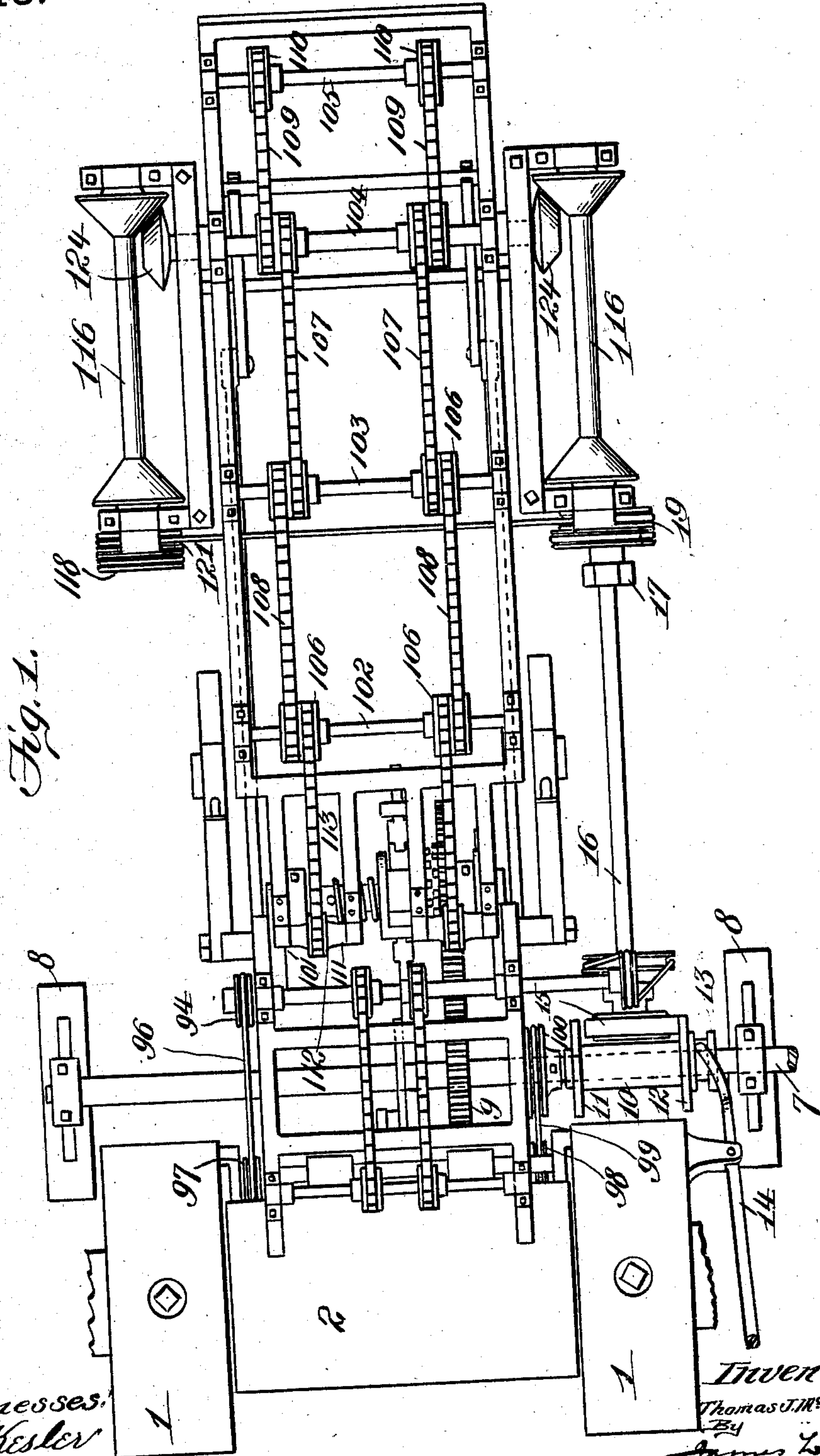


925,213.

T. J. McCULLOUGH.
PLATE MACHINE.
APPLICATION FILED MAR. 10, 1906.

Patented June 15, 1909.
6 SHEETS—SHEET 1.



Witnesses:
C. H. Kessler

[Signature]

Inventor

Thomas J. McCullough

By

[Signature]

[Signature]

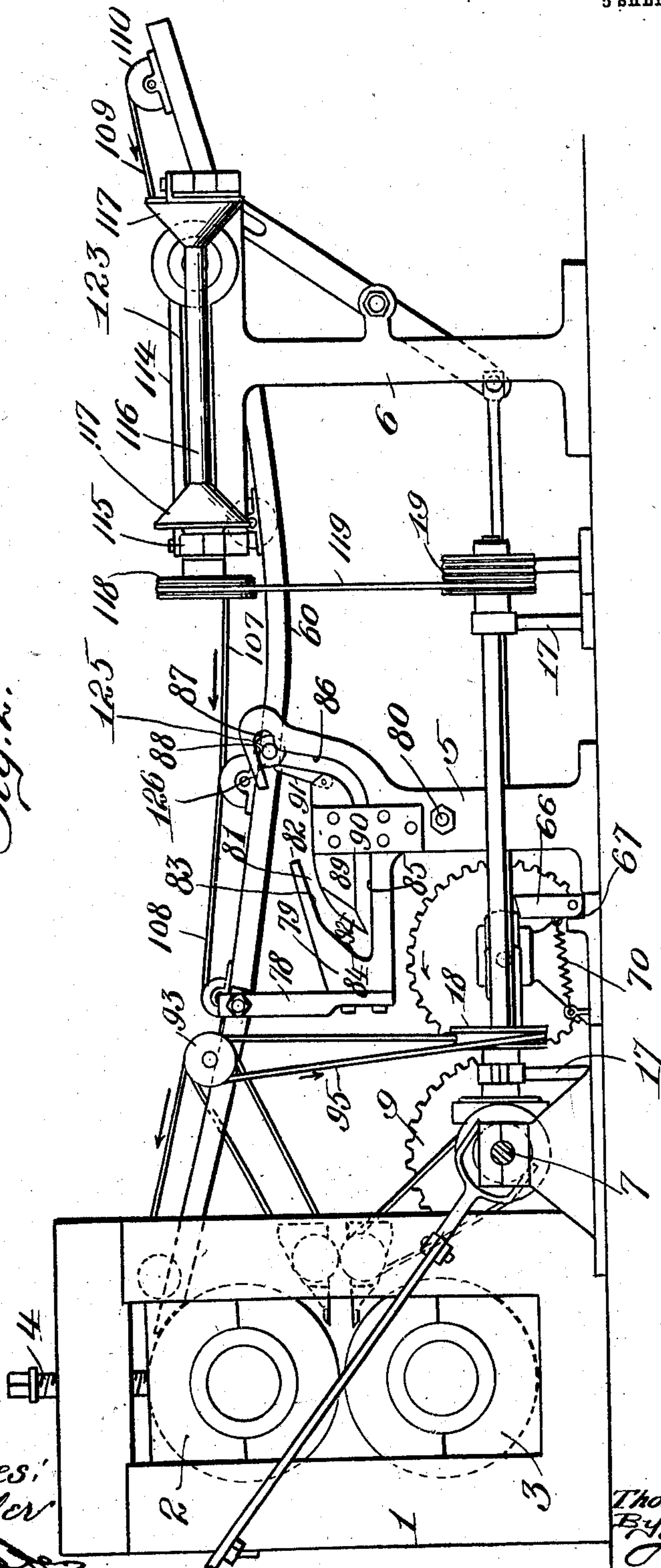
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5 SHEETS—SHEET 2.

Fig. 2.



Witnesses:
 C. D. Healer
 J. B. [Signature]

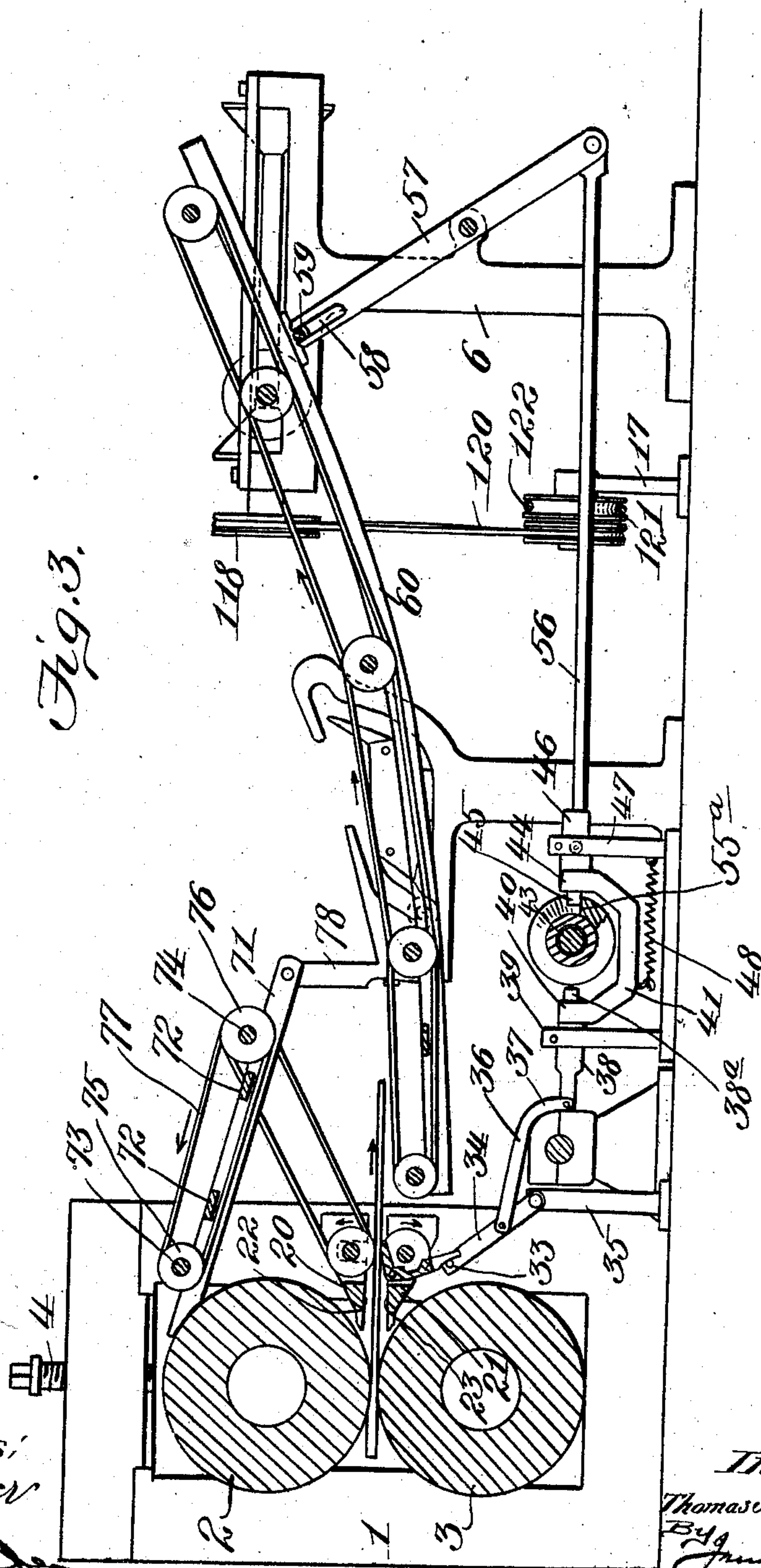
Inventor
 Thomas J. McCullough
 By James T. [Signature]
 atty.

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 5 SHEETS—SHEET 3.

Fig. 3.



Witnesses:
 C. S. Hester
 J. B. Keefe

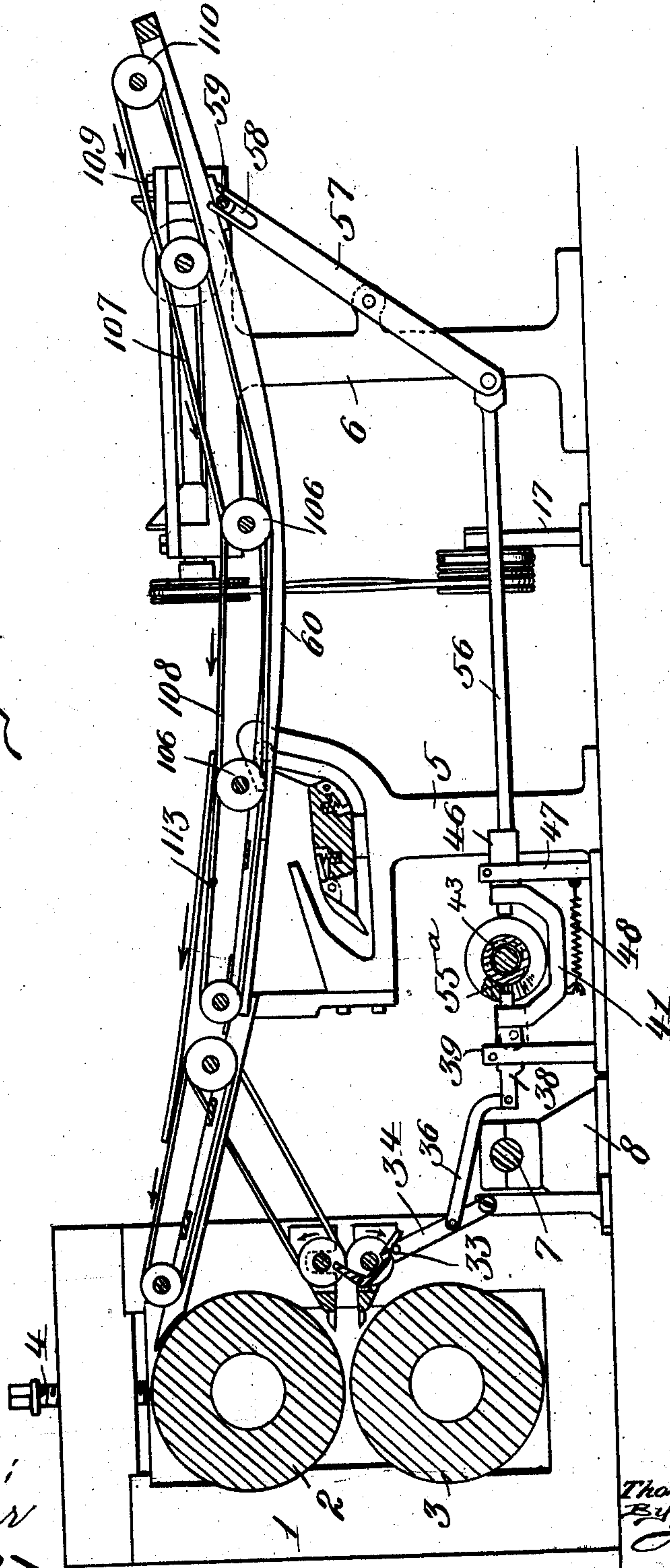
Inventor
 Thomas J. McCullough
 By James L. Norris
 ATTORNEY

T. J. McCULLOUGH.
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Patented June 15, 1909.
 5 SHEETS—SHEET 4.

925,213.

Fig. 4.



Witnesses:
 C. H. Nesler

J. B. Keefe

Inventor
 Thomas J. McCullough
 By James L. Norris

Att'y.

T. J. McCULLOUGH.
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925,213.

Patented June 15, 1909.

5 SHEETS—SHEET 5.

Fig. 5

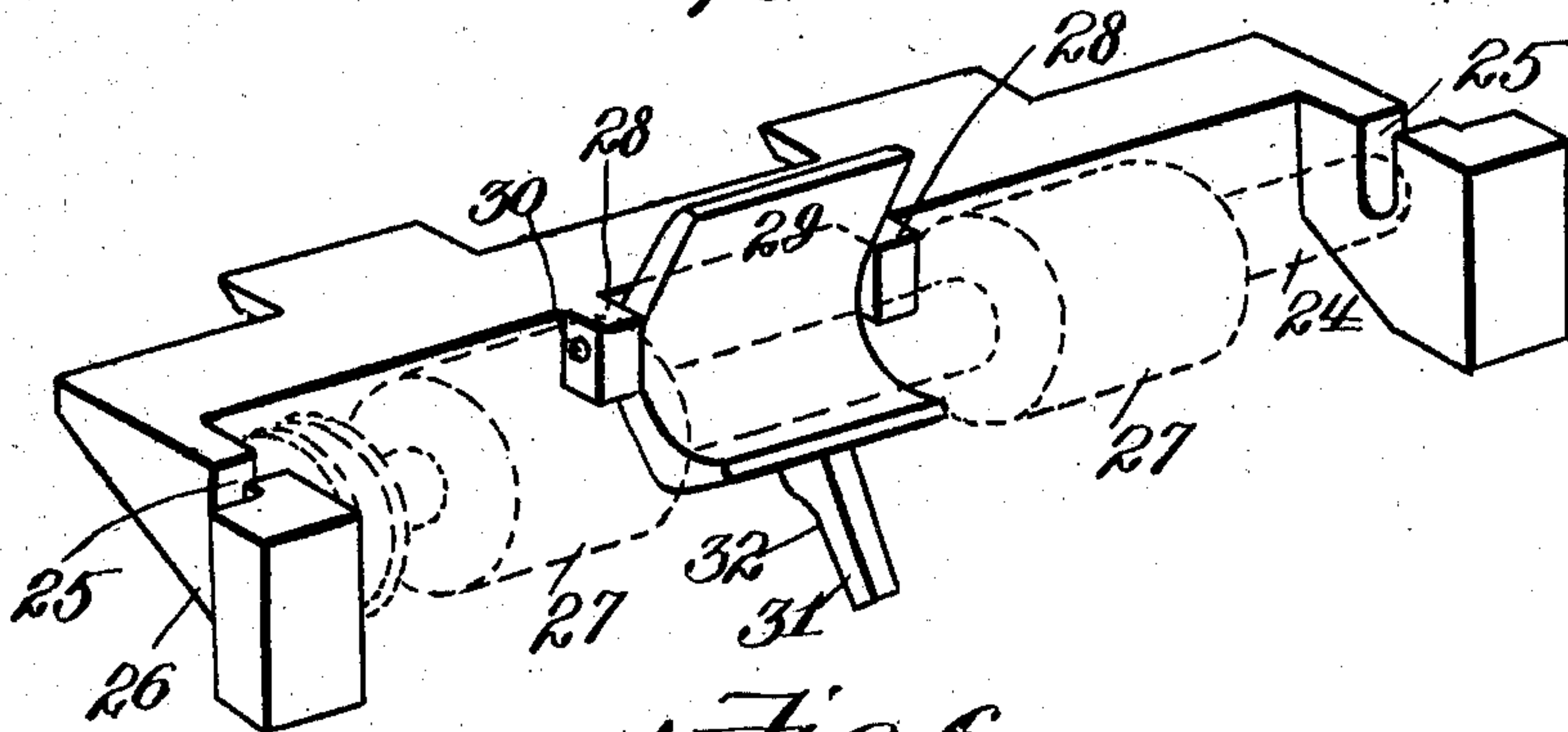


Fig. 6.

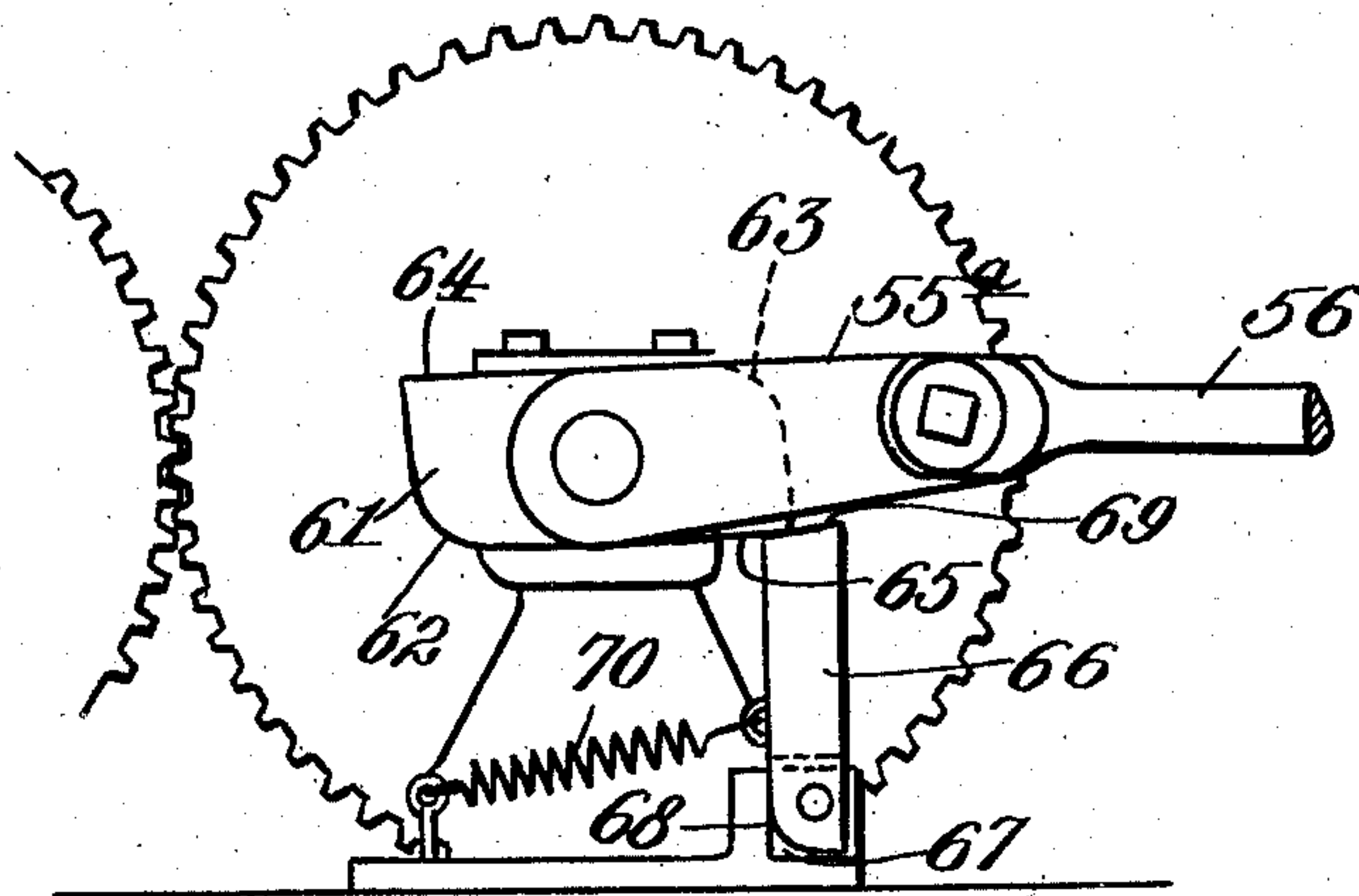
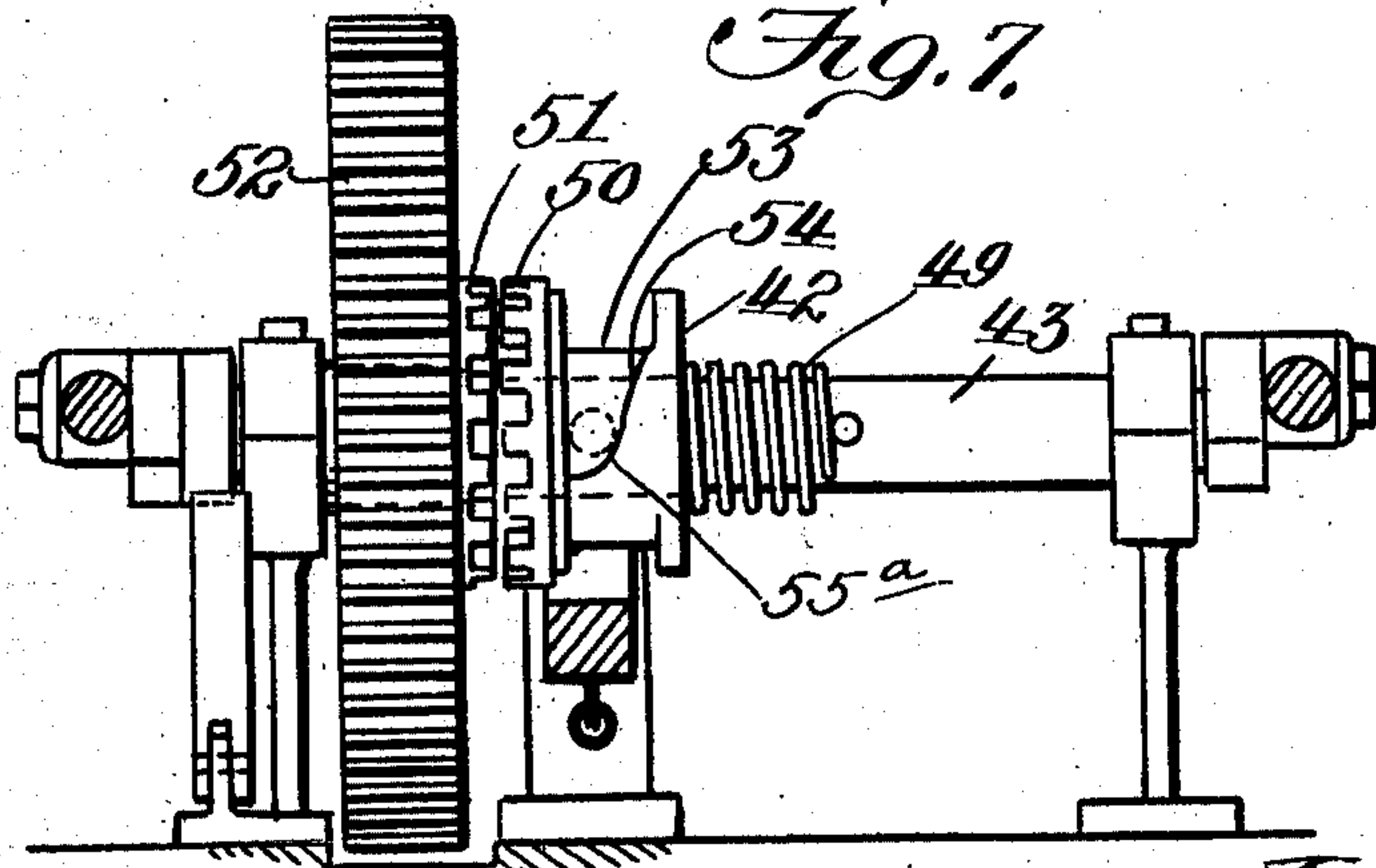


Fig. 7.



Witnesses;
C. D. Kessler
J. B. Keefe

Inventor
Thomas J. McCullough
 By *James L. Norris*
Atty.

UNITED STATES PATENT OFFICE.

THOMAS JAMES McCULLOUGH, OF ASHLAND, KENTUCKY.

PLATE-MACHINE.

No. 925,213.

Specification of Letters Patent.

Patented June 15, 1909.

Application filed March 10, 1906. Serial No. 305,398.

To all whom it may concern:

Be it known that I, THOMAS JAMES McCULLOUGH, a citizen of the United States, residing at Ashland, in the county of Boyd and State of Kentucky, have invented new and useful Improvements in Plate-Machines, of which the following is a specification.

This invention relates to a machine for producing rolled plates, either for tin plate or other purposes where thin sheets of metal are required, and in the common form of such machine it is necessary that a man or catcher stand behind the rolls in position to receive the plates as they issue from the rolls, and after the plates are so received the catcher swings the ends thereof upward on top of the upper roll and shoves the plates back to the rougher to re-roll the plates, this operation being continued until the plates have been reduced to the desired thickness. After the plates have been reduced to the prescribed thickness they are withdrawn from the machine by the catcher and disposed upon a suitable off-bearing table. Considerable skill is required on the part of the operative or catcher behind the rolls to properly manipulate the plates, and such labor is comparatively expensive.

The primary object of the present invention is to produce an automatic mechanism of a comparatively simple and positive nature, and the operation of which may, at all times, be under the complete control of the rougher from a point where he ordinarily stands to introduce the sheets to the mill, and of such character that it will automatically receive the plates as they pass out from between the rolls, return said plates over the top of the uppermost roll to a position where their ends may be caught by the rougher and again fed to the rolls, and to mechanically transfer a completed plate to a suitable off-bearing table, chute or other support.

By the operation of the improved machine the necessity of manually catching the plates, or other manipulation of the latter behind the rolls, is entirely overcome. Furthermore, by the use of the improved mechanism all the advantages derived from the removal of this particular work, from the uncertainty and limited capacity of human labor and putting it in charge of a reliable and surely acting machine are obtained, and in addition the cost of the production of the plates is materially cheapened.

In the drawings, Figure 1 is a top plan

view of the machine embodying the features of the invention. Fig. 2 is a side elevation of the same. Figs. 3 and 4 are longitudinal vertical sections of the machine showing the parts in two positions, the plate receiving carriage in Fig. 3 being lowered to take the plate from the rolls, and in Fig. 4 elevated to return the plate rearwardly over the rolls. Fig. 5 is a detail perspective view illustrating guide and clutch operating means cooperating with the rear portions of the shoulders. Fig. 6 is a detail elevation particularly showing the controlling clutch mechanism. Fig. 7 also shows a detail elevation in planes at right angles to that illustrated by Fig. 6 of the controlling clutch mechanism, parts of the devices cooperating with the clutch mechanism being shown in section.

Similar numerals of reference are employed to indicate corresponding parts in the several views.

The numeral 1 designates a roll frame, having therein a pair of rolls 2 and 3, arranged in vertical relation and having adjusting means 4 cooperating therewith. The rolls and their supporting frames, as well as the adjusting means, may be of any suitable type, and in the present instance are of the "two high" type.

The rolls and frame, as shown in the accompanying drawings, are illustrated merely to disclose a practical organization, and it is to be understood that any modifications known in the art may be adopted and used in place of the roll organization particularly illustrated.

The entire machine will be held on a suitable base rest or support, and includes opposite pillars or uprights 5 and 6.

In rear of and close to the roll frame 1 is a power transmitting shaft 7, extending transversely with relation to the machine and adapted to receive power from a suitable engine or jack shaft. The shaft 7 is rotatably held in suitable journal boxes mounted on pillow blocks or uprights 8, and keyed thereon is a master gear 9. Shiftably mounted on the shaft 7 is a frictional element operating a sleeve 10, with spaced friction disks 11 and 12, and an outer grooved shifting head 13, which is engaged by one end of a shifting lever 14. The sleeve 10 of the friction element is suitably splined or otherwise connected to the shaft 7 to rotate with the latter, and between the friction disks 11 and 12 a motion transmitting friction disk 15

is disposed and secured on one end of a counter shaft 16, extending along the one side of the machine and rotatably held in suitable bearings or uprights 17. The counter shaft 16 is controlled as to its reversal of rotation by engagement of the motion transmitting disk 15 thereon with either disk 11 and 12, as will be readily understood. On the shaft 16, adjacent to the motion transmitting disk 15 is a grooved belt wheel 18, and on the rear extremity of such shaft 16 is a double grooved belt wheel 19.

In rear of the rolls 2 and 3, and in alignment with the contiguous portions of the faces thereof, are upper and lower guides 20 and 21, respectively having reversely inclined contiguous faces 22 and 23, which are spaced a sufficient distance to permit various thicknesses of plates to pass therebetween during the operation of reducing the thickness of the plates. One of these guides is shown by Fig. 5 in detail, both guides being practically equivalent in structure, and each has a shaft 24 terminally disposed in vertical bearing slots 25 formed in rearwardly projecting extensions 26, the said shaft carrying guide rollers 27 which are fixed thereto. These rollers 27 are arranged on opposite sides of the transverse center of the shaft 24, and the lower guide 21 differs from the upper guide 20 by having rear lugs or bosses 28, and by which a clutch controller is mounted, and consists of a forwardly dished plate 29, having trunnions 30 disposed in the lugs 28 and a downwardly depending central arm 31. The upper edge of the plate 29 stands high enough above the upper surface of the guide 21 to be in the path of movement of the plate passing between and rearwardly through the rolls 2 and 3. The upper portion of the plate 29 has such maximum normal projection above its supporting guide that it will always be positively operated by the plate coming through or being fed rearwardly between the rolls 2 and 3, and as the upper part of the plate is engaged and forced over rearwardly by the plate fed through the said rolls 2 and 3, the lower part of said plate 29 and the arm 31 will be swung forwardly or in a reverse direction.

The under edge 32 of the arm 31 is cut away to loosely contact with a stud 33 carried by the upper end of a throw-lever 34 fulcrumed at its lower end on the upper terminal of a post or analogous support 35, and having a pull-link 36 pivoted to the intermediate portion thereof and provided with a rear downwardly curved terminal 37 movably attached to a draw-latch 38 slidably passing through an upright or post 39, and also secured to an adjacent terminal 40 of a longitudinally slidable clutch yoke 41 extending downwardly under and cooperating with a clutch sleeve 42 on a carriage actuating shaft 43. The clutch yoke 41 in its op-

posite terminal 44 carries a pin or projection 45 similar to the end of the draw-latch 38, and has an enlarged shank 46, which is similar to the said latch and movable in a post 47, the posts 39 and 47 serving as guides or supports for the two latch bolts. The pins or ends 38^a and 45 of the latch bolts or slides alternately cooperate with the clutch sleeve 42, and the yoke 41 has a retractile spring 48 secured to the lower portion thereof and to the post 47 to cause the yoke 41 to always have a tendency to move rearwardly when the clutch controller held by the lower guide 21 is disengaged with respect to a plate passing rearwardly between the rolls 2 and 3. The clutch sleeve 42 is splined on the carriage controlling shaft 43 and is shifted longitudinally with relation to said shaft against a spring 49 surrounding the shaft and operating to throw the said clutch sleeve outwardly when released. The clutch sleeve 42 has an outer toothed face 50 in contiguity to a toothed hub or rim 51 of a gear 52 running loose on the shaft 43, and always held in mesh with the master gear 9 on the power transmitting shaft 7. The clutch sleeve 42 is formed with a groove 53, which has a cam face 54 provided by a web extending across from one end to the other of the said sleeve, and terminating in a shoulder 55^a, as clearly illustrated by Figs. 3 and 4.

On opposite ends of the carriage controlling shaft 43, cranks 55^a are disposed and have reciprocating rods 56 secured thereto, one to each crank. The rods 56 are located on opposite sides of the machine, and are movably attached to the lower ends of rocker arms 57, intermediately fulcrumed to the rear edges of the uprights 6. The rocker arms 57 have slots 58 formed therein and opening out through the upper ends thereof, the said slots receiving a cross rod 59 secured to the under rear portion of a movable plate carriage 60. On one end of the shaft 43 a locking block or arm 61 is secured to rotate with the shaft and are arranged close to the inner side of one of the cranks 55^a. The locking block or arm 61 has diagonally opposed rounded corners or heels 62 and 63 and angular stop corners or faces 64 and 65. The function of this locking or stop arm or block 61 is to prevent the cranks 55 having motion in a downward direction in any one position, and which might otherwise ensue owing to their weight, and also to obviate any tendency to upward motion of said cranks when in a reverse position or during the time that the angular corner or stop face 64 is rearward or in the position that the stop face 65 occupies, as shown by Fig. 6. This locking or stop arm or block engages an upright check 66, pivotally held at its lower end in a socket 67, open at the rear and provided with a straight shoulder

or wall 68 at the front. The upper end of the check is inclined downwardly and forwardly, as at 69, to facilitate movement of the curved heels 62 and 63 thereover. The check 66 is held in normal upright position by a spring 70 attached to the front edge thereof and also to a portion of the base of the machine, as shown by Fig. 1.

The position of the cranks 55^a, as illustrated by Fig. 6, will be effected when the carriage 60 is lowered and forwardly projected, as illustrated by Fig. 3, and at a time when it is imperative that any accidental movement of the carriage be avoided because the plate from the rolls 2 and 3 is being fed on to the forward extremity of said carriage, and any movement of the latter during such time would result seriously, not only from a standpoint of breakage of the mechanism, but from an improper disposition of the plate.

Fixedly supported in rear of the rolls 2 and 3, and having its forward extremity practically in alinement with the upper portion of the roll 2, is a rack or transfer frame, consisting of side bars 71, connected by cross bars 72 and having roller shafts 73 and 74 journaled thereon, and each provided with pairs of sprocket wheels 75 and 76 traversed by longitudinally disposed chain belts 77. The rear ends of the side bars 71 are secured to the upper end of depending bars 78, in turn attached at their lower ends to the front extremities of longitudinally disposed members 79 held on the uprights 5, the latter being preferably connected by a suitable cross tie-rod 80 to strengthen the same. The members 79 are each formed with a cam slot 81, having a top opening 82, for convenience in assembling the parts, as will be presently explained. The cam slot 81 of each member comprises an upper front downwardly inclined straight face 83, merging into a similarly inclined face 84, having a greater angle, the latter face merging regularly into a lower horizontal face 85, from the rear terminal of which the slot takes an upward trend to form a nearly vertical edge 86, continuing into a pocket 87. From the pocket 87 the edge of the slot takes a downward trend to form an angular face 88, in alinement with the face 83.

Rigidly held in about central relation to the slot 81 is a shoe 89, secured to a supplemental upright or support 90 also rigidly attached to the upright 5, as clearly shown by Fig. 2. The upper and lower edges of the shoe 89 are shaped longitudinally to correspond to the various portions of the slot 81 contiguous thereto, and to the rear upper portion of said shoe an upwardly projecting spring actuated switch tongue 91 is movably attached, and is normally held in advance of the pocket 87. A downwardly projecting spring actuated switch tongue 92 is movably

attached to the forward end of the shoe 89. The switch tongue 91 is freely movable in a rearward direction, and the switch tongue 92 in a forward direction, and said switch tongues control the movement of an engaging element in a manner which will be presently explained.

The shaft 74 has, on opposite ends, grooved pulleys 93 and 95, the pulley 93 being traversed by a belt 95 also engaging the grooved pulley 19 of the counter shaft 16. The grooved pulley 94 is surrounded by a belt 96, which also engages a grooved pulley 97 on the one end of the shaft 24 of the upper guide 20. The shaft 24 of the lower guide also has a grooved pulley 98 thereon which is traversed by a belt 99 running to a grooved pulley 100, keyed on the power receiving shaft 7. By means of the pulleys and belts just described, the sprocket chains 77 engaging the sprocket wheels 75 and 76 of the rack or frame supporting the same, will always be moved in the direction of the arrows, as shown by Figs. 3 and 4, or so that the plate delivered or transferred to said chain belts will be moved over the upper portion of the top rail 2 within convenient reaching distance of the rougher or feeder. The shafts 24 in the upper and lower guides 20 and 21 will also be moved in a proper rearward feeding direction, as indicated by the arrows shown by Figs. 3 and 4, and the shaft 24 of the upper guide will be free to move vertically owing to the slots 25 with which the ends thereof engage to compensate for variations in thickness of the plates passing between the guide rolls.

The carriage 60 is constructed as an open frame, and has a front reduced extremity 101, which is adapted to fit in the rear extremity of the return rack or frame in advance thereof and having the sprocket wheels 75 and 76 and chain belts 77 included as a part thereof. The frame 60 also has shafts 102, 103, 104 and 105 extending transversely thereacross, the shafts 102, 103 and 104 carrying two pairs of sprocket wheels, as at 106. The shaft 104 is a drive shaft for the remaining shafts 102, 103 and 105, and from the inner sprocket wheels of the shaft 104 chain belts 107 run to and surround the inner sprocket wheels of the shaft 103, and from the outer sprocket wheels of the latter shaft chain belts 108 run to and surround the outer sprocket wheels on the shaft 102. From the outer sprocket wheels on shaft 104, chain belts 109 extend and traverse sprocket wheels 110 on the shaft 105. At the forward reduced end 101 of the carriage 60, stub shafts 111 project inwardly and carry sprocket wheels 112, one on each, the said sprocket wheels 112 being engaged by chain belts 113 traversing the inner sprocket wheels on the shaft 102.

The uprights 6 each have a longitudinally

extending head 114 thereon from which end bearing bosses 115 project outwardly to receive the terminals of a longitudinal carriage shifting shaft 116, on which are fixed opposing frictional cone disks 117, which are always held close to the bearing bosses 115. On the forward end of each shaft 116 is a grooved pulley 118, the pulleys 118 being respectively connected by belts 119 and 120 with the forward grooved portion of the pulley 19 below, and another double grooved pulley 121 at the opposite side of the machine, and which is actuated by a transversely extending belt 122 from the rear grooved portion of the said pulley 19. Each head 114 is formed with a longitudinal slot 123, and projecting through and slidable in the slot 123 of the two heads are the opposite extremities of the shaft 104 held on the carriage 60. On the projecting ends of the shaft 104 are cone friction disks or pulleys 124, which will be preferably covered by some yielding material, and are adapted to be thrown into alternate engagement with the cone friction disks 117 to reverse the movement of the shafts 102, 103, 104, 105 and 111 and the sprocket wheels and chain belts cooperating therewith.

The carriage 60 is shiftable in reverse directions longitudinally of the machine, and also has an elevating and depressing movement, all of which are carried on automatically through the medium of the reciprocating rods 56 and the operation of the carriage controlling shaft 43 and the clutch mechanism hereinbefore described. When the carriage 60 is depressed, as shown by Fig. 3, all of the chain belts, sprocket wheels and shafts on the said carriage, as just described, have motion imparted thereto in such direction as to cause said parts to rotate and move toward the rear of the carriage, and this direction of motion is effected by reason of the engagement of the frictional cone disks or pulleys 124 with the forward cone disks 117 on the shafts 116. When the carriage 60 is elevated it is moved rearwardly and the shaft 104 is shifted in the slots 123 of the heads 114, and the cone disks or pulleys 124 are caused to contact with the rear cone disks 117 of the shafts 116, and consequently the shafts 102, 103, 104, 105 and 111, together with the sprocket wheels and chain belts cooperating therewith, are caused to rotate and move in a reverse direction, or toward the forward end of the machine. The carriage 60, at a proper point with respect to its length, has side studs 126 projecting outwardly therefrom and engaging the cam slots 81 in the members or blocks 79, and on the studs 125 are antifrictional rollers 126 mounted to ease the movement of the carriage with respect to the inner sides of the said members or blocks. When the carriage 60 is in lowered position, the studs 125

are in close contact with the forward intersecting portion of the lower horizontal edge 85 and the downwardly inclined edge 84 of the cam slot 81, and in advance of the switch tongue 92. The operation of the mechanism to elevate the carriage, as will be more fully hereinafter set forth, causes the studs 125 to ride up over the switch tongues 92 in close contact with the upper edges of the shoes 89 and force the switch tongues 91 rearwardly and pass into the pockets 87, clearing the upper ends of the said switch tongues 91. The switch tongues 91 being liberated, resume their normal position, and clear what may be termed the rear passages of the cam slots 81 embodying the substantially vertical edges 86 and communicating with the lower horizontal portions of the cam slots including the edges 85. The carriage when empty is normally held elevated for a certain length of time, with the parts in the position shown particularly by Figs. 2 and 4, and when the mechanism again automatically operates to lower the carriage to receive a plate the studs 125 pass downwardly behind the switch tongues 91 in close contact with the edges 86, and eventually travel over the horizontal edges 85, forcing the lower projecting ends of the switch tongues 92 upwardly until the said studs 125 rest at the point of intersection of the edges 85 with the edges 84 in advance of the tongues 92 and in position for a further elevating motion, as just described.

In the description of the return rack or frame, heretofore set forth, and embodying side bars 71, it was stated that the said rack is held in fixed relation to the upper roll 2. This is true, and such fixed position will be maintained by the belts 95 and 96, but in the event of repair being required at the rear of the machine, or close to the rolls 2 and 3, or for other purposes, the said rack or frame, after release of the belts 95 and 96, may be disposed to clear the rear portions of the rolls and roll frame, and to arrive at this result the bars 71 are pivotally connected to the upper ends of the bars 78. It will also be seen that the front extremities of the bars 71 are reduced to permit them to be brought into closer relation to the upper roll 2.

From the foregoing description, the operation of the machine will, no doubt, be understood, but to briefly summarize, the motion of the shaft imparts through the master gear 9 meshing with the gear 52 rotation to the shaft 43 when the clutch sleeve 42 has its toothed head 50 forced into engagement with the toothed rim 51 of the said gear 52, and which will be the normal positions of the parts just specified. The actuation of the shaft 43 causes the cranks 55 to make part of a revolution in one direction, the cranks returning through another path, or do not

come back over the same path, but do make a complete or full revolution and force the carriage or table, with the assistance of the connecting rods and rocker arms, to make one complete trip, or to have a complete movement from normal position, or starting point, down through the slides, the carriage or table being forced through the lower switch by the first half of the revolution of the cranks 55, and brought back upwardly over the lower switch along the upper slide and through the upper switch back to the starting point. When the cranks are completing the last half of their revolution and when the carriage or table is thus brought back to the starting point it will be in elevated position, as shown by Fig. 4. During this operation the locking block or member 61 is correspondingly overthrown to have opposite sides thereof brought into engagement with the upper end of the check 66.

When a plate or a bar is fed to and passes between the rolls 2 and 3, and engages the clutch controller embodying the upwardly projecting plate 29, carried by the lower feed guide 26, the clutch sleeve 42 on the shaft 43 is disengaged from the gear 52, and the motion of the shaft 46 ceases, and in this condition the end or pin 38^a of the slide 38 is withdrawn from the groove 53 of the clutch sleeve 42 and out of the way of influence by the cam face 54 through the medium of the interposed throw-lever 34, having the stud 33 and the pull-lever 36 connected to the draw-latch 38, and the pin or reduced end 45 of the slide 46 is thrown into engagement with the clutch sleeve and bears against the shoulder 55^a of the latter. In this position, the carriage 60 will have been lowered almost vertically and shifted forwardly so that the front extremity thereof will be under the plate passing rearwardly through the rolls, as illustrated by Fig. 3, the carriage remaining in this lowered position until the plate shall have cleared the rolls 2 and 3 and the plate 29 of the clutch controller, when the spring 49 on the shaft 43, and which was compressed when the clutch sleeve 42 was thrown out of engagement with relation to the gear 52, will force the said clutch sleeve outwardly and establish connection thereof with the gear 52, and at the same time the pin or end 45 of the slide 46 will move rearwardly into disengaging position with relation to the clutch sleeve, and the pin or reduced end 38^a of the slide 38 will be again brought into coöperative relation to the said clutch sleeve. The clutch sleeve 42 is also immediately rotated in the direction to draw the rods 56 forwardly through the medium of the cranks 55^a and shift the carriage in a rearward direction in a substantially horizontal plane until the forward end of said carriage is in a position to clear the rear extremity of the rack or frame including the side bars 71,

and during such horizontal movement of the carriage the studs 125 will be moving over the switch tongues 92 and upper edges of the shoes 89. The forward movements of the rods 56 will continue until the studs 125 pass upwardly in close contact with the switch tongues 91, and in moving over the latter tongues the forward extremity of the carriage will continue to rise until said tongues are cleared and the studs 125 pass into the pockets 87 of the members 79. At this time, the cranks 55^a of the shaft 43 will have been fully overthrown toward the front of the machine, and the shoulder 55 of the clutch sleeve 42 will be bearing or resting on the end or pin 38^a of the slide 38, and the said clutch sleeve will have been again disengaged and the carriage permitted to remain elevated until the plate received thereby from the rolls 2 and 3 shall have passed over and in engagement with the chain belts 77.

When the carriage is lowered, as shown by Fig. 3, the cone friction disks 124, on the shaft 104, will be in engagement with the cone disks 117 on the forward extremities of the shafts 116 and the several chain belts 107, 108, 109 and 113 will all be moving toward the rear end of the carriage, as indicated by the arrows in Fig. 3. As soon as the carriage begins to rise positively through engagement with the switch tongues 91, as heretofore explained, the shaft 104 will be moved rearwardly in the slots 123 of the heads 114, and the cone friction disks 124 will be caused to engage the cone disks 117 on the rear extremities of the shafts 116, and thereby reverse the movement of the chain belts 107, 108, 109 and 113, and feed the plate forward to and over the chain belts 77 of the return rack or frame. This return movement of the chain belts 107, 108, 109 and 113 will not be effected until the carriage is fully raised, as shown by Fig. 4, and when the plate operated upon by the rolls 2 and 3 has been finished and is delivered to the carriage 60, the latter remains in elevated position and the movement of the chain belts 107, 108, 109 and 113 will be caused to feed the said plate to the rear over the said carriage by shifting the sleeve 10 on the shaft 7 to bring the friction disk 15 of the shaft 16 into engagement with the friction disk 11 of said sleeve. The finished plate will be received from the rear end of the carriage by any suitable means, and after it is fully liberated the sleeve 10 will be again shifted to cause the parts to resume the positions shown by Fig. 1 when the same operation may be carried on as just explained. It will be seen that the carriage 60, by its lowering and horizontal movements, will be caused to pass under the plate fed rearwardly by the rolls 2 and 3, and said rearwardly fed plate may have considerable projection from the rolls without any interference with respect to the movement of

the carriage and with a reliable or certain disposition of the carriage to come into operative relation to the fed plate.

Having thus described the invention, what is claimed, is:

1. In a machine of the class specified, the combination with plate forming rolls, of a frame, a carriage slidably mounted on the frame and having reverse longitudinal movements to receive a plate from the rolls and return the said plate over the said rolls, mechanism in part engaged by the plate and released after the latter has passed through the rolls to impart a receding movement to the carriage, and means for elevating the carriage as it recedes from the rolls and subsequently depressing the carriage while the latter is moving forwardly toward the rolls, the forward movement of the carriage continuing after its front extremity has been fully depressed to bring the said extremity below the plane of the pass between the rolls to avoid striking the plate that may be moving through the rolls.

2. In a machine of the class specified, the combination with plate forming rolls, of a longitudinally traveling carriage loosely mounted in rear of the rolls and provided with fulcrum means longitudinally and vertically movable with the carriage, the carriage during its opposite movement toward and from the rolls occupying different elevations with respect to the rolls, and mechanism engaged in part by the plate passing between the rolls to actuate the carriage and including means with which the said fulcrum means co-operates to maintain the carriage when in maximum lowered position in a horizontal plane to project the front extremity of the carriage forwardly below the pass between the rolls and the plate that may be fed rearwardly through the said rolls.

3. In a machine of the class specified, the combination with plate forming rolls, of a reversely sliding and rising and falling carriage in rear of the rolls provided with fulcrum devices movable in opposite longitudinal and vertical directions with the carriage, means engaged by the said fulcrum devices and operating to maintain the forward extremity of the carriage at its maximum elevated and depressed positions and causing the carriage to move longitudinally below the pass between the rolls when receiving the plate, reversely movable feeding devices on the carriage, and mechanism coöperating with the carriage and feeding devices and controlled by contact of the plate passing between the rolls with a portion thereof and released after the plate has been fully projected rearwardly from the rolls to actuate the carriage, the direction of movement of the feeding devices being changed by differentiation in position of the carriage.

4. In a machine of the class specified, the

combination with plate forming rolls, of a reversely slidable carriage provided with fulcrum devices slidable therewith, and mechanism adapted to operate the carriage and constructed and arranged to cause it to longitudinally recede from the rolls as it rises after it has received the plate and to approach the rolls simultaneously with its depression, the fulcrum devices coöperating with guiding means adapted to maintain the carriage in a certain inclined position when it is fully depressed to cause the forward extremity of the carriage after it has been depressed to move horizontally below the pass between the rolls to avoid striking a plate that may be moving through the rolls.

5. In a machine of the class specified, the combination with plate forming rolls, of a supporting means in rear of the rolls, a carriage slidably mounted on the supporting means and having longitudinal traveling movements in reverse directions over said supporting means to receive the plate from the rolls and deliver it over the top of the rolls, the carriage having fulcrum devices forming a part thereof and uniformly movable with the carriage in opposite longitudinal directions and also in opposite vertical directions, means coöperating with the fulcrum devices to impart to the carriage positive longitudinal movements in reverse directions, and also rising and falling movements, and mechanism in part engaged and released by the plate passing between the rolls for controlling the recession of the carriage from the rolls.

6. In a machine of the class specified, the combination with plate forming rolls, of a rising and falling carriage having forward and rearward sliding movements imparted thereto, the carriage being provided with fulcrum devices which are movable with the carriage in opposite longitudinal directions and by means of which the carriage also has pivotal movement, means engaged by the said fulcrum devices controlling the rising and falling and forward and rearward movements thereof, mechanism disposed on the carriage to move the plate in reverse directions, the carriage being elevatable to such a plane as to deliver the plate over the top of the rolls, devices controlled by the carriage itself for reversing the mechanism on the carriage when the latter reaches the terminal of its rearward movement, and means for actuating the carriage in part engaged by the plate passing between the rolls.

7. In a machine of the class specified, the combination with plate forming rolls, of a supporting means in rear of the rolls, a carriage slidably mounted on the supporting means to receive the plate after it has passed through the rolls, the carriage being longitudinally shiftable in reverse directions toward and away from the rolls and also having rising and falling movements, fulcrum means

on the carriage and uniformly shiftable with the latter in opposite longitudinal and vertical directions, devices engaged by the fulcrum means during the movement of the latter for controlling the longitudinal and the rising and falling movements and for maintaining the recession and approach of the carriage with respect to the rolls, operating mechanism for the carriage, a controller in the path of movement of the plate passing between the rolls, the controller being connected to said carriage operating mechanism and when engaged and released by the plate automatically changing the mechanism to modify the direction of movement of the carriage, mechanism on the carriage for moving the plate in opposite directions thereover, and devices controlled by the carriage itself for reversing the mechanism thereon when the carriage reaches the terminal of its rearward movement.

8. In a machine of the class specified, the combination with plate forming rolls, of a support in rear of the rolls, a carriage slidably mounted on the support to receive the plate after it has passed through the rolls, means cooperating with the carriage to impart rising and falling movements thereto and also to shift the carriage longitudinally in reverse directions at intervals between the rising and falling movements, operating mechanism for the carriage including clutch mechanism, and means connected to the clutch mechanism and disposed in the path of movement of the plate and operative by the said plate to position the carriage to receive the plate and also to dispose the carriage to deliver the plate over the top of the rolls.

9. In a machine of the class specified, the combination with plate forming rolls, of a support in rear of the rolls, a carriage slidably mounted on the support, and mechanism for imparting rising and falling movements to the carriage and also longitudinal movements in reverse directions with respect to the rolls at intervals between the rising and falling movements to position the carriage to receive the plate from the rolls and to deliver the plate over the top of the rolls.

10. In a machine of the class set forth, the combination with plate forming rolls, of a return rack cooperating with the uppermost roll and having movable devices thereon to return a plate over the said uppermost roll, a longitudinally slidable carriage having rising and falling movements to receive the plate from the rolls and controlled as to its position by the movement of the plate, and mechanism for operating the carriage, the said carriage being movable from a receiving position in line with the pass between the rolls to a position in conjunction with the rear end of the return rack and having plate

moving means thereon provided with automatically reversing mechanism.

11. In a machine of the class set forth, the combination with plate forming rolls, of guides mounted in rear of the said rolls, feed rollers held in the guides, a clutch controller movably supported by a part of the guides, a clutch organization operatively connected to the controller, a carriage having vertical movements imparted thereto, and operating mechanism for the carriage, said operating mechanism being started and stopped by the clutch organization which in turn is changeable by the movement of the said controller.

12. In a machine of the class specified, the combination with plate forming rolls, of a support in rear of the rolls, a carriage slidably mounted on the support, mechanism for imparting to the carriage reverse rising and falling movements and also reverse longitudinal movements at intervals between the rising and falling movements to position the carriage to receive the plate from the rolls and deliver the plate over the top of the rolls, a portion of the longitudinal movement of the carriage being effected during its change in elevation, and means carried by the carriage for moving the plate thereon in reverse directions.

13. In a machine of the class specified, the combination with plate forming rolls, of a support in rear of the rolls, a carriage slidably mounted on the support, mechanism for operating the carriage and shifting it in opposite longitudinal directions and including a clutch mechanism, means for causing the carriage to have rising and falling movements, means for maintaining the carriage in longitudinally moving positions at intervals between reverse rising and falling movements, and a movable controller connected to the clutch mechanism and disposed in rear of the rolls and in the path of movement of the plate, the contact of the plate with the controller maintaining the carriage in a lowered position in a plane below the pass between the rolls, and the release of the plate from the controller liberating the said operating mechanism and carriage and causing the latter to be bodily actuated and elevated to deliver the plate over the top of the rolls.

14. In a machine of the class set forth, the combination with plate forming rolls, of a longitudinally and vertically movable carriage to receive and return a plate delivered from the rolls thereto, feeding devices held by the carriage having their direction of movement alternately changeable, mechanism for imparting to the carriage its longitudinal and vertical movements, and a return rack cooperating with the uppermost roll and having feeding devices thereon and

means for imparting movement continuously in one direction to the said feeding devices on the return rack, the forward end of the carriage alining with the rear extremity of the rack when the carriage is elevated.

15. In a machine of the class specified, the combination with plate forming rolls, of a support in rear of the rolls, a reversely slidable carriage mounted on the support, the carriage operating to receive and elevate the plate from the rolls and deliver said plate over the top of said rolls, mechanism imparting to the carriage rearward longitudinal and forward longitudinal movements in alternation, means for causing the carriage to have rising and falling movements between the rearward and forward longitudinal movements, the carriage when moved forward also being depressed to bring the front extremity thereof under the plate after the latter has been partially fed rearwardly through the rolls, receptive guide means disposed on opposite sides of the carriage for regulating the rising and falling movements of the said carriage, and fulcrum devices carried by and uniformly movable with the carriage and engaging the said receptive guide means during the rising and falling movements of the carriage.

16. In a machine of the class specified, the combination with plate forming rolls, of a support in rear of the rolls, a carriage slidably mounted on the support and operative to receive the plate from the rolls, mechanism for shifting the carriage longitudinally in reverse directions, means for causing the carriage to have rising and falling movements, the reverse longitudinal movement of the carriage being effected at intervals between the rising and falling movements thereof, means for depressing the front extremity of the carriage and for causing the carriage in its depressed position to move in a horizontal plane for a certain interval and project the front extremity of the carriage under the plate that may be partially projected rearwardly from the rolls and consisting of guide devices on opposite sides of and engaged by portions of the carriage, and means on the carriage for moving the plate thereover.

17. In a machine of the class set forth, the combination with plate forming rolls, of a carriage to which the plate from the rolls is delivered, mechanism for imparting to the carriage upward, downward, backward and forward movements, means held by the carriage for reversing the direction of movement of the plate thereon, and a rack arranged in operative relation to the rear portion of the uppermost roll and with which the said carriage coöperates, the rack having feed devices thereon to which motion in one direction may be continuously imparted.

18. In a machine of the class set forth, the

combination with plate forming rolls, of a carriage to which the plate is delivered from the rolls, the carriage having devices with means for operating the same to either move the plate rearwardly and then forwardly thereover, or continuously in a rearward direction to liberate the plate therefrom, and a return rack coöperating with the uppermost roll having feed devices continuously moving in a forward direction, the carriage coöperating with said return rack.

19. In a machine of the class set forth, the combination with plate forming rolls, of a longitudinally slidable and vertically movable carriage to which the plate is delivered, rocker arms connected to the rear extremity of the carriage, means for giving the carriage rising and falling movements and a carriage controlling shaft having crank devices attached to the rocker arms and also provided with a clutch organization, a gear normally running loose on the carriage controlling shaft, a power shaft having a master gear continually in mesh with the said loose gear, and a controller in the path of movement of the plate from the roll to engage said plate and automatically change the relation of the clutch organization with respect to the loose gear.

20. In a machine of the class set forth, the combination with plate forming rolls, of a carriage on which the plate is delivered, mechanism for imparting longitudinal and rising and falling movements to the carriage and comprising a carriage controlling shaft having a gear normally loose thereon, a clutch sleeve shiftable on the shaft and normally engaging the gear, the clutch sleeve being provided with a cam face and a shoulder, cranks on the opposite ends of the shaft connected to the carriage, longitudinally shiftable slide devices having their ends contiguous to the clutch sleeve to engage the latter in alternation, a power shaft having a gear continuously in mesh with the gear on the carriage controlling shaft, and mechanism for causing the carriage to have rising and falling movements, and a clutch controller movably disposed in rear of the rolls for engagement by the plate to automatically change the position of the slide devices.

21. In a machine of the class set forth, the combination with plate forming rolls, of a carriage automatically shiftable in opposite longitudinal and vertical directions, a carriage controlling shaft connected to the latter and provided with a clutch organization including a gear normally loose on the shaft, a power receiving shaft having a gear meshing with the gear on the carriage controlling shaft, longitudinally slidable means forming part of the clutch organization and operative to modify the latter with respect to the loose gear on the carriage controlling shaft, and mechanism for causing the carriage to have

rising and falling movements, and a clutch controller movably disposed in rear of the rolls and engageable by the plate fed from the latter to the carriage.

22. In a machine of the class specified, the combination with plate forming rolls, of a support in rear of the rolls, a plate receiving carriage mounted on the support, mechanism imparting reverse longitudinal movements to the carriage and including a power receiving shaft, a carriage actuating shaft operated by the power receiving shaft and having clutch devices, connections between the carriage actuating shaft and carriage, means for changing the operative relation of the clutch devices with respect to the carriage actuating shaft and including a controller located in rear of the rolls and engageable by the plate passing through the rolls to the carriage, guide means on opposite sides of the carriage for controlling rising and falling movements thereof at intervals between the longitudinal movements and also for holding the front extremity of the carriage depressed and in a horizontal plane when moving toward and beneath the pass between the rolls, and projections carried by and uniformly movable with the carriage and engaging said guide means.

23. In a machine of the class specified, the combination with plate forming rolls, of a carriage for receiving the plate from the rolls and returning said plate over the top of said rolls, mechanism imparting to the carriage reverse longitudinal movements with respect to the rolls and at intervals between rising and falling movements of the carriage to increase and decrease the distance between the forward extremity of the carriage and the rolls and to elevate and depress the said extremity of the carriage above and below the pass between the rolls, a portion of the longitudinal movement of the carriage being effected during the depression thereof, and means at opposite sides of the carriage for guiding it in its longitudinal and rising and falling movements.

24. In a machine of the class specified, the combination with plate forming rolls, of a support in rear of the rolls having a structure to permit a cooperating device to travel thereover, a plate receiving carriage constituting said cooperating device and provided with reversely operating plate feeding means thereon, mechanism for shifting the carriage longitudinally in reverse directions over the support, means for elevating and depressing the carriage to cause it to move over different portions of the support and to vary the distance between the forward extremity of the carriage and the rolls, and positively driven reversing shaft means engaging a part of said feeding means on the carriage and having shifting means thereon to automatically reverse the feeding means

when the carriage is moved in opposite longitudinal directions, the forward extremity of the carriage when depressed to its fullest extent being held below the pass between the rolls to receive the plate from the latter, and the feeding means on the carriage when the said carriage is in its depressed position moving in a rearward direction to feed the plate received from the rolls over the carriage, this feed of the plate over the carriage continuing as the carriage recedes from the rolls and reversed when the carriage reaches the limit of its rearward movement.

25. In a machine of the class specified, the combination with plate forming rolls, of a carriage for receiving the plate from the rolls, mechanism for imparting to the carriage longitudinal movements in opposite directions at intervals between reverse rising and falling movements of the carriage, the carriage first receiving the plate and then delivering it over the top of the rolls, guide means for effecting positive movement of the carriage longitudinally and vertically in opposite directions, and feeding devices on the carriage provided with automatically operating means for reversing the same when the carriage is moved longitudinally and controlled by the carriage itself, the feeding devices being operated to cause the plate after it is received from the rolls to move rearwardly over the carriage and then forwardly over the latter.

26. In a machine of the class specified, the combination with plate forming rolls, of a carriage for receiving the plate from the rolls, mechanism for shifting the carriage in opposite longitudinal directions and varying the distance between the forward extremity of the carriage and the rolls, and members at opposite sides of the carriage having cam slots for engagement by portions of the said carriage and effecting a rising and falling movement of the carriage at intervals between the longitudinal movements of the latter, the carriage being projected forwardly during its falling or depressing movement.

27. In a machine of the class set forth, the combination with plate forming rolls, of a carriage, mechanism for shifting the carriage in opposite longitudinal directions and also for causing the carriage to rise and fall, and members at opposite sides of the carriage having upper and lower cam slots and fixed shoes intersecting different parts of the slots for engagement with portions of the said carriage.

28. In a machine of the class set forth, the combination with plate forming rolls, of a carriage, mechanism for shifting the carriage in opposite longitudinal directions and also for causing the carriage to have rising and falling movements, members at opposite sides of the carriage having upper and lower communicating cam slots therein, shoes fixed

in the cam slots and provided with reversely operating switch tongues at opposite ends, and means held by the carriage for engaging the said cam slots, shoes and switch tongues.

29. In a machine of the class set forth, the combination with plate forming rolls, of a plate receiving carriage shiftable in opposite longitudinal directions and having rising and falling movements, mechanism for operating the carriage, movable feed devices held on the carriage, a portion of the feed devices projecting outwardly beyond the sides of the carriage and having cone disks thereon, rotatable shafts held in elevated position at opposite sides of the rear extremity of the carriage, and provided with spaced cone disks to engage the cone disks held by the carriage to automatically reverse the movement of the feed devices of the latter, and means for operating the shafts having the spaced cone disks.

30. In a machine of the class set forth, the combination with plate forming rolls, of a longitudinally movable elevating and depressing plate receiving carriage, mechanism for operating the carriage, feed devices held by the carriage and automatically reversible as to their movement to shift the plate thereon in opposite directions, one of the devices projecting beyond the sides of the carriage and provided with means for controlling the movement of the remaining devices, longitudinally disposed slotted heads at opposite sides of the rear extremity of the carriage through which the parts of the projecting controlling feed device extend, reversing shafts held by the said heads and provided with spaced gear means to cooperate with the said means of the controlling feed device, and means for operating the said shafts.

31. In a machine of the class specified, the combination with plate forming rolls, of upper and lower guides disposed in rear of and close to said rolls in line with the pass between the rolls, feed rollers having their axes vertically movable and gravitatingly mounted in the said guides, driving mechanism positively cooperating with the upper feed roller, the lower feed roller being intermediately reduced, a controller movably cooperating with the intermediately reduced portion of the lower feed roller and having a portion thereof normally projecting above said lower feed roller for engagement by the plate passing between the rolls, and mechanism for receiving the plate from the forming rolls and said feed rollers and alternately movable from and toward the said rolls and rollers and including a clutch adapted to be shifted by the said controller to govern the actuation of the mechanism for receiving the plate.

32. In a machine of the class specified, the combination with plate forming rolls, of a plate receiving means provided with devices for moving a plate longitudinally thereover

in opposite directions, a return rack in rear of the rolls and cooperating with the upper portion of the top roll, the rack being pivotally mounted at its rear end to permit it to be swung over rearwardly, the plate receiving means operating to deliver a plate to the said rack, feeding devices carried by the rack, and mechanism for operating the feeding devices of the rack and the devices for moving the plate on the plate receiving means.

33. In a machine of the class set forth, the combination with plate forming rolls, of a plate receiving carriage alternately movable in opposite longitudinal directions and also having an elevating and depressing movement, a carriage controlling shaft having cranks on the opposite extremities thereof connected to said carriage, a gear normally loose on the carriage controlling shaft, a grooved clutch sleeve splined to the shaft to cooperate with the gear and provided with a cam face and shoulder in the groove thereof, a power shaft having a gear held in continual mesh with the gear on the carriage controlling shaft, slide devices having their ends in operative relation to the clutch sleeve to alternately engage the latter, a clutch yoke with which the slide devices cooperate, means in the path of the plate and operative by contact with the plate fed from the rolls for shifting the slide devices and clutch yoke, and means for causing the carriage to have rising and falling motions.

34. In a machine of the class set forth, the combination with plate forming rolls, of a plate receiving carriage movable in opposite longitudinal directions and also having an elevating and depressing movement, a carriage controlling shaft having cranks on the ends thereof and locking members adjacent to the cranks, movable check devices for engagement with the locking members, connecting rods attached to the cranks and also to the carriage, and means for causing the carriage to have elevating and depressing movements.

35. In a machine of the class set forth, the combination with plate forming rolls, of a plate receiving carriage automatically shiftable in opposite longitudinal directions, mechanism for elevating and depressing the carriage, a carriage controlling shaft, a power shaft for operating the carriage controlling shaft, rocker arms having upper slotted ends engaging portions of the carriage, and connecting rods attached to the lower portions of the rocker arms and to the carriage controlling shaft.

36. In a machine of the class set forth, the combination with plate forming rolls, of an automatically shiftable carriage to receive the plate from the rolls, a carriage controlling shaft having cranks at opposite ends and a clutch organization cooperating therewith, rocker arms having their upper ends engag-

ing the carriage, connecting rods between the said cranks and the lower ends of the rocker arms, clutch operating mechanism, a motion transmitting lever connected to a part of the clutch operating mechanism, by means of a pull-link, a clutch controller engaging a portion of the lever and located in the path of movement of the plate from the rolls, and means for operating the carriage controlling shaft.

37. In a machine of the class set forth, the combination with plate forming rolls, of a plate receiving carriage, a controlling shaft connected to the carriage and having a locking member and a clutch disk provided with a cam face and a shoulder, opposed slides having ends arranged to alternately engage the cam face and shoulder of the clutch device, mechanism for operating one of the slides, a clutch controller located in the rearward path of movement of the plate from the rolls, and loosely engaging a part of the mechanism for operating one of the slides, a movable check for engaging the locking member on the said shaft, and means for operating the shaft.

38. In a machine of the class specified, the combination with plate forming rolls, of a movable carriage to receive the plate from the rolls, mechanism for imparting to the carriage longitudinal movement in reverse directions, as well as rising and falling movements, feeding devices held by the carriage and operating upon the reception of the plate from the rolls to feed said plate rearwardly thereover and then forwardly, mechanism in part held by the carriage for reversing the operation of the feeding devices on the carriage when the latter reaches the terminal of its rear and forward movements, and mechanism for controlling the operation of the said feeding devices so that the latter will continue to feed in a rearward direction to deliver the plate over the rear end of the carriage.

39. In a machine of the class set forth, the combination with plate forming rolls, of a return rack having feed devices thereon arranged to feed the material back over one of the rolls, and a table for delivering the material to the rack and having reversible feed

mechanism thereon, and means for moving the table from receiving position in line with the pass between the rolls in conjunction with the rear end of the return rack.

40. In a machine of the class specified, the combination with plate forming rolls, of a movable carriage to receive the plate from the rolls, mechanism for imparting to the carriage longitudinal movements in reverse directions, as well as rising and falling movements, and including guides having upper and lower cam slots and directing devices at opposite portions of the slots, fulcrum devices held by and movable with the carriage and engaging the said cam slots, feed devices mounted on the carriage and including a shaft carrying cone disks, rear shafts extending longitudinally and having terminal cone disks for engagement with the cone disks of the feeding devices on the carriage, and mechanism for controlling the operation of said feeding devices so that the latter will continue to feed in a rearward direction to deliver the plate over the rear end of the carriage.

41. In a machine of the class specified, the combination with plate forming rolls, of a plate receiving means provided with devices for moving a plate longitudinally thereover, mechanism for imparting to the carriage opposite longitudinal and also rising and falling movements and including guides having upper and lower horizontal cam slots continuous with upwardly extending terminal slots, fulcrum projections secured to the carriage and engaging the said slots, means engageable by a part of the devices for moving a plate over the receiving means to change the direction of movement of the plate of said receiving means, and means adapted to contact with the plate passing between the rolls to control the actuation of the said mechanism and the carriage.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

THOMAS JAMES McCULLOUGH.

Witnesses:

CHAS. S. HYER,
JAMES L. NORRIS.