C. G. GROTNES.

ROLLING MACHINE.

APPLICATION FILED MAY 24, 1920.

1,428,778.

Patented Sept. 12, 1922.

4 SHEETS—SHEET 1.

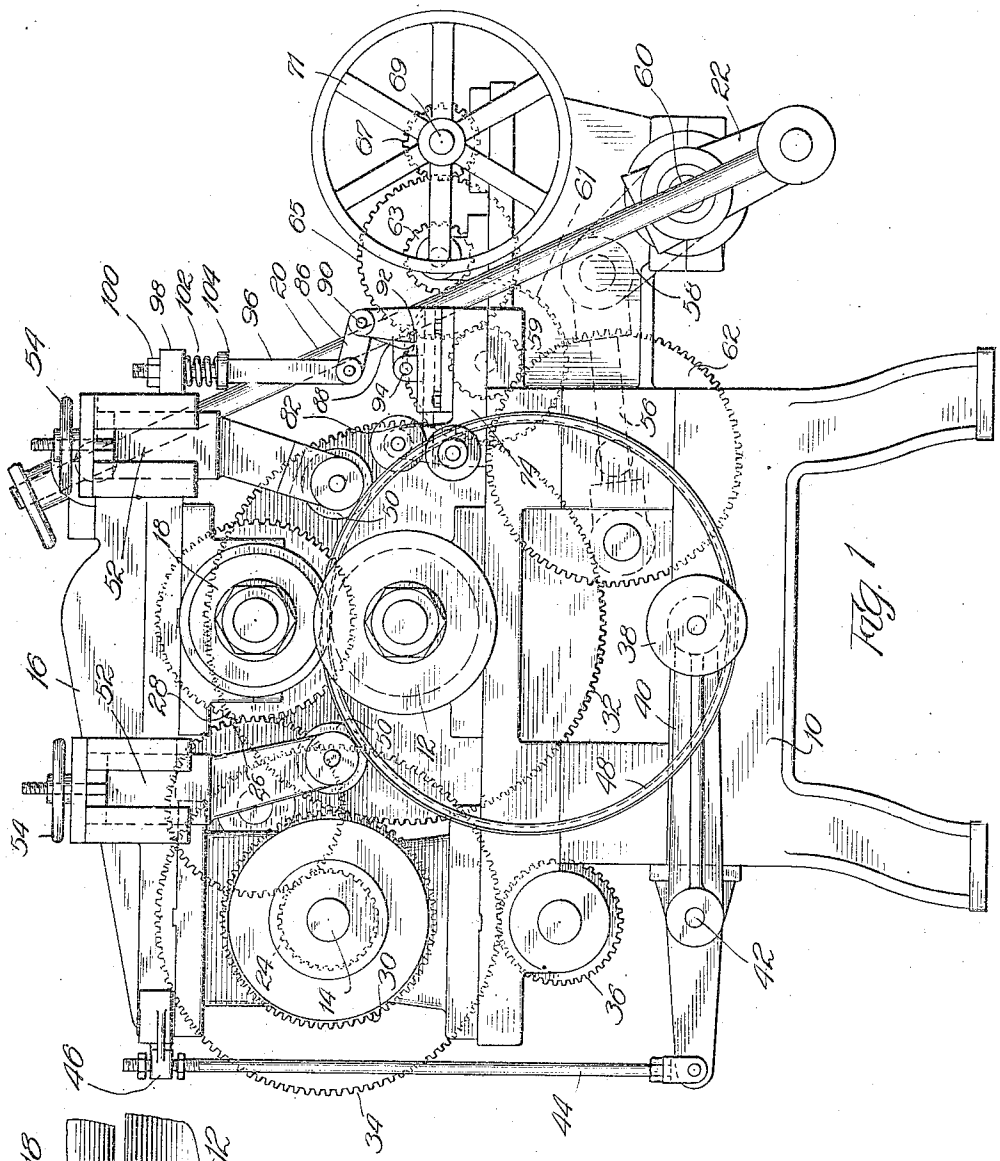


Fig. 1

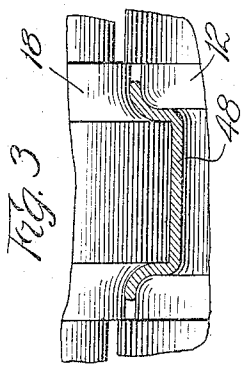


Fig. 3

Inventor
Charles G. Grotnes
By Miller Chindahl & Parker
Attys

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4 SHEETS—SHEET 2.

Fig. 2

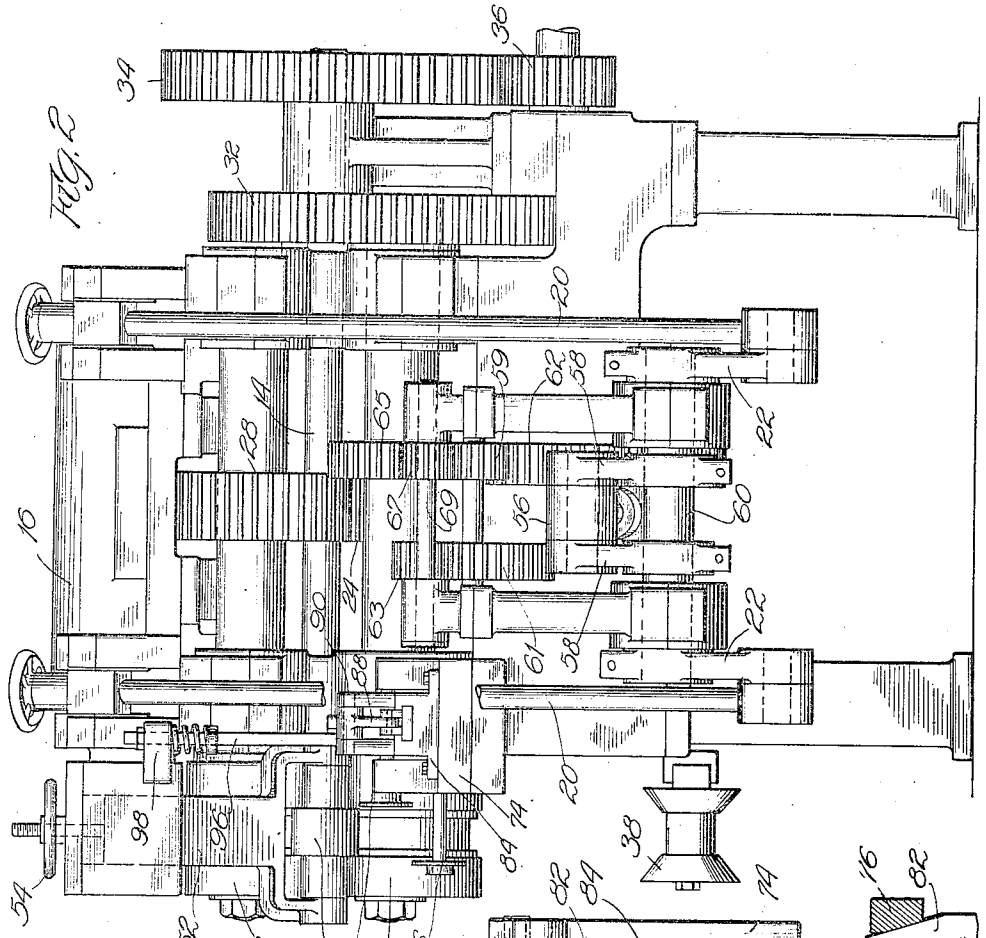


Fig. 4

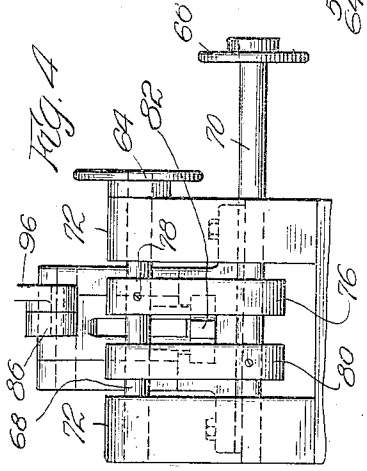


Fig. 5

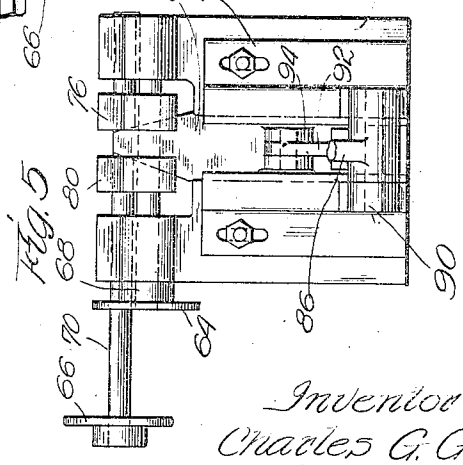
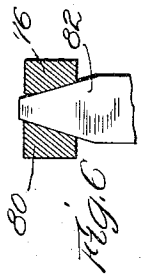


Fig. 6



Inventor
Charles G. Grotnes
By Miller Chindahl & Parke
Attys

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4 SHEETS—SHEET 3.

Fig. 8

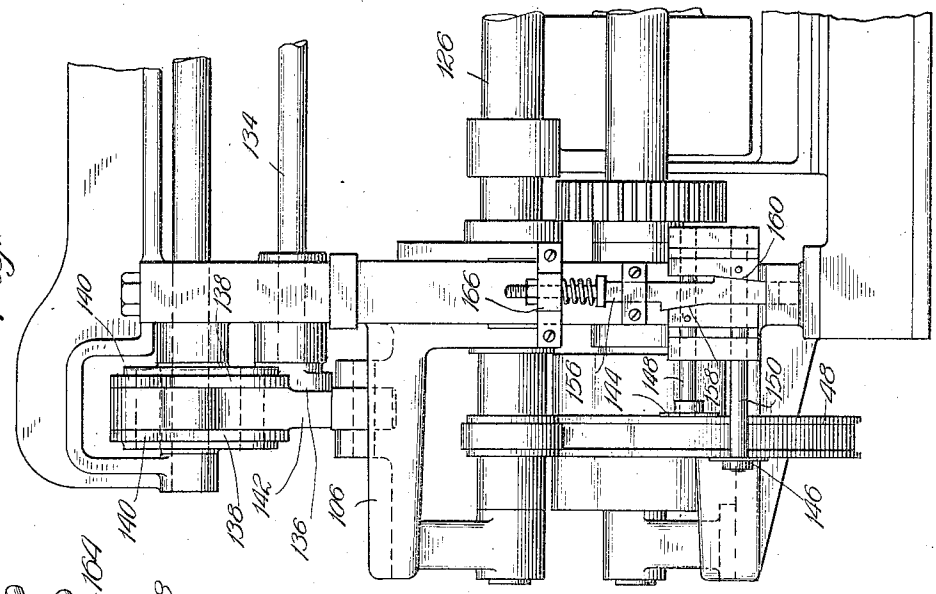


Fig. 9

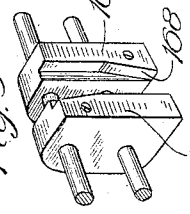


Fig. 7

Inventor

Charles G. Grotnes

By Miller Shindahl Parker

Attys

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4 SHEETS—SHEET 4.

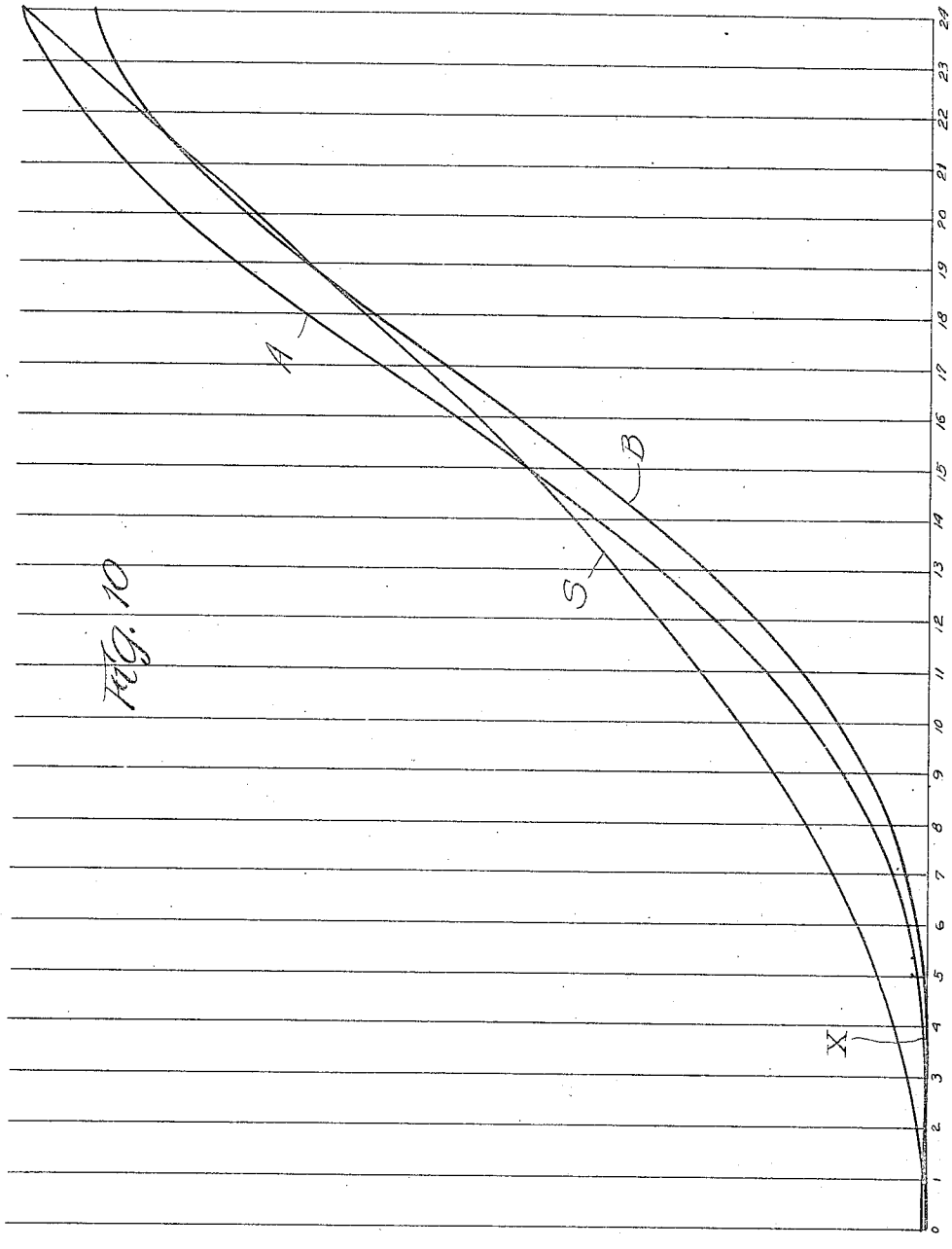


Fig. 10

Inventor

Charles G Grotnes

By Miller Chindahl Parker

Attys

Patented Sept. 12, 1922. 1,428,778

UNITED STATES PATENT OFFICE.

CHARLES G. GROTNES, OF CHICAGO, ILLINOIS.

ROLLING MACHINE.

Application filed May 24, 1920. Serial No. 383,666.

To all whom it may concern:

Be it known that I, CHARLES G. GROTNES, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Rolling Machines, of which the following is a specification.

My invention has reference to rolling machines of the general type illustrated in my Patent No. 1,284,093, November 5, 1918.

One of the objects of my invention is to provide improved and simple means for guiding the rim or other article during the rolling process and more specifically for automatically closing in the guides to keep the rim running straight as the distortion of the rim by the rolls changes the width of the rim.

Another object is to provide in power-actuated mechanism of any sort means for causing a driven element to pause periodically for a predetermined length of time in a given position without the use of cams or other irregular shaped mechanism.

Further objects and advantages of my invention will become apparent as the description proceeds.

In the accompanying drawings Figure 1 is an end elevation of a rolling machine in which the principles of my invention have been embodied. Fig. 2 is a side elevation of the same machine. Fig. 3 is a detail view showing the rim in cross section between the rolls. Fig. 4 is an enlarged elevation of the automatic guide moving mechanism. Fig. 5 is a plan view of the same mechanism. Fig. 6 is a detail of the expanding wedge and the blocks in contact with it. Fig. 7 is an end elevation and Fig. 8 a partial side elevation of another well known type of rolling machine illustrating the application of my invention thereto. Fig. 9 is a detail view of the blocks employed in this type of machine for automatically moving the roll guides. Fig. 10 is a set of curves illustrating on a time base the movement of the parts obtainable according to my invention.

In the embodiment of my invention selected for illustration a suitable frame 10 supports a pivotally mounted lower roll 12 and a combined pivot and drive shaft 14. A head 16 pivoted on the drive shaft 14 carries the upper roll 18 and may be moved into the position illustrated in Fig. 1 by a pitman 20 connected to the end of a crank 22 actuated by mechanism to be hereinafter described. Suitable gears 24, 26 and 28 drive the upper roll from the combined drive shaft and pivot 14 and other gears 30 and 32 drive the lower roll from the same shaft. The shaft itself is driven by a large gear 34 meshing with a pinion 36 which for the purposes of my present invention may be considered the source of power.

At the lowermost point of the rim diametrically opposite the lower roll 12 is a guide roll 38 adapted to prevent the rim from swinging laterally out of its proper plane of rotation. This guide roll is automatically lifted out of the way when the upper roll 18 is elevated, by a lever 40 pivoted at 42 and carrying the guide roll, said lever being actuated by the connecting rod 44 connected by a lost motion connection at 46 to the rear end of the head 16. The lost motion connection is employed to permit the roll 38 to rest in guiding position on the rim 48 by gravity only during the rolling process, the positive connection between the roll and head being effected only for the purpose of raising the roll. The above described mechanisms are old and well known in the art, being disclosed and described in detail in my above mentioned patent.

Adjustable rolls 50 carried at the ends of supports 52 slidably mounted in the head 16 with their positions of adjustment controlled by suitable hand wheels 54 are adapted to make contact with the rim at points approximately equally spaced at opposite sides of the main rolls and assist in maintaining the peripheral curvature of the rim in a true circle.

In my prior patent the crank 22 was directly connected through suitable gearing to a source of power so that it could be rotated at a constant speed. As it passed through the dead center position it would force the rolls into their final position for an instant, the movement of the rolls into and out of final position being relatively slow. One purpose of my present invention is to increase the time during which the rolls will remain at or approximately in their closed position. Such a pause is of great advantage in that it allows the rolls to remain in this position while the rim

passes completely through the rolls one or more times. By causing the rolls to pause the accuracy of the shape of the finished rim may be greatly increased and where this pause is automatically made by the mechanism itself, it will be the same for all rims and the uniformity of the rims produced is much greater than is possible where hand control is employed to produce the same pause.

The mechanism I have illustrated for causing the rolls to pause comprises a crank element 62 rotated by power at a constant rate of speed and actuating a connecting link 56 pivotally connected to a crank 58 adjustably fastened on the same shaft 60 as the crank 22. Upon reference to Fig. 1, which shows the dead center position of the connecting link 56, it will be seen that the dead center position of this connecting link occurs when the pitman 20 is also on dead center. The crank 22 for the pitman will rotate clockwise from the position shown in Fig. 1 through a trifle more than 90°, while the crank element 62 rotates through approximately 180° and will be again returned to dead center position as the crank element completes its revolution. It will be seen that the movement of the crank 22 itself into and out of dead center position is retarded by the passing of the second crank element 62 through its dead center position.

Any suitable means for driving the element 62 at a constant speed may be employed. I have illustrated this element as a gear constantly driven through a train of gearing including pinion 59, gear 61, pinion 63, gear 65, and pinion 67 on the same shaft 69 with a pulley 71 adapted to receive power from a suitable belt. The shaft 69 is so placed that the pulley 71 may be readily turned by hand, or, if desired, a combined hand or power control such as that shown in my above mentioned patent, may be installed.

Referring to Fig. 10, curve S is a simple sine curve showing the time displacement operation obtainable during half a cycle of operation with the crank 22 driven at constant speed, and curve A is a similar curve showing on the same time scale the displacement of rolls or any other elements driven by the improved linkage shown in Fig. 1. It will be seen that the wide flat spot at the bottom of curve A provides a large time interval during which no appreciable movement of the rolls will take place.

Curve B illustrates the movement obtainable by the same linkage, with the angle between the cranks 58 and 22 adjusted so that crank 22 moves five degrees past dead center, the dead center position for this curve being indicated at x. It will be seen that this curve is still further flattened and that there will be two dead center points in each cycle spaced by a considerable time interval which with a linkage of the proportions shown in the drawings is about 15.6% of the total time for a stroke. It should also be noted that the separating movement allowed the rolls between the two dead center positions is only 1—cos. 5° or .00381 times the length of crank 22. In rolling metals of rather high resilience it is sometimes very advantageous to force the metal into the final position and then after a brief relief to force it in again, eliminating many after effects of the stress existing in the metal when it is for the first time forced into the final position, and improving the metallographic and strength properties of the material. It will be obvious that the device shown in Fig. 1 may be readily made to move the rolls according to curve A or curve B by an adjustment of the angle between cranks 58 and 22.

As the originally flat rim is distorted by the rolls into the shape illustrated in Fig. 3, its width is decreased. To assist in holding the rim in its proper plane of rotation I provide guides 64 and 66 (Figs. 4 and 5) in the nature of disks carried by shafts 68 and 70 adapted to engage opposite edges of the rim and prevent it from swinging out of its plane. I have provided automatic means for moving these guides in to maintain them in contact with the edge of the rim as the rim grows narrower.

Referring to Figs. 1, 4 and 5 the shafts 68 and 70 are slidably but non-rotatably journaled in bearing portions 72 and of a block 74 mounted on the frame 10. A cross piece 76 is fastened on shaft 68 by means of a suitable set screw 78 and extends downwardly receiving shaft 70 in sliding engagement. Another parallel cross piece 80 is similarly attached to shaft 70. Between these two cross pieces a wedge-shaped element 82 slidably mounted in a guiding block 84, which may be adjustably supported on block 74, may enter to force the cross pieces apart and move the guides 64 and 66 toward each other. The means I have illustrated for automatically actuating the mechanism just described comprises crank arms 86 and 88 on a pintle 90, the downwardly extending arm being connected by a link 92 to ears 94 carried by the wedge 82 and the horizontally extending arm being pivotally connected to an upwardly extending connecting rod 96 having a lost motion connection at 98 with the front end of the head 16. The lost motion connection comprises a nut 100 adapted to act positively in raising the connecting rod and a spring 102 confined between the lug 98 on the head receiving the connecting rod and another nut 104, to resiliently force the connecting rod downward. As the rim is rolled the downward movement

of the head compresses the spring 102 and holds the guides 64 and 66 against the edges of the rim with sufficient force to maintain it precisely in its proper plane of rotation throughout the rolling process.

Figs. 7, 8 and 9 illustrate the application of the principles of my invention to another well known type of rolling machine in which the upper roll is mounted in a sliding cross head 106.

It will be apparent that with the linkage shown in Fig. 7 performance curves substantially identical with those in Fig. 10 may be obtained. To guide a rim in this type of machine and hold it in its proper plane of rotation the guides 144 and 146 are mounted as before on rods 148 and 150 slidable through lugs 152 suitably attached to or formed on the main frame 154, and a vertical slide 156 having wedge surfaces at 158 and 160 may engage cooperating wedge surfaces on the cross pieces 162 and 164 to actuate the guides. The lost motion connection may be made at 166 directly to one end of the slidable cross head 106 carrying the upper roll. While the cross pieces 162 and 164 might obviously have inclined surfaces adapted to receive a simple wedge member such as that illustrated in Fig. 6, I prefer to exert the force of the wedge connection approximately in alinement with the shaft actuated thereby. I have therefore illustrated in Figs. 8 and 9 inclined surfaces 168 on the cross pieces positioned close beside the rod to which each cross piece is rigidly connected. By this means I obtain the application of the wedging force so close to the line of action on the shaft that there is little tendency of the shafts to twist or to wear their bearings unevenly.

In this type of machine power is received by a differential casing 108 from a pinion 110 and from one end of the axle 112 is transmitted through gears 114, 116 and 118 to the lower roll 120, and from the other end through gears similar to 114 and 116 and an intermediate gear 122 to the final gear 124 carried by the upper roll shaft 126. To allow the upper roll to reciprocate vertically the intermediate gear 122 may be supported by radius links not shown pivoted on the shaft 128 and roll shaft 126. This type of construction is old and well known in the art and as it forms no part of my present invention need not be herein described in detail. Power is also received through a shaft 130 entering a casing 132 to drive a shaft 134 carrying cranks 136, by means of a worm and worm wheel. The cranks 138 and 140 correspond to cranks 22 and 58 in Fig. 1 and in this instance lie in the same vertical plane, being united to form a bell crank lever, connected by pitman 142 to the crosshead 106. While I have illustrated and described in detail the preferred embodiment of my invention, it should be clearly understood that the disclosure is merely for purposes of illustration and that many modifications and variations will naturally occur to those skilled in the art.

It will, for instance, be obvious that pitman 20 might be connected directly to the wrist pin connecting crank 58 and link 56 in case the design of the parts made such an arrangement more convenient, without changing the character of the movement obtainable. I aim in the subjoined claims to cover all such legitimate variations and modifications.

I claim as my invention.

1. In a rolling machine. a pair of rolls shaped to bend a rim and in bending to narrow it, guides engaging the edges of the rim to hold it in correct alinement, and a connection between said guides and one of said rolls for automatically moving said guides to keep them in contact with the edges of the rim as it becomes narrower during the closing of the rolls.

2. In a rolling machine, a fixed roll and a movable roll shaped to change the section of a rim, guides engaging the edges of the roll to hold it in correct alinement and a mechanical connection between the movable roll and the guides for automatically moving the guides during the rolling process to keep them in operative contact with the edges of the rim.

3. In a rolling machine, a fixed and a movable roll, guides for keeping a rim engaged by said rolls in correct alinement, and a mechanical transmission including a resilient lost motion connection, for automatically moving said guides to allow for the change in the shape of the rim during rolling.

4. In a rolling machine, in combination, a fixed and a movable roll, guides for engaging the edges of a rim placed in said rolls to hold said rim in correct alinement, wedge means for moving said guides towards each other as the rim is narrowed by the rolling process, and a mechanical connection between the movable roll and the wedge adapted to resiliently press the guides against the rim during the rolling process, and to move them toward each other as the rim narrows.

5. A rolling machine having, in combination, two coacting rolls, one fixed and the other movable, a long crank connected to the movable roll, a short actuating crank, a link connecting the ends of said cranks, means for continuously rotating the short crank to produce an oscillatory movement of rotation of said long crank, an operating element and a transmission from said long crank to said element, said transmission having a toggle action, said transmission being movable into

approximately dead center position coincidently with one of the dead center positions of said short crank and connecting link.

6. In a rolling machine, in combination, a fixed roll, a pivoted head carrying a movable roll, means for rotating said head to move said rolls into and out of operative position, guides on said frame engaging an element being rolled, and a connection between said guides and said head for moving said guides to compensate for the change in dimensions of the element being rolled as the head is moved into operative position.

7. In a rolling machine, in combination, a reciprocatory cross head carrying a movable roll, a stationary roll, guides engaging an element being rolled to hold it in alinement, a plunger having a lost motion connection with said cross head, and a transmission from said plunger to said guides tending to move said guides as the cross head lowers to compensate for the changed dimensions of the element being rolled.

8. A rolling machine having, in combination, a fixed roll and a coacting roll shaped to change the cross-sectional form of the element being rolled, a member for carrying said coacting roll into and out of engagement with said element, and means for automatically causing the coacting roll to remain approximately motionless in engagement with said element for a predetermined length of time while said element is being revolved a plurality of times by the rolls.

In testimony whereof, I have hereunto set my hand.

CHARLES G. GROTNES.