March 17, 1931. P. A. FOREN 1,796,447

ROLLING MILL

Filed May 21, 1928

FIG. 1.

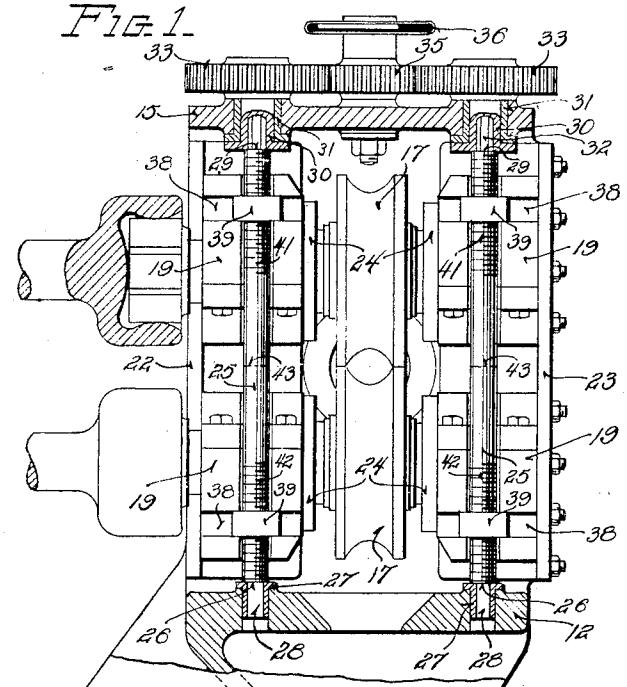


FIG. 3.

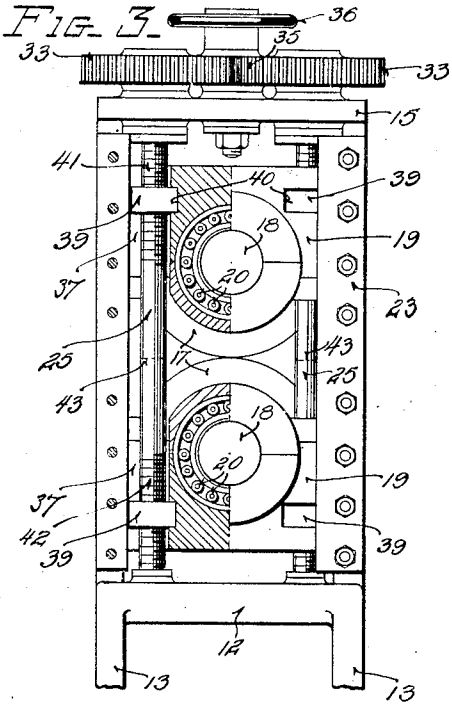
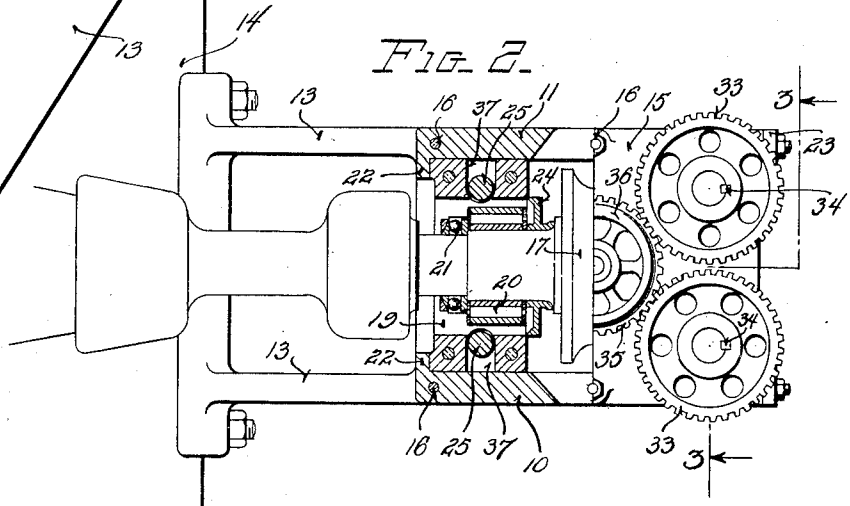


FIG. 2.



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UNITED STATES PATENT OFFICE

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ROLLING MILL

Application filed May 21, 1928. Serial No. 279,445.

This invention relates to rolling mills and more particularly to roll supports therefor.

Although the present invention is intended primarily for use in tube rolling mills of the character described in my copending application, Serial No. 270,290, filed April 16, 1928, it may be advantageously embodied in various other rolling mills, such as tube or rod sizing and reducing mills, and mills for rolling railway rails, structural steel, or the like, of the type involving successive pairs of rolls whose accurate adjustment or setting, relative to a common pass line, is required in order to effect proper passage of the work therethrough.

In rolling mills heretofore designed the rolls are ordinarily individually adjustable and an adjustment of one roll of a pair throws that pair of rolls out of proper alignment with respect to the adjacent pair or pairs of rolls. Because of this, and the relative inaccessibility of the rolls, proper setting thereof is ordinarily obtainable only by trial methods, that is:—at the first setting only an approximate alignment is possible after which trial runs are made, followed by roll adjustments, until the condition of the work indicates proper alignment. Such methods necessarily entail a considerable loss of time and waste of materials.

One object of the present invention is the provision of an improved support for rolling mill rolls which will permit a ready setting of the rolls into accurate alignment with others of a series.

Another object is the provision of an improved support for rolling mill rolls designed to facilitate replacement of the rolls.

Another object is the provision of an improved support for rolling mill rolls by which the massive frames heretofore required may be eliminated and the rolls rendered more accessible for inspection.

Other objects and advantages will appear from the following description of an illustrative embodiment of the present invention.

In the drawings:—

Figure 1 is a view in front elevation, partly in section, of a roll support constructed in accordance with the present invention.

Fig. 2 is a view in top plan, partly in horizontal section, of the roll support shown in Figure 1.

Fig. 3 is a view in side elevation, partly in section.

For purposes of illustration and explanation the invention will be shown and described as embodied in a mill having a pair of rolls although certain of the novel features thereof may be advantageously embodied in a "three-high" or "four-high" mill involving three of four or even more rolls.

The roll support selected for illustration comprises a substantially U-shaped frame having front and rear upright walls 10 and 11, integrally connected by a base plate 12, and rigidly supported upon an inclined bracket 13 removably fixed to an appropriate bed or base casting 14. The upper end of the frame is closed by a top plate 15 removably fixed to the upper ends of the walls 10 and 11 by appropriate means such as screws 16.

The rolls 17 are carried by the usual shafts 18 journaled in bearing blocks 19, guided for vertical adjustment between the front and rear walls of the frame. Appropriate roller bearings 20 and end thrust bearings 21 are preferably provided for the ends of the shafts, and inturned flanges 22 on the walls coact with guide plates 23, removably fixed to the walls, to confine the blocks, and consequently the rolls, against lateral displacement. Guard rings 24 on each shaft prevent the intrusion of scale, dust, or other foreign matter into the bearings.

Provision is made for effecting a simultaneous and uniform adjustment of both rolls 17 toward and from each other, so that the center or pass line therebetween remains fixed in all positions of the rolls. In the roll support shown this is accomplished by the use of four parallel upright screws 25, which are accurately positioned in the frame and operatively engaged with the several bearing blocks, together with appropriate gearing through which the screws are simultaneously operated. In this instance the lower end of each screw is reduced to form a shoulder 26 adapted to rest upon a bushing

27, seated within the base plate 12, the reduced portion 28 being snugly fitted for rotation in the bushing. The upper end of each screw is also reduced to form a similar shoulder 29 which bears against the end of a flanged sleeve 30, snugly fitted for rotation in a bushing 31 seated in the cover plate 15. The several screws are thus accurately positioned and securely held against lengthwise displacement between the top and base plates of the frame.

The upper reduced portion 32 of each screw is closely fitted within the sleeve 30 and is of hexagonal form or otherwise fashioned to insure rotation thereof with the sleeve. Each sleeve 30 extends upwardly into a gear 33 to which it is rotatively fixed by a key 34 or otherwise. Each of the four gears 33 mesh with an operating gear 35, rotatably supported upon the cover plate 15, and provided with appropriate operating means such as a hand wheel 36.

Each bearing block 19 is provided with two upright channels 37 formed in the forward and rear faces thereof to accommodate the adjacent pair of screws 25, and each block is also provided with two horizontal channels 38, each of which intersects one of the channels 37 and is shaped to snugly receive a nut 39 threaded on the screw therein. The rear wall or base 40 of each channel 39 coacts with the nut therein to retain the nut against rotation. The upper portion 41 of each screw is reversely threaded with respect to the lower portion 42 thereof so that upon rotation of the several screws the upper and lower bearing blocks are simultaneously and uniformly adjusted toward or from each other.

The several horizontal channels 38 in the several bearing blocks 19 are uniformly spaced above or below the axes of the shaft bearings therein, and each screw 25 is prefably scored or otherwise marked, as indicated at 43, at uniform distances above the lower shoulder 26, so that when assembled these marks lie within a theoretically correct pass plane between the rolls. From the foregoing it will be clear that when the several nuts 39 are positioned on their respective screws at uniform distances from the marks 43 and are seated in the horizontal channels 38, the axes of the two rolls 17 will always be uniformly spaced from the the theoretically correct pass line. This relationship is of course always maintained during the simultaneous rotation of the several screws under the action of the hand wheel 36 and intermeshing gears 35 and 33.

A roll support of the character described has particular utility when applied to mills involving successive pairs of rolls whose accurate setting relative to each other is necessary for proper passage of the work therethrough. In such a mill the several roll supporting frames are permanently mounted in definite relation, so that their respective pass planes, in which the screw markings 43 lie, will always intersect along a definite axis, constituting the axis of the theoretically correct pass line. The when the adjusting screws 25, nuts 39, bearing blockes 19, and rolls are assembled in each frame in the positions hereinabove described, the pass line between each pair of rolls will coincide with that of the other rolls, and the rolls of each pair may be adjusted relative to each other to obtain the proper spacing therebetween without in any way disturbing the theoretically correct positioning of the pass line therebetween.

To assemble a pair of rolls within a frame, the roll supporting shafts are first assembled with their respective bearing blocks, both nuts 39 are properly positioned on each of their respective screws at uniform distances from the markings 43, and the screws and nuts are then seated in their respective channels in the bearing blocks. With the parts thus assembled the upper ends of the four screws are fixed in their respective sleeves 30 in the cover plate 15 and the whole assembly applied as a unit to and within the frame, the lower ends of the screws seating in and upon the bushing 27 in base plate and the several bearing blocks being guided between the front and rear walls 10 and 11 of the frame. The removability of the guide plates 23 permits this entire assembly to be inserted either laterally or longitudinally into the frame. Thus when the frame is in the upright position shown the assembly may be conveniently lowered through the top end of the frame, but when the frame is horizontally disposed, the guide plates 23 may be removed and the assembly conveniently lowered through the space therebetween. The ease of assembly and the ease of roll adjustment makes roll replacement a very simple task.

It will be noted that the entire load upon the rolls, due to the spreading action of the work therebetween, is assumed by the rods 25, so that the frame may be made much lighter than is required in roll supports heretofore designed in which the frame itself sustained this heavy load.

Various changes may be made in the embodiment of the invention hereinabove specifically described without departing from or sacrificing the advantages of the invention as defined in the appended claims.

I claim:—

1. In a rolling mill the combination of a frame, a pair of rolls, bearing blocks therefor guided in said frame, and connections between said blocks for sustaining the spreading thrust on said rolls independently of said frame, said connections and blocks being removable as a unit from said frame.

2. In a rolling mill the combination of a frame, a cover plate removably attached to

said frame, roll supports including bearing blocks guided in said frame, and connections between said blocks for sustaining the spreading thrust on said rolls, said plate, supports, and connections being combined for removal as a unit from said frame.

3. In a rolling mill the combination of a frame, a cover plate removably attached thereto, roll supports guided in said frame, adjustable load sustaining connections between said supports, and means carried by said plate for simultaneously adjusting said connections, said plate, supports connections and adjusting means being combined for removal as a unit from said frame.

4. In a rolling mill the combination of a frame, roll supports guided therein, guide means for said supports removably attached to said frame, and load sustaining connections between said supports removable therewith as a unit from said frame, said guide means being removable from said frame to permit removal of said supports and connections laterally of said frame.

5. In a rolling mill the combination of a frame, roll supports guided therein, a plurality of screws journalled in said frame, each of said supports having open sided screw-receiving recesses formed in the opposite sides thereof, nuts on each screw, each of said supports having open sided nut-receiving recesses intercepting said first named recesses, said screws and nuts being laterally removable from said supports when disengaged from said frame, and means for simultaneously rotating said screws to simultaneously adjust said supports toward or from each other.

In witness whereof, I hereunto subscribe my name this 18th day of May, 1928.

PEHR A. FOREN.