No. 669,241. Patented Mar. 5, 1901.

J. G. HODGSON & L. A. NORTON.

AUTOMATIC REVERSING SHEET METAL ROLLING MILL.

(Application filed Oct. 22, 1900.)

(No Model.) 5 Sheets—Sheet 1.

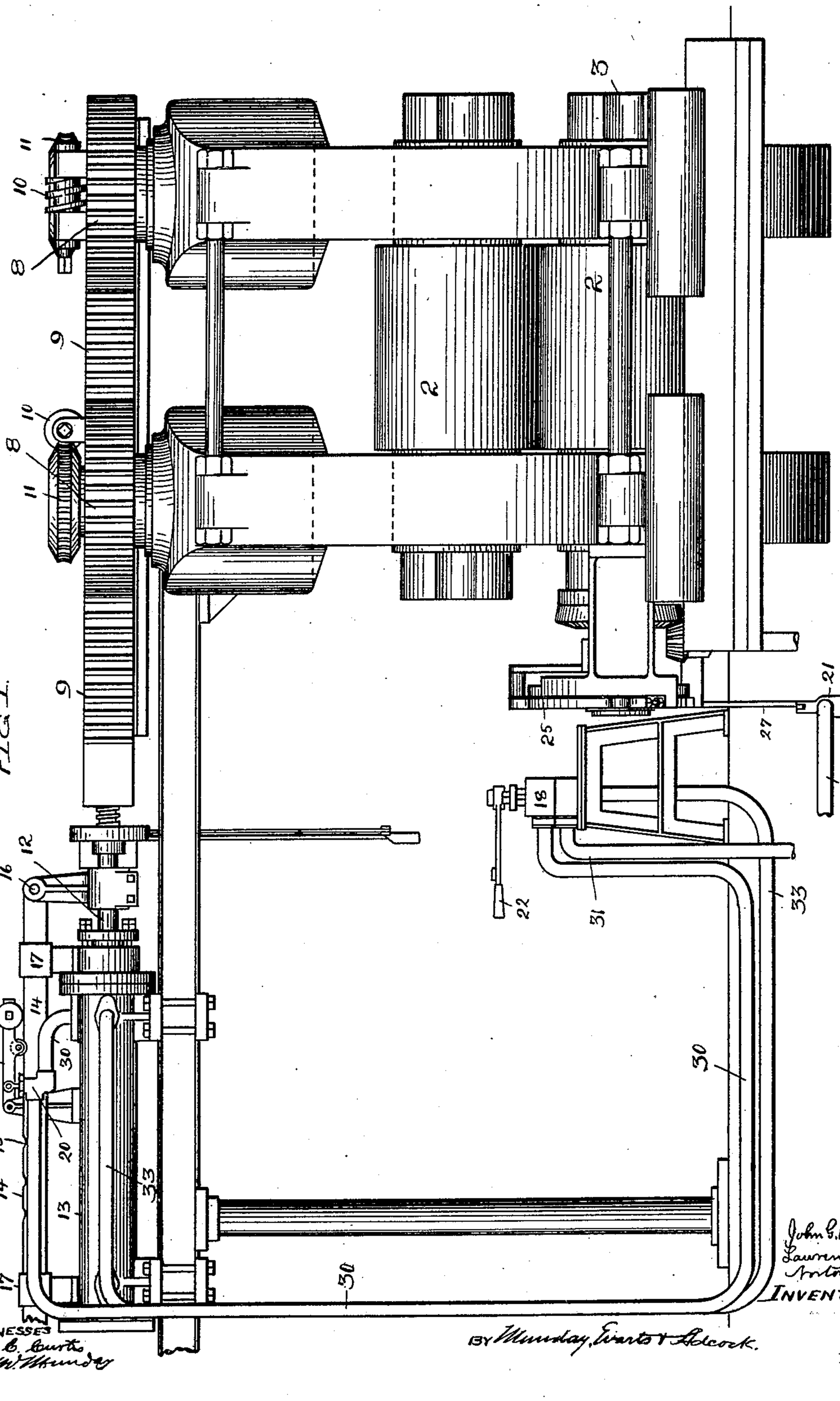


FIG. I.

WITNESSES:
Lew. B. Curtis
H. W. Munday

BY Munday, Evarts & Adcock.

INVENTORS:
John G. Hodgson
Lawrence A Norton

ATT'YS.

No. 669,241. Patented Mar. 5, 1901.

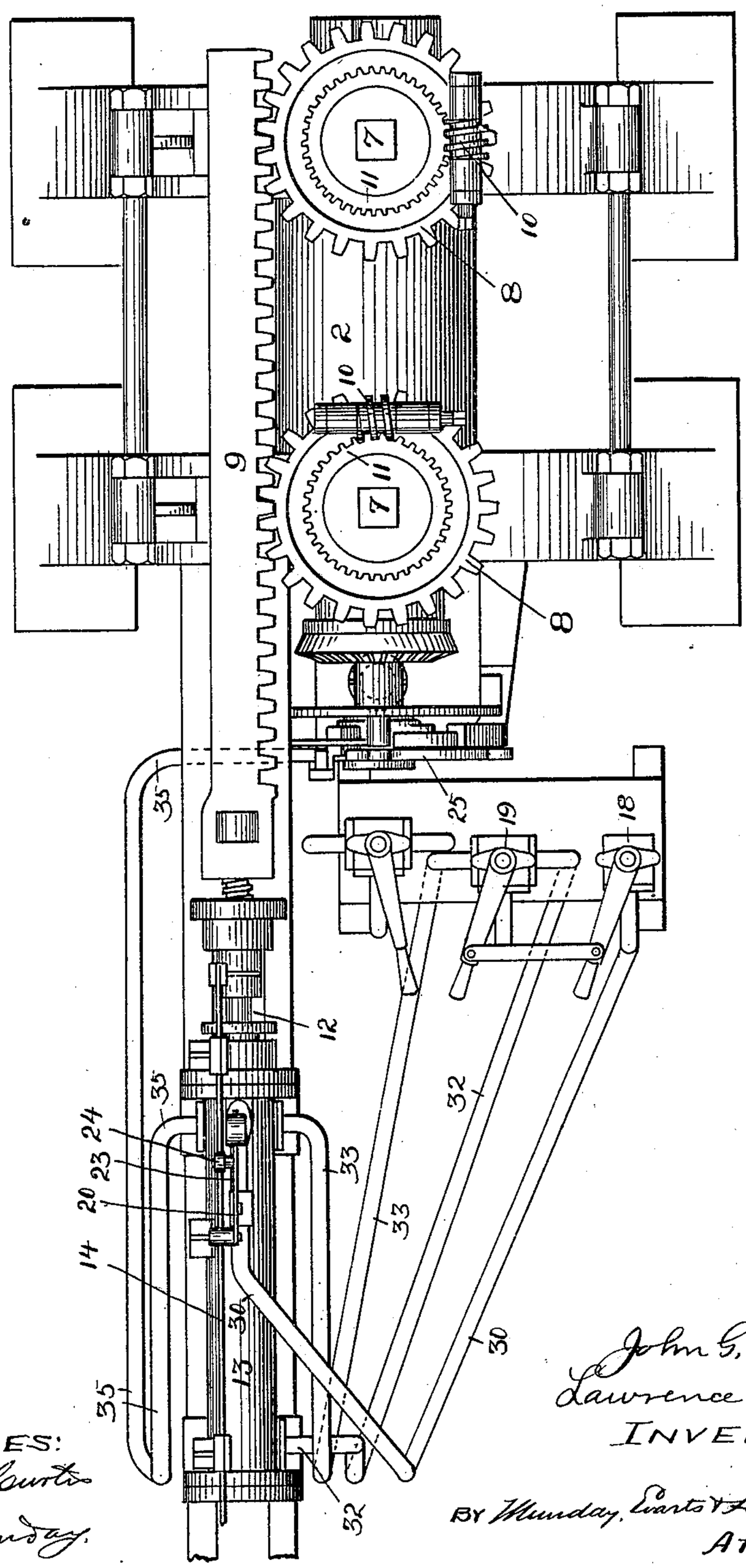
J. G. HODGSON & L. A. NORTON.

AUTOMATIC REVERSING SHEET METAL ROLLING MILL.

(Application filed Oct. 22, 1900.)

(No Model.) 5 Sheets—Sheet 2.

FIG. 2.



WITNESSES:
Lew. C. Curtis
H. W. Munday.

John G. Hodgson
Lawrence A. Norton
INVENTORS.

BY Munday, Evarts & Adcock.
ATTORNEYS.

No. 669,241. Patented Mar. 5, 1901.

J. G. HODGSON & L. A. NORTON.

AUTOMATIC REVERSING SHEET METAL ROLLING MILL.

(Application filed Oct. 22, 1900.)

(No Model.) 5 Sheets—Sheet 3.

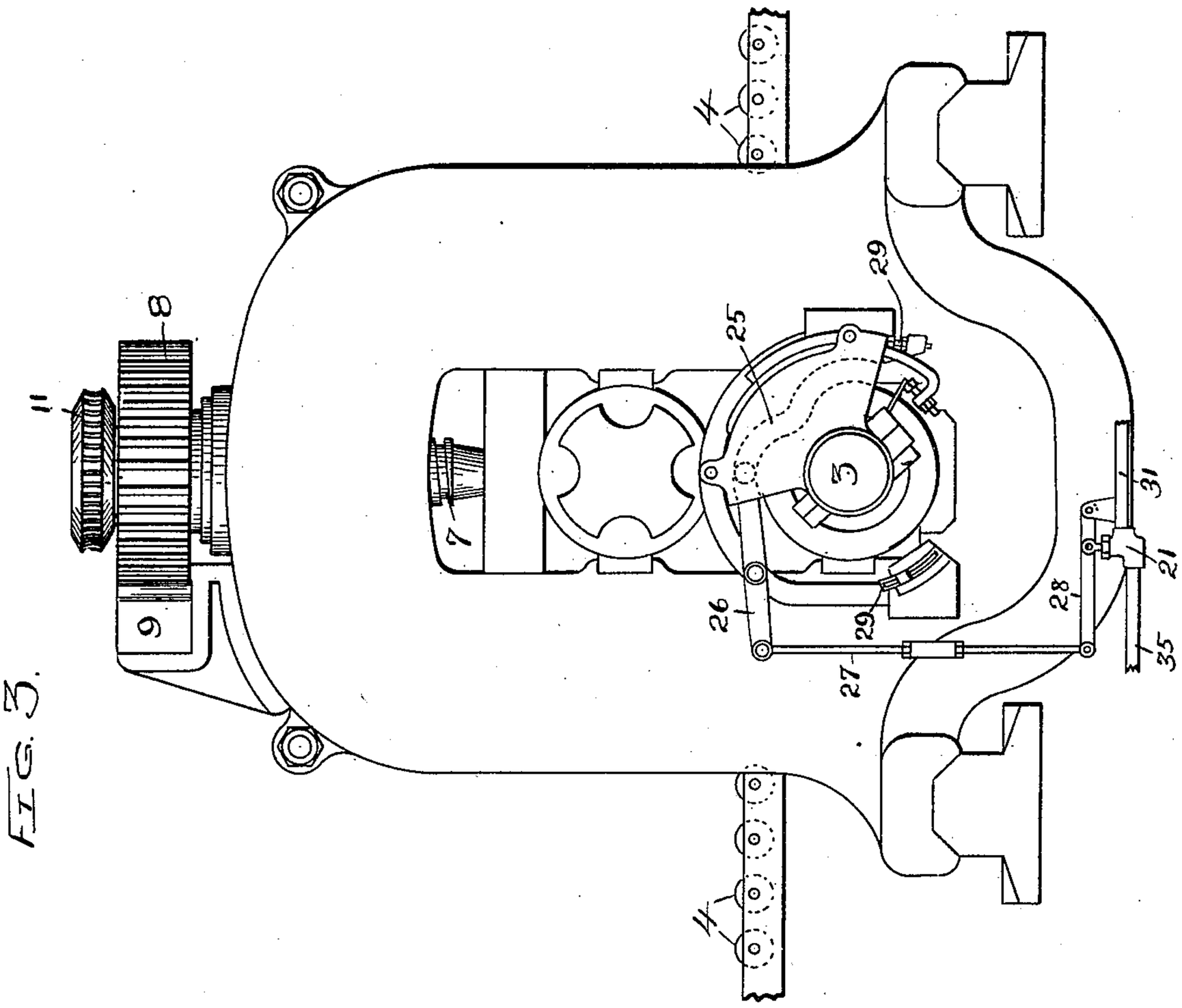


FIG. 3.

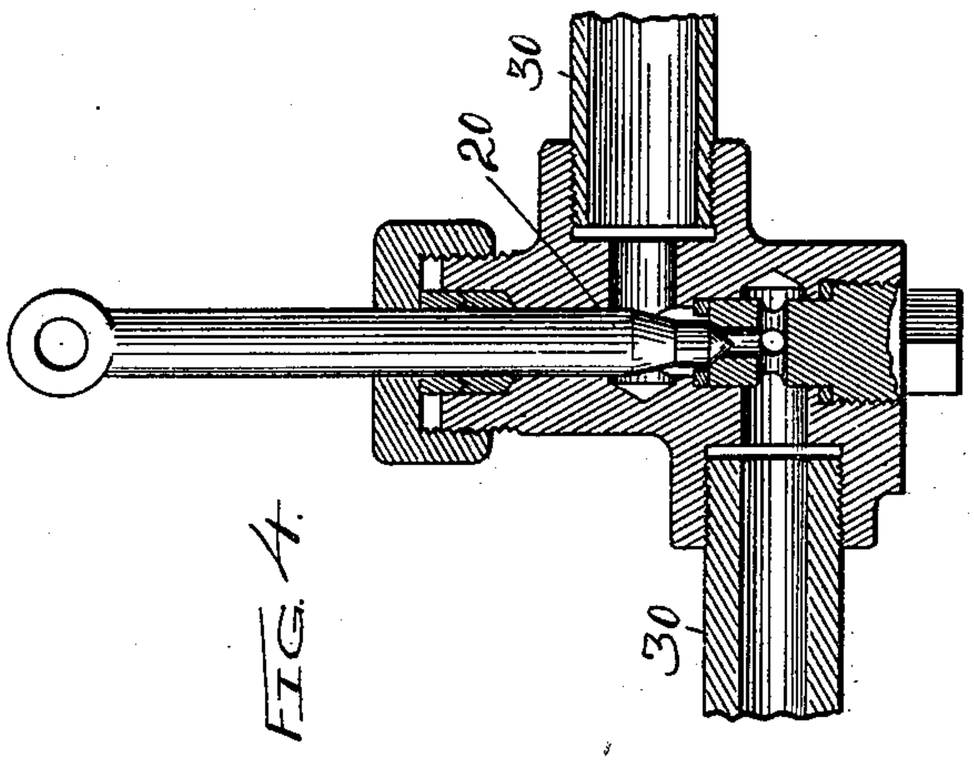


FIG. 4.

WITNESSES:
Lew. E. Curtis
H. W. Munday.

INVENTORS:
John G. Hodgson
Lawrence A. Norton

BY Munday, Evarts & Adcock
ATTORNEYS.

No. 669,241. Patented Mar. 5, 1901.

J. G. HODGSON & L. A. NORTON.

AUTOMATIC REVERSING SHEET METAL ROLLING MILL.

(Application filed Oct. 22, 1900.)

(No Model.) 5 Sheets—Sheet 4.

FIG. 5.

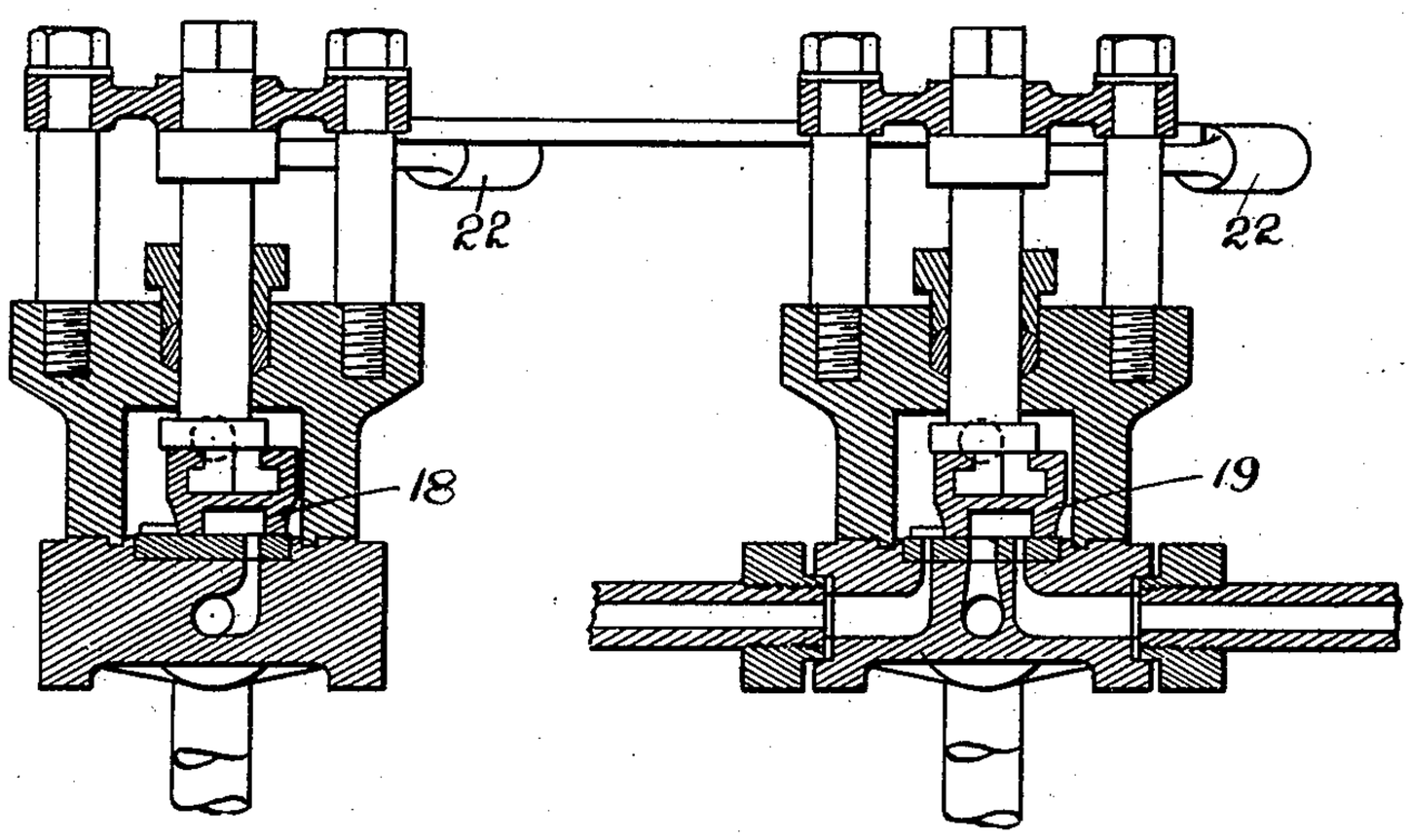
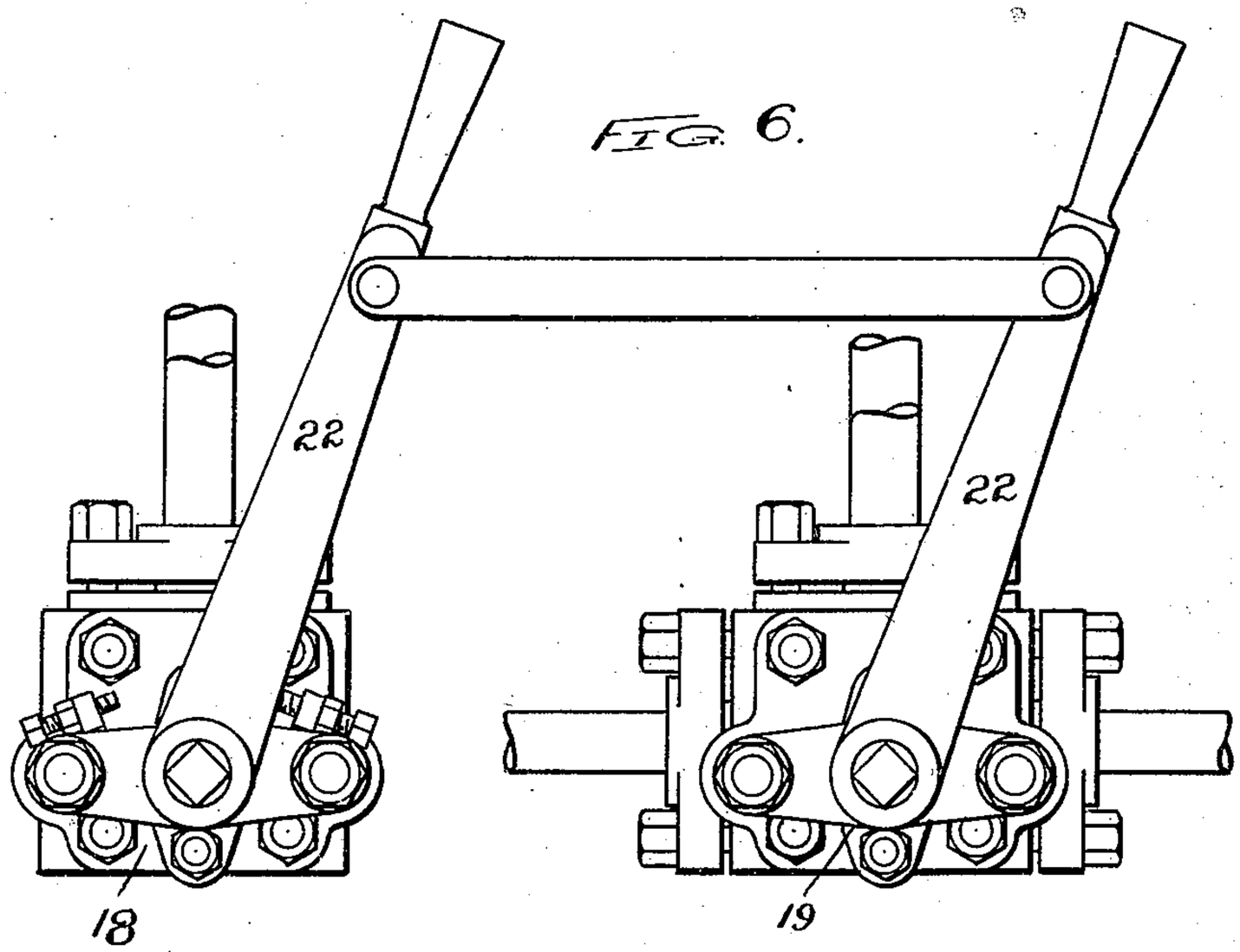


FIG. 6.



WITNESSES:
Lew. E. Curtis
H. W. Munday.

John G. Hodgson
Lawrence A. Norton
INVENTORS.

BY Munday, Evarts & Adcock
ATTORNEYS.

No. 669,241. Patented Mar. 5, 1901.

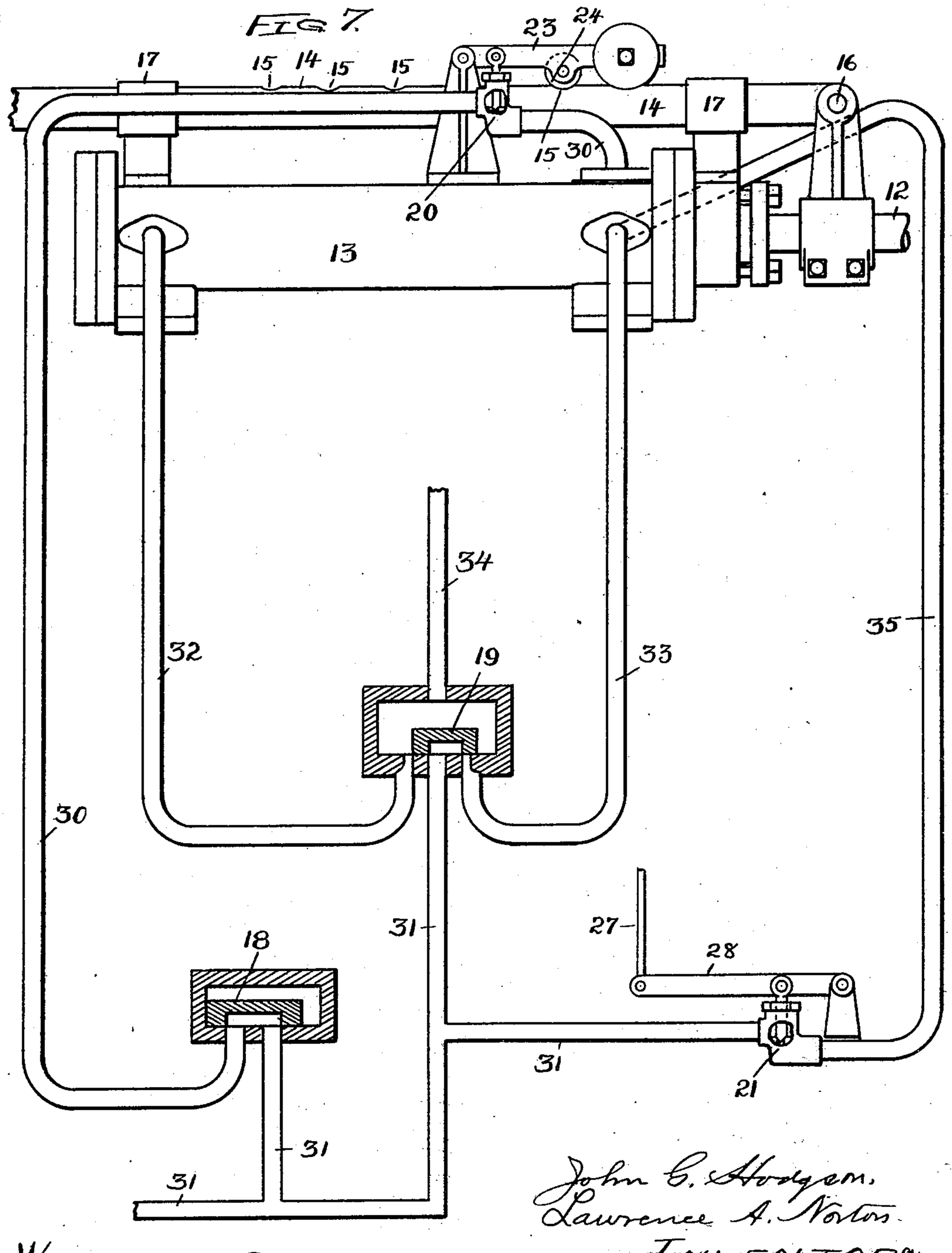
J. G. HODGSON & L. A. NORTON.

AUTOMATIC REVERSING SHEET METAL ROLLING MILL.

(Application filed Oct. 22, 1900.)

(No Model.) 5 Sheets—Sheet 5.

FIG 7.



WITNESSES:
Lew. C. Curtis
A. W. Munday.

INVENTORS:
John G. Hodgson.
Lawrence A. Norton.
BY Munday, Evarts & Adcock.
ATTORNEYS.

UNITED STATES PATENT OFFICE.

JOHN G. HODGSON AND LAWRENCE A. NORTON, OF MAYWOOD, ILLINOIS,
ASSIGNORS TO NORTON BROTHERS, OF CHICAGO, ILLINOIS.

AUTOMATIC REVERSING SHEET-METAL-ROLLING MILL.

SPECIFICATION forming part of Letters Patent No. 669,241, dated March 5, 1901.

Application filed October 22, 1900. Serial No. 33,960. (No model.)

To all whom it may concern:

Be it known that we, JOHN G. HODGSON and LAWRENCE A. NORTON, citizens of the United States, residing in Maywood, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Automatic Reversing Sheet-Metal-Rolling Mills, of which the following is a specification.

Our invention relates to improvements in automatic reversing rolling-mills for rolling metal bars, plates, sheets, or packs of sheets in the manufacture of sheet metal.

Our invention relates more particularly to improvements in the mechanism for automatically setting or adjusting the rolls closer and closer together, as required, as the rolling proceeds.

The object of our invention is to provide an automatic metal sheet, plate, or bar rolling mill by means of which the bars, plates, sheets, or packs of sheets may be automatically passed rapidly and successively back and forth between the rolls for any desired number of passes and which will operate to automatically set the rolls closer and closer together as required at intervals by diminishing increments and in which the rolls may be held rigidly and unyieldingly in position, so as to produce the required uniform reduction.

Our invention consists, essentially, in a reversing rolling-mill in combination with the reversing-rolls and their feed-tables by which the bars or plates or sheets or packs of sheets are fed back and forth between the rolls and the feed-screws for setting or adjusting the rolls closer and closer together and a rack and gears for turning the feed-screws, of a hydraulic cylinder and piston for operating the rack, and a notched bar connected with the piston and having notches at varying distances apart, as required, for controlling the valves of the hydraulic cylinder, and thus automatically regulating in an absolutely fixed and positive manner the extent to which the feed-screws are turned. By simply substituting one notched bar, in which the notches are differently spaced, for another notched bar in the mechanism the extent to which the feed-screws are turned at each successive pass or successive series of passes may be varied as required, according to the nature of the work being done by the mill.

In the accompanying drawings, which form a part of this specification, and in which similar numerals of reference indicate like parts throughout the several views, Figure I is a front elevation of a reversing rolling-mill embodying our invention. Fig. II is a plan view. Fig. III is a side elevation; Fig. IV, a sectional detail view of one of the valves. Fig. V is a section, and Fig. VI an elevation, of the inlet and outlet valves; and Fig. VII is a diagram view showing the valve connections of the hydraulic cylinder.

In the drawings, 2 2 represent the reversing-rolls of the mill, between which the bars, plates, sheets, or packs of sheets are to be passed back and forth in opposite directions.

3 is the shaft of the lower or driven roll.

4 4 are the feed-tables, one on each side of the rolls, the same being preferably roller feed-tables, the rolls of which are connected by suitable gearing with the shaft of the lower or driven roll in the usual manner, so that the feed-tables will be reversed with the rolls.

7 7 are the feed-screws by which the rolls are set closer and closer together after each successive pass or series of passes of the bars or sheets between the rolls, as may be required.

8 8 are gears for turning the feed-screws, the same meshing with the reciprocating rack 9. The gears 8 8 are loose on the feed-screw shafts, the same being connected thereto through the medium of the worms 10 10 and gears 11, which latter are fast on the feed-screw shafts, the worms 10 10 being mounted on the gears 8 8. This enables the feed-screws to be turned independently of each other by hand, as required for setting the rolls parallel to each other.

The rack 9 is connected to the piston-stem 12 of a powerful hydraulic cylinder 13, by which the rack is operated. The movement of the piston-stem and of the feed-screw-operating rack connected thereto is positively and accurately controlled by a notched bar 14, connected to the piston-stem and having notches 15 15 at different or the required distances apart, corresponding to the extent to

which it is desired to turn the feed-screws each succeeding turn. By locating the series of notches 15 closer and closer together toward the left-hand end of the bar, as shown in Fig. I, the feed-screws are set closer and closer together by diminishing increments. The notched bar 14 is removably connected to the piston by a pin 16, so it can be readily disconnected therefrom and slipped out of its guide 17 and replaced by another similar bar, but with its series of notches differently spaced, as may be required for different work. My improved mill may thus be very conveniently changed or adapted for different work.

The hydraulic cylinder 13 is furnished with four valves 18, 19, 20, and 21. The valves 18 and 19 are connected together and operated by the hand-lever 22. The valve 20 is operated by the notched bar 14 through the connecting-lever 23 and roller 24 thereon, which engages the notches 15 of the bar 14. The valve 21 is automatically operated at each reversal of the rolls by a friction arm or cam 25 on the shaft of the driven roll through the connecting levers and link 26 27 28. The cam or arm 25 has a frictional connection with the roll-shaft 3, so that the roll may continue to revolve after the movement of the cam is arrested by the stops 29 29, which limit its movement in either direction. The valve 18, which is a discharge-valve, is connected by a pipe 30 to the front end of the hydraulic cylinder 13 and also with the discharge-pipe 31, this valve being a two-way valve. The valve 19, which is both an inlet and discharge valve, is connected by pipes 32 33 with both ends of the hydraulic cylinder, and it also connects with the discharge-pipe 31. 34 is the water-supply pipe, leading from the hydraulic pump or ram and connecting with this valve 19. The valve 20 is located in the pipe 30, leading from the front end of the hydraulic cylinder to the discharge-valve, and the valve 21 connects, through pipe 35, with the front end of the hydraulic cylinder and also with the discharge-pipe. Now when the valves 18 and 19 are shifted—for example, as illustrated in Fig. VII—to admit the water through pipe 32 to the rear end of the cylinder 13 and to open the discharge-valve 18 no movement of the piston can as yet take place, because the pipe 30, leading to the open discharge-valve 18, is still closed by the valve 20, and the pipe 35, leading to the discharge 31, is closed by the valve 21, so that no water can escape from the front end of the cylinder. The instant, however, that the rolling-mill is reversed the valve 21 is for a short interval lifted or opened by the friction-cam on the shaft of the driven roll. This permits the water to escape from the front end of the cylinder 13 through the pipe 35 momentarily or until the valve 21 closes, so that the piston-stem moves sufficiently to the right to cause the roller 24 on the valve-lever 23 to ride out of the notch 15 in the bar 14, and thus open the valve 20 in the pipe 30, so that the water can continue to escape through said pipe 30 until the piston and the notched bar 14 move one full step—that is to say, until the roller 24 on the valve-lever 23 drops into the next succeeding notch 15, and thus again closes the valve—and in like manner at the next reversal of the mill the valve 21 is again momentarily opened by the friction-cam 25 on the roll-shaft 3, and the operation above described is repeated and the notched bar 14 and piston-stem 12 move forward another step to the next notch 15, which is or may be a shorter space, thus imparting to the feed-screws a less increment of motion than before. After the desired or required number of passes have been made and the piston and notched bar are moved through the whole series of steps or notches on the bar 14 and it is desired to return the piston to the opposite end of the hydraulic cylinder to repeat the rolling operation the valve-lever 22 is shifted, thus closing the communication between pipes 30 and 31 through valve 18 and opening the communication between pipes 32 and 31 through the valve 19 and the water-inlet to the cylinder through the pipe 33, thereby causing the piston to move in the opposite direction or from the right-hand to the left-hand end of the cylinder, as shown in Fig. VII.

We claim—

1. In an automatic reversing rolling-mill, the combination with the rolls, and feed-screws for setting the rolls closer together, of a rack and gears for turning the feed-screws and a hydraulic cylinder and piston for actuating the rack, and a notched bar for regulating the movement of the piston-cylinder, substantially as specified.

2. In a reversing rolling-mill, the combination with the rolls and feed-screws, of a hydraulic cylinder and piston for actuating the feed-screws, and means for automatically graduating the movements of said piston, substantially as specified.

3. In a reversing rolling-mill, the combination with the rolls and feed-screws, of a hydraulic cylinder and piston for actuating the feed-screws, and a notched bar controlling the step-by-step movement of the hydraulic-cylinder piston, substantially as specified.

4. In a reversing rolling-mill, the combination with the rolls and feed-screws, of a hydraulic cylinder and piston, a connecting rack and gears, a frictionally-held cam on the shaft of the driven roll, a valve operated by said arm, a notched bar, and a valve operated by said notched bar, substantially as specified.

5. In a reversing rolling-mill, the combination with the rolls and feed-screws, of a hydraulic cylinder and piston, a connecting rack and gears, a frictionally-held arm on the shaft of the driven roll, a valve operated by said arm, a notched bar, a valve operated by said notched bar, and valves 18 and 19, substantially as specified.

6. The combination with the rolls and feed-screws, a rack and gears for turning the feed-screws, a hydraulic cylinder and piston, a bar connected with the stem of the piston and furnished with a series of notches or projections, valves 18, 19, 20 and 21, and a frictionally-held arm or cam on the shaft of the driven roll for operating said valve 21, substantially as specified.

7. The combination with the rolls and feed-screws, of a hydraulic cylinder and piston for actuating the feed-screw-turning mechanism having a series of notches or devices for controlling the movements imparted to the feed-screws by said cylinder and piston, and means for independently turning the feed-screws, substantially as specified.

8. In a rolling-mill, the combination with the rolls and their feed-screws, a rack and gears for turning said screws, a cylinder and piston operating the rack, and a notched bar controlling the step-by-step movements imparted by the cylinder and piston to the feed-screws, substantially as specified.

9. In a rolling-mill, the combination with the rolls and feed-screws, of a cylinder and piston for actuating the feed-screws, and means for automatically controlling the extent of the successive movements imparted by the cylinder and piston to the feed-screws, substantially as specified.

10. The combination with the rolls and their feed-screws, of a feed-screw-operating ram, and a device having a series of notches or projections for automatically controlling the extent of movement of the feed-screws, substantially as specified.

11. The combination with the rolls and their feed-screws, of mechanism for turning the feed-screws, and a bar having notches or projections at different distances apart to regulate and definitely limit the extent of movement of the feed-screws, substantially as specified.

12. The combination with rolls, of feed-screws therefor, a cylinder and piston for operating the feed-screws, a valve therefor, and a device having a series of notches or projections for operating said valve to control the extent of movements of the feed-screws, substantially as specified.

13. The combination with rolls, of feed-screws therefor, a feed cylinder and piston for operating the feed-screws, a valve therefor, and a device having a series of notches or projections for operating said valve to control the extent of movements of the feed-screws, said cylinder having additional valves to enable the feed-screws to be returned to position by a continuous movement, substantially as specified.

JOHN G. HODGSON.
LAWRENCE A. NORTON.

Witnesses:
EDMUND ADCOCK,
H. M. MUNDAY.