E. H. BIRNEY.

REPEATER.

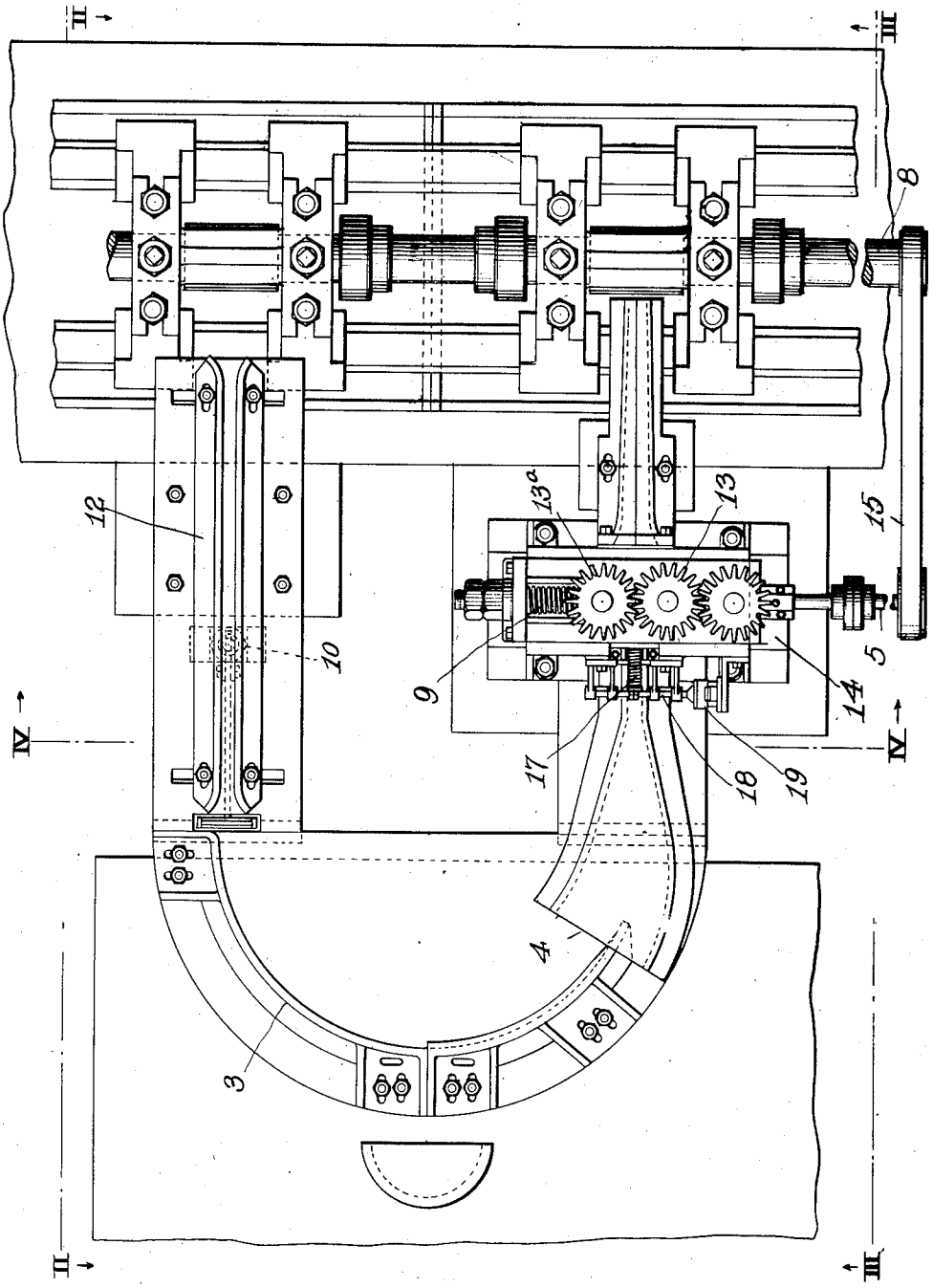
APPLICATION FILED OCT. 6, 1910.

1,046,950.

Patented Dec. 10, 1912.

4 SHEETS—SHEET 1.

FIG. 1.



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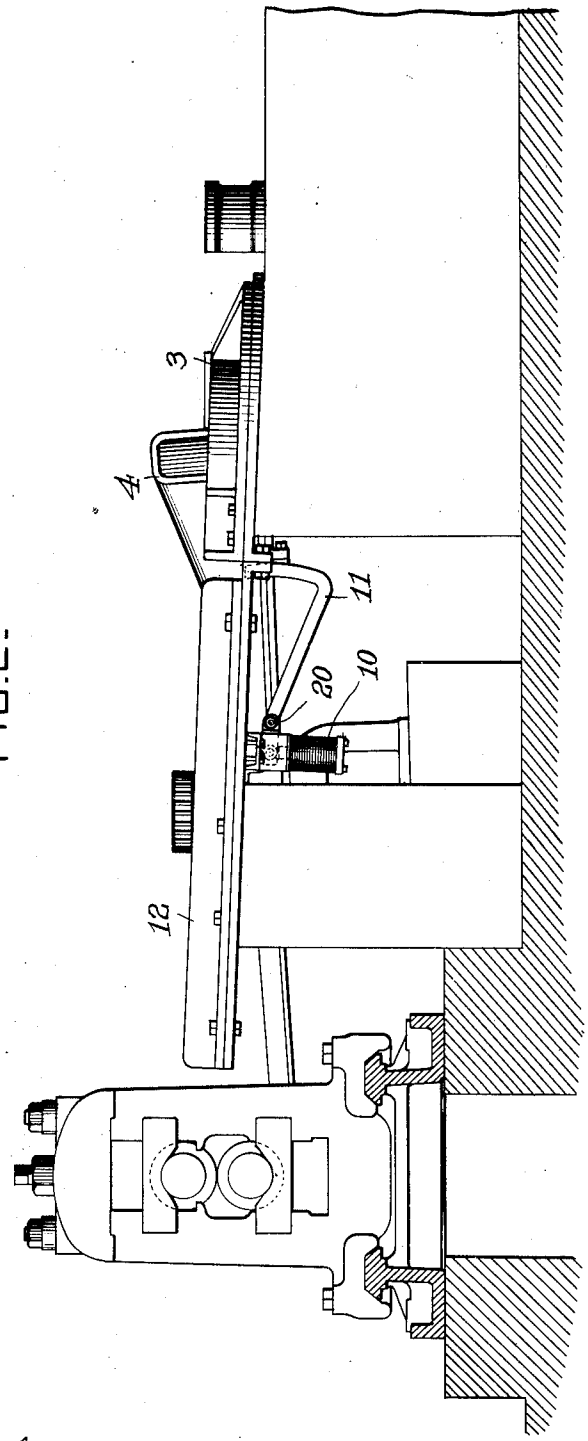

FIG. 2.

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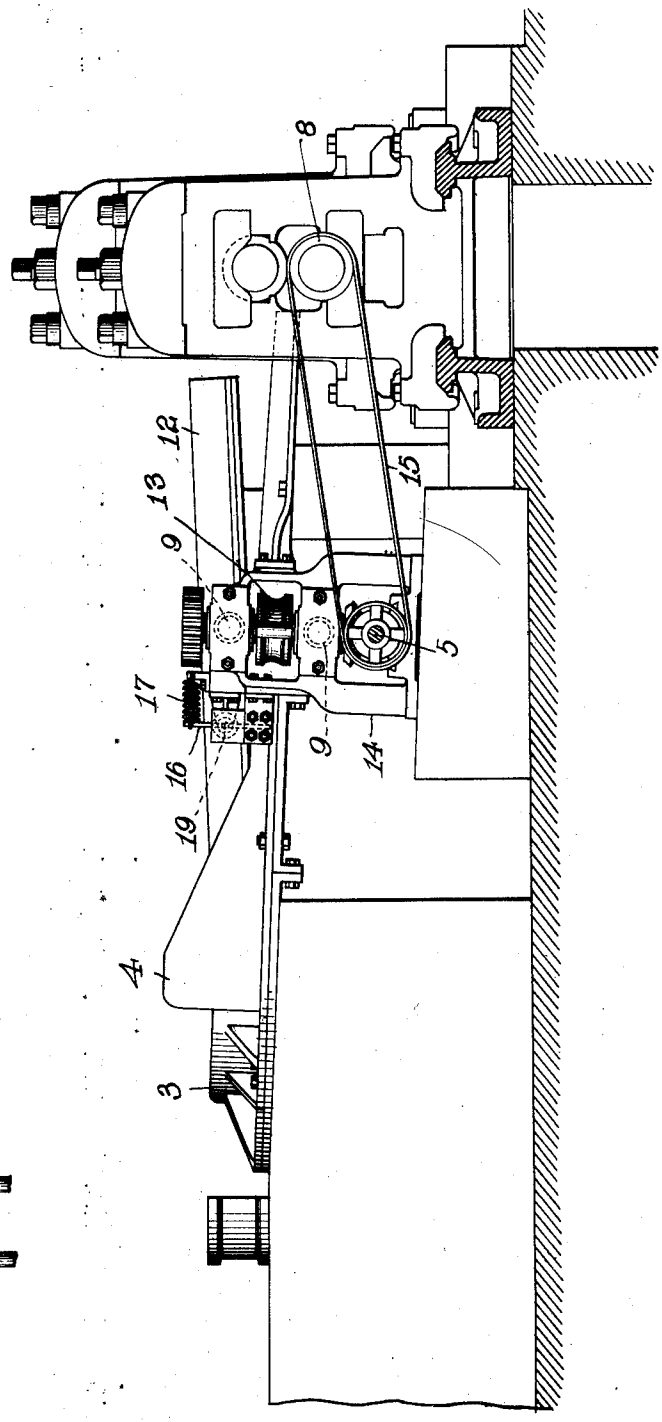

FIG. 3.

FIG. 6.

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4 SHEETS—SHEET 4.

FIG. 4.

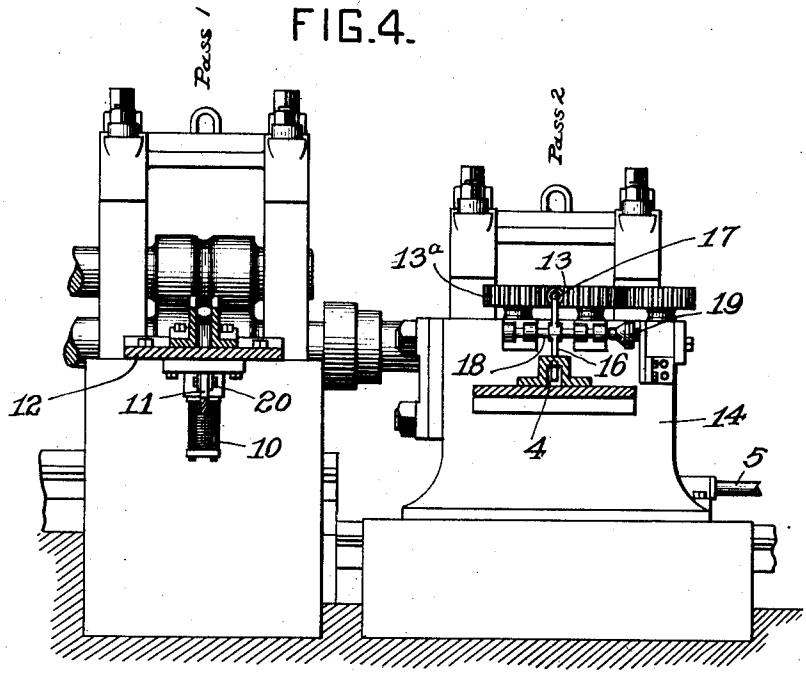
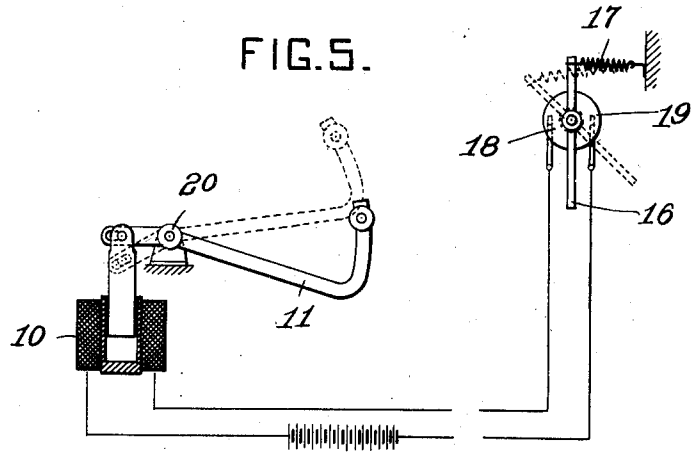


FIG. 5.



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UNITED STATES PATENT OFFICE.

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REPEATER.

1,046,950. Specification of Letters Patent. Patented Dec. 10, 1912.

Application filed October 6, 1910. Serial No. 585,682.

To all whom it may concern:

Be it known that I, EMMET H. BIRNEY, residing at Pittsburgh, in the county of Allegheny and State of Pennsylvania, a citizen of the United States, have invented or discovered certain new and useful Improvements in Repeaters, of which improvements the following is a specification.

My invention relates to repeaters used in connection with rolling mills.

More particularly my invention has to do with directing the course of the material, when elliptical, diamond shaped, or otherwise elongated in cross-section, as it passes from one pair of rolls through the repeater to the next pair of rolls, and the object of my invention is to provide a mechanically operated means for thus directing the course of such material.

In the accompanying drawings, which form part of my specification, Figure 1 is a plan view of two pairs of rolls and a repeater between them, embodying my invention; Fig. 2 is a transverse section taken on the line II—II, Fig. 1; Fig. 3 is a transverse section taken on the line III—III, Fig. 1, looking in the opposite direction; Fig. 4 is a section taken on the line IV—IV, Fig. 1; Fig. 5 shows diagrammatically the electrical connections; and Fig. 6 shows a modification in the form of the directing rolls.

My invention, though broadly applicable to rolling mills for material of any kind, finds application in steel rolling mills.

In the following description of my invention in its application to steel rolling mills the term "material" is used as meaning the hot steel that is being rolled, ordinarily in the shape of bars or rods, and "repeater" is used to designate the troughs and guards taken together, which in this case divert the path of the material through an angle of 180 degrees.

For illustrative purposes I will call the set of rolls from which the material issues "pass 1" and the rolls into which it is directed "pass 2." However it will be understood that my invention is applicable to a repeater between any two passes, and is particularly desirable where, in pass 1, the material has been given an elliptical, diamond-shaped, or other elongated cross-sectional form. It is in connection with such a pass that I particularly choose to describe my invention.

The material issues from pass 1 elongated in cross section with its long axis horizontal, passes through the trough 12, and strikes the guard 3 which directs its course of travel into the trough 4. The trough 12 and the guard 3 may be of any suitable form and material to accomplish the directing of the material into the anterior end of the trough 4, which is preferably made of cast iron, and of such an interior contour as will bring the material into the proper position for the grasp of the directing rolls 13 and 13^a.

The directing rolls 13 and 13^a which it will be understood do not bear against the material with sufficient pressure to accomplish any rolling of the steel, are preferably mounted in a cast iron housing 14 with their axes normal to the axis of the rolls in pass 2. The directing rolls may be actuated in any convenient manner. Preferably they are actuated by a suitable connection to the shaft 8 of the main rolls. As shown in Figs. 1 and 3 the said directing rolls are connected to the shaft 8 by a belt 15 which drives the shaft 5, which in turn, by a suitable arrangement of gear wheels, shown in Figs. 1 and 3, causes the directing rolls to feed the material into pass 2 at a predetermined rate relative to the speed of the main rolls. The form given to the periphery of each directing roll 13 and 13^a will be determined by the cross-sectional form of the material.

As shown on Fig. 3 the rolls are grooved to receive material of elongated cross-sectional form and direct it into pass 2 with its long axis vertical. In Fig. 6 is shown a form of directing rolls particularly adapted to be used in connection with the rolling of flats. Furthermore, in order to accommodate a variation in cross section of the material, the roll 13^a is conveniently mounted against the springs 9, thus giving the said roll opportunity to move laterally with respect to the engaged material.

As the rolling of a piece of steel progresses, it is well known that the steel elongates and that with rolls of the same diameter and driven at the same speed a greater time is required for a given piece of steel to go through each successive pass than the one immediately before it. This being the case, where a repeater is used, it will be apparent that so long as the material is engaged by both passes there will be a gradual increase in the length of the loop between

these passes which would cause its buckling were it allowed to remain in the path set by the guard. To prevent this buckling I provide a suitable arrangement for automatically disengaging the material from the guide, at practically the same time its anterior end reaches the directing rolls, and for keeping said material from being again engaged by the guide. Preferably I accomplish this by providing a lever 16 rigidly fixed to the rotary shaft 18. One end of the said lever lies in the path of the material, as it passes through the trough 4, and the other end is attached to the spring 17, which spring keeps the said lever normally in a vertical position. On one end of the shaft 18 is an electric circuit switch 19, arranged in such a way that when the lever is in its normal position, namely vertical, the circuit will be broken, but when it is deflected by the passage of the material the circuit will be closed. In this circuit I place an electro-magnet 10, shown in Figs. 1, 2, 4, and 5, which will be active or inactive as the circuit is complete or broken. With the said magnet I suitably arrange a lever 11, fulcrumed at 20, so that when the magnet is active, the arm of said lever which is more remote from the magnet will rise and, the parts having been suitably adjusted, cause the material to be thrown above the guards, hence away from engagement thereby. It will be understood that the lever 11 will remain in this position until the posterior end of the material has passed beyond the lever 16, thereby keeping the material from engagement by the guards.

It will be observed of my invention that the material between the two passes wherein the repeater is used is directed mechanically through its entire traverse, and that the mechanism is operated automatically. Also it will be observed of my invention that by varying the shape of the directing rolls as described in the specification, I may cause a bar which is of any preferred shape in cross section to enter the second pass in any desired position.

I claim herein as my invention:

In a rolling mill, the combination of two roll passes, a repeater extending from the delivery side of one of said roll passes to the receiving side of the second of said roll passes, and a pair of power driven directing rolls arranged between said repeater and said second roll pass, substantially as described.

In testimony whereof, I have hereunto set my hand.

EMMET H. BIRNEY.

Witnesses:

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PAUL N. CRITCHLOW.