time of installment so that oil is by passed into the cylinders between the inner ends of the opposing pistons thus to allow all the cylinders to be filled. After the chambers on both sides of each piston have been filled, the passageway through the pipes 36' and 37' is closed by the valves 36'' and 37''. Pipes 36' and 37' are only used at filling or emptying of the cylinders.

When the motor 3 is operated to move the pistons 24 in either direction, the oil is alternately forced through the pipes 36 and 37 and then through pipes 38 and 39 to operate the tread block shifting mechanism connected with the pistons of the compound cylinder 5; for as seen in the drawings the pipes are arranged in pairs as at 36, 37 and at 38, 39; the pipes of one pair being connected at one end of the cylinders 12 and 13 and 38 and 39 at the other end. These pipes 36, 37, 38 and 39 extend to the railroad crossing 6 and are connected to the compound cylinder 5; which apparatus consists of the integrally connected cylinders 40, 41, 42 and 43 respectively; which cylinders are positioned in pairs; that is the cylinders 40 and 42 are connected by the passageway 44, and the cylinder 41 and 43 are connected by the passageway 45; and the passageways 44 and 45 are separated by a wall 46 that is integrally cast with the compound cylinders 5. In these cylinders are mounted the pistons 47, 48, 49 and 50, each of which is connected by the piston rods 51 to a tread block moving mechanism that will be explained later.

The cylinders 40, 41, 42 and 43 are provided with cylinder heads 52, through which the piston rods 51 extend; and these heads are provided with packing boxes 53 to prevent leakage from the cylinders.

When the motor 3 is actuated to move the pistons 24 toward the pipes 36 and 37 oil will be forced through these pipes to one side of the pistons 47 and 48 in the cylinders 40 and 41 to move them against the pistons 49 and 50 in the cylinders 42 and 43, and the pistons 49 and 50 will force the oil out of cylinders 42 and 43 through the pipes 38 and 39 toward the piston 24 in the power cylinder, thus completing the circuit, and when the piston 24 is moved in the oppo-

site direction or toward the pipes 38 and 39 the reverse action relative to the pistons in the compound cylinder 5 takes place; that is, the pistons 49 and 50 will be forced inwardly against the pistons 47 and 48, and the purpose of this movement of parts is to shift the tread block into or out of the gaps in the rails of the crossing.

As previously stated the compound cylinder 5 is located centrally in the railroad crossing 6, which railroad crossing can be of the usual construction, that is, the intersecting rails 54' and 55' can be beveled to abut one another and the short rails 56 can be of the usual construction and placed in the usual position with the gaps 57 and 57' cut therein for the passage of the wheel flange of the car.

As previously stated the principal object of this invention is to provide practical means by which to insert the tread blocks 58 and 58' into the gaps 57 and 57' to form a continuous tread surface for the car wheels so that in passing over the railroad crossing the wheels of the car will contact with the upper surface of the tread blocks 58 or 58', thereby eliminating the usual shock incident to the wheels dropping into the gaps 57 or 57' for provision is made for moving these blocks into these gaps whenever necessary to form continuous tracks. The movement of the blocks 58 or 58' into or out of the gaps 57 or 57' is accomplished by means of the compound cylinder 5; that is, the oppositely disposed piston rods 51 and 51' of this cylinder are joined to the tread blocks 58 and 58' through a connection that will now be plain. Near the outer end of the piston rods 51 and 51' and integrally connected thereto are the cross arms 59 which have their extending ends pivotally connected by the pins 60 to the links 61. The links 61 have their other ends connected by the pins 62 to the rocker arms 63, which rocker arms have at one end thereof the rollers 65 that normally abut the curved tracks 66; and these rocker arms have their other ends curved and abutting the plates 67, which plates are secured by the bolts 68 to the rails 54' and 55'. Near to one end of the rocker arms 63 are the pivots 69 to which pivots are connected the rods 70.

The rods 70 have one end thereof loosely mounted in the boxes 71, which boxes have the recess portions 72 that are cylindrical and are adapted to form sliding bearings for the pins 73, which pins are secured in the ends of the rods 70. The other ends of the rods 70 have the reduced portions 74 that pass through the flanges 75 on the tread blocks 58 and 58' and the flanges 75 are secured to the ends of the rods 70 by means of the nuts 76.

From the foregoing it can readily be seen that when the power cylinders 2 are actu-

ated to move the arms 59 toward or away from the compound cylinder 5 they will move the tread blocks 58 and 58' either into or out of the gaps 57 or 57'. When the blocks are being moved into these gaps they are first actuated in the arc of a circle toward the rails and then moved parallel with the rails until the tread blocks are located exactly in the gaps; and when the reverse movement takes place or when the arms 59 are moved away from the compound cylinder 5 the blocks will first be moved out of the gaps in a direction longitudinal of the rails and then move outward in the arc of a circle to a position where they are out of the way of the wheel flanges.

With the tread block 58 and 58' positioned as shown in Figs. 2, 4, 5 and 7 the gaps in the track 54 formed by the rail 54' are closed and the gaps in the track 55 formed by the rails 55' are open so that a car can pass over the track 54 and the tread portion of the car wheels will contact with and be supported by the blocks 58; and the flanges of the car wheels will be unobstructed in crossing the track 55.

Assuming that the parts are in the position shown in the drawings and that a train is on the track 55 and approaching the crossing 6 in either direction; as soon as the car wheels close either of the switches 78 the pistons in the compound cylinder 5 will be actuated to shift the tread blocks 58 and 58' or reverse the position of the blocks.

That is the pistons 47 and 48 will be actuated toward the center of the compound cylinder 5 to move the tread blocks 58' into the gaps 57' and form a continuous track on the rails 55'; and as the blocks 58' are moved into the gaps 57' the other pistons 49 and 50 will be moved away from the center of the compound cylinder 5 and consequently move the tread blocks 58 out of the gaps 57 so that these gaps 57 are open for the passage of the car wheel flanges.

From the foregoing it can readily be seen that when the tread blocks 58 are in the gaps 57, the gaps 57' will be open for the passage of the flanges on the car wheels; and when the tread blocks 58' are in the gaps 57' the gaps 57 will be open; and this reverse movement of parts is accomplished by the movement of the opposing pistons in the compound cylinder 5; said pistons being operated by the remotely located power cylinders 2.

As seen in Fig. 1 the railroad track 54 has therein the contact switches 77; and the track 55 has therein the contact switches 78, that are closed by the pressure of the car wheels, on insulated plungers 77' which when depressed contact the spring plate 80' with the contact 82 and these switches open automatically after the car wheels have

passed over them. The construction and operation of these switches are old and is well known. They are located a sufficient distance from the railroad crossing to give the tread block shifting mechanism time to move one set of the tread block out of the way of the car wheel flanges, and to move the other tread block into position to fill the gaps in the track on which the car is traveling.

The contacts 79 of the switches 77 are connected by the wires 80 and 80' to the line wire 81; and the contact 82 of the switches 77 are connected by the wire 83 and 83' to the contact 84 on the magnet 85.

The contact 86 of the magnet 85 is connected by the wire 87 to another line wire 88; which wiring completes a circuit between the line wires 81 and 88 when either of the switches 77 are closed. It is understood of course that the wires 81 and 88 are supplied with current from a generator, not shown.

When either of the switches 77 is closed the magnet 85 will be energized to close the switch 89 which switch has one contact 90 connected by the shunt wire 91 to the wire 83. The other contact 92 of the switch 89 is connected by the wire 93 to the contact 94 on the motor 3. From the contact 95 of the motor 3 a shunt wire 96 leads to the wire 87; by which wiring a circuit is formed through the motor 3 to the line wires 81 and 88.

The switches 78 are connected to the line wires and motor 3 as follows: The contact 97 of these switches are connected to the line wire 81 by the wires 98 and 98'; and the other contact 99 of the switch 78 is connected by the wire 100 and 100' to a contact 101 on the magnet 102. From the contact 103 of the magnet 102 a wire 104 leads to the line wire 88; thus completing a circuit through the magnet 102 to the line wires 81 and 88 when either of the switches 78 are closed.

When either of the switches 78 are closed the magnet 102 will be energized to close the switch 105, which switch has one contact 106 connected by a wire 107 to the wire 100. The other contact 108 is connected by the wire 109 to a contact 110 on the motor 3. From another contact 111 on the motor 3 a wire 112 leads to the wire 104 that is connected to the line wire 88.

Assuming that the tread blocks are in the position as heretofore described and a train is approaching the crossing 6 and has closed the switch *a* then the following movement of parts will be accomplished.

The magnet 102 will be energized to close the switch 105 as shown; which of course will supply current to the motor 3 through the circuit heretofore described.

When the motor 3 is thus energized it will rotate the shaft 33 in a direction that will move the pistons 24 to force the oil in the power cylinders 12 and 13 through the pipes

36 and 37 into the cylinders 40 and 41 to drive the pistons 47 and 48 toward one another. This movement of the pistons 47 and 48 causes the other pistons 49 and 50 to move outward from the center of the compound cylinder 5, which movement of parts shifts the tread blocks 58 out of the gaps 57 and moves the tread blocks 58' into the gaps 57', thereby forming a continuous wheel tread in track 55 and opening the gaps for the car wheel flanges in the intersecting track 54.

When the tread blocks have been fully shifted as heretofore described, the motor is stopped by opening the switch 105; and this switch and also switch 89 are opened automatically as will be hereinafter described.

Also it will be understood from the wiring of the motor that it alternately rotates in opposite directions. That is when the switch 89 is closed the motor 3 will drive the shaft 33 in a direction to force the pistons 24 toward the pipes 38 and 39, and when the switch 105 is closed, opposite movement of parts transpires.

The switches are separated by the insulated bar 113, which bar is pivotally connected by the pin 114 to the arm 115 of the switch 105. The other end of bar 113 passes through the guide ring 116, secured to the table 117, and the end of this bar abuts the arm 118 of the switch 89 so that when either switch is actuated by its operating armature the insulating bar 113 will be shifted to open the other switch should it inadvertently be closed.

The switch arm 118 is secured by any well known means in the arm 119 of the three arm bell crank 120, and this bell crank is made of insulating material. This bell crank is pivotally mounted on the pin 121 that is secured in the table 117. The arm 122 of the bell crank 120 is pivotally connected by the pin 123 to one end of a lever 124, which lever is fulcrumed on the bearing bolt 125 that is secured to the table 117.

The opening around the pin 123 is sufficient to permit of the slight movement of the arm 122 and lever 124 when the switch 89 is actuated.

The other end of the lever 124 has thereon the armature 126 that is adapted to be attracted toward the magnet 85 when the latter is energized thereby moving the lever 124 to move the associated parts and close the switch 89.

When the switch 89 is closed the motor 3 will be actuated as heretofore stated and by means that will hereafter be explained the switch is opened by the trip 127 on the plate 128, engaging the roller 129 on the arm 130, which arm is integrally connected to the bell crank 120.

The switch arm 115 is secured by any well known means to an arm 131 on a three arm

bell crank 132; and this bell crank is made of insulated material; and it is also pivotally mounted on the pin 133 that is secured in the table 117.

The arm 134 of the bell crank lever 132 is pivotally connected by the pin 136 to one end of the lever 137; and the openings around the pin 136 is large enough to permit the slight movement between the arm 135 and lever 137; when these parts are moved to open or close the switch 105.

The lever 137 is fulcrumed on the bearing bolt 138, which bolt is secured in the table 117. The other end of the lever 137 has thereon the armature 139 that is adapted to be attracted toward the magnet 102 when the latter is energized; thereby moving the lever 137 to actuate the associated parts to open or close the switch 105.

When the switch 105 is closed the motor 3 will be actuated in a direction opposite to its rotation when the switch 89 is closed as has been heretofore explained. After the switch 105 is closed and the motor 3 has been actuated to shift the tread block as provided the switch 105 is opened by means connected with the motor; that is a trip 140 on a plate 141 is moved to engage the roller 142, which roller is connected to the arm 143 of the bell crank 132; which engagement and movement of parts will open the switch 105.

The plates 128 and 141 are provided with the slots 144, and by means of these slots and the bolts 145 these plates are adjustably secured to the extension 146.

The extension 146 is secured to the cross head 26 by the bolts 27, see Fig. 11; and this extension 146 and its associated parts moves with the cross head, consequently when the switch 89 is closed the motor 3 will be actuated to move the cross head toward the motor 3; which movement of parts will bring the trip 127 into contact with the roller 129 and move the roller and associated parts to open the switch 89 and stop the motor.

The reverse movement of parts transpires when the switch 105 is closed. The motor 3 will be reversed and move the cross head 26 away from the motor which movement of parts will bring the trip 140 into contact with the roller 142 to move it and associated parts to open the switch 105 and stop the motor.

The table 117 is mounted on the supports 147 that are secured by any well known means to the base plate 17; and the table is located so that the plates 128 and 141 can be adjusted to bring the trips 127 and 140 into engagement with the rollers 129 and 142 to open the switches 89 and 105 and stop the motor at the proper time.

In the event that there is an obstruction

in the railroad crossing so that it is impossible for the tread blocks to be shifted, means are provided for automatically stopping the motor and for operating a danger signal to indicate that the crossing is out of order.

Each of the power cylinders 12 and 13 are provided with auxiliary cylinders 148 and 149 in which are the pistons 150 and 151; and these pistons are joined by the connecting rod 152. The ends of these pistons opposite to their connection to the rod 152 are provided with suitable packing to prevent leakage as the auxiliary cylinders are open at the end adjacent the connecting rod 152. The other ends of the auxiliary cylinders are closed with the plug nuts 153, see Figs. 12 and 13.

The auxiliary cylinders 148 and 149 are connected by the ports 154 and 155 with the respective compartments 156 and 157 in the cylinders 12 and 13.

The connecting rod 152 passes through the opposing springs 158 and 159 and also through the spacing block 160 and end bearing plates 161 and 162; and these parts are positioned so that normally they hold the pistons 150 and 151 in a fixed position, as the tension of these springs is sufficient to resist the normal pressure in the cylinders 12 and 13 as the pistons 24 are moved to shift the tread blocks. In the event, however that an obstruction in the railroad track prevents the shifting of the tread blocks, the movement of the pistons 24 will enormously increase the pressure in one end or the other of the cylinders 12 and 13; which increased pressure will be transmitted to one or the other of the auxiliary cylinders 148 or 149.

As previously indicated the pistons 150 and 151 and the blocks 160 are integrally connected to the piston rods 152 so that they move together.

When excess pressure is produced at either end of the cylinders 12 and 13 it will be transmitted to the auxiliary cylinders as heretofore described and this pressure will move the pistons 150 and 151 against the tension of one or the other of the springs 158 and 159 and consequently move the block 160, to which block there is attached a switch closing contact 163, constituting means to cut off power for actuating the motor to shift the elements, as the blocks 58.

As previously stated the safety operating mechanisms associated with the cylinders 12 and 13 are substantially alike; consequently there are two contacts 163 that can operate independently or in unison, that is an excess pressure in a compartment of the cylinders 12 and 13 will move one or the other of the blocks 160 to actuate the switch closing contact 163.

These switch closing contacts and asso-

ciated parts are connected to the motor 3 and a red light 164 by wiring that will now be described; it is understood of course that the red light is located at the railroad crossing a height above the tracks that is effective and practical. The means for securing the red light in place is old and well known and is not described in detail.

A wire 165 and 165' leads from the line wire 81 to the contacts 163. A cross wire 166 connects the contact 167 of the cylinder 12 with the contact 168 of the cylinder 13, and from the cross wire 166 another wire 169 leads to a contact 170 of a magnet 171.

From the other contact 172 of the magnet 171 a wire 173 leads to the line wire 88. Also from the wire 169 a shunt wire 174 leads to one contact of the red light 164; and from the other contact of this light a wire 175 leads to the wire 173 which is attached to the line wire 88 so that when pressure in either of the cylinders 12 and 13 moves the contact 163 into engagement with the contacts 167 and 168 the magnet 171 will be energized to open the switch 105 and stop the motor 3, for as best shown in Figs. 11 and 15 the magnet 171 when energized operates the lever 137 to move the switch arm 115 out of contact also by the foregoing wiring the red light will be lit when the circuit is closed.

The contact 176 and 177 on the cylinders 12 are joined together by the wire 178; and from this wire another wire 179 leads to the contact 180 of a magnet 181; and from the contact 182 of this magnet a wire 183 leads to the wire 173, which is connected to the line wire 88; also a shunt wire 184 connects the wire 183 with the wire 174 that leads to one contact of the red light 164 so that when excess pressure is applied in the cylinders 12 and 13 to move the contacts 163 into engagement with the contact 176 and 177 the magnet 181 will be energized to open the switch 89 and stop the motor 3 and also light the red light 164.

The magnets 85, 102, 171 and 181 are all constructed, mounted and operated alike; each has the core 184 with the winding 185, which winding is secured to the respective contacts of each magnet. As seen in Fig. 19 the winding 185 is attached to the contacts 84 and 86 which contacts are connected to and insulated from the casing 186 of the magnets.

The casings 186 are secured by the stud bolts 187 and nuts 188 to the upwardly extending flanges 189 on the table 117.

The stud bolts 187 have one end secured in the cores 185; and when secured in place hold the cores central in the casings 186.

The core, bolt and casing are insulated from one another by the fiber plug 190 and washer 191. When these magnets are in circuit with the line wires 81 and 88 they will

attract their respective armatures and consequently actuate the switch with which they are associated.

In order that the power cylinders 12 and 13 and the pipe connections 4 to the compound cylinder 5 may be maintained completely filled with oil, so that there will be no lost motion in any of the moving parts the power cylinders 12 and 13 are connected by the pipes 192 to a pressure tank 193 which tank is filled with oil through a pipe 194.

By a pump, not shown, the oil in the tank 193 is continually subjected to a higher pressure than the oil in the cylinders 12 and 13 and associated parts so, that in the event of leakage from any of the cylinders, the oil will be replaced by the pressure tank.

The pipe 192 is connected by the T pipe 195 to the distributing pipes 196, which latter is connected by pipes 197 to the pipes 38 and 39; and within the pipes 197 are the check valves 198. Also there are the cross pipes 199 that connect the pipe 38 with pipe 36 and pipe 39 with the pipe 37, and within these cross pipes are the check valves 200.

A plugged pipe 201 is shown attached to the T pipe 195 and this pipe 201 can be connected to distributing pipes of the power cylinders 14 and 15 when these cylinders are to be operatively connected to another railroad crossing.

In order that the power cylinders 2 may be filled with oil to the exclusion of air the cylinder heads 20 are provided with the air vents 202, which are open when the power cylinders and associated parts are being filled with oil; after which the vents are sealed with the screw plugs 203. Also an aluminum ball 204 is seated in the chamber 205 below the screw plug 203, which ball moves upward when the cylinders are full, and prevents the oil from escaping until the screw plug can be secured in place.

When the oil is to be removed from the cylinders the plugs 206 are removed from the discharge openings 207 in the cylinder heads 20; and also the plugs 203 are removed from the vents 202 after which the oil will discharge from the cylinders.

It is also understood that by locking the check valve open in the pipe connections between the power cylinders and pressure tank, that by opening the air vents 202 and applying suction in the tank 193 instead of pressure that the oil can be removed from the power cylinders and their associated oil containing parts.

The railroad crossing 6 is preferably secured by any well known means to a base plate 208, which base plate is provided with the upwardly extending stands 209 on which stands are secured by any well known means the top plates 210.

In order to reduce the frictional contact of the tread blocks 58 and 58' with the base

plate 208, plates 211 having finished top surfaces 212 can if desired be interposed between the tread blocks and the base plate; see Figs. 6 and 8.

Also to reduce the frictional contact between the tread blocks and the rails as the former is moved longitudinally of the latter, a ball bearing plate 213 is secured by the bolts 214 to the web portion of the rails 54' and 55' in position so that a side wall of the tread blocks 58 and 58' will contact with the balls 215.

It is understood, however, that while these frictional reducing features add materially to the efficiency of the tread block shifting mechanism, the apparatus can be operated without them. As seen in Figs. 12 and 14 the cylinder heads are provided with the packing rings 216 that abut the end wall 217 of a cylindrical recess 218. The opening through the end wall 217 is enlarged so that oil under pressure from the chamber 157 will force the ring 216 outwardly or axially against the packing in the packing box 22 thereby applying a continuous pressure to the packing to prevent leakage.

In operation the parts of the apparatus are positioned as previously stated so that a train approaching the crossing 6 on either of the tracks 54 or 55 will close a switch connected with a circuit to the motor 3 so that the motor will be actuated to shift the tread blocks as heretofore described.

I claim:

1. In an appliance of the character described, a pair of power cylinders secured to a shaft boxing, pistons in said cylinders, a shaft, and means connected with said shaft for actuating said pistons.

2. In an appliance of the character described, shaft boxing, power cylinders secured to the shaft boxing, pistons in said cylinders, a shaft in said boxing, a motor for rotating said shaft, and means connected with said shaft for actuating said pistons.

3. In an appliance of the character described, a pair of power cylinders, pistons in said cylinders, piston rods connected to said pistons, a cross head connected to said piston rods, a shaft, a motor for rotating said shaft, and a connection between said cross head and said shaft whereby the rotation of said shaft moves said cross head to actuate said pistons.

4. In an appliance of the character described, cylinders, pistons in said cylinders, piston rods attached to said pistons, a cross head attached to said piston rods, a screw block attached to said cross head, a shaft passing through said screw block, a motor for rotating said shaft, and a screw on said shaft for moving said screw block.

5. In an appliance of the character set forth the combination with a pair of power cylinders and a pair of auxiliary cylinders

for each power cylinder and by-passes connecting the pairs of auxiliary cylinders with their respective power cylinders, and pistons in said cylinders respectively; of an
 5 electric motor to operate the pistons of the power cylinders; means to start said motor; a switch to stop said motor; a connection between the piston of the auxiliary cylinders and said switch; and means whereby the pis-
 10 tons in the auxiliary cylinders are actuated by excess pressure in the power cylinders to operate said switch to stop said motor.

6. In an appliance of the character described, power cylinders, pistons in said cyl-
 15 inders, auxiliary cylinders attached to said power cylinders, communication between said power and said auxiliary cylinders, auxil-
 iary pistons, in said auxiliary cylinders, and means for holding the auxiliary pistons neu-
 20 tral until they are actuated by excess pres-
 sure in the power cylinders.

7. In an appliance of the character described, power cylinders, pistons in said cyl-
 25 inders, auxiliary cylinders attached to said power cylinders, communications between said power and said auxiliary cylinders, auxiliary pistons in said auxiliary cylinders, and springs for holding the auxiliary pis-
 30 tons in a neutral position until they are ac-
 tuated by excess pressure in the power cyl-
 inders.

8. In an appliance of the character described, power cylinders, pistons in said cyl-
 35 inders, auxiliary cylinders attached to said power cylinders, communications between the power and the auxiliary cylinders, auxil-
 iary pistons in said auxiliary cylinder, op-
 posing springs for holding the auxiliary pis-
 40 tons in a neutral position until they are moved by excess pressure in the power cyl-
 inders, a motor for moving the pistons in the power cylinders, and means connected with the auxiliary pistons for stopping said
 motor.

9. In an appliance of the character described, power cylinders, pistons in said power cylinders, auxiliary cylinders attached to said power cylinders, passageways be-
 50 tween the power and the auxiliary cylinders, auxiliary pistons in the auxiliary cylinders, opposing springs for holding the auxiliary pistons in neutral position until they are moved by excess pressure in the power cyl-
 55 inders, a motor for moving the pistons in the power cylinders, and means connected with the auxiliary pistons for stopping said motor when excess pressure occurs in the power cylinders.

10. In an appliance of the character de-
 60 scribed; a pair of power cylinders; pistons in said cylinders; a motor connected to and adapted to move the pistons in said power cylinders; means for starting said motor; a pair of auxiliary cylinders for each power
 65 cylinder; by-passes connecting each pair of

auxiliary cylinders to their respective power cylinders; pistons in said auxiliary cylinders that are connected with a switch controlling said motor, said pistons arranged in said auxiliary cylinders so that excess pressure in
 70 said power cylinders will actuate them to stop said motor; a compound cylinder connected to said power cylinder, said compound cylinder having pistons therein that move coordinately with the pistons in said
 75 power cylinders.

11. In an appliance of the character described, a pair of power cylinders; pistons therein, a motor operatively connected to move the pistons in said cylinders; means
 80 for starting said motor; a pair of auxiliary cylinders for each power cylinder; by-passes connecting each pair of auxiliary cylinders to their respective power cylinder; pistons in said auxiliary cylinders that are opera-
 85 tively connected to a switch for stopping said motor; a compound cylinder connected by pipes to said power cylinders, said compound cylinder having pistons therein that move coordinately with the pistons in said
 90 power cylinders; and a fluid medium in all of said cylinders and in the pipe connection between the power and compound cylinders.

12. In an appliance of the character described; a pair of power cylinders; pistons
 95 therein; a motor operatively connected to move the pistons in said power cylinders; a compound cylinder having pairs of opposing pistons therein; pipe connections from said compound cylinder to said power cylinders;
 100 means for starting the motor to put the piston in said power cylinders in action and co-ordinately move the pistons in said compound cylinder; a pair of auxiliary cylinders connected to each power cylinder; by-
 105 passes connecting each pair of auxiliary cylinders to their respective power cylinder; a switch; pistons in said auxiliary cylinders that are operatively connected to said switch for stopping said motor; a fluid medium
 110 filling said cylinders and pipe connections so that pressure applied to said fluid medium by actuation of the pistons in said power cylinders coordinately actuates the pistons in said compound cylinder and
 115 whereby pressure on said fluid in excess to that required to move the pistons in the power and compound cylinders will actuate pistons in the auxiliary cylinders to open said switch and stop said motor.
 120

13. In an appliance of the character described, a pair of power cylinders connected to a boxing in which a shaft is revolubly mounted, pistons in the power cylinders that are connected to a screw threaded block, a
 125 motor for driving the shaft in either direction, means connecting the power cylinders with elements adapted to be moved, and means whereby certain elements are moved in one direction and other elements are
 130

moved in the other direction simultaneously, and vice versa.

14. In an appliance of the character described, pairs of cylinders integrally connected in the form of a cross, the cylinders of each pair communicating with each other at their adjacent ends, pistons in said cylinders that are connected to movable elements, and means for operating said pistons to shift said elements.

15. In an appliance of the character described a plurality of cylinders integrally connected, pistons in said cylinders that are connected to movable elements, and means for automatically operating said pistons to shift such elements.

16. In an appliance of the character described, a plurality of cylinders integrally connected, said cylinders arranged in pairs that are at an angle to one another, elements to be moved, pistons in said cylinders that are connected to said movable elements, and automatic means for actuating said pistons to move said elements.

17. In an appliance of the character described, a plurality of cylinders that have their chambers connected integrally, separated by a wall into pairs; said pairs of

chambers positioned at an angle to one another, pistons in the chambers that are connected to elements to be moved, power cylinders that are connected by pipes to said plurality of cylinders, pistons in said power cylinders and a motor for actuating the pistons.

18. A fluid motor comprising a worm; power means to operate said worm; power and auxiliary cylinders; pistons in said cylinders respectively; means operable by the worm to reciprocate the pistons in said power cylinders to produce a working pressure and an excess pressure; connections whereby the operation of the pistons in said power cylinders under excess pressure will actuate the pistons in the auxiliary cylinders; and means operable by the piston in the auxiliary cylinders to control the power that operates the pistons in said power cylinders.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 22nd day of July, 1919.

CHARLES A. HELFER.

Witnesses:

WM. M. GENTLE,
JAMES R. TOWNSEND.