

No. 669,242.

Patented Mar. 5, 1901.

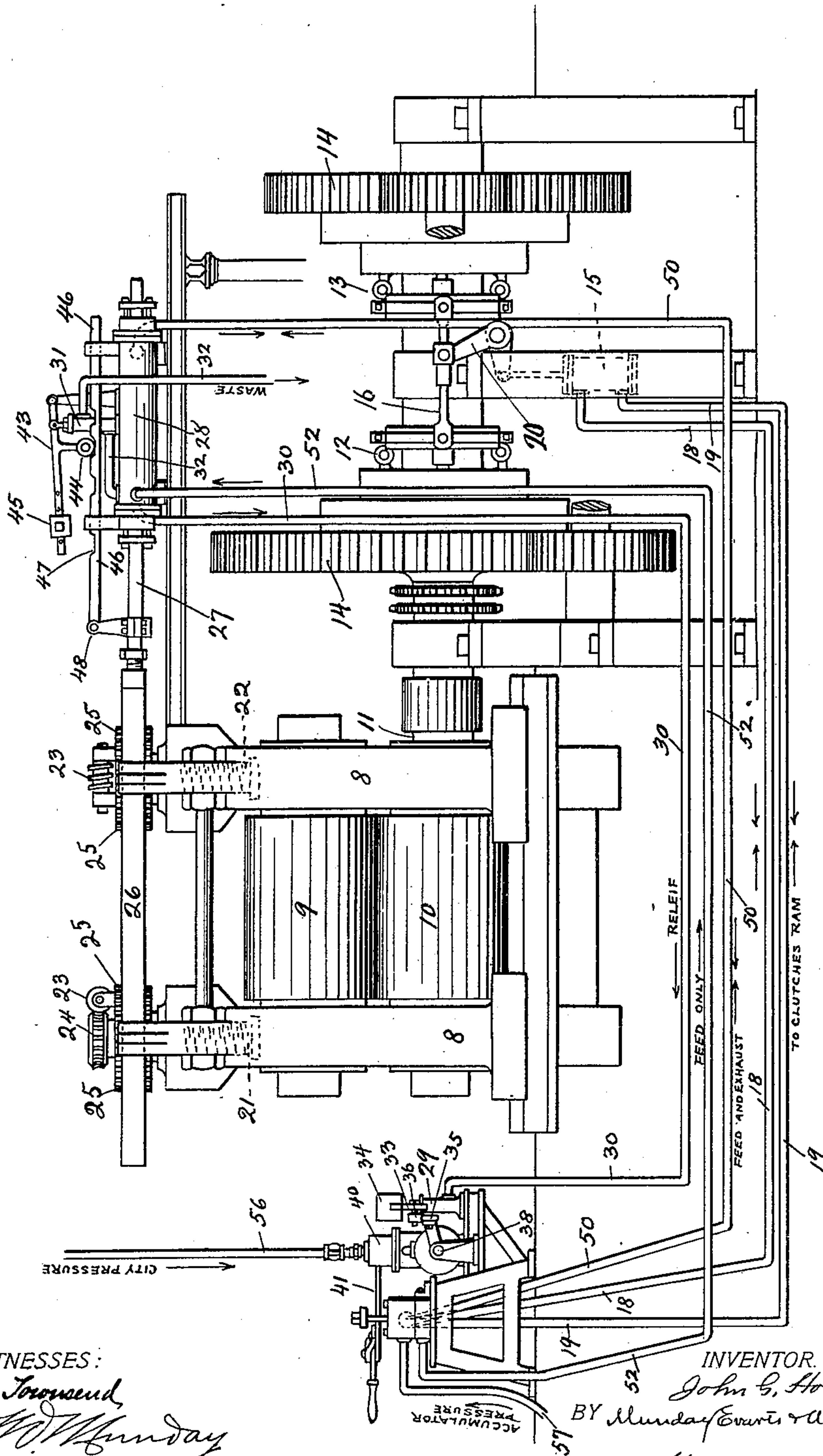
J. G. HODGSON.
REVERSING ROLLING MILL.

(Application filed Oct. 22, 1900.)

(No Model.)

4 Sheets—Sheet 1.

FIG. 1.



WITNESSES:
F. B. Townsend
J. W. Munday

INVENTOR.
John G. Hodgson
BY *Munday, Evans & Adcock*
His ATTORNEYS.

No. 669,242.

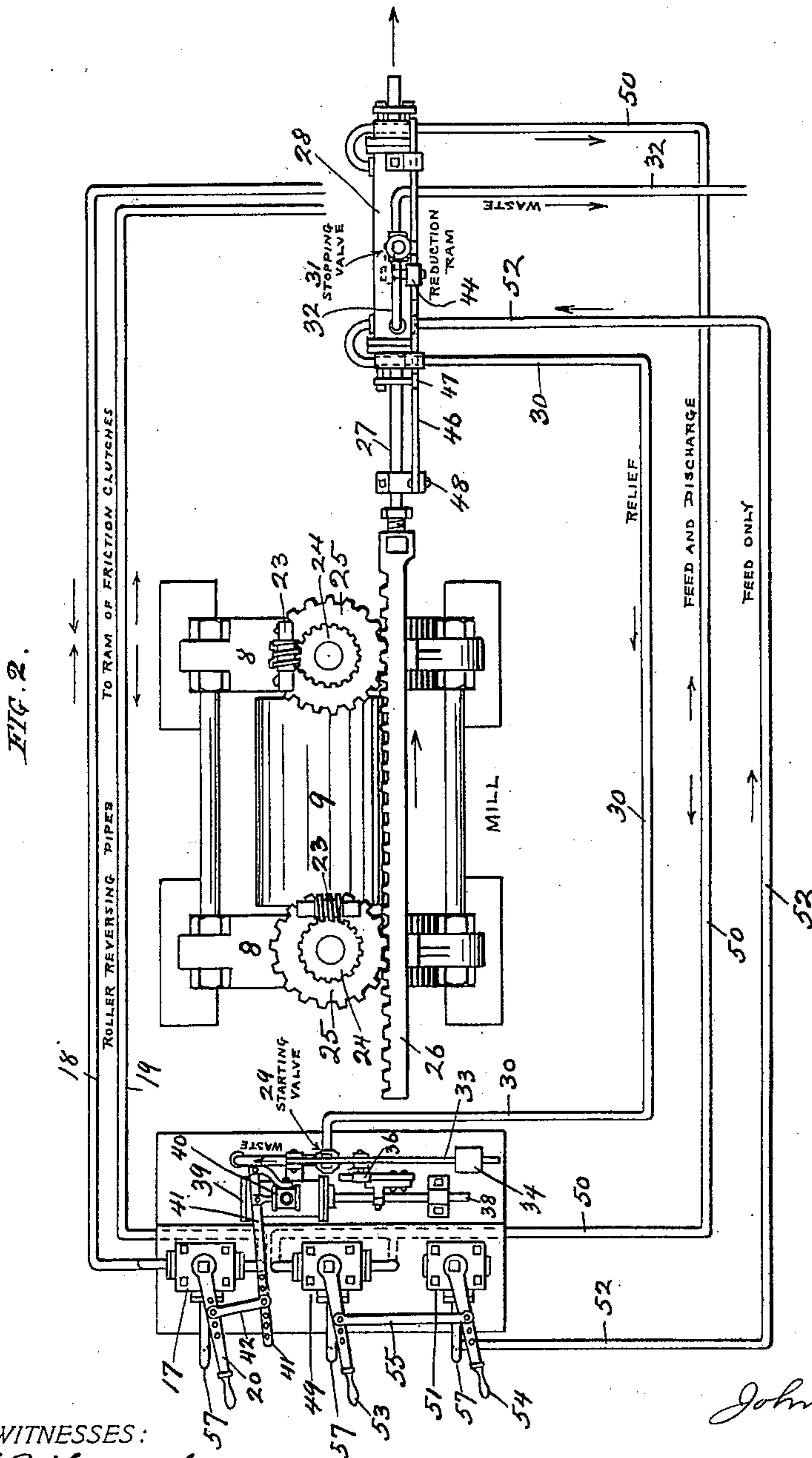
Patented Mar. 5, 1901.

J. G. HODGSON.
REVERSING ROLLING MILL.

(Application filed Oct. 22, 1900.)

(No Model.)

4 Sheets—Sheet 2.



WITNESSES:

F. B. Townsend
A. W. Henday

John G. Hodgson
INVENTOR.

BY *Monday Evans & Adeock*
His ATTORNEYS.

No. 669,242.

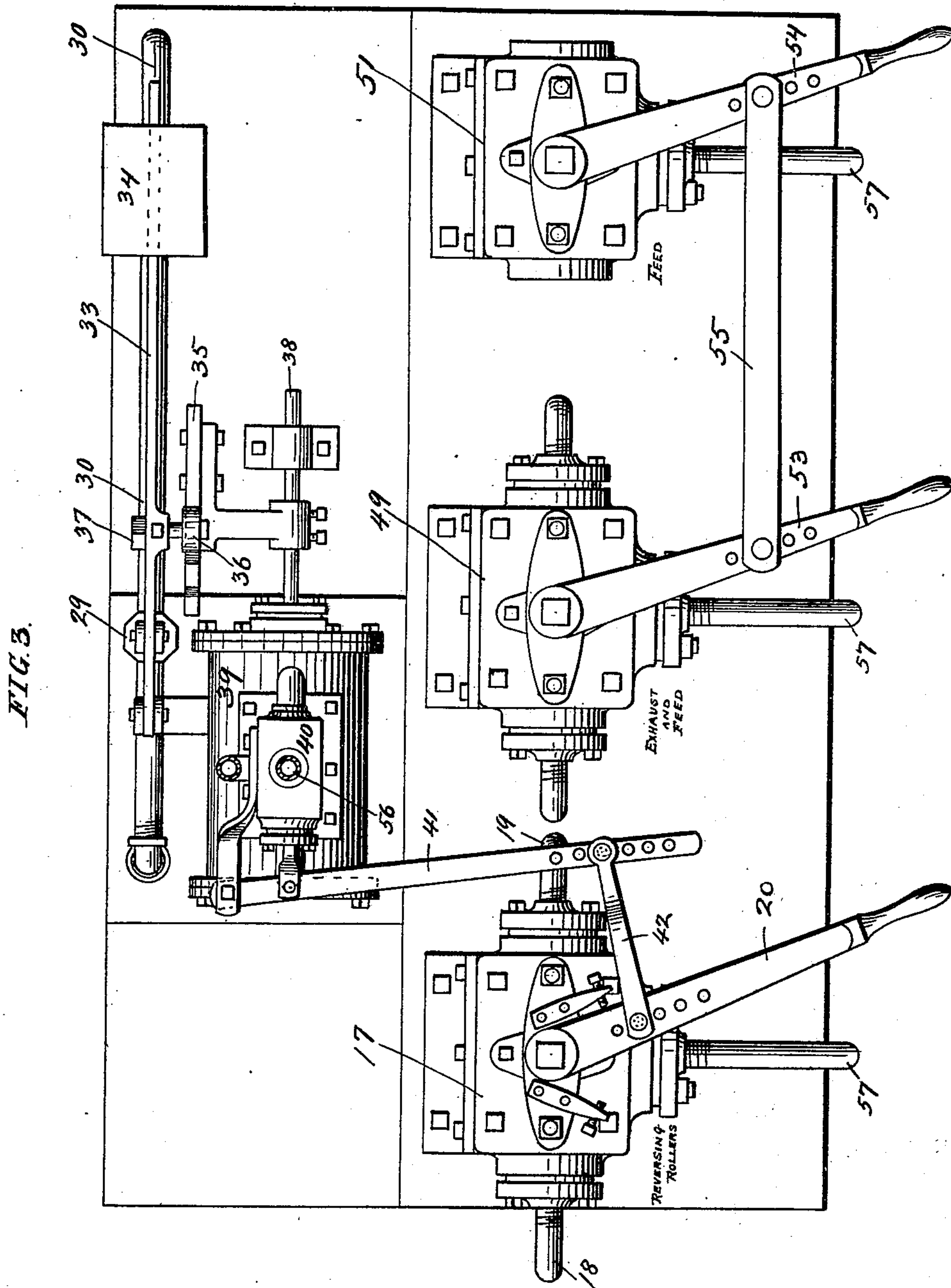
Patented Mar. 5, 1901.

J. G. HODGSON.
REVERSING ROLLING MILL.

(Application filed Oct. 22, 1900.)

(No Model.)

4 Sheets—Sheet 3.



WITNESSES:

F. B. Townsend
N. W. Munday

John G. Hodgeson
INVENTOR.

BY Munday Evans & Aldcock
His ATTORNEYS.

No. 669,242.

Patented Mar. 5, 1901.

J. G. HODGSON.
REVERSING ROLLING MILL.

(Application filed Oct. 22, 1900.)

(No Model.)

4. Sheets—Sheet 4.

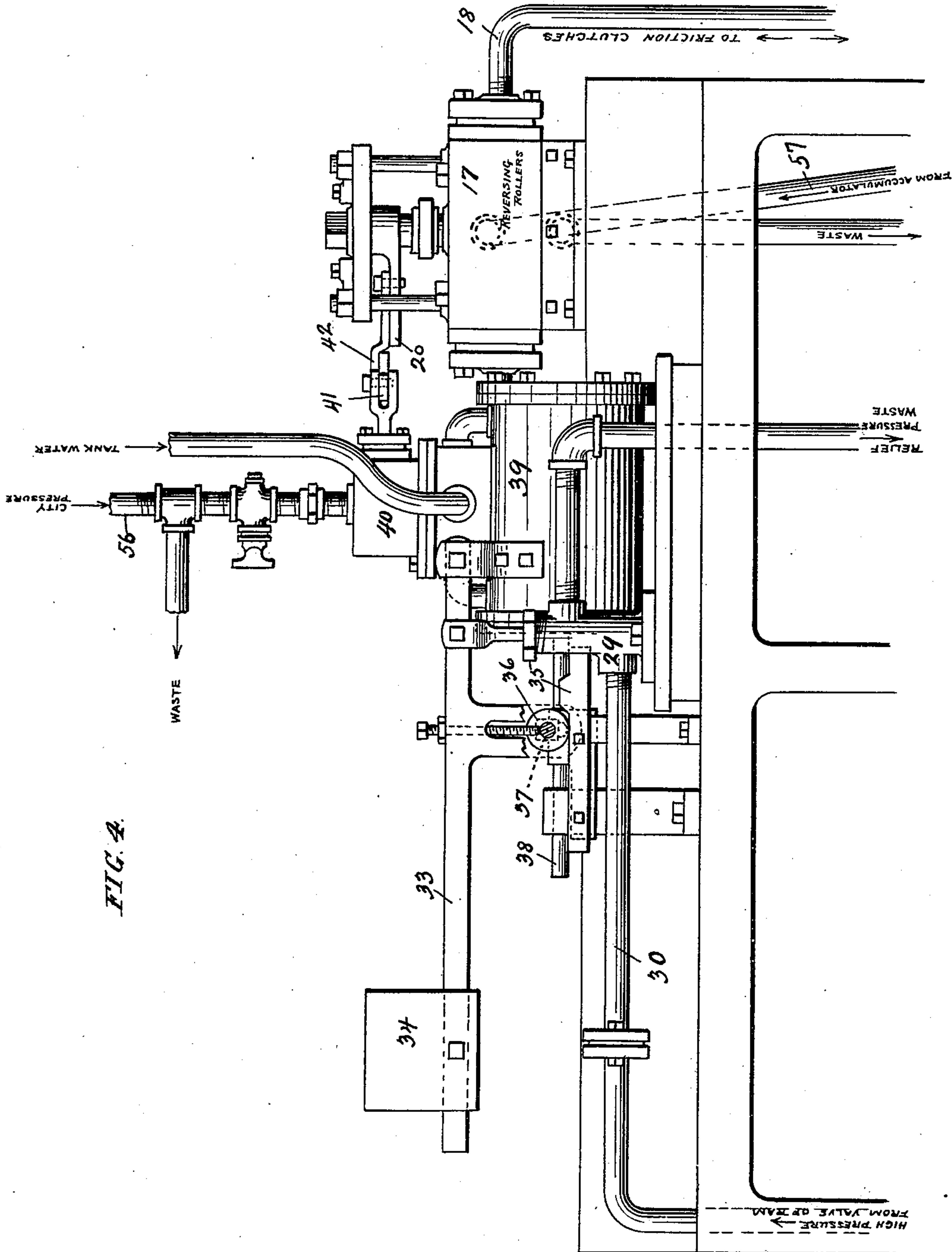


FIG. 4.

WITNESSES:

F. B. Townsend
H. W. Munday

INVENTOR.

John G. Hodgson
BY *Munday, Evans & Adcock*
His ATTORNEYS,

UNITED STATES PATENT OFFICE.

JOHN G. HODGSON, OF MAYWOOD, ILLINOIS, ASSIGNOR TO NORTON BROTHERS, OF CHICAGO, ILLINOIS.

REVERSING ROLLING-MILL.

SPECIFICATION forming part of Letters Patent No. 669,242, dated March 5, 1901.

Application filed October 22, 1900. Serial No. 33,965. (No model.)

To all whom it may concern:

Be it known that I, JOHN G. HODGSON, a citizen of the United States, residing in Maywood, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Reversing Rolling-Mills, of which the following is a specification.

This invention relates to reversing rolling-mills for rolling metal bars, sheets, or packs of sheets.

The object of this invention is to provide a reversing metal sheet, plate, or bar rolling mill of a strong, simple, efficient, and durable construction, by means of which metal bars, plates, sheets, or packs of sheets may be rapidly and successively passed back and forth between the rolls and in which the feed-screws, by which the rolls are set or adjusted closer together as the rolling proceeds, may be operated either by hand or automatically at each reversal of the mill and by diminishing increments after each successive pass, as may be required, and by means of which the feed-screws may at the same time be positively and accurately adjusted and rigidly and unyieldingly held in adjustment.

The invention consists in the means or mechanism employed for practically accomplishing this object or result—that is to say, it comprises in a reversing rolling-mill in co-operative combination with the reversing-rolls friction-clutches and a hydraulic ram for operating the same to reverse the rolls, a reversing valve and valve-lever for said ram, feed-screws for setting or adjusting the rolls closer and closer together, as required, worms and worm-gears for turning the feed-screws by hand, a rack and gears for turning or adjusting the feed-screws automatically, a hydraulic cylinder and piston for operating the rack, a starting-valve for said feed-screw-operating ram operated by a low or city-water pressure cylinder and piston connected to the reversing valve-lever, a stopping-valve for said feed-screw ram automatically operated by a notched register or controlling bar connected to the piston of said ram, the notches in which register or controlling bar are differently spaced to give the required or diminishing increments of motion to the feed-

screws at successive passes, the feed-screw ram having also two further valves for returning its piston and the feed-screw rack and notched bar connected thereto to position by a single continuous movement after each complete rolling operation.

The invention also consists in the novel construction of parts and devices and in the novel combination of parts and devices herein shown and described, and specified in the claims.

In the accompanying drawings, forming a part of this specification, Figure 1 is a front elevation of a reversing rolling-mill embodying my invention, and Fig. 2 is a detail plan showing in diagram the valve and hydraulic pipe system. In these views the reversing feed-tables which are geared or connected to the driven roll by any suitable gearing or connecting mechanism, so as to be reversed with the rolls, are omitted for sake of clearness of illustration. Fig. 3 is an enlarged detail plan view of the valve-table, and Fig. 4 a side elevation of the same.

In the drawings, 8 represents the frame of the machine or mill; 9, the upper roll; 10, the lower or driven roll; 11, its shaft; 12 and 13, friction-clutches for reversing the rotation of the rolls through any suitable gearing or mechanism; 14 and 15, the hydraulic ram which operates the friction-clutches alternately through the connecting-lever 16.

17 is the reversing-valve, connected by the pipes 18 19 with the clutch-ram 15, and 20 is the friction-clutch valve-lever, by movement of which lever the operator reverses the rotation of the rolls as required.

21 22 are the feed or housing screws, by which the rolls 9 10 are adjusted closer together or farther apart, as required. These feed-screws may each be turned or adjusted by hand through the worm 23 and worm-gear 24, with which each is provided for this purpose. They may also be turned or adjusted automatically by means of the gears 25 25 and the rack 26, which meshes with said gears. The worms 23 23 are mounted on the gears 24 24, so that neither means of turning or adjusting the feed-screws interferes with the other. The rack 26 is connected to the piston-

stem 27 of a hydraulic ram 28, by which the feed-screws are automatically operated. This feed-screw-operating ram 28 has a starting-valve 29, which is connected by a pipe 30 with the rear or left-hand end of the ram-cylinder 28, and it also has a stopping-valve 31, which is likewise connected with the rear end of the ram-cylinder 28 by a pipe 32, which is a waste or discharge pipe. The starting-valve 29 has a valve-lever 33, which is furnished with a weight 34, and is operated so as to be momentarily opened by a sliding cam or bar 35, which engages a roller 36, adjustably mounted on the starting-valve lever 33 through the adjusting-screw 37. The cam-bar 35 is connected to the piston-stem 38 of a low or city pressure cylinder 39, the valve 40 of which is connected by a valve-lever 41 with the reversing valve-lever 20 through a detachable link 42, so that the starting-valve of the feed-screw ram may be connected with the reversing valve-lever or not, according as it is or is not desired to operate the feed-screws automatically at each reversal of the mill through the feed-screw ram and the connecting-rack 26 and gears 25 25.

The stopping-valve 31 of the feed-screw ram 28 has a valve-lever 43, furnished with a roller 44 and a weight 45, and is operated by a notched register or controlling bar 46, which is secured to the piston-stem 27 of the feed-screw ram, so as to be reciprocated thereby. The notches 47 in the register or controlling bar 46 are at varying distances apart, being closer together at the right-hand end of the bar than at the left-hand end thereof, so that the feed-screw-operating rack 26 will be moved by diminishing increments at each successive reversal of the rolls as the rolling proceeds. The notched controlling-bar 46 is removably connected to the piston-stem 27 or rack 26 by a pin 48, so that by simply removing one notched bar and replacing it with another having its notches differently spaced any required degree or extent of movement may be automatically given to the feed-screws as may be required.

The feed-screw ram 28 has a combined feed and exhaust or two-way valve 49, connected by a pipe 50 with its forward or right-hand end, and a feed-valve 51, connected by a pipe 52 with the rear or left-hand end of the feed-screw ram 28. The operating-levers 53 54 of the valves 49 51 are connected together by a link 55, so that they are operated simultaneously.

56 is the city or low-pressure water pipe leading to the valve 40 of the low-pressure cylinder 39, by which the starting-valve is operated, and 57 is the pipe leading to the accumulator or hydraulic pump, from which water under pressure is supplied to the hydraulic rams as required through their operating-valves.

The operation is as follows: When the detachable link 42, connecting the reversing

valve-lever 20 and the lever 41, through which the starting-valve of the feed-screw ram is operated, is disconnected, the mill is reversed by the operator moving the reversing-lever 20, which releases one friction-clutch and operates the other through the clutch-ram 15. When thus operated, the feed-screws remain unchanged or unmoved through successive passes and are turned or adjusted as may be required by hand through the worms and worm-gears 23 24. When, on the other hand, the levers 20 and 41 are connected together by the detachable link 42, the low-pressure-cylinder valve 40 is operated, thus causing the starting-valve 29 to be momentarily opened—that is to say, while the cam or projection 35 is passing under the roller 36 on the starting-valve lever 33, the starting-valve lever being closed very soon after it is opened. During the short interval the starting-valve 29 is open the water or other liquid under pressure may flow out from the rear or left-hand end of the feed screw ram cylinder 28 through the relief-pipe 30, which connects with the waste or discharge pipe through the starting-valve 29, and the two-way valve 49 being in its normal position, as illustrated in Fig. 3, the water under pressure flows through the pipe 50 into the forward or right-hand end of the ram 28, thus moving its piston to the left and causing the roller 44 to ride out of the notch 47 in the register or controller bar 46, and thus to open the stopping-valve 31, so that the water may now escape from the rear end of the ram 28 through the waste-pipe 32 until the stopping-valve 31 is again closed, which is automatically done the moment the bar 46 is moved far enough to permit the roller 44 to drop into the next notch, as the controller-bar 46 only holds the stopping-valve 31 open for the space between the notches. The moment the stopping-valve is thus closed the feed-screw ram 28 can give no further movement to the rack 26, because the water cannot escape from the rear end of the cylinder, the starting-valve 29 having been previously closed, as before stated. When it is desired to turn up the feed-screws by withdrawing the rack 26 to the right to its first position, this is done by swinging the levers 53 54 into the reverse position from that indicated in Fig. 3, thus causing the water under pressure to feed into the left-hand end of the ram 28 through the pipe 52 and flow out from the right-hand end thereof through the pipe 50, which the two-way valve 49 now connects with the discharge or waste and disconnects from the water feed or supply pipe leading from the accumulator or hydraulic pump or other source of liquid under pressure. If the operator wishes to turn the rolls down several or all of the notches of the register or controlling bar 46 at once or by one continuous movement to the left, this he may do by simply lifting the weight or holding up the lever 33 of the starting-valve 31, thus keeping the relief or

discharge through the starting-valve open until the feed-screws are turned down to the extent desired.

I claim—

5 1. In a reversing rolling-mill, the combination with reversing-rolls, friction-clutches for reversing the rolls, a hydraulic ram for operating said clutches, a reversing valve and valve-lever for said ram, feed-screws for setting the rolls closer together, a rack and gears for turning the feed-screws, a feed-screw ram for actuating the rack, a notched bar for regulating the movement of the feed-screw-ram piston, a stopping-valve for said feed-screw ram, and a starting-valve for said feed-screw ram, and means connecting said valve with said reversing valve-lever, substantially as specified.

20 2. In a reversing rolling-mill, the combination with reversing-rolls, a hydraulic ram for reversing the rolls, a reversing valve and valve-lever for said ram, feed-screws, rack and gears, a feed-screw ram and a starting-valve for said ram, and connecting mechanism for operating said starting-valve from the reversing valve-lever, substantially as specified.

30 3. In a reversing rolling-mill, the combination with reversing-rolls, a hydraulic ram for reversing the rolls, a reversing valve and valve-lever for said ram, feed-screws, rack and gears, a feed-screw ram and a starting-valve for said ram, connecting mechanism for operating said starting-valve from the reversing valve-lever, a stopping-valve for said feed-screw ram, and means for automatically operating said stopping-valve when the mill is reversed, substantially as specified.

40 4. In a reversing rolling-mill, the combination with reversing-rolls, a hydraulic ram for reversing the rolls, a reversing valve and valve-lever for said ram, feed-screws, rack and gears, a feed-screw ram and a starting-valve for said ram, connecting mechanism for operating said starting-valve from the reversing valve-lever, a stopping-valve and a notched register or regulating bar for automatically operating the stopping-valve, substantially as specified.

50 5. In a reversing rolling-mill, the combination with reversing-rolls, a hydraulic ram for reversing the rolls, a reversing valve and valve-lever for said ram, feed-screws, rack and gears, a feed-screw ram and a starting-valve for said ram, connecting mechanism for operating said starting-valve from the reversing valve-lever, a stopping-valve, a notched register or regulating bar for automatically operating the stopping-valve, and independent valves for said feed-screw ram enabling its piston to be returned to position at one movement, substantially as specified.

60 6. The combination with reversing-rolls, of a hydraulic ram for reversing the same, a valve and valve-lever for said ram, feed-screws, rack and gears, a feed-screw ram, a

starting-valve for said ram, a movable cam or bar for momentarily opening said valve, a low-pressure cylinder and piston for operating said cam or bar, a valve for said low-pressure cylinder, and means connecting said low-pressure-cylinder valve with said reversing valve-lever, substantially as specified.

7. The combination with reversing-rolls, of a hydraulic ram, valve and valve-lever for reversing said rolls, feed-screws, a feed-screw ram and a valve for operating the same connected with the reversing valve-lever, substantially as specified.

8. The combination with reversing-rolls, of a hydraulic ram, valve and valve-lever for reversing the rolls, feed-screws, a feed-screw ram and a valve for operating the same connected with the reversing valve-lever, a stopping-valve for the feed-screw ram and a notched bar for automatically operating the same, substantially as specified.

9. The combination with reversing-rolls, of a hydraulic ram, valve and valve-lever for reversing the rolls, feed-screws, a feed-screw ram and a valve for operating the same connected with the reversing valve-lever, a stopping-valve for the feed-screw ram, a notched bar for automatically operating the same, and independently-operated valves to permit the piston and the feed-screw ram to be returned to position at one movement, substantially as specified.

10. The combination with reversing-rolls, of a hydraulic ram and valve for reversing said rolls, feed-screws, a feed-screw ram, a starting-valve therefor, and connecting mechanism between said starting-valve and the reversing-valve, substantially as specified.

11. The combination with reversing-rolls, of a hydraulic ram and valve for reversing said rolls, feed-screws, a feed-screw ram, a starting-valve therefor, connecting mechanism between said starting-valve and the reversing-valve, said connecting mechanism comprising a cam and lever to cause said starting-valve to be only momentarily opened, substantially as specified.

12. The combination with reversing-rolls, of a hydraulic ram and valve for reversing said rolls, feed-screws, a feed-screw ram, a starting-valve therefor, connecting mechanism between said starting-valve and the reversing-valve, said connecting mechanism comprising a cam and lever to cause said starting-valve to be only momentarily opened, and a low-pressure cylinder and piston for operating said cam, substantially as specified.

13. The combination with reversing-rolls, of a hydraulic ram and valve for reversing said rolls, feed-screws, a feed-screw ram, a starting-valve connected with and operated by the movement of the reversing-valve, and a stopping-valve, and means for automatically operating the stopping-valve to stop the feed-screw ram as required, substantially as specified.

14. The combination with reversing-rolls,
of a hydraulic ram, valve and valve-lever for
reversing said rolls, feed-screws, a rack and
gears for operating the same, a feed-screw
5 ram, a starting-valve, valve-lever, sliding
cam-bar, low-pressure cylinder and piston, a
valve and valve-lever therefor, and a detach-

able connection between said low-pressure
valve-lever and said reversing valve-lever,
substantially as specified.

JOHN G. HODGSON.

Witnesses:

EDMUND ADCOCK,
H. M. MUNDAY.