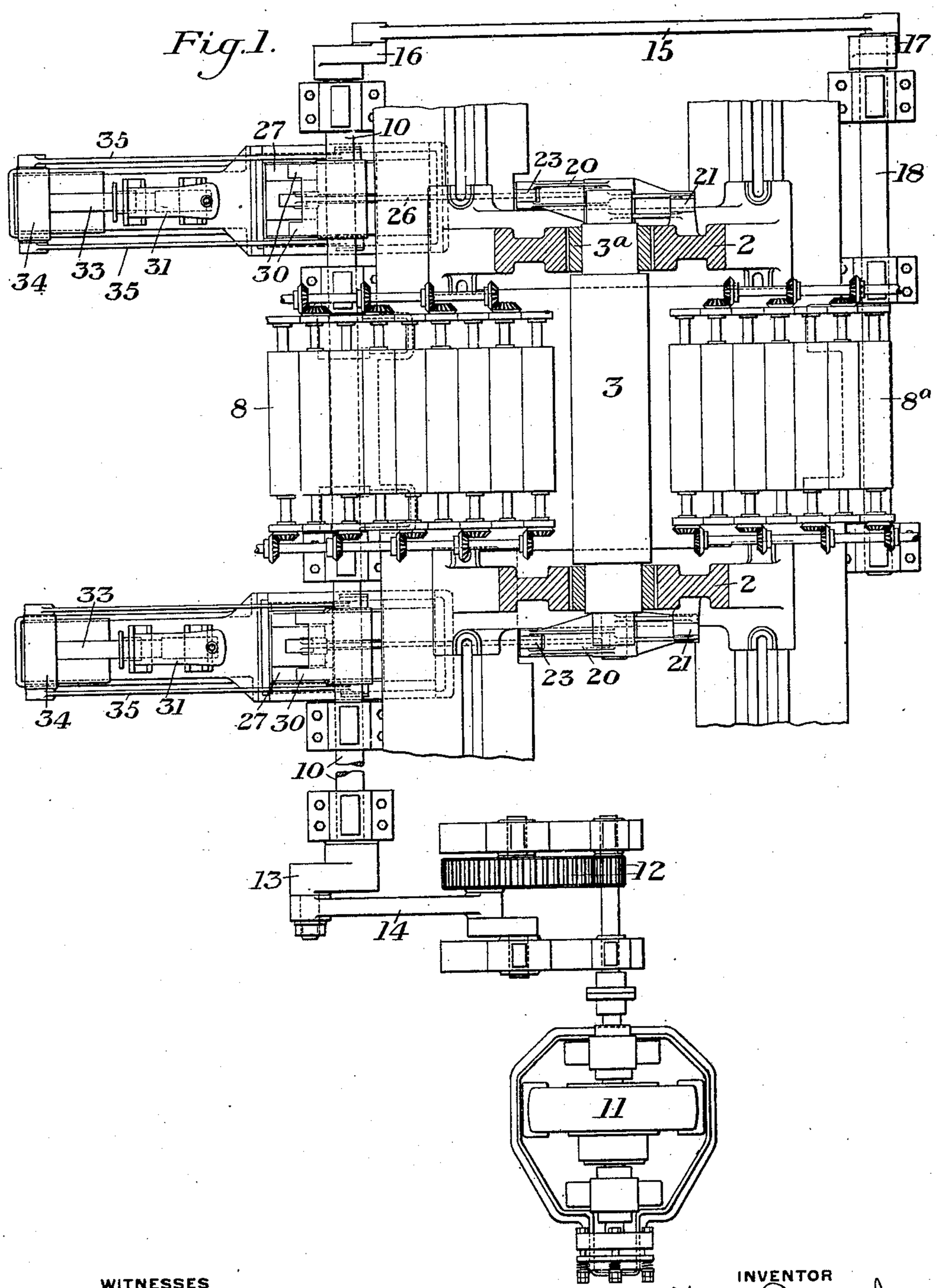
No. 891,032. PATENTED JUNE 16, 1908.

F. C. BIGGERT, Jr.

ROLLING MILL.

APPLICATION FILED JUNE 17, 1907. 2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

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2 SHEETS—SHEET 2.

Fig. 2.

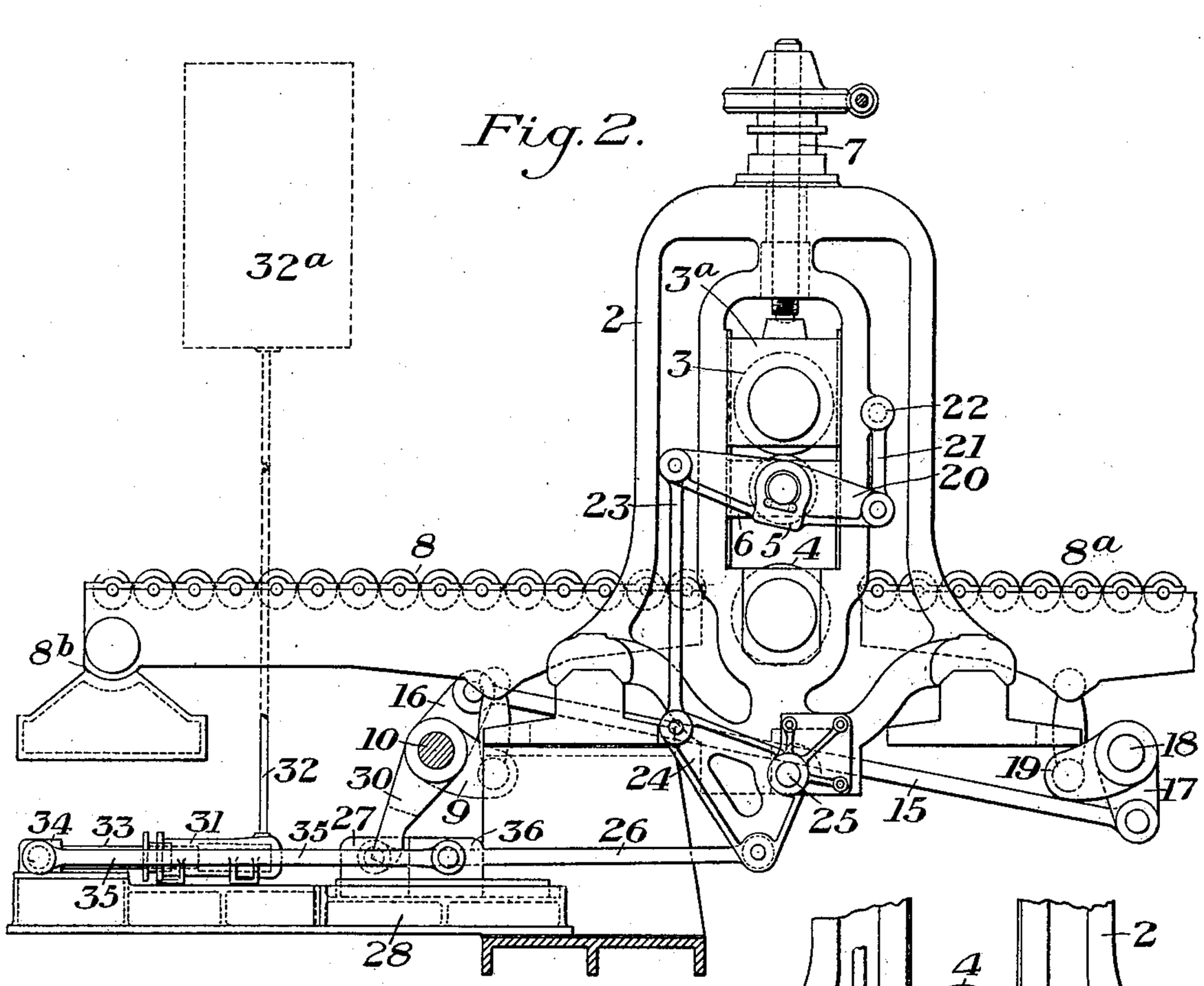
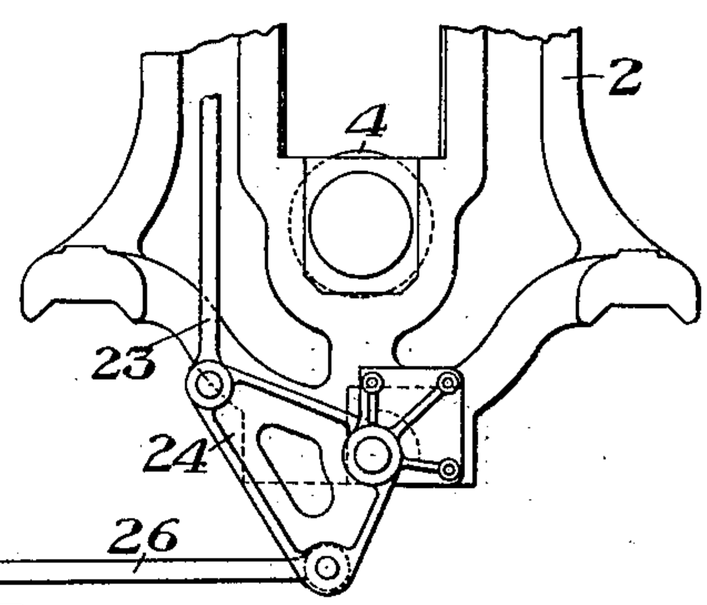


Fig. 3.



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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.

No. 891,032. Specification of Letters Patent. Patented June 16, 1908.

Application filed June 17, 1907. Serial No. 379,383.

To all whom it may concern:

Be it known that I, FLORENCE C. BIGGERT, Jr., 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 plan view of a portion of a rolling mill embodying my invention; Fig. 2 is a side view of the same; and Fig. 3 is a partial side view showing a modification of the counterbalance.

My invention has relation to rolling mills, and more particularly to that class of rolling mills having a vertically movable roll, which is movable vertically towards and away from another roll or rolls, as in three-high mills where the central roll is movable into driving contact with either the upper or the lower roll.

My invention is designed to provide simple and efficient means whereby the movable roll is automatically operated to raise and lower it by the vertical movement of the feed table.

Referring to the accompanying drawings, the numeral 2 designates the roll housings, 3 the upper roll, 4 the lower roll, and 5 the middle roll, which is journaled in the movable bearings 6 to be moved into driving contact with either the roll 3 or the roll 4.

7 designates any usual or suitable screw-down mechanism for adjusting the upper roll 3, which is also journaled in vertically movable bearings 3[a].

8 and 8[a] designate the vertically movable tables, only a portion of the table 8[a] being shown. The table 8 is pivoted at its outer end to move on the center 8[b] in any suitable or usual manner. In the arrangement shown, the table is raised and lowered by a lifter arm 9 secured to a rock shaft 10 extending transversely underneath the table. One end of this shaft is driven by motor 11 through the gears 12, crank 13 and connecting rod 14.

15 indicates a link which connects an arm 16 on the shaft 10 with an arm 17 of a similar shaft 18 extending underneath the table 8[a] and having a lifter arm 19, the connection 15 providing means whereby both tables are operated in unison. My invention is, however, independent of any particular table-operating mechanism, or manner of actuating the same.

Mounted upon each end portion of the middle roll 5 outside the roll housing is a two-armed lever 20. One arm of each of these levers is connected by link 21 with the roll housing at 22. The other arm of each lever is connected to a depending link 23. The lower end of each of these links is pivoted to one arm of a bell crank lever 24, which is pivoted at 25 at the base of the housing. To a second arm of the bell crank lever 24 is connected one end of a link 26 whose opposite end is connected to a cross-head 27, which is longitudinally movable on the bed 28.

31 designates cylinders, which have a connection 32 at their inner ends with any suitable tank or reservoir (indicated diagrammatically at 32[a]) and whose pistons are connected by rods 33 with a cross-head 34, mounted for longitudinal movement on the bed 28.

35 are parallel links, which connect each cross-head 34 with the cross-head 36, which is mounted on the bed 28 behind the cross-head 27, and which is engaged by a depending arm 30 on the rock-shaft 10.

The operation is as follows:—When the shaft 10 is actuated to raise the table from the position shown in Fig. 2, to its elevated position, the arms 30 on said shaft engage with the cross-heads 36, thereby moving the latter backwardly and, through the cross-heads 34, moving the pistons inwardly in the cylinders 31 to force the liquid thereon back into the supply connections 32. The backward movement of the cross-heads 36 permits the roll 5 to move gradually downward by its weight into contact with the lower roll 4 as the table is raised against the resistance of the pistons in the cylinder 31. When the shaft 10 is actuated to lower the table 8, the cross-heads 36 are moved forwardly by the action of the cylinders 31, thereby moving the cross-heads 27 to actuate the links 26 and the bell-crank 24 to cause the roll 5 to move into driving engagement with the upper roll 3. The depending arms 30 of the rocker shaft 10 are not secured to the cross-heads 36, but simply contact with the same, thus permitting an independent movement of the parts to provide a sufficient lost motion to take care of variations in the diameter of the rolls and to allow for different adjustments of the upper roll 3 by the screw-down mechanism 7.

Instead of using the hydraulic cylinders 31,

as shown in Figs. 1 and 2, the inner cross-heads 36 may be connected by links 35 with the arms 37 of a transverse rock shaft 38, to which is attached a counterweight 39, as shown in Fig. 3. These counterweights have substantially the same action as the cylinders 31, being raised when the table is lifted, and thereby acting to raise the roll 5 when the table is lowered.

The advantages of my invention result from the fact that the middle roll is actuated automatically by the movement of the table, thereby dispensing with the use of hydraulic cylinders or other motors for actuating said roll. This is of importance, especially where it is desirable to economize in the use of hydraulic power since no consumption of such power is required by my invention. My invention also effects the counterbalancing of the middle roll so that its movements are steady and without shock, and without the use of separate controlling mechanism.

It will be obvious that various changes may be made by those skilled in the art. Thus, the counterbalancing cylinders or weights, and the connections between the same, and the movable roll may be changed. Other forms of table-actuating mechanism may also be used. The invention is also applicable to tables which are bodily movable, as well as to those which are pivoted at their outer ends.

What I claim is:—

1. In a rolling mill, a vertically movable middle roll, a vertically movable feed table, a counterbalance for the middle roll, and connections whereby the movement of the table effects the movement of the roll said connections including lost motion means; substantially as described.

2. In a rolling mill, a vertically movable roll, a vertically movable table, a counterbalance, connections between the counterbalance and the table operating mechanism for actuating the counterbalance in one direction said connections including lost motion means, and connections between the counterbalance and the roll for lifting the roll; substantially as described.

3. In a rolling mill, a vertically movable roll, a vertically movable feed table, a counterbalance, controlled by the movement of the table, and a lost-motion connection between the counterbalance and the roll; substantially as described.

4. In a rolling mill, a vertically movable roll, a vertically movable table, a counterbalance, a lost motion connection between the table and the counterbalance, and a lost motion connection between the counterbalance and the roll; substantially as described.

5. In a rolling mill, a vertically movable roll, a vertically movable table, a lifting lever connected to the roll, a cross-head connected to the lifting lever, a counterbalance, a second cross-head connected to the counterbalance and arranged to cause a movement of the first-named cross-head, and means whereby the movement of the table effects a movement of said first-named cross-head the first-named cross-head, which is connected to the lifting lever, being disconnected from the table and from the other cross-head, whereby the table may continue to move after the movable roll has been fully raised by the counterbalance; substantially as described.

6. In a three-high rolling mill, an adjustable upper roll, a vertically movable middle roll, a vertically movable roll table, and connections actuated by the movement of said table for controlling the movement of the middle roll, said connections having a counterweight for raising said roll as the table is lowered, and also a lost motion device for permitting movement of the table through a portion of its travel without actuating said connections; substantially as described.

7. In a rolling mill, a vertically movable feed table, actuating mechanism therefor, a vertically movable roll, levers mounted upon the ends of the roll and supported from the roll housing, lifting levers connected to the first-named lever, cross-heads connected to the lifting levers, other cross-heads arranged to engage the first-named cross-heads and to be engaged by the table actuating mechanism to actuate said cross-heads during the upward movement of the table and counterbalances connected to such other cross-heads one set of the cross-heads being movable towards and away from the cross-heads of the other set; substantially as described.

8. In a rolling mill, a vertically movable roll table, actuating mechanism therefor, a pair of cross-heads arranged for engagement with each other, one of said cross-heads being movable towards and away from the other, means carried by the table-actuating mechanism for engaging one of said cross-heads during the upward movement of said table, and having a movement independent of said heads during the downward movement of the table, a counterbalance connected to the said cross-head, a vertically movable roll, lifting mechanism therefor, and a connection between the lifting mechanism and the other cross-head; substantially as described.

In testimony whereof, I have hereunto set my hand.

FLORENCE C. BIGGERT, Jr.

Witnesses:
H. M. Corwin,
Geo. H. Parmelee.