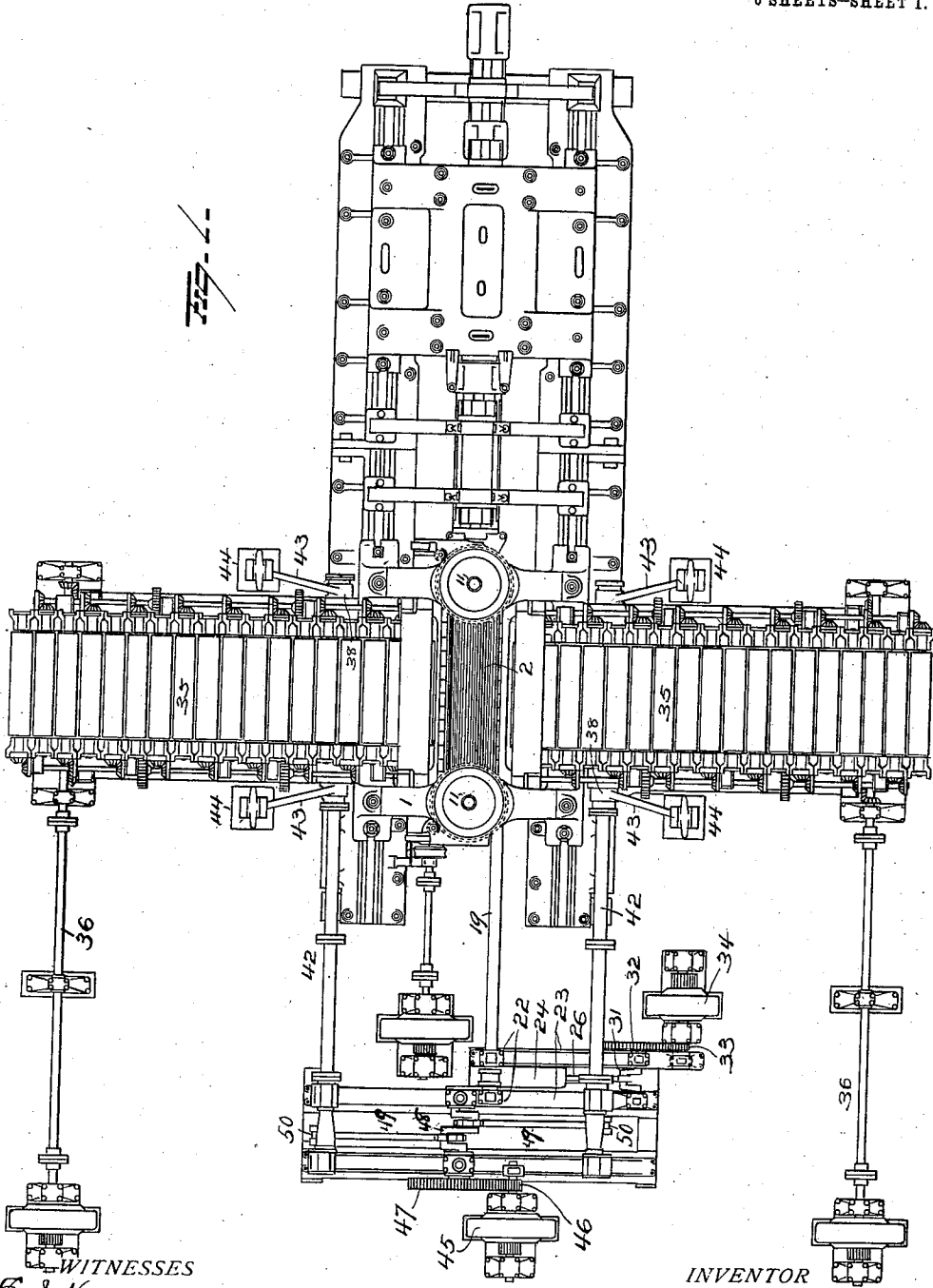


C. L. TAYLOR.  
THREE HIGH ROLL MILL.  
APPLICATION FILED AUG. 16, 1909.

1,014,676.

Patented Jan. 16, 1912.

6 SHEETS—SHEET 1.



WITNESSES  
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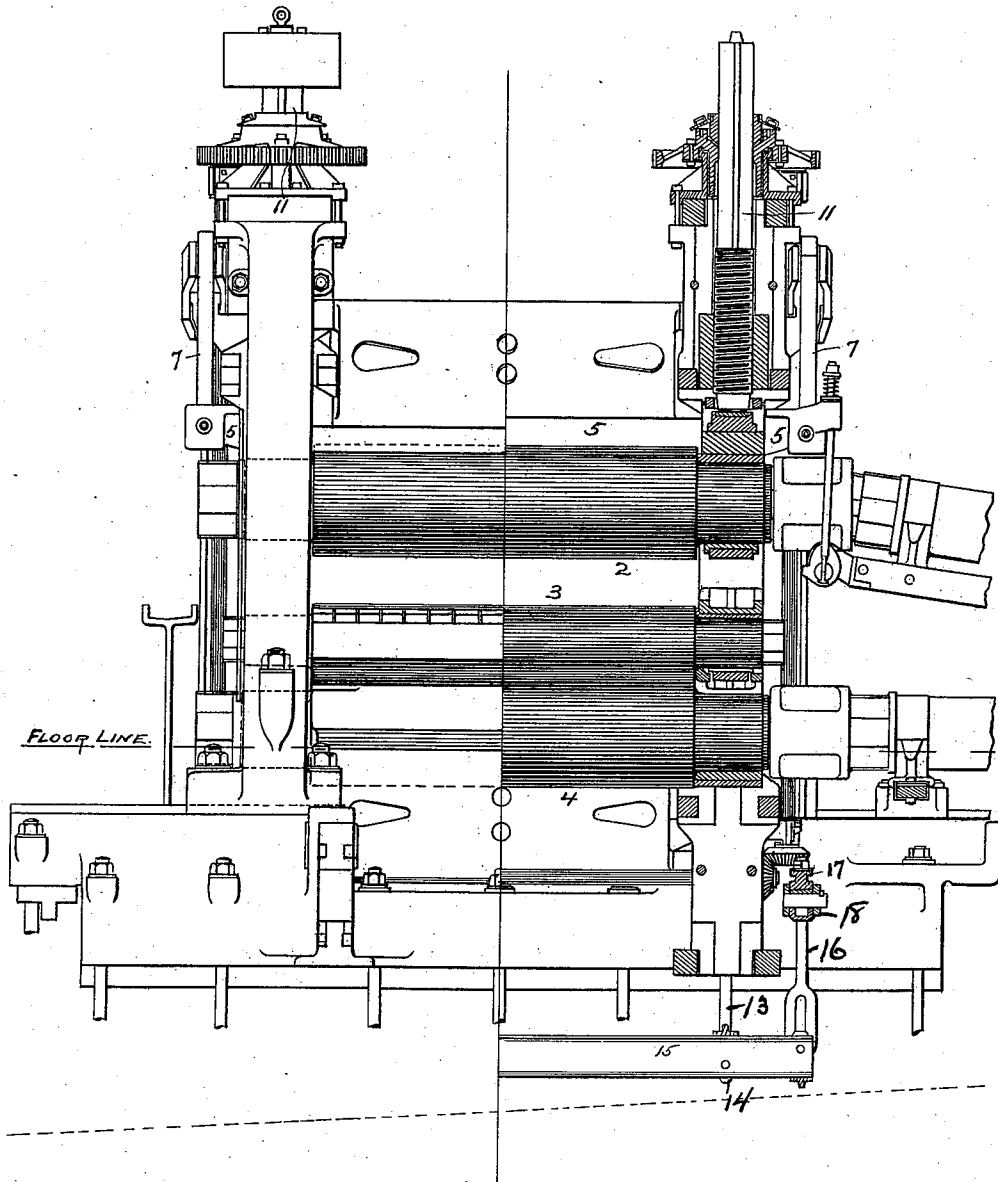
C. L. TAYLOR.  
THREE HIGH ROLL MILL.  
APPLICATION FILED AUG. 18, 1909.

1,014,676.

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6 SHEETS—SHEET 2.

Fig. 2 -



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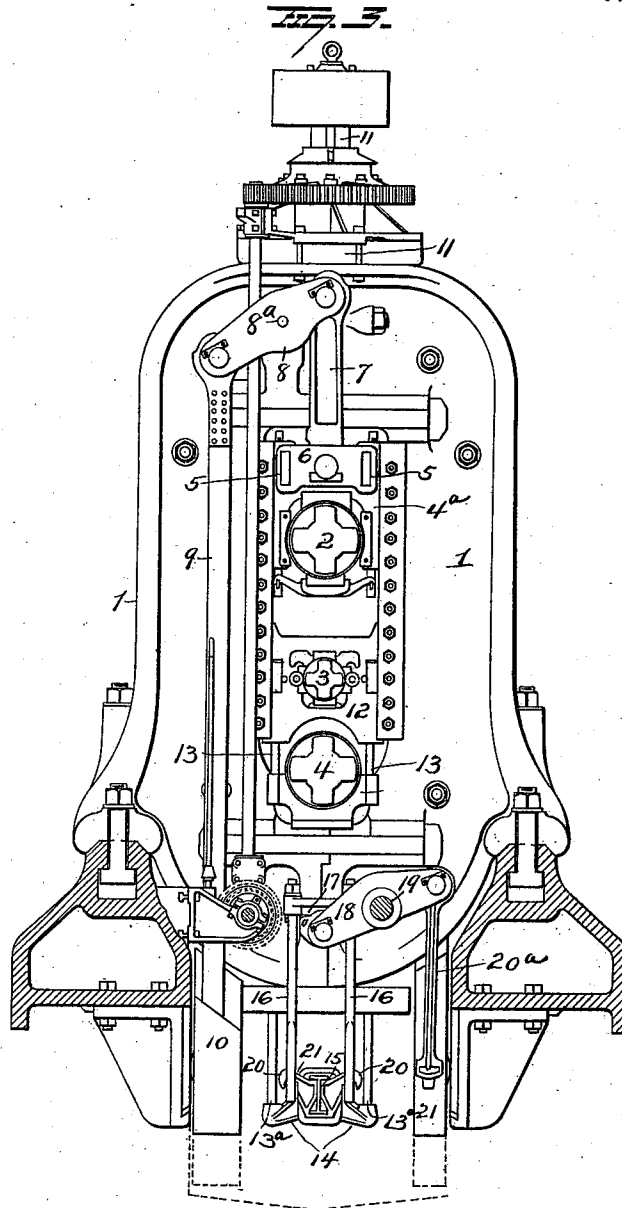
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6 SHEETS—SHEET 3.



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6 SHEETS—SHEET 4.

Fig. 6.

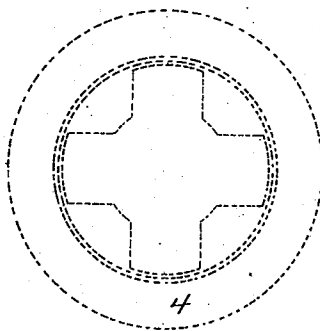
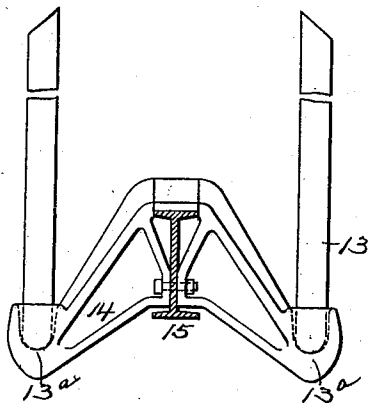
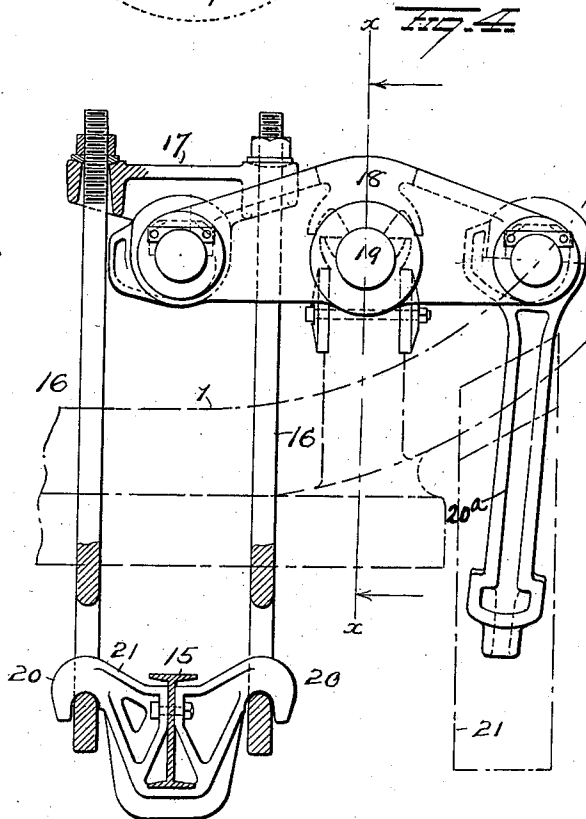
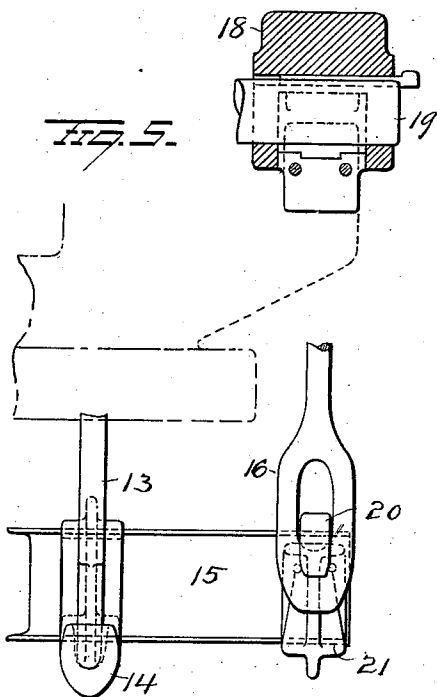


Fig. 4.

Fig. 5.



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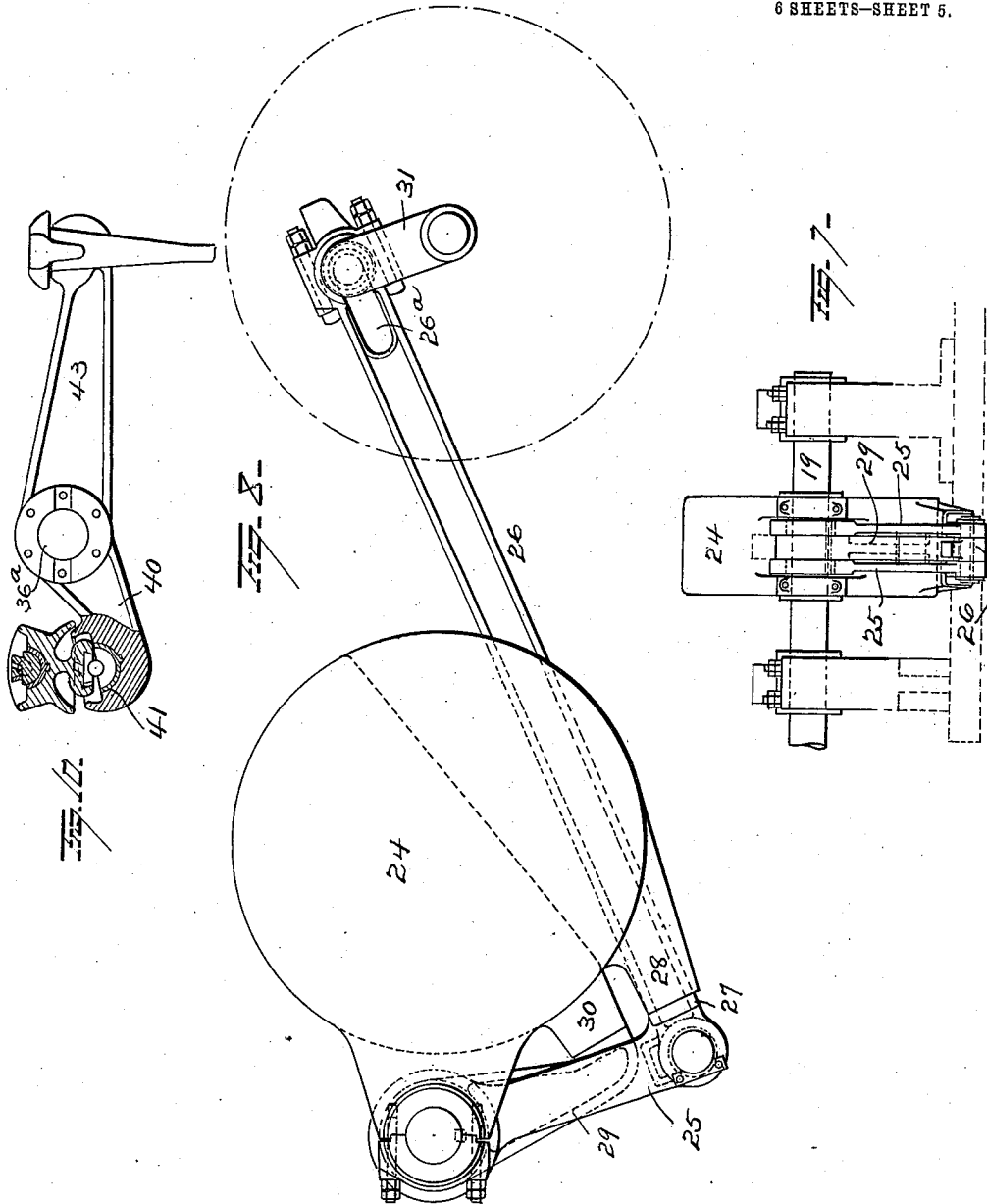
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6 SHEETS—SHEET 5.



WITNESSES

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*G. J. Downing*

INVENTOR

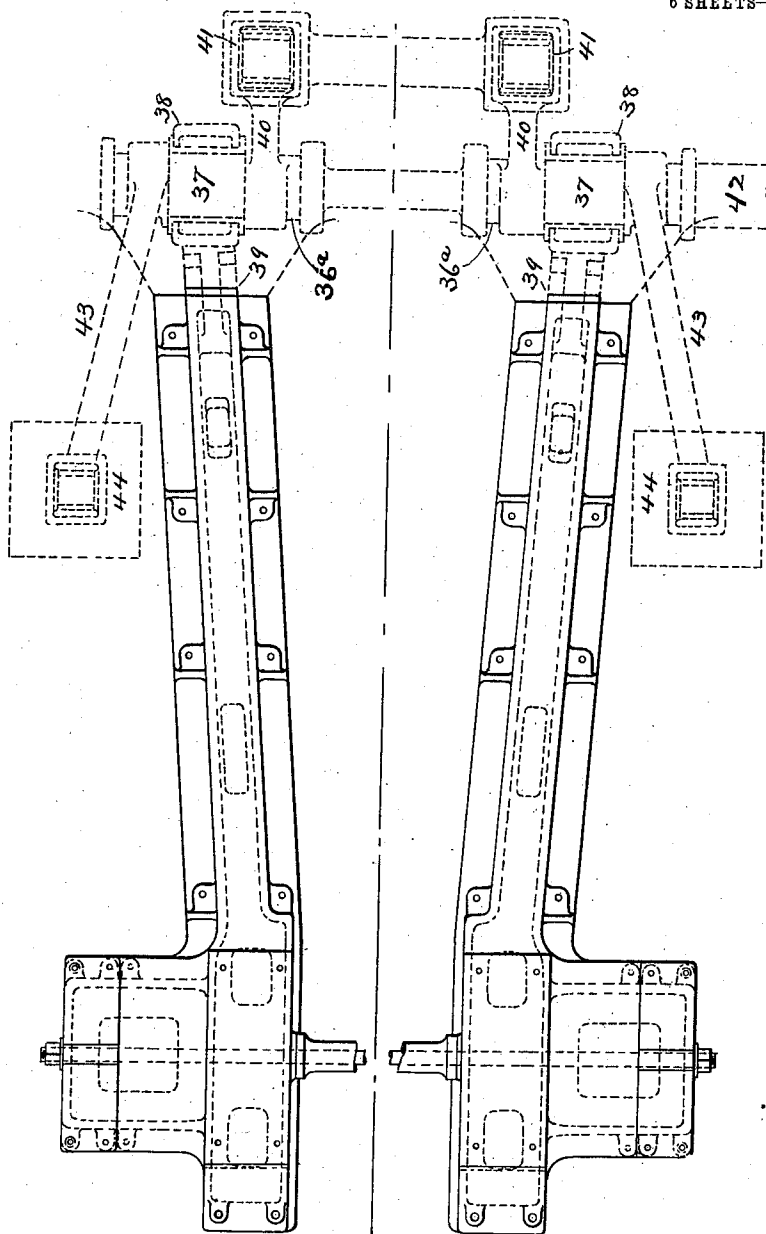
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6 SHEETS—SHEET 6.



WITNESSES  
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*Fig. 5.*

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# UNITED STATES PATENT OFFICE.

CLARENCE L. TAYLOR, OF ALLIANCE, OHIO, ASSIGNOR TO THE MORGAN ENGINEERING COMPANY, OF ALLIANCE, OHIO.

## THREE-HIGH-ROLL MILL.

1,014,676.

Specification of Letters Patent.

Patented Jan. 16, 1912.

Application filed August 16, 1909. Serial No. 513,205.

*To all whom it may concern:*

Be it known that I, CLARENCE L. TAYLOR, of Alliance, in the county of Stark and State of Ohio, have invented certain new and useful Improvements in Three-High-Roll Mills; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improvement in three high roll mills, the object being to provide improved means for yieldingly sustaining the upper roll in contact with the adjusting screws, combined with means for yieldingly sustaining the middle roll in contact with the upper roll, whereby both rolls, when in contact, may be adjusted by the screws without danger of injury to any of the parts.

A further object is to provide improved means for elevating and lowering the middle roll, the construction being such that the operator can manipulate the middle roll actuating mechanism during the passage of the plate through either of the passes, so as to cause the middle roll to change its position immediately upon the passage of the plate, thereby saving time and rendering the mechanism immune from injury due to a hasty or untimely shifting of the middle roll actuating means.

With this and other objects in view my invention consists in the parts and combinations of parts and in the details of construction as will be more fully described and pointed out in the claims.

In the accompanying drawings, Figure 1 is a view in plan of my improved mill; Fig. 2 is a view in side elevation partly in section of the rolls and their housing; Fig. 3 is a view in end elevation of Fig. 2; Fig. 4 is a view in elevation, partly in section of the counterweight supporting devices for the middle roll; Fig. 5 is a view in section on the line  $x-x$  of Fig. 4. Fig. 6 is a view in end elevation of the supports for the middle roll carrying rods; Fig. 7 is a view in elevation of the middle roll lifting device; Fig. 8 is a side view of the latter, Fig. 9 is a view in plan of the roller table support and Fig. 10 is a view in side elevation of that portion of Fig. 9 shown in dotted lines.

1 represents the housing in which are mounted the top, middle, and bottom rolls

2, 3 and 4 respectively. The top and bottom rolls 2, and 4, are driven in the ordinary manner by any approved means, and the plates to be rolled are fed to the rollers by tables to be hereinafter referred to, located on opposite sides of the mill.

The top roll 2, is journaled at its ends in the carriers 4<sup>a</sup>, which latter are mounted in the end frames of the housing, and the two carriers 4<sup>a</sup>, one at each end of the roll, are connected by the tie bars 5, which latter project at their ends beyond the housing and are secured to the blocks 6, to which the lower ends of the links 7 (one at each end of the mill) are pivoted. The upper end of each link 7 is pivotally connected to one end of a lever 8, which latter are mounted to rock on the bearings 8<sup>a</sup> carried by the housing 1, and carry at their opposite ends the hanger bars 9. These hanger bars, extend downwardly below the lower roll, and are connected at their lower ends to the counterweight 10, which latter extends lengthwise the roll from one end housing 1 to the other, and yieldingly holds the top roll 2 up against the lower ends of the screws 11 which operate, in the usual manner, to adjust the position of the top roll.

The middle roll 3 is mounted at its ends in the carriers 12, each of which is supported on two rods 13, mounted at their lower ends in the seats 13<sup>a</sup> of the yokes 14 located in the vertical planes of the roll carriers 12. The two yokes are secured to the beam 15, which latter is located below the housing and extends in the direction of the length of the rolls, and is supported at each end by the links 16 depending from a cross head 17 carried by one end of a rocking lever 18 rigidly secured to the shaft 19, the links 16 engaging the hooked ends 20 of the yokes 21 secured to the beam 15. There is a rocking lever 18 with its depending links at each end of the mill adjacent to each end of the housing, so that the beam 15 is supported, at or near its ends, on two rocking levers, both of which are rigidly secured to the shaft 19. This shaft passes through the housing 1 in the direction of the length of the rolls, and in a plane below the lower roll 4. Pivotally suspended from the outer end of each rocking lever 18, is a link 20<sup>a</sup> connected at its lower end to the counterweight 21, the two links 20<sup>a</sup> forming the sole support for said counterweight, which latter is located

under the housing and extends in the direction of the length of the rolls.

Counterweight 21 is not quite as heavy as the middle roll 3, and the roll sustaining bars, yokes and beams, consequently under normal conditions, and when unrestrained, the middle roll will rest on lower roll 4. By turning shaft 19 in a direction to lower counterweight 21, the beam 15 and the middle roll supported thereby, will be elevated.

Shaft 19 extends to one side, beyond the housing 1, as shown in Fig. 1, and is supported at its outer end in the bearings 22, mounted on the frame 23 which carries the motors and gearing for actuating the table lifting, middle roll, and screw down shafts.

Loosely mounted on shaft 19, and between parallel members of the frame 23, is the counterweight 24, and also loosely mounted on the same shaft and depending therefrom, are the levers 25 connected at their lower ends to the connecting rod 26, the levers 25 having shoulders 27 adapted to engage lugs 28 on the counterweight, the latter being recessed so as to overlap or receive the connecting rod as shown in Fig. 8. Keyed to the shaft 19 between levers 25 is the arm 29, the lower free end of which is engaged by the lug 30 on the counterweight 24. Connecting bar 26, which as before explained is connected to the lower ends of levers 25, is connected at its opposite end to the crank 31, the shaft of which carries a gear wheel 32 meshing with a smaller gear wheel 33 driven directly by the motor 34. I prefer to provide the connecting bar with an elongated slot 26<sup>a</sup>, so that when the counterweight 24 is elevated, as it is when a plate is going through the lower pass of the mill, the pin of crank 31 may have an unrestricted movement in said slot thus providing for the free movement of the crank pin in the event the motor be started out of time.

With the parts constructed and arranged as shown, it will be seen that when the counterweight 24 is bearing against arm 29, which is keyed to shaft 19, the weight of counterweight 21 added to that of counterweight 10 and turns shaft 19 in a direction to elevate the middle roll.

With the parts as shown in Fig. 8, the weight of counterweight 24 is borne by arm 29 and shaft 19, and when in such position the middle roll is in its elevated position and in contact with the upper roll. By now starting the motor so as to move connecting bar 26 longitudinally in a direction toward the motor, the shoulders 27 on levers 25, engage lugs 28 on counterweight 24, and turn latter upwardly on shaft 19, and away from the arm 29, thus liberating the latter and throwing the weight of the middle roll wholly on counterweight 21 which as before explained is insufficient by itself to hold

said roll elevated, hence when counterweight 24 is lifted or moved out of the path of the arm 29, the lower roll descends. Counterweight 24, therefore operates to raise and release the middle roll. If when the middle roll is in contact with the upper roll, the screws 11 should be rotated in a direction to lower the upper roll, the depression of the middle roll would simply operate through shaft 19 and arm 29, to slightly lift the counterweight. When it is desired to lower the middle roll, the motor is operated to move bar 26 longitudinally in a direction to carry counterweight 24 away from arm 29, thus permitting shaft 19 to turn, and the middle roll to drop onto the lower roll by its own weight. Should there be a plate between the bottom and the middle roll, at the time the latter was relieved of the sustaining weight of counterweight 24, the middle roll will be held up by the passing plate, and drop onto the lower roll as soon as the plate passes from between the rolls. Should the plate be between the middle and top rolls, when the counterweight 24 is moved to its position to elevate the middle roll, the latter would move up in contact with the top roll as soon as the plate passed from rolls.

From the foregoing it will be seen that while a plate is going through either pass, the operator can manipulate the motor controlling the position of the middle roll, so that the latter will go to its proper place as soon as the plate runs out, thus saving time, and rendering it impossible to do any damage by untimely or the continued operation of the motor.

35 are the roller tables of any approved construction. These tables are each pivotally connected at their outer ends on an axis concentric with its roller driving shaft 36, located near the outer end of the table, and each table is supported at its end adjacent the mill, on the counterweighted rocking frame 36<sup>a</sup>. Each frame 36<sup>a</sup> (one for each table) is provided with trunnions 37 mounted in the bearings 38 in the table supporting frame 39, and each is also provided with two arms 40 projecting toward the mill, each arm terminating in bearings 41, upon which the inner end of its table rests. A trunnion of each frame 36<sup>a</sup> is coupled up direct to a table lifting shaft 42, and each is also provided with two rearwardly and outwardly projecting arms 43, each of which carries a counterweight 44 which assist the lifting motor in lifting the inner ends of the table.

By projecting the arms rearwardly and outwardly, or diagonally, I avoid the necessity of locating them under the table, thus doing away with pits for the counterweights, and rendering the parts more accessible.

The two table lifting shafts 42 are op-

erated in unison by the motor 45, through gear wheels 46 and 47 the latter being connected directly to the double crank shaft 48. Each crank is connected by a connecting rod 49 with cranks or arms 50 depending from shafts 42, the cranks being so located that the tables will be raised and lowered in unison.

Having fully described my invention what I claim as new and desire to secure by Letters-Patent, is:—

1. In a three high mill, the combination with upper and lower rolls, of a middle roll, a counterweight for partly counterbalancing the weight of said middle roll, and means for assisting the counterweight in elevating the middle roll.

2. In a three high roll mill, the combination with upper and lower rolls, of a middle roll, a counterweight connected to the latter and partly counterbalancing same, a second counterweight and means for adding its weight to that of the first counterweight for elevating the middle roll.

3. In a three high roll mill the combination with upper and lower rolls, of a middle roll, a counterweight partly counterbalancing the middle roll and connected to the latter and tending to raise same, and means for applying additional power to that of the counterweight for elevating the middle roll.

4. In a three high roll mill, the combination with upper and lower rolls, of a middle roll, means insufficient, but constantly tending, to elevate the middle roll, and supplemental means adapted to coact with the first mentioned means for elevating the middle roll.

5. In a three high roll mill, the combination with upper and lower rolls, of a middle roll, means supporting said middle roller, a shaft carrying said supporting means, a counterweight connected with said shaft and tending to elevate the middle roll, a second counterweight and means for shifting the weight of said second counterweight onto said shaft whereby it assists the first mentioned counterweight in elevating the middle roll.

6. In a three high roll mill, the combination with upper and lower rolls, of a middle roll, supporting means for said middle roll, a counterweight connected to said supporting means and tending to elevate the middle roll, a second weight, and means for connecting the second weight to the counterweight whereby their combined weight will elevate the middle roll.

7. In a three high roll mill, the combination with upper and lower rolls, of a middle roll, supporting means therefor, a counterweight connected to said supporting means and tending to elevate same, a second counterweight and means for shifting the weight of the second counterweight to the middle

roller supporting means, and thereby elevate the middle roll by the combined weight of the two counterweights.

8. In a three high roll mill, the combination with upper and lower rolls, of a middle roll, a rock shaft, middle roll supporting means carried by said rock shaft, a counterweight supported by the rock shaft, the counterweight tending to rock the shaft in a direction to elevate the middle roll, a second counterweight for rocking the shaft in a direction to elevate the middle roll and means for removing the weight of this second counterweight from the shaft.

9. In a three high roll mill, the combination with upper and lower rolls, of a middle roll, a rock shaft, supporting means for the middle roll carried by said rock shaft, a counterweight adapted to rock said shaft in a direction to elevate the middle roll and means for removing the weight of said counterweight from the shaft whereby the middle roll will descend by gravity.

10. In a three high roll mill, the combination with upper and lower rolls, of a middle roll, supporting means for the latter, a rock shaft carrying said supporting means, an arm fixed to said shaft, a weight, and means for moving the weight to engage and disengage said arm whereby the middle roll will be elevated by said weight, or permitted to descend by its own weight.

11. In a three high roll mill, the combination with upper and lower rolls, of a middle roll, supporting means for the latter, a rock shaft carrying said supporting means, an arm fixed to said shaft, a weight adapted to rest on said arm and turn the shaft in a direction to raise the middle roll, and means for removing the weight from said arm.

12. In a three high roll mill, the combination with upper and lower rolls, of a middle roll, supporting means for same, a rock shaft carrying said supporting means, a counterweight tending to turn the shaft in a direction to elevate the middle roll, an arm fixed to said shaft, a weight adapted to rest on said arm and assist the counterweight in elevating the middle roll and means for removing said weight from the arm, thereby permitting the middle roll to descend by gravity.

13. In a three high roll mill, the combination with upper and lower rolls, of a middle roll, supporting means therefor, a rock shaft carrying said supporting means and engaging the latter in a plane below the rolls, an arm on said shaft, a weight normally resting on said arm and holding the shaft in a position to support the middle roll in its elevated position and means for removing said weight from the arm on the shaft thereby permitting the latter to turn under the weight of the middle roll.

14. In a three high roll mill the combination with upper and lower rolls, screws for

depressing the upper roll and counterweight means for holding said upper roll against the screws, of a middle roll, supporting means therefor, counterweight means engaging said supporting means for holding the middle roll elevated, and means for removing the weight from said supporting means thereby permitting the middle roll to descend by gravity.

15 15. In a three high roll mill, the combination with upper and lower rolls, of a middle roll, supporting means for same, a rock shaft, a lever on said shaft carrying said supporting means, an arm on said shaft, a weight

15 normally in the path of said arm for holding the middle roll elevated, and means for removing said weight from the path of the arm whereby the shaft will be permitted to turn in a direction to lower the middle roll.

20 16. In a three high roll mill, the combination with upper and lower rolls, of a middle roll, a supporting frame located below the housing, bars carried by said frame and carrying the middle roll, a shaft, levers

25 thereon, means connecting said levers and the supporting frame, whereby the latter is carried by the shaft, an arm on said shaft, a weight normally resting in the path of move-

ment of said arm, and means for removing the weight whereby the arm and its shaft will be permitted to turn in a direction to lower the middle roll. 30

17. The combination with upper and lower rolls, of a middle roll, supporting means for same, a counterweight connected to said supporting means for partly overcoming the weight of the middle roll, a second weight, and means for connecting this second weight to the counterbalance weight for elevating the middle roll. 35 40

18. The combination with upper and lower rolls, of a middle roll, supporting means therefor, a movable weight, means connecting said weight and the middle roll supporting means whereby the weight elevates the roll, and means for removing said weight from the supporting means thereby permitting the middle roll to descend. 45

In testimony whereof, I have signed this specification in the presence of two subscribing witnesses. 50

CLARENCE L. TAYLOR.

Witnesses:

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N. C. FETTERS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."