No. 741,702. PATENTED OCT. 20, 1903.

J. W. OFFUTT.

ROLLING MILL.

APPLICATION FILED AUG. 6, 1902.

NO MODEL.

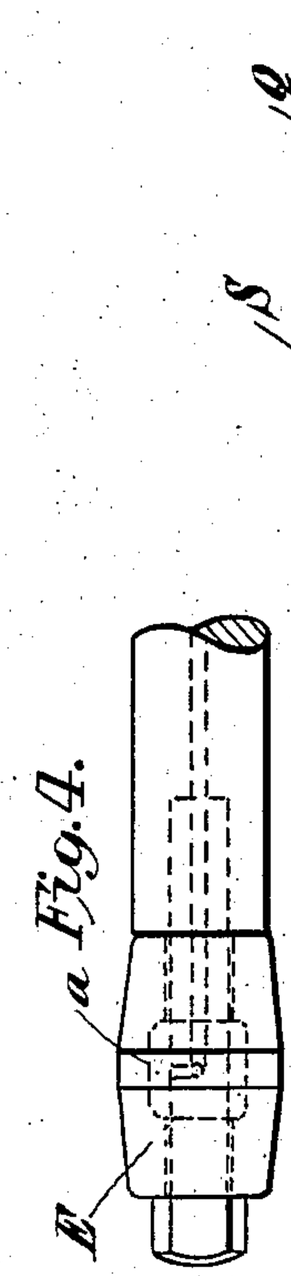

Fig. 4.

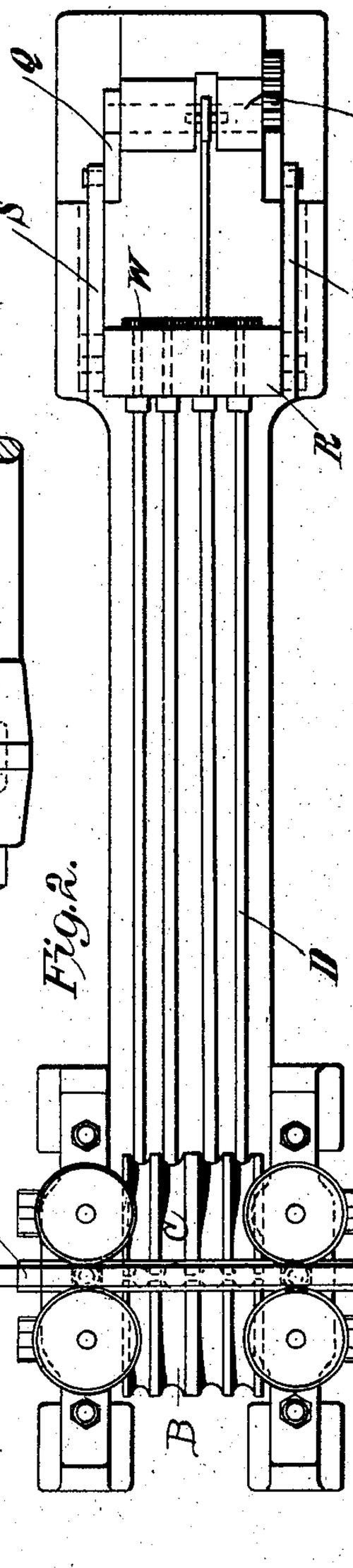

Fig. 2.

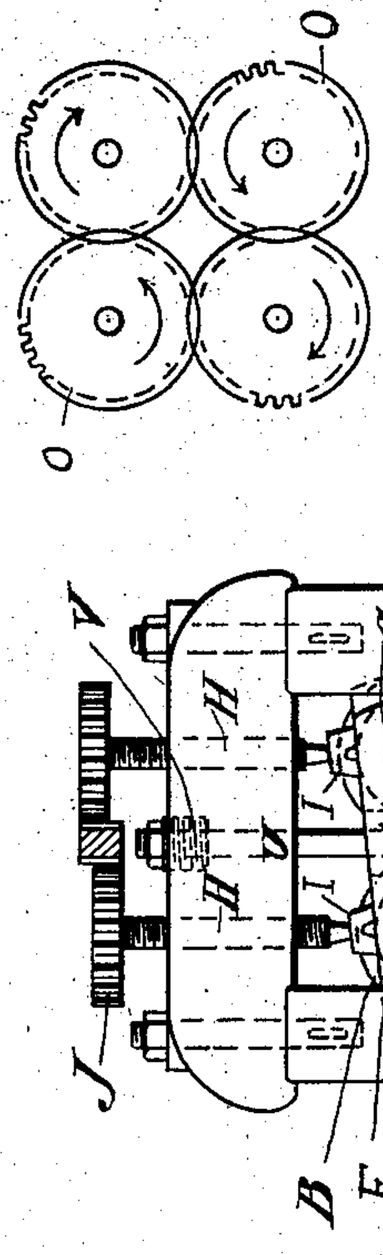

Fig. 3.

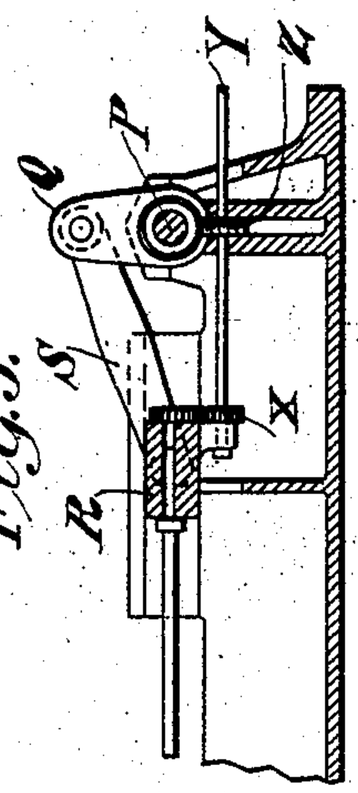

Fig. 5.

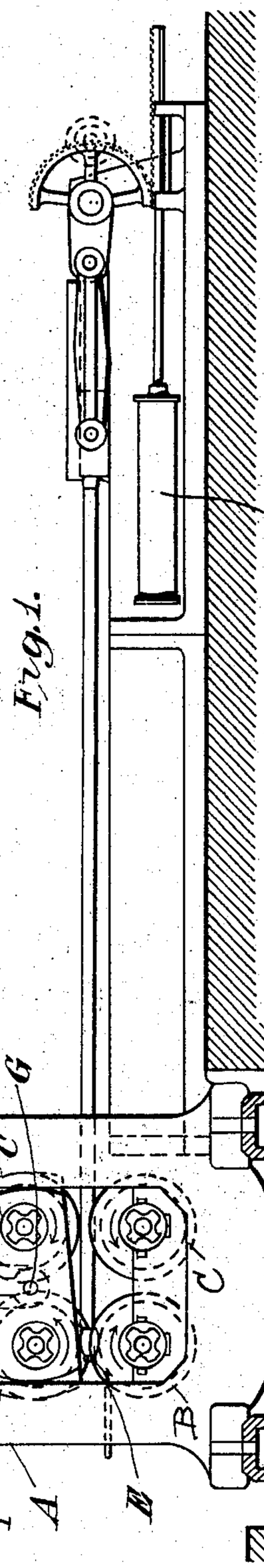

Fig. 1.

Witnesses
Herbert G. Greene
Herbert L. Hopkins

Inventor
John W. Offutt
By Dickerson, Brown, Raegener & Binney
Attorneys.

No. 741,702. Patented October 20, 1903.

UNITED STATES PATENT OFFICE.

JOHN W. OFFUTT, OF ELLWOOD CITY, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO NATIONAL TUBE COMPANY, A CORPORATION OF NEW JERSEY.

ROLLING-MILL.

SPECIFICATION forming part of Letters Patent No. 741,702, dated October 20, 1903.

Application filed August 6, 1902. Serial No. 118,678. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. OFFUTT, a citizen of the United States, residing at Ellwood City, in the State of Pennsylvania, have invented certain new and useful Improvements in Rolling-Mills, of which the following is a specification, accompanied by drawings.

My invention relates to rolling-mills, more particularly to mills for rolling tubular billets; and its objects are to improve upon the construction of such mills and to simplify and cheapen the cost of rolling tubes.

Further objects of my invention will hereinafter appear; and to these ends my invention consists in rolling-mill apparatus for carrying out the above objects and having a general mode of operation substantially as hereinafter fully described and shown in this specification and accompanying drawings, in which—

Figure 1 is a longitudinal side elevation of apparatus embodying my invention. Fig. 2 is a plan view of the same. Fig. 3 is a detail view of the roller-driving mechanism. Fig. 4 is a detail view of the mandrel-cooling connections, and Fig. 5 is a detail view of the mechanism for shifting and rotating the mandrel-bars.

Referring to the drawings, upon a suitable frame A are arranged pairs of rolls B B and C C, as shown, there being two pairs of rolls, and in this instance a plurality of mandrel-bars D are provided for the rolls, each having a mandrel E, as usual, over which the tubular billet is adapted to be passed, the apparatus being adapted for hot-rolling seamless tubes from hollow billets. As shown in the drawings and according to my invention, the sets of rolls B B and C C are arranged in tandem along the line of the billet-pass and means are provided for opening one pair of rolls while closing the other, and this operation may be carried out alternately. In other words, the pairs of rolls may be alternately opened and closed. The sets of rolls are adapted to rotate in opposite directions, so that the billet going through the closed rolls will pass freely through the open rolls, even although they are rotating in opposite directions.

In the operation of the apparatus the tubular billet is passed through the closed pair of rolls, as B, the rolls C being open, and then the mandrel bar or bars D are shifted to bring the mandrel E between the open rolls C, which are then closed and the billet run back through the closed rolls.

In order to operate the rolls, suitable means are provided, shown in this instance as rocking frames F, suitably pivoted at G and carrying the upper rolls B C. Means are provided for rocking the frames F, as shown, screw-threaded shafts H extending downwardly through the frame A of the machine and bearing at their lower ends on the bearing-blocks I on the frames F, the upper ends of the shafts being provided with pinions J, meshing with a rack K, connected to be operated by suitable means, as an engine, a portion of the cylinder L only of which is shown in the drawings. Movement of the piston-rod and rack K in one direction will cause vertical movement of the rods H in such manner as to depress one side of the frames F and allow the other to be elevated, the reverse action taking place when the rack K moves in an opposite direction.

Means are provided for balancing one of the upper of the pairs of rolls against the other, the frames F or carrier being hung from the housing-cap of the frame B and, as described, free to turn about the point of support, in this instance the support being a bolt U, provided with a compression-spring V to take up all the slack motion of screws, bearings, and other operative parts. It will be seen that the rolls being supported in this manner are self-balancing.

Suitable means are provided for driving the rolls, in this instance they being driven by four (4) pinions O, arranged as shown in Fig. 3, the power being transmitted by spindles in the usual manner. As seen in Fig. 3, each driving-pinion O meshes with two other driving-pinions, or, in other words, each of the pinions is in gear at two portions of its circumference.

In order to move the mandrel-bars D longitudinally, a driving-shaft P is provided with cranks Q, connected to the cross-head R by

links S, the driving-shaft being connected to be rotated through a half-revolution by means of a steam or air cylinder T or other suitable means. When in a rear or forward position, the cranks are on the dead-center, thus giving a rigid support to the bars. The length of the cranks Q should be substantially equal to one-half of the horizontal distance between the centers of the two sets of rolls, slightly more or slightly less, as the case may be, if it is found that better results may be had by placing the plug or mandrel in advance of or behind the vertical center line of the rolls.

Means are provided for rotating the mandrel-bars D about longitudinal axes, preferably while said bars are being brought to the rear position, a quarter of a turn being given in order that the billet thereon will be in proper position for the return pass. As the bar is drawn back at the same time that it is turned, the turning of the billet will be practically positive. Any suitable means may be provided for turning the bars, as shown, there being gears W at the ends of the bars, which are driven by a gear X on a driving-shaft Y, connected to be driven from the crank-shaft P, as by a worm and wheel Z, the connections being so proportioned that a half-revolution of the crank-shaft P produces a quarter-turn of the bars. The shaft Y is free to slide through its gearing as it travels with the cross-head. The plug or mandrel E being brought to its rear position, the rear rolls C are closed down to their working position, while the front rolls B are opened and the billet is rolled off the bar.

The mandrel-bars and mandrels are provided with cooling means, as shown in the drawings, each mandrel E being provided with a cooling-space or water-space *a*, and connections are provided for forcing cooling liquid within said space and within the mandrel. In this instance the water connections extend through the mandrel-bars D, and a small pressure will cause enough water to fill the space *a* within the mandrel and cause it to escape at each end thereof, thus preventing the mandrel from becoming heated to a high temperature. The fluid may escape at each end of the mandrel by being forced out between the mandrel-bar and mandrel. As shown in Fig. 4, the mandrel does not have an absolutely tight fit upon the mandrel-bar, there being sufficient looseness between the two to afford provision for the escape of the fluid between the mandrel and the bar.

I do not herein claim the improvements relating to the form of mandrel and mandrel-bar, as this is not proper subject-matter to be claimed in this case, together with the remaining claims; but I reserve the right to make a separate application for said subject-matter at a future date.

Obviously some features of my invention may be used without others, and my invention may be embodied in widely-varying forms.

Therefore, without enumerating equivalents nor limiting myself to the construction shown and described, I claim, and desire to obtain by Letters Patent, the following:

1. In a rolling-mill, the combination of two sets of rolls rotating in opposite directions, a mandrel-bar and mandrel and means for operating the same, and means for opening one set of rolls and simultaneously closing the other set, for substantially the purposes set forth.

2. In a rolling-mill, the combination of two sets of rolls rotating in opposite directions, a mandrel-bar and mandrel, and means for moving the mandrel from one set of rolls to the other, and operative means connected to automatically open one set of rolls and simultaneously close the other set, for substantially the purposes set forth.

3. In a rolling-mill, the combination of sets of rolls rotating in opposite directions arranged in tandem along the line of the billet-pass, a mandrel-bar and mandrel and means for moving the mandrel from one set of rolls to the other and for holding it in position, and means for opening one set of rolls while closing the other, substantially as set forth.

4. In a rolling-mill, the combination of sets of rolls, means for opening one set of rolls and simultaneously closing the other set, a mandrel-bar, means for moving the said bar from one set of rolls to another, and means for turning the bar about its longitudinal axis, for substantially the purposes set forth.

5. In a rolling-mill, the combination of sets of rolls, means for opening one set of rolls and simultaneously closing the other set, a mandrel-bar, and means for shifting said bar from one set of rolls to another and means for simultaneously turning it about a longitudinal axis, for substantially the purposes set forth.

6. In a rolling-mill, the combination with the frame, of two pairs of upper and lower rolls arranged in tandem along the line of the billet-pass, and operative connections between the upper rolls pivoted for movement relatively to the frame, whereby one roll is balanced by the other during rolling, for substantially the purposes set forth.

7. In a rolling-mill, the combination of two pairs of rolls arranged in tandem along the line of the pass, and a driving-pinion for each roll, each of said pinions meshing with two other of said driving-pinions, substantially as set forth.

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

JOHN W. OFFUTT.

Witnesses:
H. M. CRESSWELL,
L. ROELOFS.