Aug. 20, 1940. W. C. McBAIN ET AL 2,211,981

APPARATUS FOR COOLING AND GUIDING STRIP

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Fig. 1.

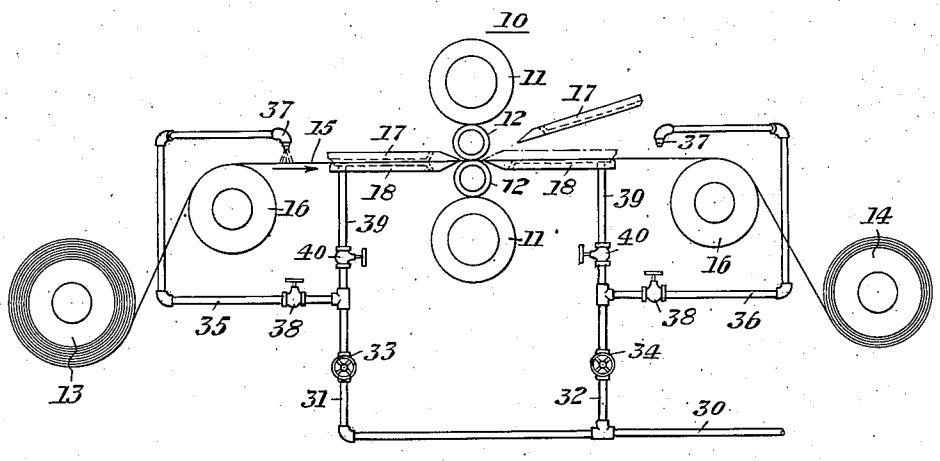
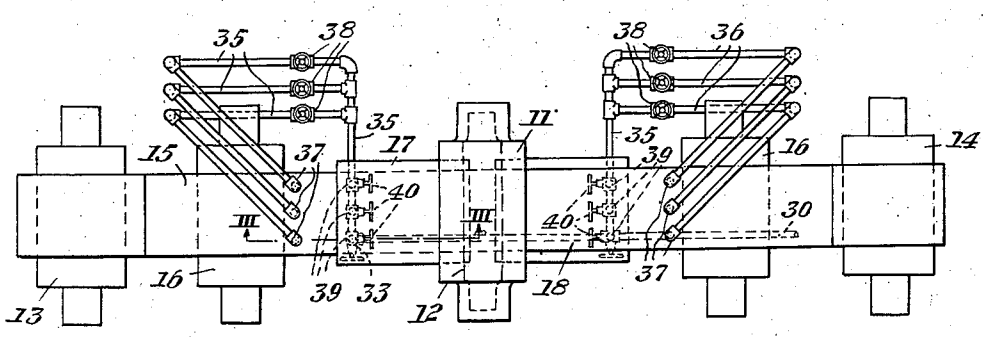


Fig. 2.



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Fig. 3.

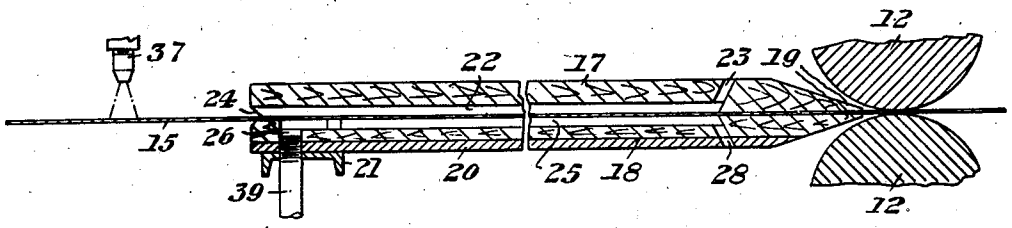


Fig. 4.

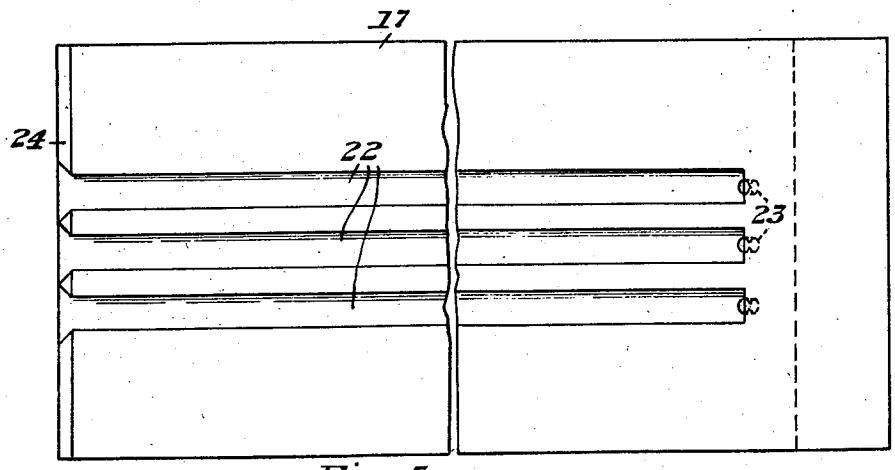
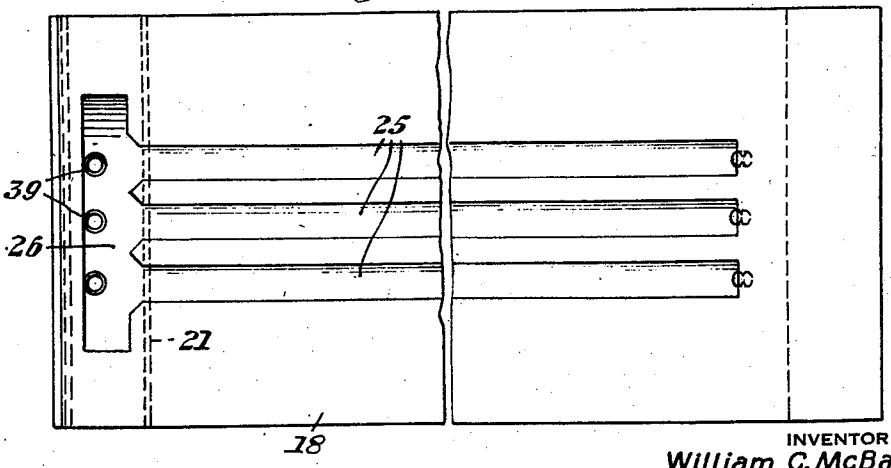


Fig. 5.



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APPARATUS FOR COOLING AND GUIDING STRIP

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Application November 24, 1937, Serial No. 176,234

1 Claim. (Cl. 80—51)

This invention relates to apparatus for cooling and guiding strip and is useful particularly in connection with the cold rolling of metal strip to reduce it to the desired thickness.

In the cold rolling of strip as now carried on, a considerable amount of heat is generated in the strip by reason of the work exerted thereon in reducing its thickness. It is undesirable that this heat be permitted to accumulate in the strip or the rolls of the mill in which the reduction is being carried on and it is an object of this invention to provide simple yet effective means for removing from the strip any heat generated thereon during rolling, and at the same time to guide the strip accurately into the pass between the mill rolls.

It has been the practice heretofore to spray the strip and rolls during rolling with a coolant such as oil or water or a combination of both. The use of sprays is in many cases objectionable on account of the splash and mist thrown off into the air. When the flow of coolant is reduced in order to cut down the excessive splash and mist thrown off the mill, the mill cannot be operated at its maximum speed. We have invented a novel apparatus for cooling and guiding strip as it enters a rolling mill which overcome the objections to the previous practice and, in particular, permit the mill to be operated at a speed greater than that which has been deemed desirable heretofore.

In accordance with our invention we provide guides in the shape of substantially flat members adapted to engage opposite sides of the strip and elongated in the direction of travel of the latter. In one or both of these guides we provide longitudinal channels and means for circulating a coolant therethrough. A complete understanding of the invention may be obtained from the following detailed description referring to the accompanying drawings illustrating a present preferred embodiment and practice. In the drawings:

Figure 1 is a diagrammatic view showing the apparatus of our invention in side elevation in connection with a rolling mill;

Figure 2 is a corresponding plan view;

Figure 3 is a sectional view taken along the line III—III of Fig. 2;

Figure 4 is a bottom plan view of the top guide showing part of our invention; and

Figure 5 is a plan view of the bottom guide.

Referring now in detail to the drawings, our invention is adapted to be utilized in connection with a rolling mill indicated generally at 10. While the mill may be of any desired type, we have illustrated diagrammatically a 4-high mill having backing rolls 11 and work rolls 12. These rolls are journaled in bearings adjustably supported in housings in the usual manner. Reels 13 and 14 on opposite sides of the mill 10 are adapted to serve alternately as unwinding and winding up reels for feeding strip 15 through the mill. Guiding sheaves 16 cooperate with the reels, the tangent common to the sheaves and the work rolls defining what is known as the pass line of the mill.

Top and bottom guides in the form of blocks 17 and 18 are disposed on both sides of the mill. The top guides 17 are preferably movable out of operative position as shown at the right in Fig. 1, to permit the strip issuing from the mill to pass freely onto the winding up reel 14. The guides 17 and 18 are more clearly shown in Figs. 3 through 5. They are preferably made of wood and comprise elongated members having flat-wise engagement with opposite sides of the strip. The ends of the guides adjacent the mill are bevelled so that the tips 19 thereof may extend into the space between the work rolls 12. The bottom guide 18 is supported on a plate 20 and a cross piece 21 extending between the mill housings. The top guide 17 is movably supported as before indicated, by any convenient means adapted to cause it to engage the strip with the desired pressure.

The top guide 17 is provided with a plurality of grooves or channels 22. The channels 22 extend inwardly from the end of the guide remote from the mill and terminate short of the end adjacent the mill. Discharge passages 23 communicate with the channels 22. The end of the guide 17 remote from the mill is bevelled as at 24.

The bottom guide 18 has grooves or channels 25 corresponding to the channels 22 of the top guide. The channels 25 terminate at the end of the guide 18 remote from the mill in a well 26. Coolant supply pipes communicate with the well 26 and discharge passages 28 communicate with the ends of the channels 25 adjacent the mill.

The coolant supply system is best shown in Figs. 1 and 2. A main supply pipe 30 has branches 31 and 32 for supplying coolant to opposite sides of the mill. Valves 33 and 34 in these branches permit coolant to be supplied to one side of the mill or the other, as desired. From the branches 31 and 32, connections 35 and 36 extend to nozzles 37 disposed above the pass line, adapted to discharge coolant on the strip entering the mill. Valves 38 in the connections 35 and 36 permit

the flow of coolant to the nozzles to be individually controlled. Connections 39 extend from the branches 31 and 32 to the wells 26 in the bottom guides 18. Valves 40 permit individual control of the flow through each of the connections 39.

In the operation of the apparatus described, the valve 33 is opened when the strip is moving from the reel 13 to the reel 14 and the valve 34 is closed. The top guide 17 on the entering side of the mill is moved into engagement with the strip as shown in Fig. 1, while the top guide on the other side is retracted. Under these conditions, cooling fluid is discharged onto the upper surface of the strip 15 as it moves from the reel 13 toward the mill. The coolant discharged by the nozzles 37 moves with the strip toward the guides 17. On reaching the guides, the coolant enters and passes into the channels 22 wherein it is confined for further movement with the strip toward the mill. Since the coolant is intimately in contact with the strip during this period, a highly effective cooling action occurs. On reaching the ends of the channel 22, the coolant passes out through the discharge passages 23 and is returned to a sump for recirculation. It will be understood that the movement of the strip toward the mill causes the coolant discharged thereon to move through the channels 22 and finally out of the passages 23. In other words, the movement of the strip under the coolant causes the latter to build up a slight velocity head.

Similarly coolant is supplied through the connections 39 to the well 26 in the bottom guide 18 whence it flows along the channels 25 and out through the passages 28. The valves 38 and 40 permit variation in the amount of coolant supplied to the several portions of the width of the strip.

On reversing the direction of movement of the strip, the positions of the top guides 17 are reversed, the valve 33 is closed and the valve 34 opened. The operation and effect of the cooling and guiding apparatus is the same in the reverse direction as in the case of the first pass previously described. In this manner the material is given the number of passes through the mill necessary to reduce it to the desired thickness, after which the succeeding coil of strip may be similarly treated.

The coolant we prefer to employ is lubricating oil, and we have found that our invention makes it possible to employ a heavier oil than has been practical heretofore with the result that greater protection against rusting of the finished strip is provided. A further advantage of the invention is that it has made possible an increase of at least 10% in permissible rolling speeds. It will be apparent that the inventian provides simple yet effective means for cooling and guiding for the strip entering the mill, thus avoiding accumulation of heat or building up of temperature in either the strip or the mill rolls. We thus avoid overheating of the mill rolls and changes in the shape of the pass incident thereto. The material produced on mills equipped with our invention is thus characterized by a superior flatness and freedom from gauge variations across the width of the strip.

Although we have illustrated and described but a preferred form and practice of the invention, it will be understood that changes in the construction and operation disclosed herein may be made without departing from the spirit of the invention or the scope of the appended claims. Instead of discharging cooling fluid on top of the strip from the nozzles 37, for example, the top guides may be made like the bottom guides and coolant delivered directly to the longitudinal channels thereof.

We claim:

Apparatus for guiding strip into a rolling mill and cooling it prior to entry into the mill, comprising a pair of substantially flat guides adapted to engage the strip surfaces flatwise, said guides being elongated in the direction of travel of the strip, the surfaces of said guides adjacent the strip having longitudinal grooves therein, and means for circulating coolant through said grooves.

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