

Dec. 20, 1938.

L. C. STEELE

2,140,860

POLISHER FOR ROLLING MILLS

Filed March 11, 1937

4 Sheets-Sheet 1

Fig. 2.

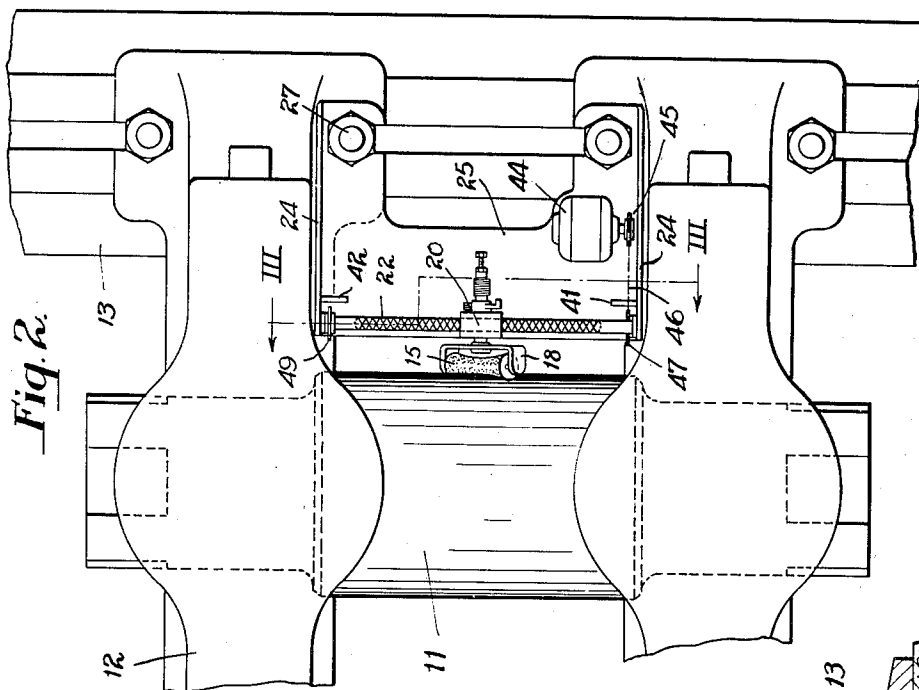
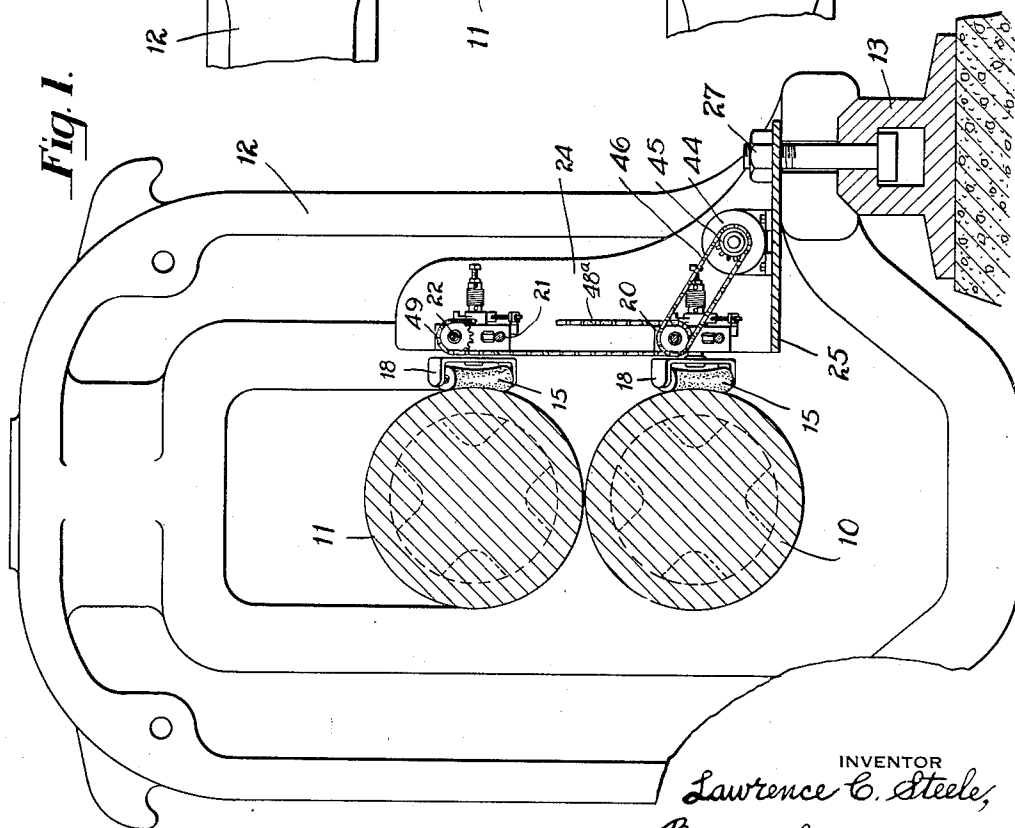


Fig. 1.



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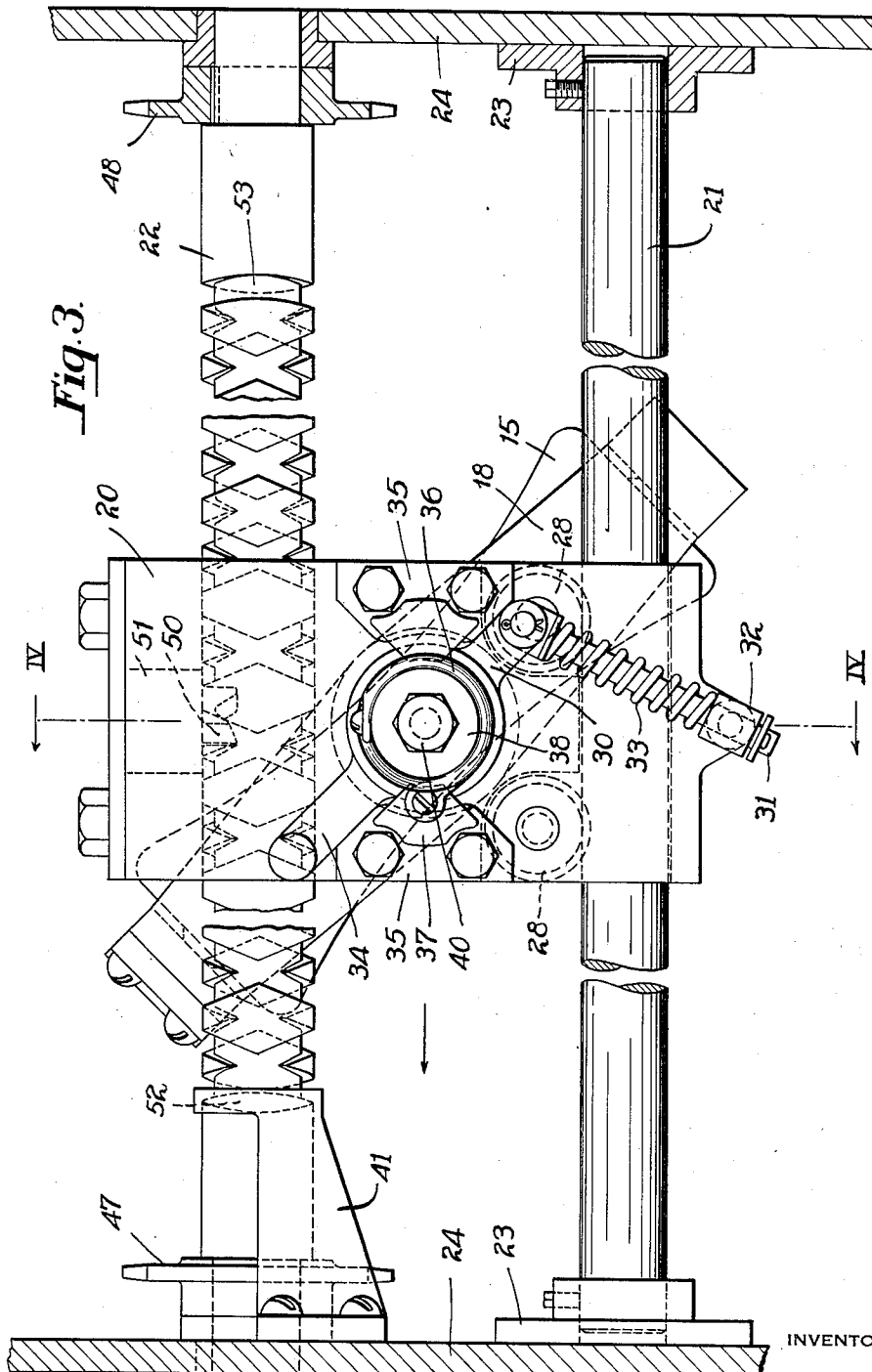
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4 Sheets-Sheet 2



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Fig. 5.

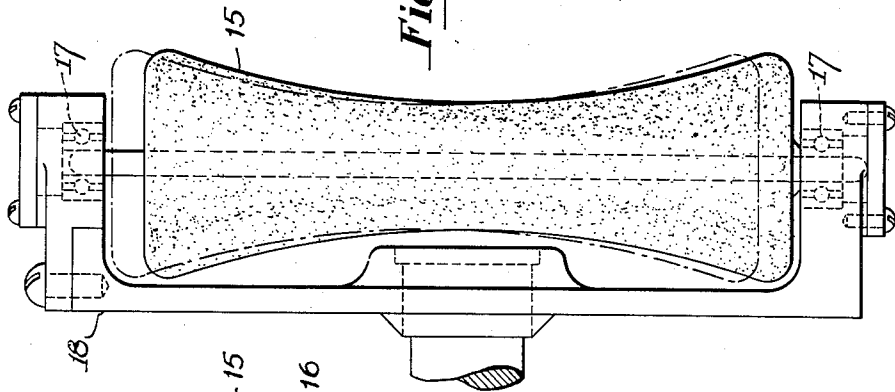
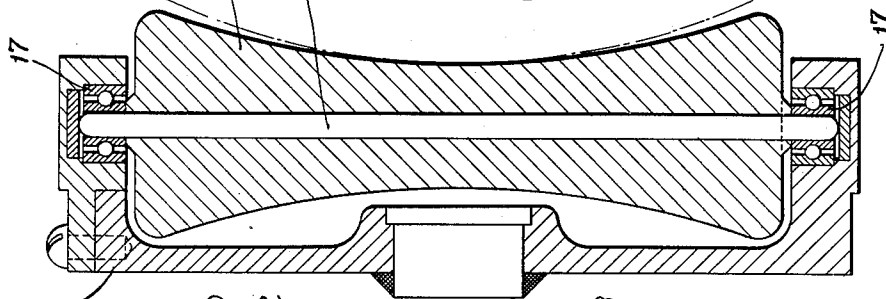
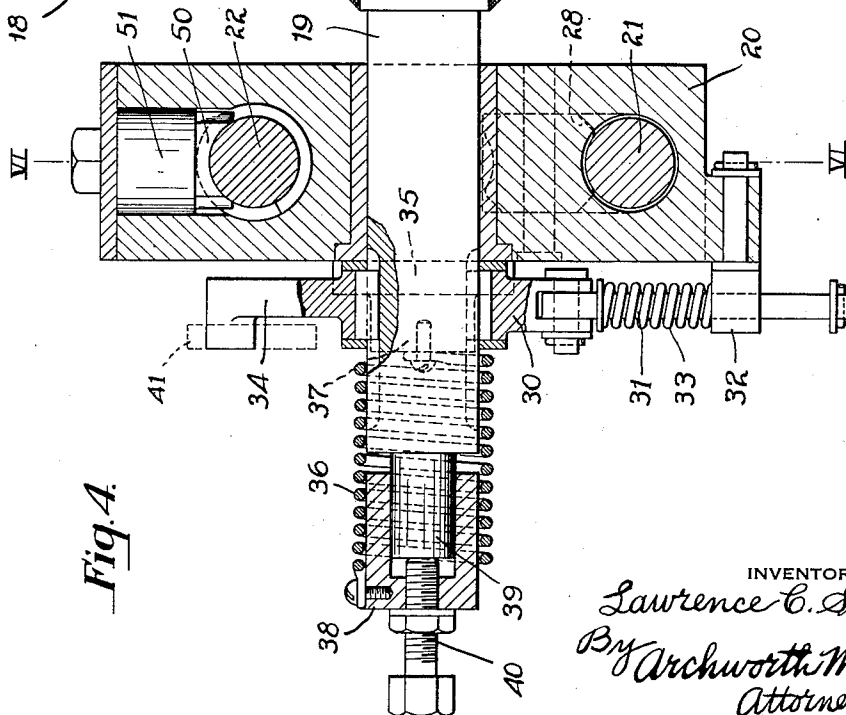


Fig. 4.

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4 Sheets-Sheet 4

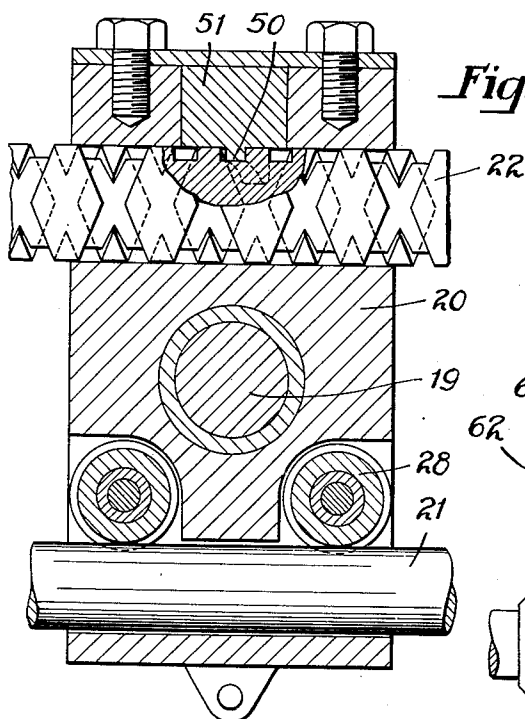


Fig. 6.

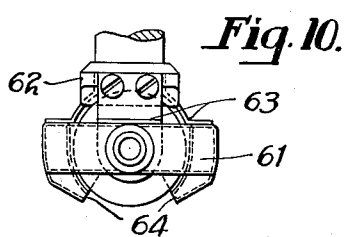


Fig. 10.

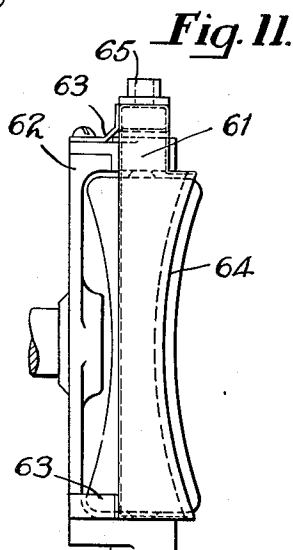


Fig. 11.

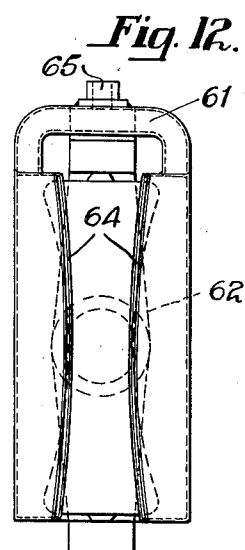


Fig. 12.

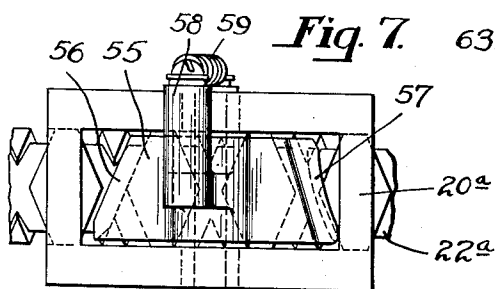


Fig. 7.

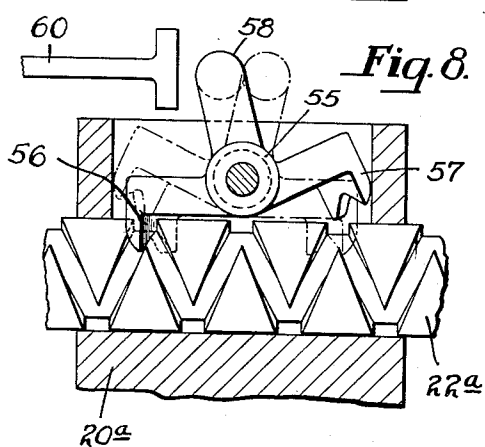


Fig. 8.

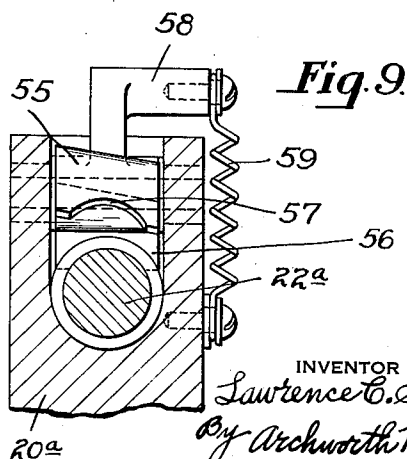


Fig. 9.

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UNITED STATES PATENT OFFICE

2,140,860

POLISHER FOR ROLLING MILLS

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Application March 11, 1937, Serial No. 130,361

8 Claims. (Cl. 51—254)

My invention relates to roll polishing apparatus, and more particularly to apparatus for polishing plain cylindrical rolls employed in rolling mills in the rolling of metal.

One object of my invention is to provide apparatus for maintaining the rolls of a rolling mill in working condition during operation of the mill, for such periods as to materially reduce the need for their removal from service for subsequent dressing operations.

Another object of my invention is to provide a roll polisher of such form that it will be effective to maintain the rolls free of scale and other foreign matter, and will be substantially self-cleaning.

Another object of my invention is to provide means for preventing rapid wear and self-contamination of the roll polishing element.

A further object of my invention is to provide a roll polishing apparatus of generally simplified and improved form.

Some of the forms which my invention may take are shown in the accompanying drawings, wherein Figure 1 is a sectional view of a rolling mill taken transversely through the rolls; Fig. 2 is a plan view thereof; Fig. 3 is a view on an enlarged scale taken on the line III—III of Fig. 2; Fig. 4 is a sectional view taken on the line IV—IV of Fig. 3; Fig. 5 is a side elevational view of the polishing element for the upper roll; Fig. 6 is a view taken on the line VI—VI of Fig. 4; Fig. 7 is a plan view showing a modified form of mechanism for effecting reversals of the direction of traveling movement of the polisher longitudinally of the rolls; Fig. 8 is a vertical sectional view thereof; Fig. 9 is a transverse sectional view thereof; Fig. 10 is a plan view of a modified form of the roll polishing element, and Figs. 11 and 12 are side and face views respectively thereof.

Referring more particularly to Figs. 1 to 6, I show the polishing apparatus in cooperative relationship with a pair of rolls 10 and 11, that are journaled in the roll stands or housings 12, the housings 12 being supported on the girders 13 in the usual manner. The upper roll 11 is journaled for movement toward and away from the lower roll 10, and both rolls are adapted to be driven in a manner well known to the art.

Associated with each of the rolls 10 and 11 is a roll polishing element or wheel 15, that is supported for traveling movement back and forth in directions longitudinally of the rolls. As shown more clearly in Fig. 4, each of the polishing wheels is mounted on a shaft 16 that

is journaled at its ends in bearings 17 carried by a supporting yoke 18. The yoke 18 is rigidly secured to a shaft 19 that is journaled in a slide block 20. The block 20 is slidably supported on a guide rod 21 and also has slidable engagement with a screw shaft 22. The guide rod 21 is supported at its ends in bushings 23 secured to upright wing portions 24 of a base plate or bracket 25.

As shown in Fig. 5, the span of the yoke 18 for the polishing element 15 of the top roll 11 is such as to permit limited movement of the polishing element and its shaft 16 in axial directions, as shown in dotted lines, so that the polishing element 15 will automatically follow the movements of the top roll 11 and accommodate itself to the vertical position thereof.

The supporting bracket 25 is mounted on the flanges of the housings 12 and is securely held therebetween by means of the hold-down bolts 27, with the wing portions 24 disposed adjacent to the inner faces of the roll housings. The screw shaft 22 is journaled at its ends in the wings 24 and is disposed in parallelism to the guide rod 21, the guide rod 21 and the screw shaft 22 each being disposed in parallelism with the axis of its adjacent roll, so that movement of the slide block 20 along the guide rod 21 and the screw shaft 22 will move the polishing wheel longitudinally of the roll. Antifriction guide rollers 28 are rotatably journaled in the slide block 20 for supporting the block for movement on the rod 21.

A lever arm 30 is mounted on the shaft 19 and has key connection therewith to effect rocking movements of the shaft while permitting the shaft to slide relative thereto in axial directions. The lever arm 30 has pivotal connection with one end of a link 31 that slidably extends through a block 32 which is pivotally secured to the lower side of the block 20. A spring 33 is carried by the link 31 and is interposed between the end of the lever 30 and the block 32, the lever and link forming a toggle joint. The lever 30 is provided with an upwardly projecting arm 34 by means of which the lever and the shaft 19 are turned on its axis. Abutment blocks 35 are secured to the slide block 20 in position to be engaged by the lever 30, and serve as stops to limit movement of the toggle under influence of the spring 33 in both directions of movement of the toggle. The shaft 19, of course, has a range of rotary movement within the limits prescribed by the stops 35.

The polishing wheel 15 is normally maintained

in an oblique position with relation to the longitudinal axis of the associated roll, for movement in one direction across the longitudinal face of the roll. The polishing wheel is yieldably maintained against the face of the roll by means of a tension spring 36 that has one end secured to a boss 37 formed integrally with one of the stop abutment blocks 35, and its other end fixed to thimble-like member 38 which has telescopic engagement with a reduced end portion 39 of the shaft 19. The tension of the spring 36 is adjusted by means of adjusting screw 40. As the slide block 20 is moved along the rod 21 and the screw shaft 22, as hereinafter described, to move the polishing wheel 15 across the face of the roll, the arm 34 is brought into abutting engagement with a stop 41 that is mounted on the upright wing 24 and causes turning movement of the lever 30 and the shaft 19. When the toggle passes over center, the spring 33 continues the movement of the shaft until the lever 30 engages the opposite abutment 35. This movement results in changing the position of the polishing wheel relative to the longitudinal axis of the roll. Thus, during traversing movement of the polishing wheel in a direction opposite to that just described, the wheel will be maintained in a different oblique position relative to the roll. At the end of such traversing movement, the arm 34 will engage an abutment 42 to reactuate the toggle and cause the polishing wheel to assume its other oblique position.

A motor 44 is mounted on the base plate 25 and through a sprocket wheel 45 and sprocket chain 46 drives a sprocket wheel 47 that is mounted on one end of the screw shaft 22 of the polishing device associated with the lower roll 10. This screw shaft is provided with another sprocket wheel 48 and has a chain driving connection 48a with sprocket wheel 49 mounted on the screw shaft of the polishing device associated with the upper roll 11, whereby these screw shafts are driven substantially in synchronism.

Each screw shaft 22 is provided with a right-hand and left-hand thread and cooperating therewith is a screw follower 50 formed on the under side of a cylindrical block 51, that is rotatably positioned in the upper portion of the slide block 20. The thread follower cooperates with one of the screw threads and causes traversing movement of the slide block 20 in one direction along the screw. At its one end, the left-hand screw thread is connected with the adjacent end of the right-hand thread by means of an annular cam groove or slot 52 (Fig. 3), so that the thread follower 50 will be turned on its axis as it leaves the left-hand thread, and be led into the right-hand thread, thereby reversing the direction of movement of the slide block 20. Similarly, at their other ends, the threads are connected by means of a cam groove or slot 53 to cause the thread follower to be directed into the lead of the left-hand screw thread. It will be understood, of course, that movement of the polishing wheel 15 into opposite angular position with relation to the adjacent roll will have been effected prior to reversal of movement of the slide block 20.

The polishing elements or wheels 15 are preferably formed of "carborundum" or other abrasive materials and are of cylindrical or tubular form with concave faces, the curvature of the concave faces corresponding to the curvature of the adjacent rolls along the oblique line of con-

tact therebetween, so that there will be engagement between the rolls and the polishing elements throughout the entire length of the polishing wheels. It will be seen that due to the oblique or skewed position of the polishing wheels relative to the rolls, there will be a differential wiping action therebetween to effectively clean and polish the rolls and at the same time cause the polishing wheels to be rotated on their axes, thereby continuously presenting fresh polishing surfaces to the rolls. The wiping action between the polishing elements and the rolls, of course, is augmented by the continuous traversing action of the polishing elements longitudinally of the rolls, thereby eliminating excessive wear of the polishing elements. Also, the reversal of the angular position of the polishing elements, relative to the rolls, at the end of each traversing movement, causes reversal of the direction of rotation of the polishing elements through contact with the rolls, which is, therefore, effective to assist in removing scale and other foreign material from the rolls and the polishing elements.

In the operation of the device associated with each roll of the mill, the desired degree of pressure between the polishing element 15 and the body of the roll is effected by tensioning of the spring 36. The polishing wheel 15 is also initially turned about the axis of the supporting shaft 19 to set the axis of the wheel at an oblique or angular position relative to the axis of the roll, the concavity of the wheel being such as to permit rotary movement of the wheel about the axis of the shaft 19 until its face coincides with the curved contour of the adjacent surface of the roll, and is yieldably maintained in this position by the toggle spring 33. In this angular position the concave face of the wheel will be in contact from end-to-end with the side of the roll, and forms an inclined deflecting surface against which foreign matter on the roll impinges and is deflected therefrom. The screw shaft 22 being driven by the motor 44, the screw follower 50 cooperates with the righthand and lefthand threads on the shaft, causing the carrier 20 and the polishing element 15 carried thereby to traverse the length of the roll alternately in opposite directions. During such traversing movement, the lever 34 alternately engages the stops 41-42 to actuate the toggle device 30-31 associated with the shaft 19, thereby automatically turning the shaft 19 and reversing the angular position of the polishing wheel. Since the mill roll is rotated and the carrier 20 continuously traverses the roll, the polishing wheel is subjected to a component of forces causing rotation thereof on its obliquely disposed axis. Due to the concave form of the roll-engaging surface of the wheel, the peripheral speed varies from end-to-end regardless of the rate of rotation, causing a differential wiping action between the roll and the wheel, which serves effectively to clean and polish the roll.

Uniformity of polishing action at points along the roll is assured, regardless of differences or variations in roll diameter because of the fact that the spring 33 permits turning movement of the wheel about the axis of the shaft 19, whereby the concave face of the wheel automatically adjusts itself into coincidence with the curved contour of the roll surface. The polishing wheel engaging the roll along an oblique line with respect to the rotary movement of the roll, presents an angular deflecting surface to scale and

other detritus on the roll. Uniformity of wear of the wheel 15 is assured due to the periodic reversing of its angular position and its direction of rotation.

5 Referring now to Figs. 7, 8 and 9, I show another manner of effecting reversals of movement at the end of each path of travel of the polishing carrier. In this instance, the screw shaft 22a is provided with right-hand and left-hand
10 threads. A rocking lever 55 is pivotally mounted in the carrier block 20a and is provided with projecting arms 56 and 57 having thread-engaging portions formed on their outer ends, each of which is movable alternately into position to co-
15 operate with the right-hand and left-hand threads of the screw shaft. The rocker member 55 is provided with an upwardly projecting arm 58, and has connection with one end of a spring 59, the other end of the spring being secured to the slide block 20a. The upper end of the arm
20 58 is arranged to be disposed over center with respect to the pivotal support for the rocker member 55 when either of the thread-engaging arms 56 and 57 is moved into thread-engaging position. A stop member 60 is suitably supported
25 adjacent to each end to the path of travel of the slide block 20a with which the arm 58 is brought into engagement to rock the member 55 in a direction to move one of the thread-engag-
30 ing arms out of engagement with its thread, and to move the other thread-engaging arm into engagement with the opposite thread of the screw shaft 22a, thereby effecting reversal of traveling movement for the polisher carrier 20a.

35 In Figs. 10, 11 and 12, I show provisions for cooling the polishing wheels and the rolls, by means of steam jets directed against the same, adjacent to the point of contact therebetween. A steam conduit 61 of substantial yoke-like form is mounted on the polishing wheel-supporting
40 yoke 62 by means of brackets 63. The legs of the conduit 61 are provided with outlet nozzles 64 which direct the steam against the rolls and the polishing wheels. Steam is admitted to the conduit from any suitable source through flexible hose connections leading to the steam inlet 65. Since the rolls are operated at approximately 500°
F. it will be seen that the steam blast will be effective to cool both the rolls and the polishing wheels. Also, the steam blast will be effective to carry away particles of scale and other foreign matter loosened from the rolls by the polishing elements.

The polishing apparatus is mounted preferably at the rear or discharge side of the rolls so as not to interfere with the feeding of metal into the rolls.

It will be understood that the base plate 25 which carries the polishing elements and operating mechanisms may be mounted in some other manner than on the roll housings, since it could be attached to a movable wheeled carriage and brought into polishing relation with the rolls whenever desired.

I claim as my invention:

65 1. The combination with a rotatably supported roll having a cylindrical body and means for rotating the roll, of a polishing element disposed in an angular position relative to the axis of the roll and in contact with the body of the
70 roll, means for moving said element longitudinally along the roll in opposite directions, and means automatically actuated at a predetermined point in the path of travel of said element, for changing the angular position of the element relative
75 to the axis of the roll.

2. The combination with a rotatably mounted roll having a cylindrical body and means for rotating the roll, of a polishing element in contact with the body of the roll, means for supporting said element for traveling movement in a path
5 parallel to the axis of the roll, means for automatically reversing the direction of said traveling movement at points adjacent to each end of the roll, means for holding said element in an oblique position relative to the axis of said roll, 10 and means operable at predetermined points during said traveling movements of said element for reversing the oblique position of said element relative to the axis of said roll.

3. The combination with a rotatable roll having a cylindrical body, of a polishing wheel having a concave roll engaging face in contact with the body of the roll at one side thereof, means for supporting said wheel with its axis disposed obliquely to the axis of the roll, means for re-
20 ciprocating said wheel in directions longitudinally of the roll, and means operable periodically during reciprocatory movements of said polishing wheel for changing the oblique position of said wheel relative to the axis of the roll. 25

4. Roll polishing apparatus comprising a carrier, means for supporting the carrier, means for reciprocating the carrier in directions length-
wise of a roll, a shaft journaled on the carrier, a yoke on the forward end of the shaft, a polish-
30 ing element rotatably mounted in said yoke, in engagement with the adjacent side of the roll, means operatively connected to said shaft for maintaining said polishing element with its axis oblique to the axis of said roll, and means dis-
35 posed in the path of travel of the carrier for actuating said last-named means, to turn said shaft, whereby said element is moved into another oblique position relative to the axis of the roll. 40

5. Roll polishing apparatus comprising a carrier, means for supporting said carrier, means for reciprocating the carrier in directions length-
wise of a roll, a shaft journaled on the carrier, a yoke on the forward end of the shaft, a polish-
45 ing element rotatably mounted in said yoke, the axis of said element being oblique to the axis of the roll, means for yieldably maintaining said element against the adjacent side of the roll, a toggle device connected to said shaft and mov-
50 able to rock the shaft and thereby rock said yoke, and resilient means yieldably maintaining the toggle device in a position to hold said yoke and element in either of two oblique positions. 55

6. Roll polishing apparatus comprising a carrier, means for supporting said carrier, means for reciprocating the carrier in directions length-
wise of a roll, a shaft journaled on the carrier, a yoke on the forward end of the shaft, a polishing
60 element rotatably mounted in said yoke, the axis of said element being oblique to the axis of the roll, means for yieldably maintaining said element against the adjacent side of the roll, a spring pressed toggle device connected to said shaft for yieldably maintaining said element in
65 said oblique position, and means for actuating the toggle device at predetermined points in the path of travel of the carrier, for changing the oblique position of the said element relative to the axis of the roll. 70

7. In apparatus for polishing rolls or the like, the combination with a rotatable roll, of an elongated polishing wheel having a concave roll-engaging face, means for supporting said wheel for
75 rotation on its axis, means for positioning said

wheel with its axis disposed obliquely to the axis of the roll and with said concave face in contact substantially from end-to-end with the adjacent surface of the roll, means cooperating
5 with said last-named means for yieldably maintaining said wheel in said oblique position, and means for effecting feeding movement of said wheel parallel to the axis of said roll.

8. In apparatus for polishing rolls or the like,
10 the combination with a rotatable roll, of an elongated polishing wheel having a concave roll-engaging face, a yoke for supporting said wheel for rotation on its axis, means for supporting

said yoke for rotary movements on an axis disposed perpendicular to the axis of the roll, means operatively connected to said yoke-supporting means for yieldably biasing said yoke to such a rotary position that said wheel is yield- 5 ably held in an oblique position relative to the axis of said roll and with said concave face in contact from end-to-end with the adjacent surface of the roll, and means for effecting feeding movement of said wheel in directions parallel to 10 the axis of the roll.

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