F. C. BIGGERT, Jr.

ROLLING MILL.

APPLICATION FILED JUNE 4, 1910.

984,345.

Patented Feb. 14, 1911.

3 SHEETS—SHEET 2.

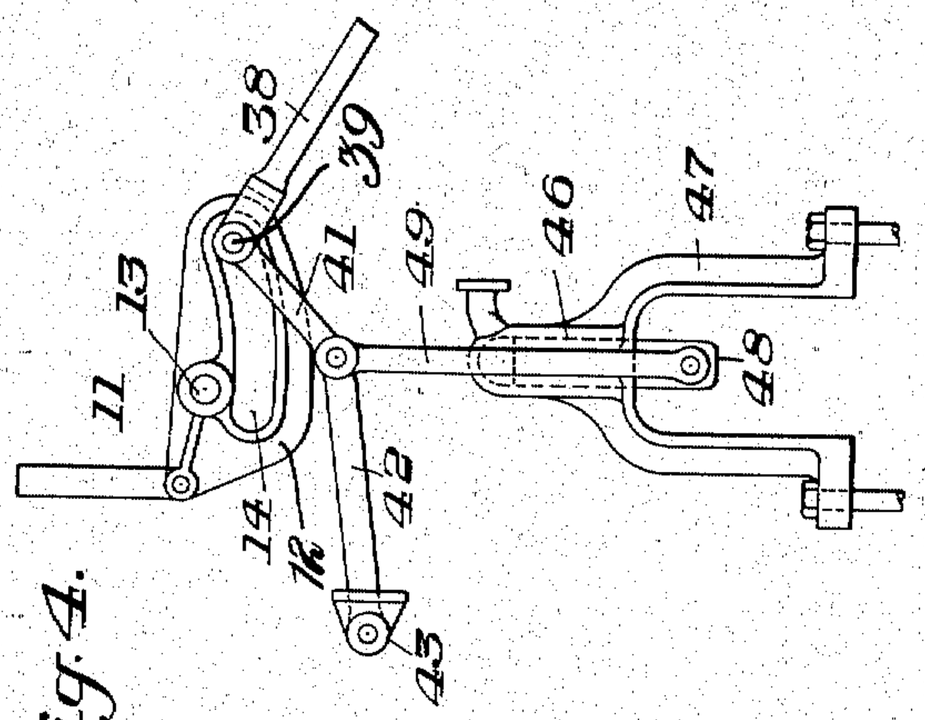

Fig. 4.

Fig. 2.

WITNESSES

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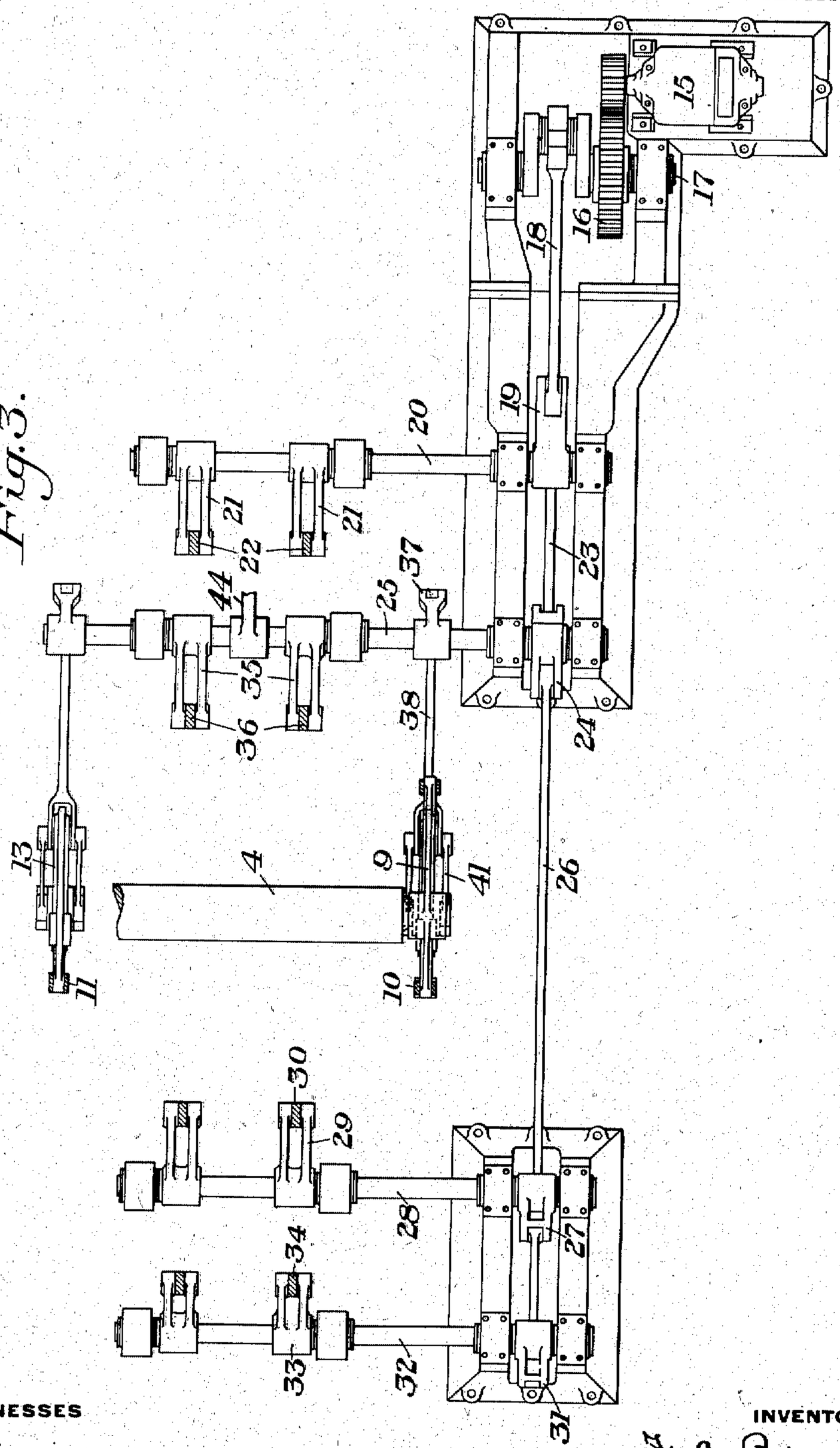
3 SHEETS—SHEET 3.

Fig. 3.



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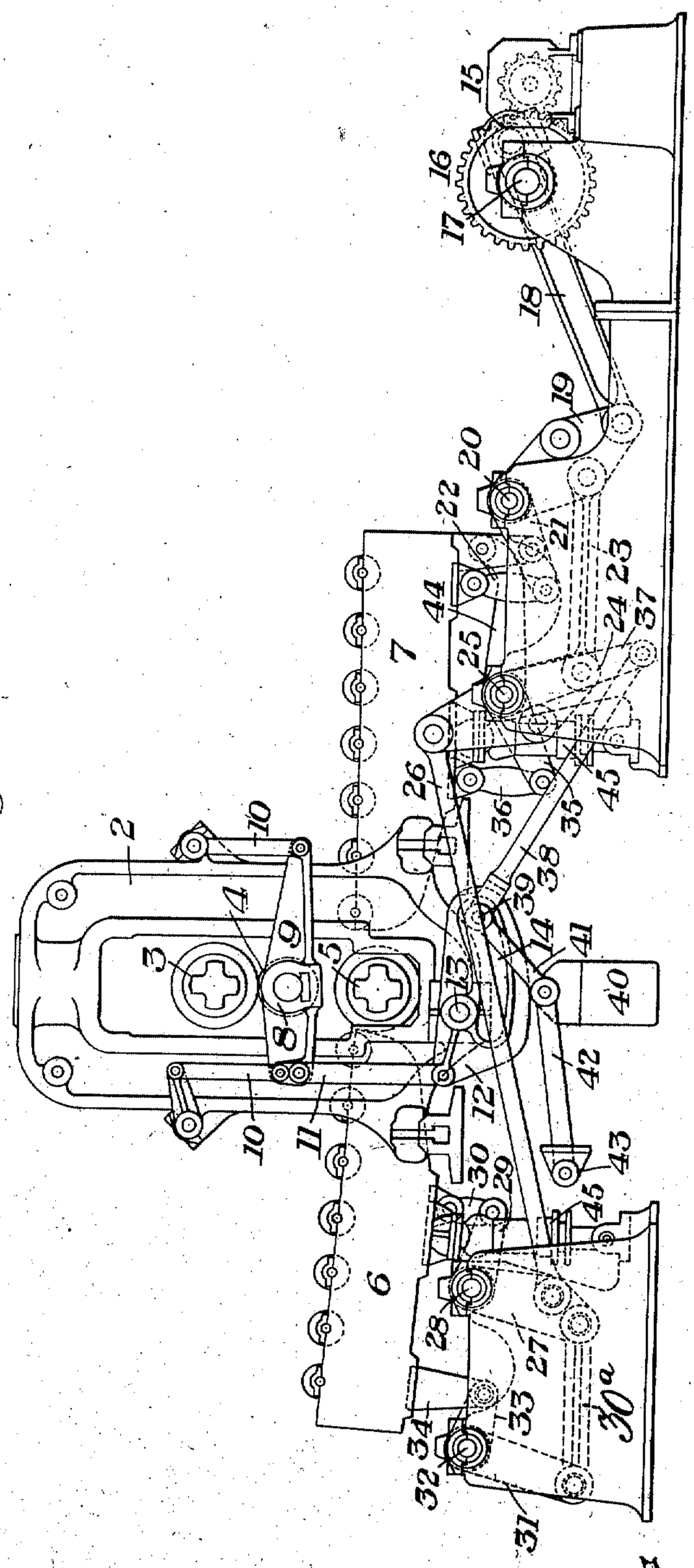
3 SHEETS—SHEET 1.

Fig. 1.



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UNITED STATES PATENT OFFICE.

FLORENCE C. BIGGERT, JR., OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO UNITED ENGINEERING & FOUNDRY COMPANY, OF PITTSBURG, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

ROLLING-MILL.

984,345. Specification of Letters Patent. Patented Feb. 14, 1911.

Application filed June 4, 1910. Serial No. 565,085.

To all whom it may concern:

Be it known that I, FLORENCE C. BIGGERT, Jr., resident of Pittsburg, Allegheny county, Pennsylvania, have invented a new and useful Improvement in Rolling-Mills, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a side view showing a portion of a rolling mill having my invention applied thereto, the tables being shown in their lowered positions. Fig. 2 is a similar view with certain of the parts removed, showing the tables in their raised positions. Fig. 3 is a sectional plan view showing the table and middle roll actuating parts. Fig. 4 is a detail view showing a modification.

My invention has relation to rolling mills, and more particularly to three-high mills; and is designed to provide means of novel and efficient character for shifting the middle roll and simultaneously raising and lowering the roll tables. My invention provides means of this character which can be operated by a single motor, and which will effectually shift the middle roll and the roll tables without undue shocks or jars on the parts.

The nature of my invention will be best understood by reference to the drawings, in which I have shown the preferred embodiment thereof, and which will now be described, it being premised, however, that various changes can be made in the details of the construction and arrangement of the parts without departing from the spirit and scope of my invention as defined in the claims.

Referring to the drawings, the numeral 2 designates the housing of a three-high rolling mill; 3 the upper roll; 4 the vertically movable middle roll, and 5 the lower roll. 6 and 7 designate the two roll tables, which may be of any usual or suitable character.

The middle roll 4 is supported at its ends in suitable bearings 8, which are carried by the levers 9 supported by links 10 from the roll housing. One arm of each lever 9 is connected by a downwardly extending link 11 with an arm of a lever member 12 which is pivoted at 13, and which has a curved slot 14 therein.

The tables 6 and 7 are arranged to be raised and lowered by an electric motor 15, which drives a gear wheel 16 on a crank shaft 17. A pitman 18 connects the crank of the shaft 17 with the lower portion of a lever 19, which is secured at its upper end to a transversely extending rock shaft 20. This rock shaft has two or more crank arms 21, which are connected to the rear end of the table 7 by links 22. The intermediate portion of the lever 19 is connected by a link 23 with a depending lever arm 24 of a transverse rock shaft 25. The upper end of the lever arm 24 is connected by a link 26 with a depending lever arm 27, which is secured at its upper end to a transverse rock shaft 28 extending underneath the table 6 and having two or more crank arms 29 which are connected by the links 30 with the forward end portion of the table 6. The lower end of the lever 27 is connected by a link 30ª with a depending lever arm 31 of a rock shaft 32, parallel with the shaft 28, and which has cranks or lever arms 33 which are connected with depending portions 34 at the rear end of the table 6. The rock shaft 25 also has lever arms 35, which are connected by links 36 with the under side of the forward end portion of the table 7. Said shaft 25 also has a depending lever arm 37 which is connected by rod 38 with a pin 39, which is arranged to slide in the curved slot 14 of the lever member 12 before described, and to which is connected a weight 40 by means of a link 41.

42 is a link connected to the upper end portion of the weight and secured to a fixed point 43 on the bed of the mill.

44 is a guide arm loosely sleeved on the shaft 25 and connected to the under side of the end portion of the table 7.

45 in Fig. 1 designates cylinders of the usual character, forming a counterbalance for the tables 6 and 7. The cylinders 45 are pivotally connected to the table, and their plungers are pivotally connected to the bed plate of the machine. Ports are provided so that connection may be maintained with a source of constant pressure. This pressure is sufficient to normally carry substantially the entire weight of the tables, thus reducing the work required of the motor 15. The pivot connections are used to allow the cylinders and their plungers to accommodate themselves to the movements of the tables.

In the operation of the mill, when the tables go up, the middle roll must move down, and when the tables move down the middle roll must move up. When the parts are in the position shown in Fig. 1, the middle roll is shifted to its upward position through the connections described, as will be readily seen, and is held in such position by the action of the weights 40, which are pulling upon the right-hand end portion of the lever members 12. When, however, the motor is operated to lower the tables, bringing the pitman 18 and lever 19 into the position shown in Fig. 2, and the connections operated from the lever 19 are moved into position shown in Fig. 2 to cause the tables to rise, the movement of the shaft 25 actuates the rods 38 to move the pins 39 to the left-hand ends of the slots 14 of the lever members 12. In this position the pins 39 are almost directly underneath the centers 13 on which the lever members 12 are pivoted, and therefore they cease to exert any lifting action on the middle roll, and the latter falls by gravity to its lower position. The movements of the table and middle roll are gradual, being eased by the system of levers and weights and without injurious shock to any of the parts.

It will be understood from the foregoing that when the tables fall, the lever members 12 are actuated to raise the middle roll, and that the weights 40 are shifted to a position in which they overbalance the middle roll and hold it in its raised position; and that when the tables rise, the weights are shifted to such a position relatively to the center of the lever members 12 that the middle roll is unbalanced, and is caused to descend and fall by its own weight.

Instead of a weight, I may employ other force-exerting means. Thus, in Fig. 4 I have shown a modification in which a power cylinder 46 is substituted for the weight. This cylinder is fixed to a suitable support 47. It has a piston 48 which is connected by links 49 to the lever 42. The upper portion of the cylinder is connected to an accumulator (not shown), or other source of constant power.

It will be obvious that various changes may be made in the details of construction and arrangement of the system of levers, by which the necessary movements are effected; that various forms of motors may be employed for operating the tables; and that the weight or cylinder may be replaced by any other suitable constantly acting force. Instead of causing the means for overbalancing and unbalancing the roll to be actuated by the table-actuating mechanism, it is obvious that such means may be shifted in various other ways such as an independent motor, or other independent source of power. These and many other changes may be made in the details of the apparatus without departure from my invention as defined in the appended claims.

What I claim is:—

1. In a rolling mill, the combination with a table movable in a vertical plane, and a vertically movable roll, of mechanism for raising and lowering the table, and means operatively connected with the table actuating mechanism and arranged to have its point of application shifted by the movements of the table-actuating mechanism to alternately overbalance and unbalance the movable roll; substantially as described.

2. In a three-high rolling mill having a vertically movable middle roll, and vertically movable tables, the combination with the table-actuating mechanism and connections between said actuating mechanism and the middle roll, of a weight, and connections between the weight and the table actuating mechanism whereby the point of application of the weight is shifted to alternately overbalance and unbalance said middle roll; substantially as described.

3. In a rolling mill, the combination with a vertically movable roll, and vertically movable tables, of a movable carrier for the middle roll, a lever connected to said carrier, a weight having a shiftable connection with said lever, and table actuating means arranged to effect the shifting of the point of application of said weight with respect to the pivotal axis of the lever; substantially as described.

4. In a rolling mill, the combination with a vertically movable roll, a vertically movable carrier for the roll, and vertically movable tables, of a table actuating motor, a system of links and levers actuated by the motor and connected to the tables for effecting the raising and lowering thereof, a weight shiftably connected to the movable roll, and connections between said weight and the link and lever system for shifting the point of application of said weight into positions where it alternately overbalances and unbalances said roll; substantially as described.

5. In a three-high rolling mill, the combination with a vertically movable middle roll and vertically movable tables, of pivoted carriers for the middle roll, slotted levers connected to said carriers, weights suspended from the slotted levers, link and lever mechanism for effecting the raising and lowering of the tables, and connections between said weights and the link and lever mechanism for shifting the points of application of the weights with respect to the pivotal axes of said levers; substantially as described.

6. In a three-high mill, the combination with a vertically movable middle roll, and vertically movable tables, of a motor for actuating the tables, a link and lever system

operatively connected to the motor and arranged to simultaneously raise and lower both tables, the movement of the tables being in a reverse direction to the movement of the roll, a shiftable weight connected to the movable roll, and connections between said shiftable weight and the link and lever mechanism for shifting the point of application of the weight to positions in which it either overbalances or unbalances the middle roll; substantially as described.

7. In a rolling mill, the combination with a table movable in a vertical plane, and a vertically movable roll, of mechanism for raising and lowering the tables, and a weight operatively connected with the table actuating mechanism and arranged to have its point of application shifted by the movements of the table-actuating mechanism to alternately overbalance and unbalance the movable roll; substantially as described.

8. In a rolling mill, the combination with a vertically movable roll, and vertically movable tables, of a movable carrier for the middle roll, a lever connected to said carrier, a force-exerting means having a shiftable connection with said lever, and table-actuating mechanism arranged to shift the point of application of said means with respect to the pivotal axis of the lever; substantially as described.

9. A rolling mill having a vertically movable roll, a lever mechanism connected thereto, a force-exerting device connected to the lever mechanism, and means for shifting the point of application of said device to the lever mechanism to alternately unbalance and overbalance the roll; substantially as described.

10. A rolling mill having a vertically movable roll, a force-exerting means, and motive means for shifting the point of application of the force-exerting means to thereby cause it to alternately unbalance and overbalance the roll; substantially as described.

In testimony whereof, I have hereunto set my hand.

FLORENCE C. BIGGERT, JR.

Witnesses:
H. M. CORWIN,
GEO. H. PARMELEE.