Jan. 29, 1924.

1,482,350

J. S. DAYTON

MACHINE FOR SAWING AND PUNCHING RAILS

Original Filed May 14, 1920 9 Sheets-Sheet 1

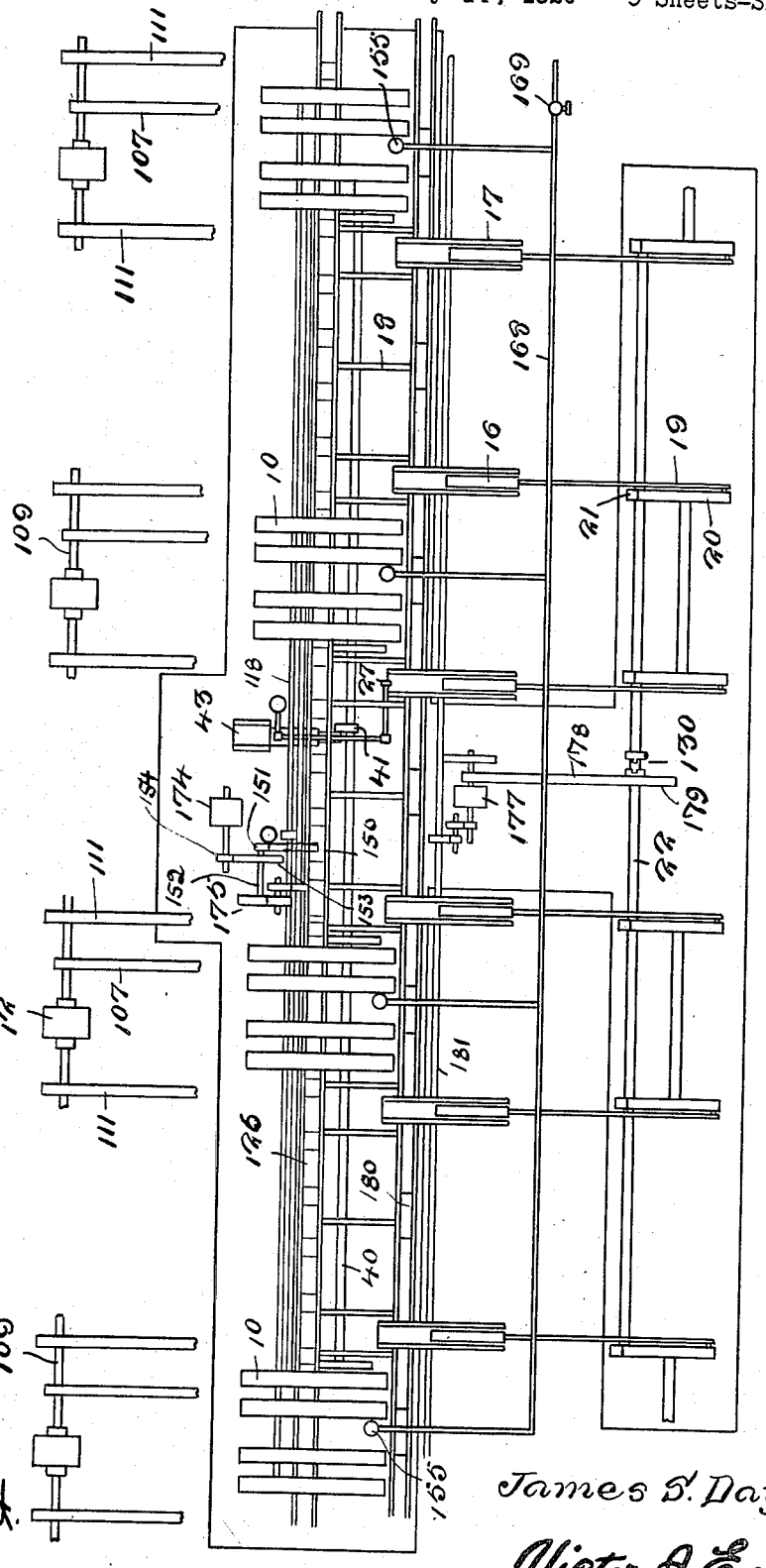

Fig. 1.

E. R. Ruppert.

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Jan. 29, 1924.

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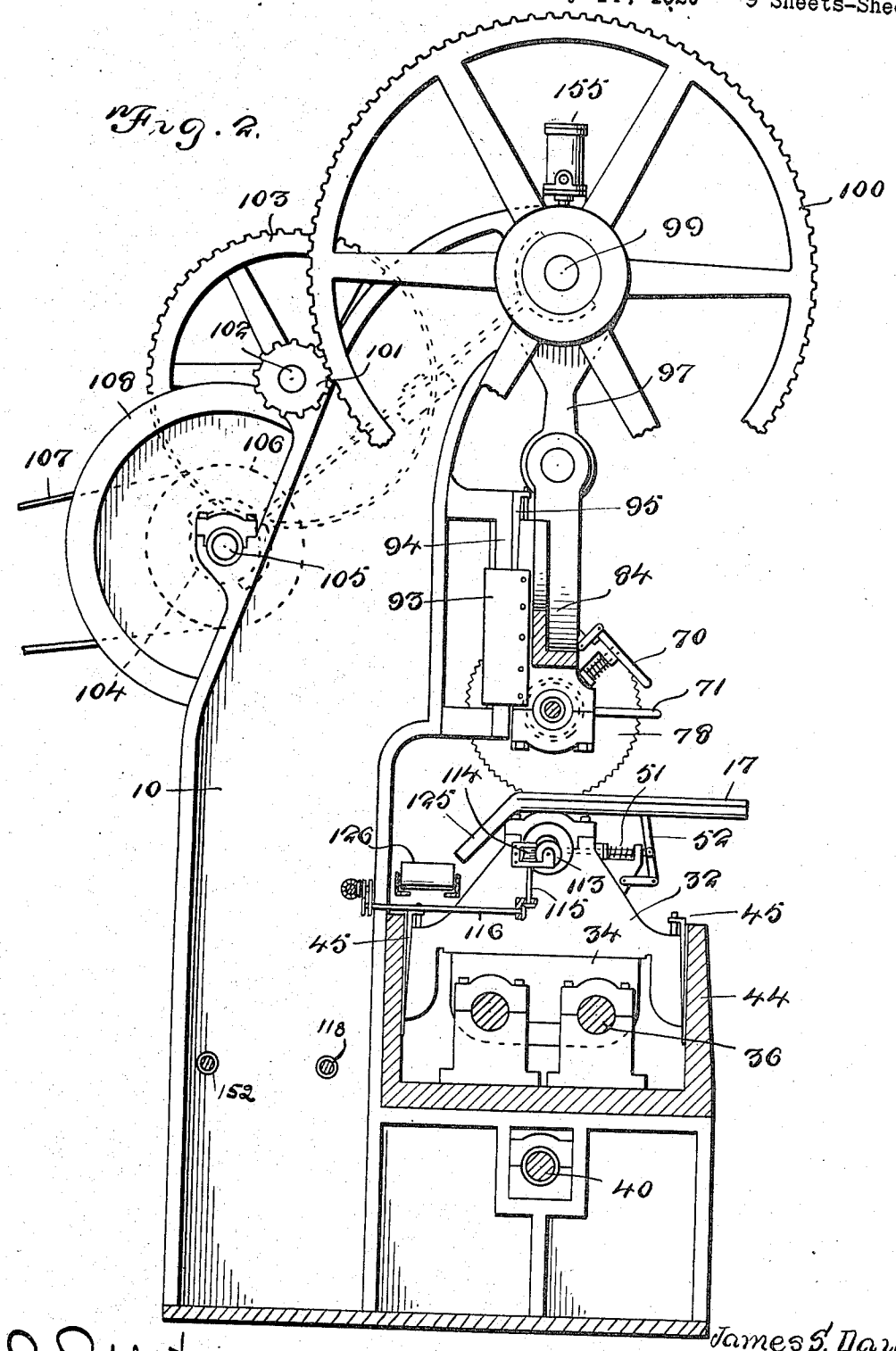
MACHINE FOR SAWING AND PUNCHING RAILS

Original Filed May 14, 1920 9 Sheets-Sheet 2

Fig. 2.



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MACHINE FOR SAWING AND PUNCHING RAILS

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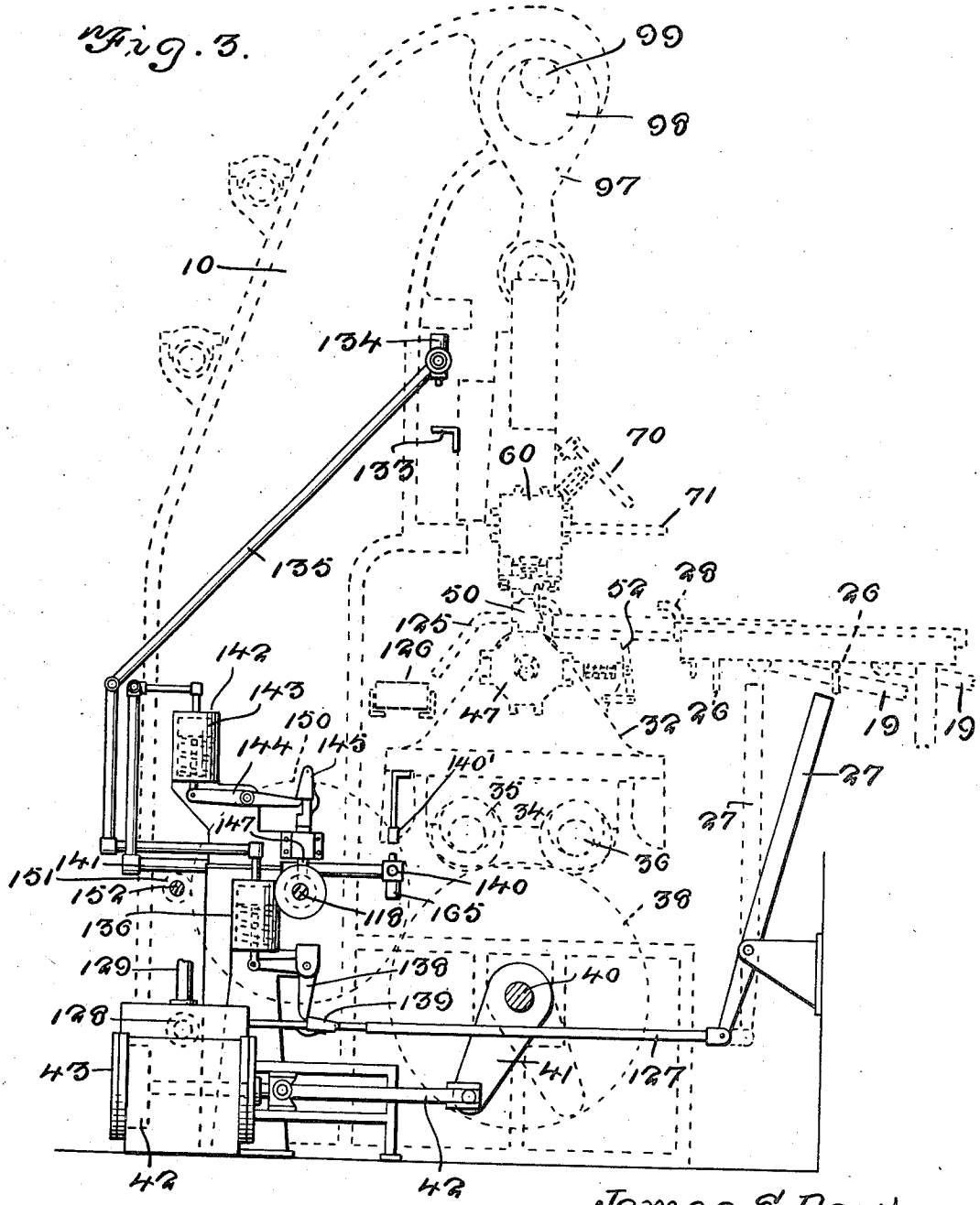
Fig. 3.



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1,482,350

MACHINE FOR SAWING AND PUNCHING RAILS

Original Filed May 14, 1920 9 Sheets-Sheet 4

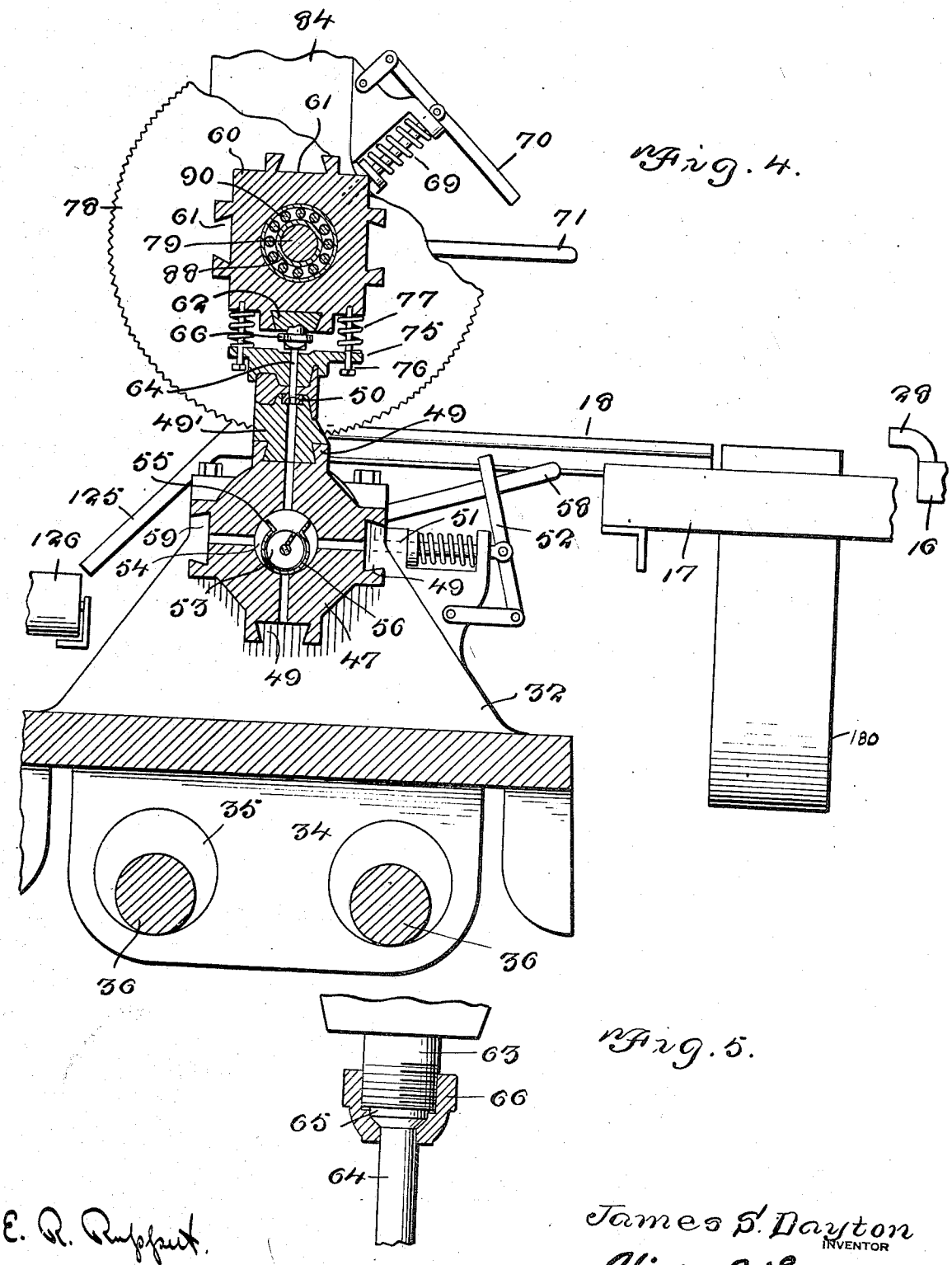

Fig. 4.

Fig. 5.

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MACHINE FOR SAWING AND PUNCHING RAILS

Original Filed May 14, 1920 9 Sheets-Sheet 5

Fig. 6.

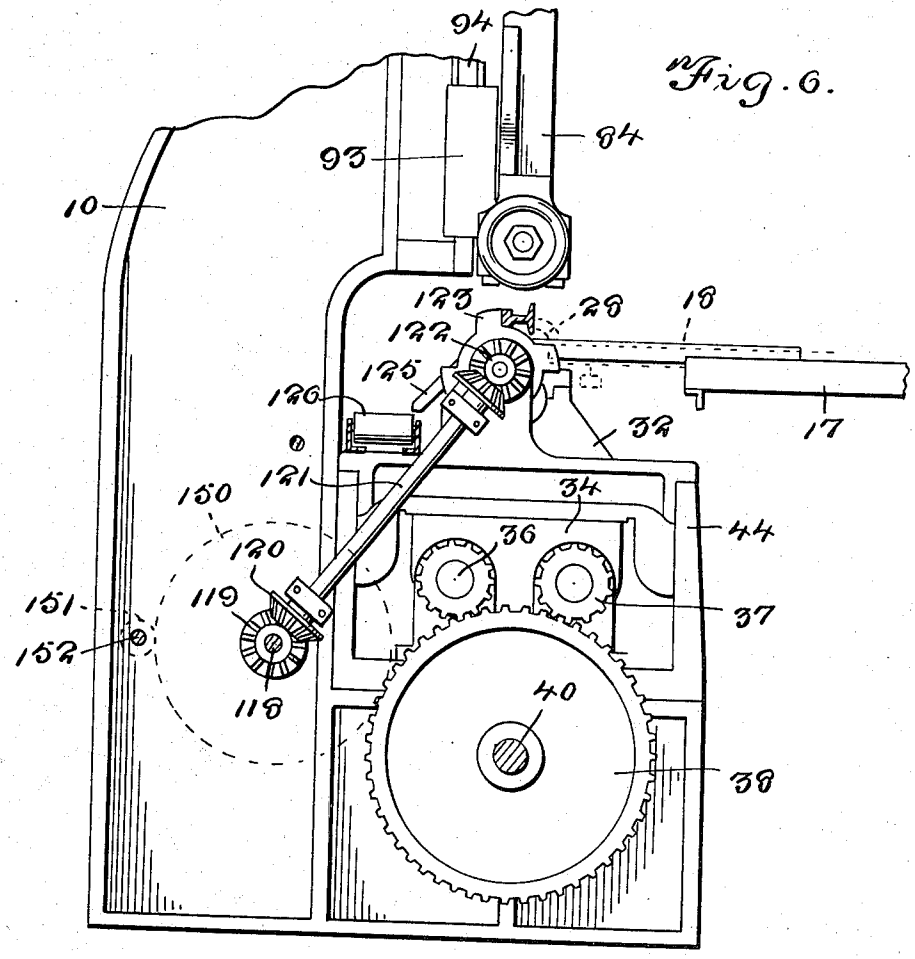
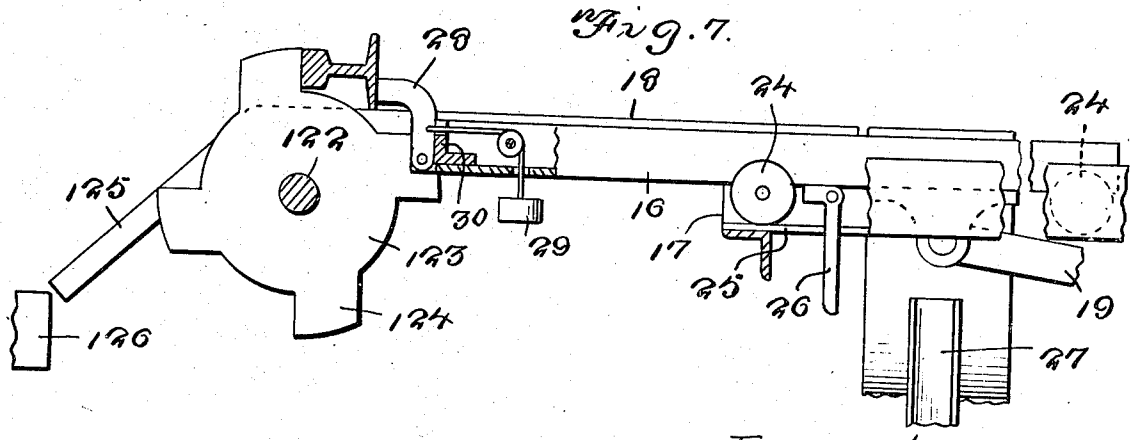


Fig. 7.



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MACHINE FOR SAWING AND PUNCHING RAILS

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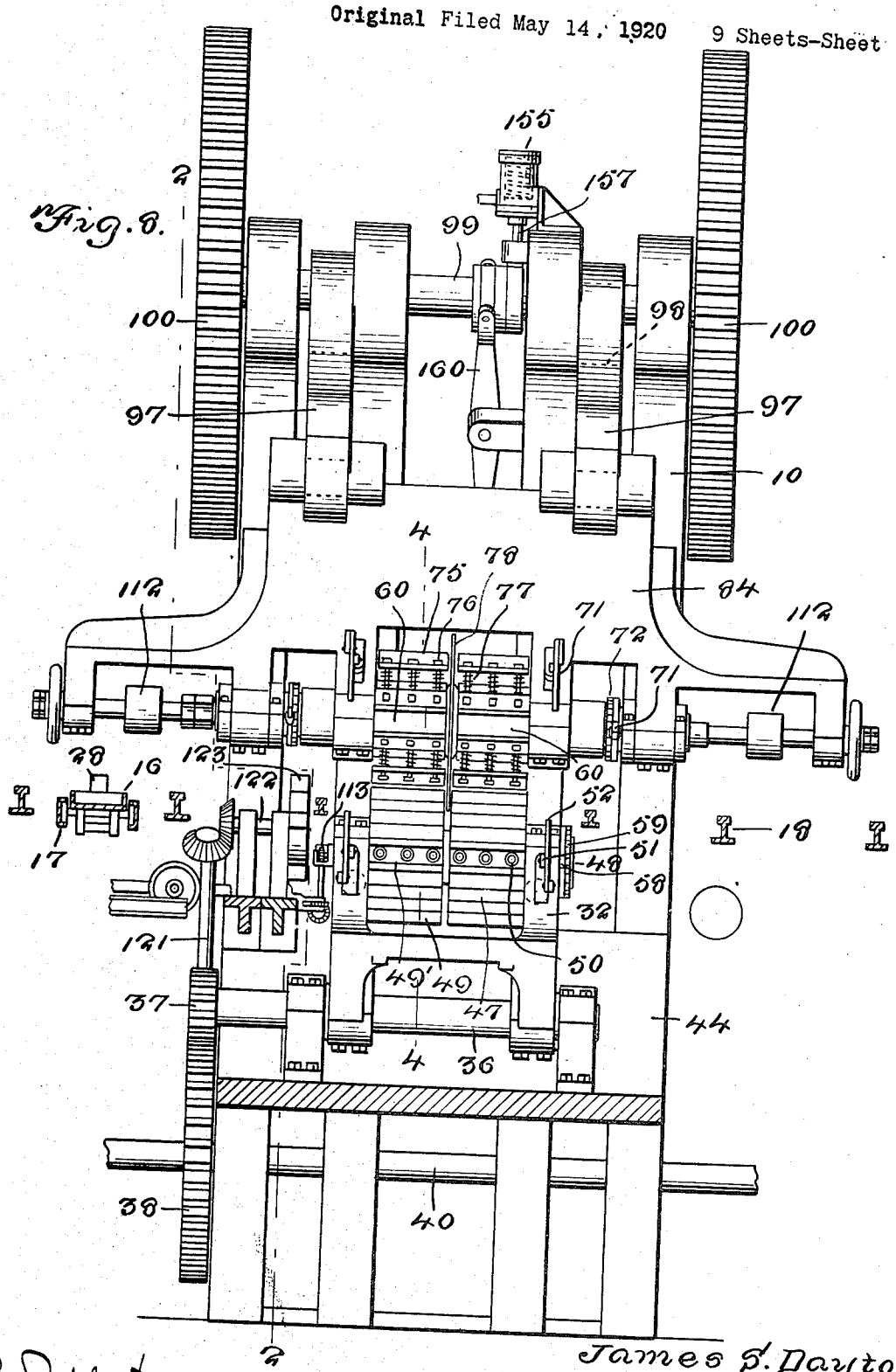
Fig. 8.



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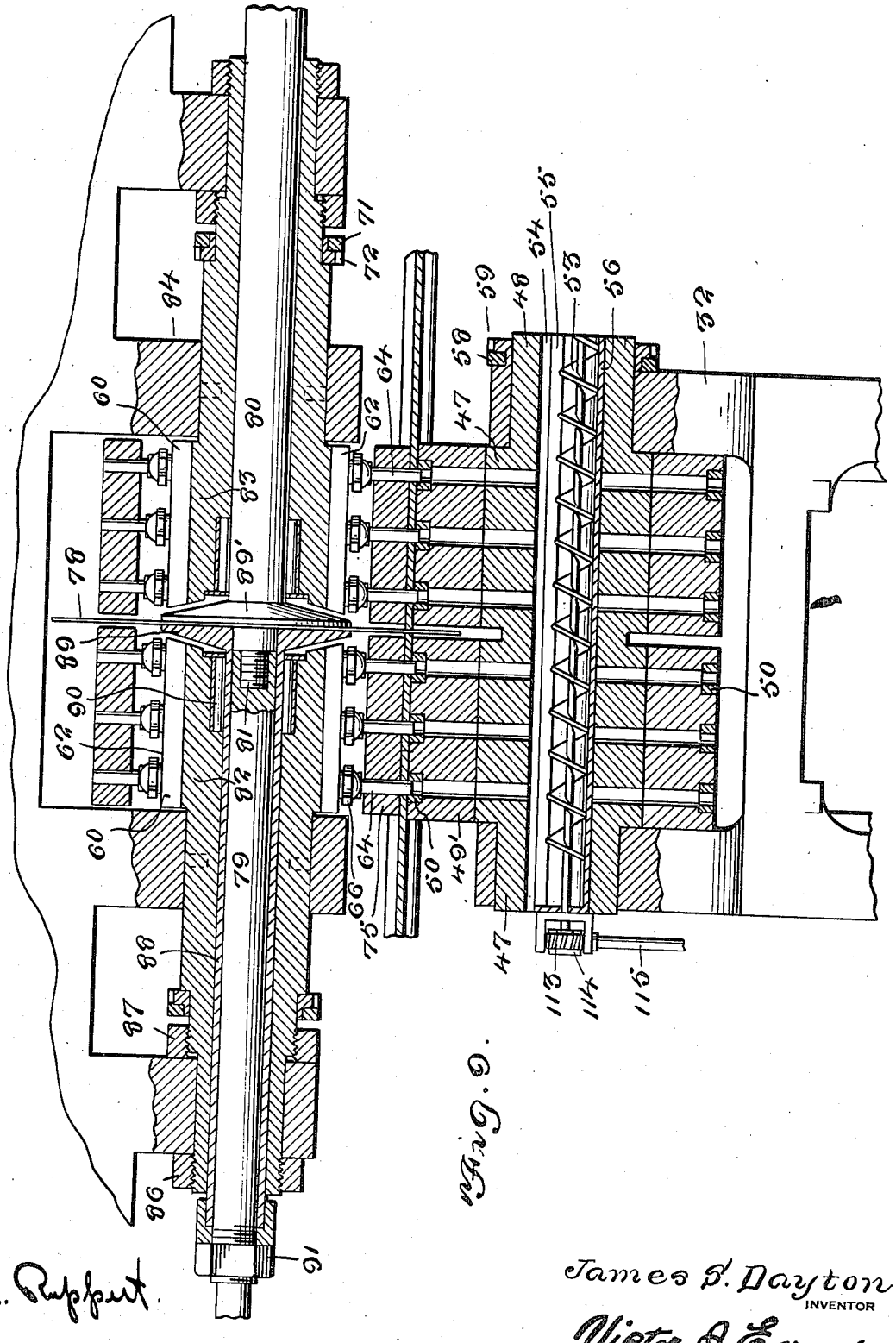
MACHINE FOR SAWING AND PUNCHING RAILS

Original Filed May 14, 1920 9 Sheets-Sheet 7



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MACHINE FOR SAWING AND PUNCHING RAILS

Original Filed May 14, 1920 9 Sheets-Sheet 8

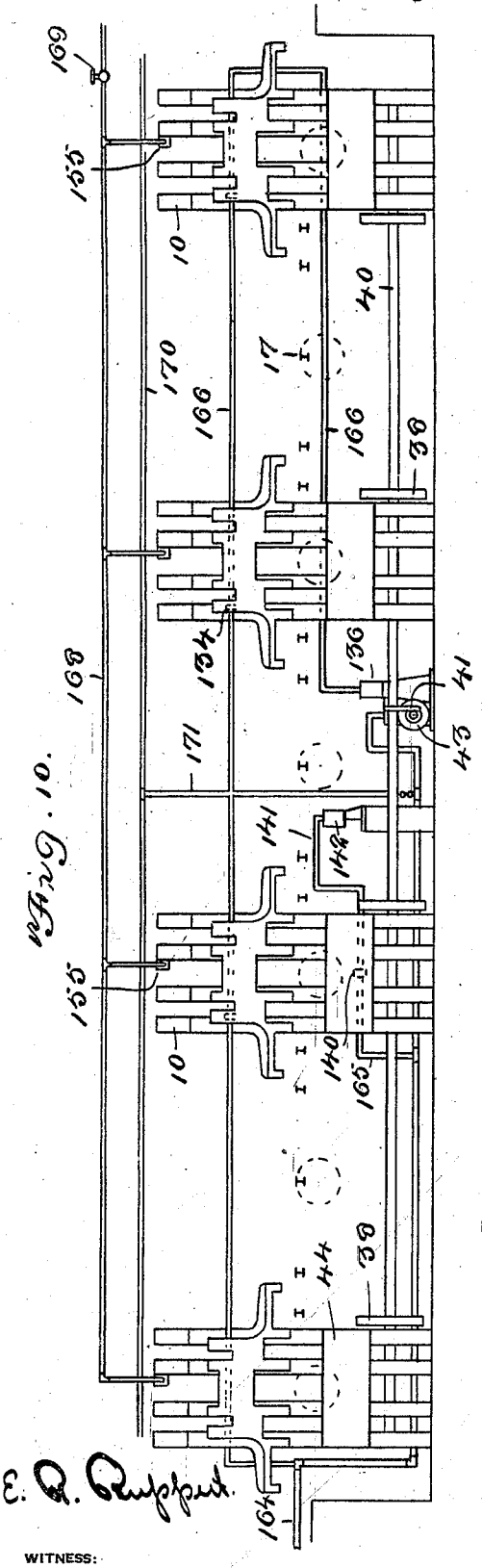

Fig. 10.

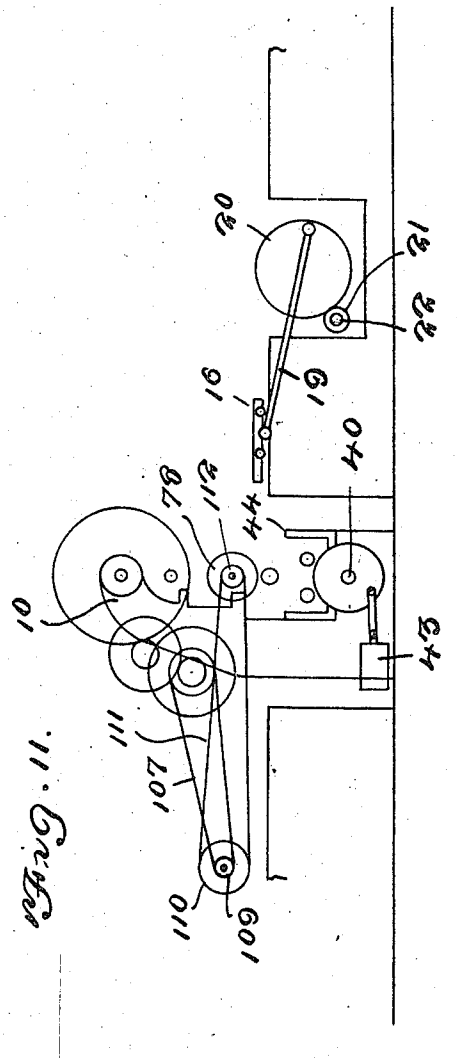

Fig. 11.

E. Q. Rudsput.

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Jan. 29, 1924. 1,482,350

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MACHINE FOR SAWING AND PUNCHING RAILS

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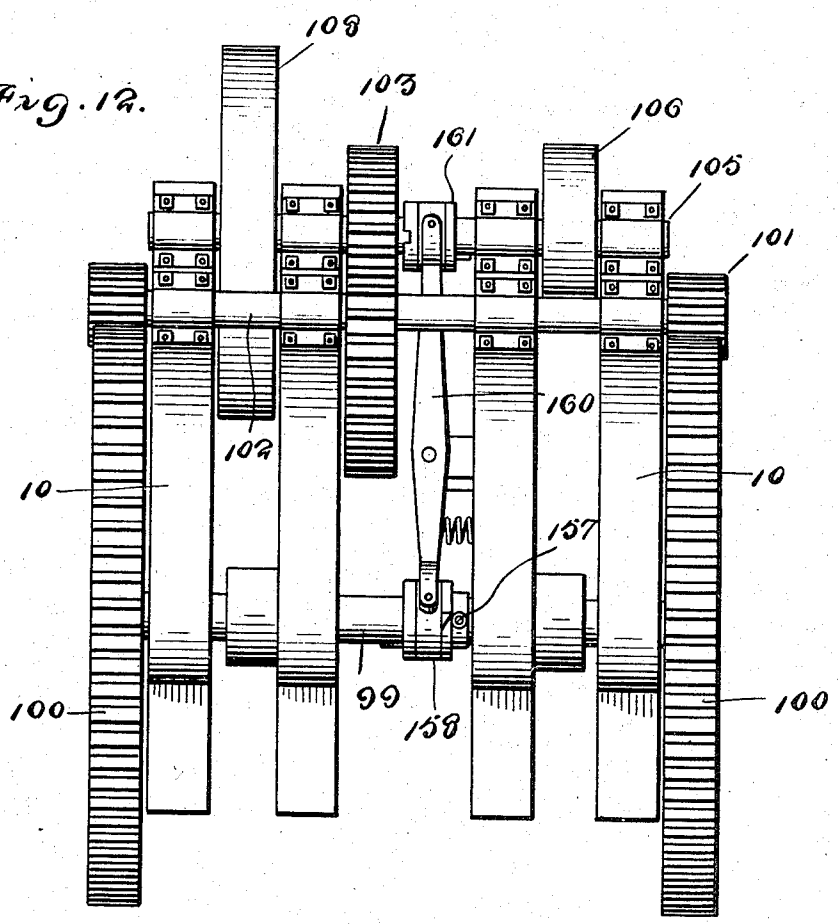
Fig. 12.



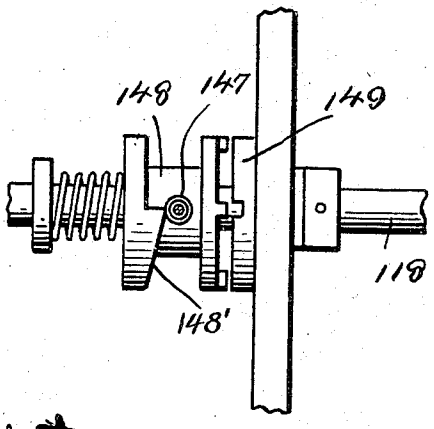


Fig. 13.

E. R. Ruplpert.

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Patented Jan. 29, 1924. 1,482,350

UNITED STATES PATENT OFFICE.

JAMES S. DAYTON, OF CUMBERLAND, MARYLAND.

MACHINE FOR SAWING AND PUNCHING RAILS.

Application filed May 14, 1920, Serial No. 381,388. Renewed October 30, 1923.

To all whom it may concern:

Be it known that I, JAMES S. DAYTON, citizen of the United States, residing at Cumberland, in the county of Allegany and State of Maryland, have invented new and useful Improvements in a Machine for Sawing and Punching Rails, of which the following is a specification.

This invention relates to a machine for sawing and punching rails, and more particularly to a machine of the general type of that described and claimed in my U. S. Patent No. 1,297,112, issued March 11, 1919.

One object is to provide a machine which shall include a plurality of rail presses, with means for feeding the rail to be cut and punched to all of the presses at one time, and means for simultaneously controlling all of the die blocks through the medium of one actuating device, such as a rock shaft extending the full length of the machine.

A further object is to provide in a device of the type indicated, and in connection with the mechanism for carrying the rail forward to the presses, means actuated by the return stroke of certain elements of the feeding mechanism which shall produce the first step in the operation upon the rail by raising the die blocks to operative position.

A further object is to produce a machine of the type indicated, the mechanism of which shall include controlling devices operated by compressed air, for throwing the die blocks to operative position, for returning them to inoperative position, and for throwing off the rail, after the sawing and punching operation has been effected, by mechanism under the control of a clutch connected with the air control system.

A still further object is to provide certain novel means for mounting the die blocks, means for rotating the latter, for placing in operative position a new set of dies, and means for locking the blocks when rotated to correct position.

A still further object is to provide a plurality of blocks for mounting the punches, means for rotating the blocks, and means for locking them when rotated to the required position for placing a given set of punches in position for use.

A still further object is to provide certain novel means for mounting the saw.

A still further object is to provide means for shifting laterally the blocks in which the punches are mounted, in order to secure correct alinement with the dies.

A still further object is to provide particular means for mounting a stripping plate, permitting the latter to have resilient action.

A still further object is to provide for disposing of the slugs by means of a worm conveyer passing through the die block, and to provide for throwing off the rail after the completion of the sawing and punching operation, by automatically placing in action a device having radial arms for engaging the rail and discharging the latter to the conveyer rolls, and thence to the hot bed.

A still further object is to provide an air control system including a plurality of cylinders, each controlling a clutch connected with the driving mechanism of each rail press or unit, these cylinders having connection with an air duct to which air is admitted by the operation of any one of a number of valves so located that the operator (whose duty it is to control the punches and keep the working parts oiled and in running condition), may find a valve within easy reach at any time, so that all of the saws and punches may be instantly controlled.

With the foregoing and other objects in view, the invention consists in the novel construction, combination, and arrangement of elements, and of organized mechanism hereinafter described and claimed.

In the accompanying drawings,

Figure is a diagrammatic view showing various portions of the mechanism in top plan,

Figure 2 is a vertical section approximately on line 2—2 of Figure 8.

Figure 3 is more or less diagrammatic, in that it shows the greater portion of the mechanism required for feeding the rail, elevating the die block, operating the punches, and effecting the air control, exclusive of the air control of the upper clutch.

Figure 4 is a vertical section on line 4—4 of Figure 8.

Figure 5 is a detail view showing in section the manner of mounting the punches,

Figure 6 is a side elevation, and shows particularly the means for throwing off the rail after the completion of the operation thereon,

Figure 7 is a detail view showing the jack or carriage for feeding the rail to the press, and the means for throwing off the rail,

Figure 8 is a view of the press in front elevation,

Figure 9 is a vertical section longitudinally of the saw shaft, and showing the punch blocks and die block in section,

Figure 10 is an elevation showing four units or presses, with the operative elements removed, but showing the relative position of the air cylinders,

Figure 11 is a diagrammatic view, showing at the right the rail feeding jack and showing the drive for the saw shaft and the upper shaft which controls the operation of the punches,

Figure 12 shows details of the driving gear illustrated in Figure 11, and the means for controlling one of the punches.

Figure 13 is a detailed view showing a clutch which is thrown in for actuating the rail ejecting means.

Before proceeding to the description of the machine in detail, reference will be made to Figure 3 which is a general view of the operative elements of one of the units, or individual presses, and of the means for effecting the air control. Vertical frame members 10 support an upper transverse shaft in suitable bearings, this shaft effecting the operation of the punches. Punch blocks are mounted on the opposite sides of the saw in the manner shown in Figure 9, and each block carries a plurality of sets of punches, and is rotatable so that either set may be placed in operative position.

The dies are mounted in a somewhat similar manner, and the die block is movable vertically when the mounting means therefor are elevated by the operation of the cam mechanism controlled by suitable gearing. The lower transverse shaft 40 shown in Figure 3 extends the full length of the machine and controls all of the die blocks.

When the jack or pusher which feeds the rail to the machine moves outwardly, or to the right in Figure 3, after having placed a rail in position above the die blocks, a lever 27 is automatically tripped, operating a slide valve permitting air to enter lower cylinder 43 causing its plunger and the elements connected therewith to rock shaft 40 and operate the cam mechanism for raising the die blocks to the position of Figure 3, that is, to operative position.

An air cylinder 155 (Figures 2 and 8), is under the control of a valve opened by an operator at the proper time, and the stem 157 of the plunger of this cylinder controls a clutch referred to below. When the clutch is thrown in, the driving means for shaft 99 controlling the working stroke of the saw and the punches is set in operation, and the rail is cut and the bolt holes punched therein. The head, the punches, and the saw then return to inoperative position, shaft 99 having completed one revolution.

The raising of the head effects the opening by engaging device 133 (on the head), of an upper valve 134 admitting air to cylinder 136, the plunger of which operates a device 138 engaging trip 139 on valve rod 127, for throwing the slide valve of cylinder 43 into position for admitting air on the other side of the plunger in this cylinder, whereby the crank arm 41 is thrown to dotted line position, and the gearing and cam mechanism operate to permit the die holding means to drop to lower position. This downward movement results in opening valve 140 by element 140' admitting air to cylinder 142 controlling a clutch operating device for throwing into operation mechanism discharging the rail from the press, allowing it to pass to conveyor rolls 126 and thence to the hot bed.

In the practical embodiment of my invention, any suitable number of rail presses may be provided, but in Figure 1 I have shown four of these units, the position and outline of which is illustrated diagrammatically, the vertical elements of the units being designated 10. Each unit is driven from its own motor, these motors being designated 12, and each motor shaft carrying pulleys through the medium of one of which motion is imparted to the saw shaft, while the other imparts movement to the mechanism actuating the punches.

The rail to be cut and punched is fed by means of the jacks 16, the rail being supported by rolls 180 (Figures 1 and 4), and the jacks being guided by elements 17, said rail resting on skids 18 when discharged from the jacks. The jacks are controlled and operated by means of arms 19 to which motion is imparted by means of wheels 20 with which they are connected by crank pins. These wheels are driven by wheels or pinions 21 on shaft 22. (This construction is illustrated in Figures 1 and 11). In Figure 7 and elsewhere one of the jacks is shown as mounted on wheels 24 operating on tracks 25, and an arm 26, mounted as shown, is positioned for engagement with an operating arm 27 referred to below. Each jack carries an angular pivotally mounted element 28, normally held in the position shown in Figure 7, in view of its connection by means of a chain or the like with weight 29 which retains arm 28 in contact with stop 30.

Upon the outward movement of the jack —that is, movement to the right—the arm

28 swings under the rail, and then assumes an upright position on the other side of the rail, so that the movement of the jack inwardly toward the press will produce engagement with the rail, and carry the latter into position to be operated upon.

Each press includes a box 32 vertically movable within the main frame and provided with means for mounting the die block. This box includes a plurality of transverse members 34 each provided with concave cutaway portions for engagement by the cams 35 mounted on shafts or spindles 36. The elements last named each carry a pinion 37 meshing with gear wheel 38 on main shaft 40 which extends the full length of the machine. This shaft 40 is a rock shaft and is controlled by an arm 41 connected with plunger 42 of main air cylinder 43, the connection being made in any well known manner.

Upon the admission of air from a suitable source of supply, to cylinder 43, the crank arm 41 will be thrown to the full line position shown in Figure 3, and the cams 35, controlled by the mechanism described, will cause the box 32 and the die block to move upwardly, as previously indicated. Members 34, directly engaged by the cams, have lateral movements.

In Figure 2 one of the boxes 32 is shown as being vertically slidable in frame elements 44, wedge shaped members 45 being suitably mounted and serving to take up wear between the sides of the box and the vertical elements of the frame.

The block 47 is rotatable, being mounted on shaft 48 and being provided with four channels 49 receiving holders 49′ for dies 50. Dies may be provided for cooperation with punches of different sizes, and when it is necessary to place a new die or set of dies in position, it is only necessary to rotate the block 47 through a quarter turn. The block is held in this position by means of a locking device 51 operated or controlled by lever 52.

In Figure 9 I have shown a side view of the conveyor or worm for discharging the slugs. This element is designated 53 and it passes through an enlarged bore 54 in block 47. The worm is surrounded by a channel element having flexible flared edge portions, the latter being shown at 55 and the partly cylindrical portion being shown at 56. This construction permits of the vertical movement of the block 47. The block may be rotated by means of a lever 58 cooperating with ratchet wheel 59, the usual pawl being provided.

The blocks 60 positioned on each side of the saw, each include four sockets 61 receiving transverse elements 62 each carrying a plurality of threaded pins 63. The saw shaft passes through these blocks and the saw is positioned between them, as intimated above. The punches 64 are provided with heads 65, and the threaded members 66 retain the punches in engagement with the ends of pins 63. The blocks 60 are retained against rotation by locking pins 69 controlled by levers 70, rotation being effected when desired by means of lever 71 carrying pawls cooperating with ratchet wheels 72.

The stripping plates 75 are resiliently mounted being guided in their movement by pins 76 and bearing against springs 77.

The mounting of the punch blocks and saw is shown in Figure 9, the saw there illustrated being designated 78, and being mounted on a saw shaft consisting of two sections 79 and 80, having threaded connection with each other, as shown at 81. These shaft sections pass through sleeves 82 and 83 mounted in the head 84, suitable bearings being provided.

Blocks 60 carrying the punches are mounted on sleeves 82 and 83, and the latter are adjustable longitudinally, permitting the alinement of the punches, by means of lock nuts 86, 87. The punch blocks are of course rotated separately when placing new sets of punches in operative position, and each block is provided with an operating lever 71, as above indicated. A sleeve 88 rigid with reference to shaft section 79, is provided with a flange 89 which abuts the saw, and another flange 89′, on shaft section 80 engages the opposite surface of the saw, permitting the latter to be clamped in position. Lock nuts 91 retain sleeve 88 in position for clamping the saw. Roller bearings 90 are located as shown, and it will be understood that the sections of the saw shaft are disconnected when removing or replacing the saw.

The head 84 is guided in its vertical movement by means of the yokes or channel shaped elements 93 which cooperate with the vertical guiding elements 94, any play or wear being taken up by the wedge shaped elements 95.

Pivotally connected with each head are the links 97 operated by eccentrics 98 on the upper transverse shaft 99 of the unit or rail press. This shaft is driven by gear wheels 100 meshing with pinions 101 on shaft 102 carrying a gear wheel 103, the latter cooperating with pinion 104 on shaft 105 carrying pulley 106 driven by belt 107. This belt is driven from the shaft 109 of the motor 12 shown in Figure 1. Shaft 105 carries a fly wheel 108. Motor shaft 109 carries a pulley 110 driving a belt 111 passing around pulleys 112 on the saw shaft. The drive for shaft 99 imparting movement to the head through the eccentrics is shown in Figure 2, and the drive for the saw shaft is shown in Figure 11. The drive for the worm conveyer is shown in Figures 2 and 8, and includes a wheel 113 on the worm shaft, a

worm 114 meshing therewith, and shafts 115 and 116 connected by suitable gearing, the shaft 116 being driven in any suitable manner.

Means for disposing of the rail after the sawing and punching operation are shown particularly in Figures 6 and 7. A shaft 118 carries a bevelled gear wheel 119 meshing with gear wheel 120, the latter being rigid with the shaft 121 which drives the horizontal shaft 122 through suitable gearing. Shaft 122 carries rigidly a wheel 123 having radial arms 124 extending therefrom, these arms being of the form shown, and any one of them being adapted to engage a rail after the sawing and punching operation, and throw the rail to the left in Figure 2, onto the skids 125, from which it drops to the conveyor rolls 126, shown especially in Figures 2, 6 and 7.

A clutch referred to below is automatically thrown in at the proper time, and movement is imparted to shaft 118, for actuating the mechanism throwing off the rail, as indicated.

Reference will now be made to the system of air control shown in Figure 3. When the jack 16 has delivered the rail to the press, it moves toward the right, in Figure 3, and element 26 engages the pivoted lever 27, shifting connecting rod 127 secured to slide valve 128 which controls cylinder 43. The air inlet for the valve casing is designated 129, and is connected with the general system of air supply.

Lever 27 is shown in Figure 3 as having been shifted (to full line position), slide valve 128 also having been shifted, and the plunger 42 moved to the left by the admission of air to the cylinder. Crank arm 41 has therefore moved to the left, and the die block supporting means have been elevated.

The movement of the jacks is controlled from one point by means of clutch 130, and the clutch referred to below which controls the upper transverse shaft 99 is under the control of another operator who observes the feeding of the rails by the jacks, and at the proper time throws in the clutch for imparting movement to the shaft 99 for operating the saw and the punches, the elements being at this time in the position shown in Figure 3. Upon the raising of the head, the saw shaft, and the punches, in completing a single rotation or revolution of shaft 99, a bracket 133 engages and opens valve 134 by striking the stem of the valve, and permits air to pass through pipe 135 and enter cylinder 136, for depressing the plunger 137 therein and operating angle lever 138 which engages a spring held trip or catch 139 on connecting rod 127.

This movement last referred to throws rod 127 toward the right and restores lever 27 to a vertical position, shown in dotted lines in Figure 3. At the same time slide valve 128 is shifted and air is admitted to that end of the cylinder 43 opposite to that first indicated, and the plunger 42 moves toward the right, throwing crank arm 41 to dotted line position, and through the gearing before described permitting the cams to restore the elements supporting the die block to lower position.

When the box 32 passes to its lower position, valve 140 is opened, and air is admitted to pipe 141 and air cylinder 142. The plunger 143 therein is depressed and the pivoted arm 144 engages the catch or trigger 145 and throws in the clutch referred to below, so that movement is imparted to the shaft 121 shown in Figure 6, and wheel 123 is rotated, for the purpose of throwing off the rail. The stem 147 releases a spring held clutch element such as 148, on shaft 118, and this clutch element under the influence of the spring engages cooperating clutch element 149 causing the latter to rotate with shaft 118 and impart movement to shaft 121 through the gearing shown in Figure 6. This shaft 118 carries a gear wheel 150 meshing with pinion 151 on shaft 152, the latter being driven by belt 153 passing around pulley 154 on the shaft of motor 174 shown in Figure 1. When clutch element 148 rotates through one revolution, its cam surface 148′ assumes the position, shown in Figure 13, with reference to stem 147, thus disengaging the clutch. The trigger 145 is spring held and is disengaged by arm 144 prior to the completion of the upward movement of the engaging end of the arm.

Similar clutch mechanism is shown in connection with shaft 99, controlling the punches. An air cylinder 155 has mounted therein a plunger 156 controlling a stem 157 carrying an idler which cooperates with a slidable collar 158 having a cam face, the collar being grooved and controlling or retaining a spring held arm 160. This arm when released by the withdrawal of the stem 157, due to the movement of the plunger under air pressure, throws clutch element 161 on shaft 105. Rotation is then imparted from shaft 105 to pinion 104, and through the gearing shown and previously described, to shaft 99 controlling the punches. The clutch construction is shown and described in my Patent 1,297,112 before mentioned, the only important difference being that the weighted arm shown in that patent is replaced by spring held arm 160. When shaft 99 completes a revolution, cam 158 will have thrown arm 160, releasing the clutch.

A general view of the air controlling system is shown in Figure 10. Air is admitted to the system from the compresser, not shown, the air passing into pipe 164 which is in communication with the valve

chamber of cylinder 43, the plunger of which controls rock shaft 40 for effecting the elevation of the die blocks. Connected with pipe 164 is a pipe 165 controlled by valve 140 (Figures 10 and 3), a pipe 141 leading to cylinder 142, the plunger of which controls the clutch for placing in operation mechanism for throwing out the rail after the sawing and punching operation.

Cylinder 136 is connected with pipe 166 leading from valves 134 which are opened simultaneously upon the return stroke of the punches. The plunger of cylinder 136 operates devices for shifting slide valve 128 of cylinder 43 in the direction required to rock shaft 40 in lowering the die blocks.

The upper air cylinders 155 are connected with air line 168 controlled by valves 169 placed at convenient points permitting of their operation and the consequent operation of the plungers of air cylinders 155 at one time, by the opening of any of these valves by one of the operators, also acting as an oiler, which passes along a running board extending the full length of the machine. A storage air line is shown at 170, and a feed pipe 171 is connected therewith and with pipe 164, previously mentioned.

The conveyer rolls 126 are driven from motor 174 by the gearing shown conventionally at 175 in Figure 1. One of the conveyor rolls by means of which the rails are fed to the machine is shown in Figure 4, being there designated 180. In Figure 1 a motor 177 is shown as driving shaft 181 through gearing illustrated conventionally, and shaft 181 drives the conveyor rolls 180 by means not shown. Belt 178 is also driven from the shaft of motor 177, and drives pulley 179 on shaft 22, by which the mechanism for feeding the rails to the machine, from rolls 180, is operated.

What I claim is—

1. In a machine of the class described, dies and means for mounting the dies, punches and mounting means therefor, feeding means, and means for automatically raising the die mounting means by the return of the feeding means to normal position.

2. In a machine of the class described, a die block, mounting means therefor, punches and mounting means therefor, mechanism for raising the mounting means of the die block, means automatically operated for controlling the time of operation of said mechanism, and stock-ejecting means controlled by the reverse movement of the mounting means.

3. In a machine of the class described, a rotatably mounted die block, locking means therefor, punches and means for operating the punches, means for raising the die block, feeding means, and automatic means controlled by the feeding means for placing the block raising means in operation.

4. In a machine of the class described, punching mechanism and operating means therefor, dies cooperating with the punching mechanism, a die block for mounting the dies, a vertically movable box in which the die block is mounted, cams for elevating the box, means for imparting motion to the cams, and mechanism automatically controlled for placing in operation the means last named.

5. In a machine of the class described, means for feeding a rail into position to be punched, said means including a slidable member, and a pivotally mounted and gravity retained pusher carried by the slidable member.

6. In a machine of the class described, means for punching a rail, means for feeding a rail into position to be acted upon by the punching mechanism, an engaging device carried by the feeding means, a die block cooperating with the punching means, and means set in operation by contact with the engaging device on the feeding means for raising the die block to operative position.

7. In a machine of the class described, the combination with a punching device, of a die and die block, a box for mounting the die block, said box including elements having bearing surfaces for cooperation with cams, cams engaging said surfaces, means acted upon by air pressure for operating the cams for raising said box and die block, and means effecting the release of the air pressure upon the downward movement of the box.

8. In a machine of the class described, the combination with a punch and die block, of means for mounting the die block, the mounting means comprising a box supported for vertical movement, cams bearing against elements of the box for effecting said vertical movement in one direction, and air controlled means for imparting movement to the cams.

9. In a machine of the class described, a punch, a die cooperating therewith, a die block for mounting the die, mounting means for the die block, including a vertically movable box, cams for elevating the box, a pinion rigid with each cam, a gear wheel meshing with the pinion, means for imparting movement to the gear wheel, and stock-ejecting means set in operation by the movement of the box to normal position.

10. In a machine of the class described, a punch, a die cooperating therewith, a die block for mounting the die, means for supporting the die block, cams for effecting the vertical movement of the supporting means, a pinion rigid with each cam, a gear wheel

engaging said pinions, a rock shaft for mounting the gear wheel, and air controlled means for imparting movement to the rock shaft.

11. In a machine of the class described, a plurality of sets of punches, a plurality of sets of dies, a die holder for each set of dies, a die block, mounting means for the die block, means for raising the mounting means and die block, said means including a rock shaft, air controlled means for imparting movement to the rock shaft, and a plurality of gear wheels, one of which is carried by the rock shaft.

12. In a machine of the class described, a plurality of sets of punches, a plurality of sets of dies cooperating therewith, a die block for mounting each set of dies, elevating means for each die block, and means for imparting movement to the elevating means, feeding means associated with each set of punches and dies, the feeding means being reciprocable, and means automatically actuated by the return stroke of certain elements of the feeding means for operating all of the block raising devices.

13. In a device of the class described, punching means, die holding means, air controlled means for elevating the die holding means, and additional air controlled means for governing the operation of the air controlled means first named, and operable upon the return stroke of the punching means, for restoring to normal position one of the operative elements of the air controlled means first named.

14. In a machine of the class described, punching means, die holding means, means including a rock shaft and cam mechanism for operating the die holding means, air controlled means for imparting movement to the rock shaft, and air controlled means operable upon the return stroke of the punching means and cooperating with the air controlled means first named, for restoring to normal position the rock shaft and cam mechanism.

15. In a machine of the class described, punching means, die holding means, actuating mechanism for the latter, including an air controlled device, a feeding device, means automatically operated upon the return stroke of the feeding device for placing the air controlled device in operation, and air controlled means automatically operated for restoring the air controlled means first named to normal position.

16. In a machine of the class described, punching means, die holding means, mechanism for imparting movement to the punches, mechanism for imparting movement to the die holding means, means for feeding a rail into position to be operated upon by the punches, and means automatically operated for throwing off the rail.

17. In a machine of the class described, punching mechanism and operating means therefor, die mechanism and operating means therefor, a rail feeding device, and an automatically operated and air controlled rail discharging device.

18. In a machine of the class described, punching mechanism and operating means therefor, die mechanism and operating means therefor, rail feeding means, mechanism automatically controlled by the feeding means for elevating the die mechanism, means automatically operated for lowering the die mechanism, and means automatically operated incident to said lowering movement for discharging a rail after the punching operation.

19. In a machine of the class described, punching mechanism, die mechanism, rail feeding mechanism, means for automatically controlling the die mechanism by the movement of an element of the feeding mechanism, a rail discharging device, and air controlled means automatically operated upon the return movement of the die mechanism, for operating the rail discharging device.

20. In a machine of the class described, rail punching mechanism, die mechanism, rail feeding mechanism, and rail discharging mechanism, said mechanism last named including a rotatable device provided with radial arms, and air controlled means automatically operated for imparting movement to the rail discharging mechanism.

21. In a machine of the class described, rail punching means, die mechanism, rail feeding mechanism, rail discharging mechanism, and air controlled mechanism automatically operated for setting in motion the discharging mechanism, said air controlled mechanism including a cylinder, a plunger operating therein, a clutch, driving mechanism controlled by the clutch, means for normally holding the clutch inoperative, and devices for connecting the means last named with said plunger.

22. In a machine of the class described, punching mechanism, die mechanism, and means for automatically controlling the die mechanism, said means last named including a rock shaft and cam mechanism, an air cylinder including a plunger therein, means connecting the plunger with the rock shaft, a valve for said cylinder, a rod connected with the valve, a rail feeding device, means for actuating the rod by the feeding device for shifting the valve and admitting air to the cylinder, a second air cylinder, a plunger therein, means actuated by the plunger for shifting the valve in the opposite direction, and means automatically operated upon the return stroke of the punching mechanism for admitting air to the second named cylinder.

23. An air controlling device for a rail punching machine, including a cylinder, a plunger operating therein, a valve for admitting air to the cylinder, means for shifting the valve in one direction, and air controlled means automatically operated for shifting said valve in the opposite direction, and effecting the movement of the plunger in a direction opposite to that produced upon the first movement of the valve.

24. In a machine of the class described, punching mechanism, die mechanism, a rail feeding device and a valve controlled thereby, an air cylinder controlled by said valve, a valve controlled by the return movement of the die mechanism, a valve controlled by the return movement of the punching mechanism, air cylinders controlled by the second named valve and the valve last mentioned, plungers in said air cylinders, means connected with one of the plungers for restoring to normal position the valve first named, and means operated by the other of said plungers for discharging the rail after the punching operation.

25. In a machine of the class described, punching mechanism, die mechanism, a rail feeding device, a valve automatically operated upon the return movement of the feeding device, an air cylinder controlled by said valve, a valve controlled by the return movement of the die mechanism, a valve controlled by the return movement of the punching mechanism, air cylinders controlled respectively by the second named valve and the valve last named, plungers in said air cylinders, means connected with one of the plungers for shifting the valve first named, and means including a clutch controlled by the other of said plungers, for discharging the rail after the punching operation.

26. In a machine of the class described, tool holding mechanism, movable die mechanism, a rail feeding device, and an automatically operated rail discharging device, set in operation incident to movement of the die mechanism to normal position.

27. In a machine of the class described, tool holding mechanism, die mechanism, a rail feeding device, and an automatically operated and air controlled rail discharging device.

28. In a machine of the class described, tool holding mechanism, air controlled means for operating said mechanism, die mechanism, a rail feeding device, and an air controlled rail discharging device.

29. In a machine of the class described, tool holding mechanism, air controlled means for operating said mechanism, die mechanism, automatically governed air controlled means for operating the die mechanism, and a rail discharging device.

30. In a machine of the class described, tool holding mechanism, air controlled means for operating said mechanism, die mechanism, air controlled means for operating the die mechanism, and an automatically operated rail discharging device.

31. In a machine of the class described, tool holding mechanism, die mechanism, rail feeding mechanism, and air controlled means operated by the tool holding mechanism upon receding from the work, for restoring the die mechanism to normal position when operated.

32. In a machine of the class described, tool holding mechanism, die mechanism, rail feeding mechanism, air controlled means set in operation by the feeding mechanism, for operating the die mechanism and air controlled means set in operation by the tool holding mechanism, upon receding from the work, for restoring the die mechanism to normal position when operated.

33. In a machine of the class described, a plurality of units each including tool holding mechanism, dies cooperating with the punching mechanism of each unit, feeding mechanism, and air controlled means set in operation by the mechanism last named, for moving the dies simultaneously to operative position.

34. In a machine of the class described, a plurality of units each including tool holding mechanism, dies cooperating with the said mechanism of each unit, air controlled means for governing the operation of the tool holding mechanism, feeding mechanism, and means automatically operated by the mechanism last named for moving the dies simultaneously to operative position.

35. In a machine of the class described, a plurality of units each including tool holding mechanism, air controlled means for operating said mechanism, dies cooperating with the said mechanism of each unit, feeding mechanism, air controlled means set in operation by the feeding mechanism for throwing the dies to operative position, simultaneously, and an air controlled device cooperating with that first named for throwing the dies to inoperative position, simultaneously.

36. In a machine of the class described, a plurality of units each including tool holding mechanism, air controlled means for operating said mechanism, dies cooperating with the said mechanism of each unit, feeding mechanism, air operated means controlled by the feeding mechanism for throwing the dies to operative position simultaneously, rail discharging mechanism, and means automatically controlled incident to the movement of the dies for setting in operation the rail discharging mechanism of the several units, simultaneously.

37. In a machine of the class described, punching mechanism, and die mechanism

cooperating therewith, said die mechanism including a rotatable die block having a bore extending horizontally therethrough, the block being provided with sockets, die holders proportioned to be received within the sockets, dies carried by said die holder, and a conveyer for slugs extending through the bore of the block.

38. In a machine of the class described, punching mechanism, and die mechanism cooperating therewith, said mechanism last named including a rotatably mounted die block, a conveyer for slugs extending transversely therethrough, means for imparting movement to the conveyer, a vertically movable box for mounting the die block, and cam mechanism for elevating said box and die block.

39. In a machine of the class described, punching mechanism, die mechanism cooperating therewith, said die mechanism including a vertically movable box, a rotatably mounted die block supported by the box, a die holder detachably mounted in the block, dies carried by the die holder, a feeding device including a pivotally mounted pusher thereon, serving to carry forward a rail into position above the dies and between the latter and the punches.

40. In a machine of the class described, punching mechanism including a rotatably mounted punch block and punches carried thereby, a resiliently mounted stripping plate carried by the punch block and through which the punches pass, die mechanism including a vertically movable box, a rotatably mounted die block carried thereby, a die holder carried by the block, dies mounted in the die holder, and a feeding device including a pivotally mounted pusher, for carrying forward a rail into position above the dies, to be operated upon by the punches.

41. In a machine of the class described, punching mechanism, die mechanism, feeding mechanism, said feeding mechanism including a rail supporting device and a pivotally mounted element carried thereby, skids for supporting a rail during the feeding operation, skids for supporting the rail above the dies, and means for actuating the feeding mechanism.

42. In a machine of the class described, punching mechanism, die mechanism, feeding mechanism, said feeding mechanism including a rail supporting device movable toward and away from the punching mechanism, the feeding mechanism including a pivotally mounted element for directly engaging the rail, a pivotally mounted trip, a pivoted lever for engaging said trip, and means controlled by the lever for throwing the die mechanism to operative position.

43. In a machine of the class described, punching mechanism including a vertically movable head, means for guiding said head, a transverse shaft, air controlled means for imparting movement to the shaft, eccentric mechanism for driving the head from the shaft, a transverse shaft mounted in bearings in the head, punching mechanism carried by the shaft last named, and die mechanism cooperating with the punching mechanism.

44. In a machine of the class described, punching mechanism, die mechanism, and means for controlling the operation of the die mechanism, said means including an upper shaft, a driven shaft, a countershaft, means for imparting motion from the driven shaft to the countershaft, means for imparting motion to the shaft first named from the counter shaft, clutch mechanism on the driven shaft, air controlled means for actuating the clutch mechanism, a head forming a part of the punching mechanism, and eccentric mechanism connecting said shaft first named and the head.

45. In a machine of the class described, tool holding mechanism, vertically movable rail-supporting mechanism, rail feeding means, and air operated means under the automatic control of the feeding means, for controlling the movement of the rail supporting means in one direction.

46. In a machine of the class described, tool holding mechanism, vertically movable rail supporting mechanism, air operated means for effecting movement of the rail supporting means in one direction, and air operated means under the control of the tool holding mechanism for restoring the air operated means first named, and the rail supporting means, to normal position.

47. In a machine of the class described, tool holding mechanism, rail feeding mechanism, air operated rail supporting means under the control of the feeding means, rail ejecting means, and automatically operated air controlled clutch mechanism governing the operation of the rail ejecting means.

48. In a machine of the class described, tool holding means, rail feeding means, rail ejecting means, and automatically operated air controlled clutch mechanism governing the operation of the rail ejecting means.

In testimony whereof I affix my signature.

JAMES S. DAYTON.