W. C. CORYELL.

ROLLING MILL.

APPLICATION FILED NOV. 4, 1915.

1,233,647.

Patented July 17, 1917.

2 SHEETS—SHEET 1.

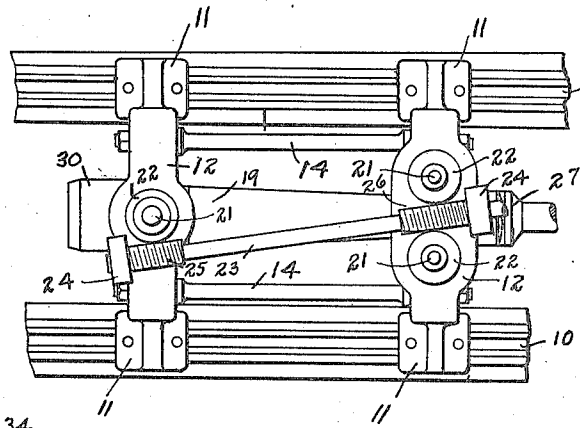


Fig. 1.

Fig. 4a

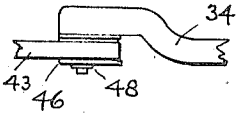
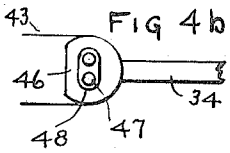


Fig 4b



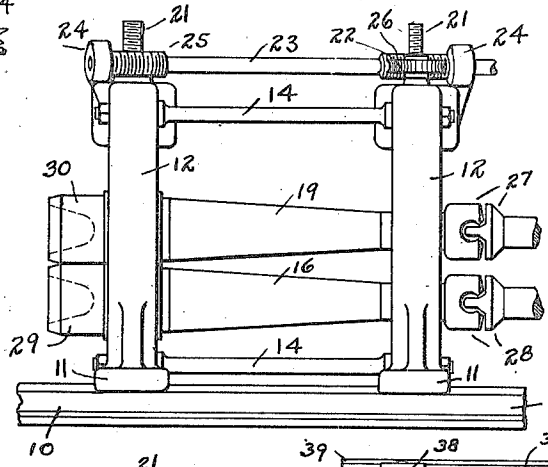


Fig. 2

Fig. 4.

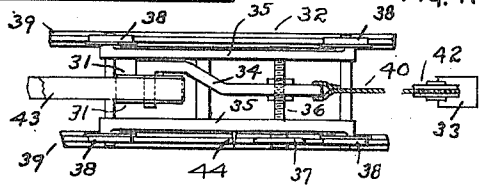


Fig. 3

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2 SHEETS—SHEET 2.

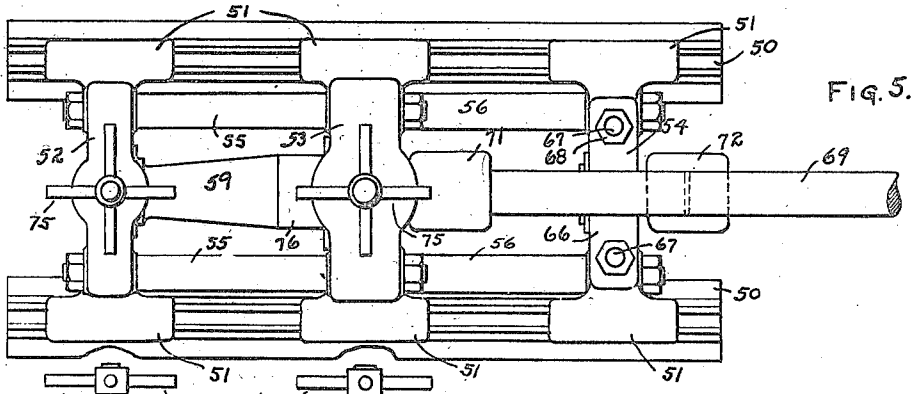


FIG. 5.

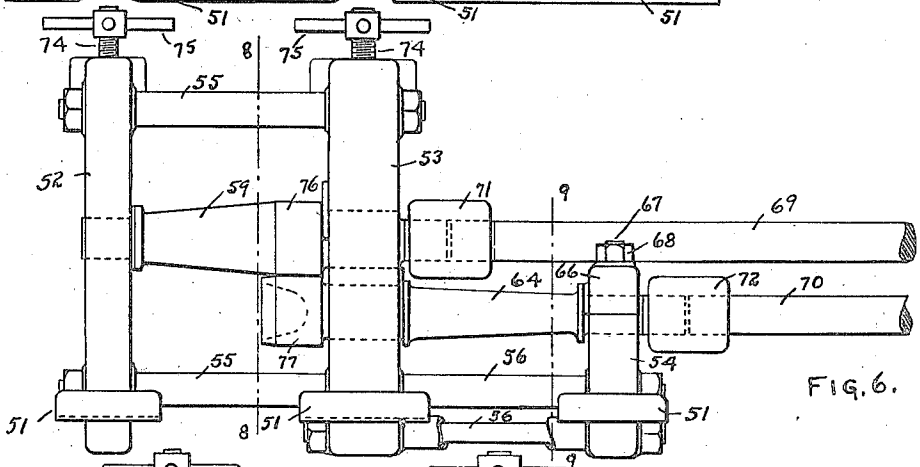


FIG. 6.

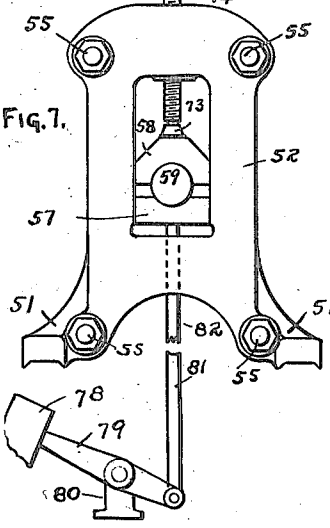


FIG. 7.

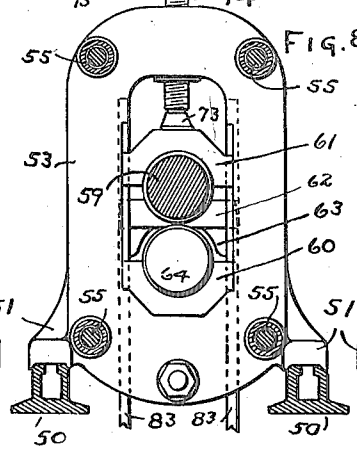


FIG. 8

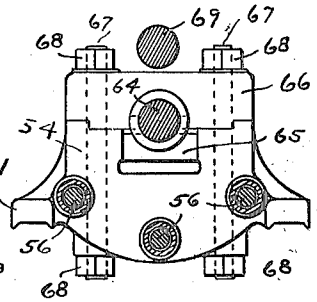


FIG. 9.

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UNITED STATES PATENT OFFICE.

WILLIAM C. CORYELL, OF YOUNGSTOWN, OHIO.

ROLLING-MILL.

1,233,647. Specification of Letters Patent. Patented July 17, 1917.

Application filed November 4, 1915. Serial No. 59,582.

To all whom it may concern:

Be it known that I, WILLIAM C. CORYELL, a citizen of the United States, residing at Youngstown, county of Mahoning, State of Ohio, have invented certain new and useful Improvements in Rolling-Mills, of which the following is a specification.

The present invention relates to rolling mills, and the principal object of the invention is to produce a mill which shall be capable not only of reducing bars and other straight pieces of metal in the usual way, but also of producing endless articles, such as bands, belts, hoops, etc., from rings or perforated pieces of metal. Another object of the invention is to produce a mill in which the original blank, or the more or less finished article, may be readily placed upon or withdrawn from a reducing roll of the mill. Another object is to provide an improved device for drawing the loop of the partially finished article outward away from the rolls, by which the loop may be readily put in place upon the device or removed from it.

I attain these and other objects, such as efficiency of operation, accessibility of parts for removal and repair, and rigidity of structure, by providing a mill having at least one overhung roll, and a pulling device preferably having an overhung part for engaging the loop of steel or other metal. The overhung roll has its work-receiving surface on the overhung portion so that the perforated blank or the more or less finished article may be readily slipped on and off as circumstances may require. The overhung part of the pulling device is also capable of being readily placed in engagement with the loop of the material being worked upon.

The specific character of the invention will be more fully understood upon consideration of the following detailed description taken in connection with the accompanying drawing, and the scope of the invention will be particularly pointed out in the appended claims.

In the drawing, Figure 1 is a plan view of a rolling mill constructed in accordance with the present invention; Fig. 2 is a side elevation of the same; Fig. 3 is a front elevation of the mill in association with the trolley device for drawing out the loop of the article being worked upon; Fig. 4 is a plan view of the latter mechanism; Figs. 4^a and 4^b are respectively plan view and elevation of a modified loop-engaging member for the trolley device; Fig. 5 is a plan view of a second rolling mill constructed in accordance with my invention; Fig. 6 is a side elevation of the same; Fig. 7 is an end elevation; Fig. 8 is an elevation of the common housing, parts being shown in section taken on a plane indicated by the line 8—8 of Fig. 6; and Fig. 9 is a like elevation of the smallest of the housings, parts being shown in section taken on a plane indicated by the line 9—9 of Fig. 6. Throughout the figures, illustrating these two embodiments of the invention, like characters refer to like parts.

Referring to the first embodiment of the invention, 10 designates the shoes upon which the feet 11 of the housings 12 rest. These housings are of rigid construction and each is provided as usual with a central opening or window 13. In this instance two housings are employed and they are spaced apart and held in spaced relation by separators 14 of usual construction. They consist of solid rods having collars positioned upon them so as to properly space the housings and provided with nuts at their opposite ends. Each of the housings is provided with a lower box or bearing 15 upon which the roll 16 is journaled. The boxes 15 lie at the bottom of the windows and their ends engage the guiding surfaces 17 at the sides of the window 13. The housings 12 are also provided with similar upper bearings or boxes 18 which are similar in construction and similarly engage at their ends the guiding surfaces 17. These upper boxes 18 serve as bearings for the upper roll 19. The boxes 18 are vertically adjustable and the upper face of each is engaged by the breaker 20 which in turn is engaged by the screw 21 of the so-called "screwdown." As clearly illustrated in Fig. 1, there are two of these screws associated with one of the housings 12 and a single screw associated with the other. A worm wheel 22, or other control wheel, is journaled on the top of each housing and is in threaded engagement with the associated screw so that as the wheel is rotated in one direction or the other, the screw is correspondingly raised or lowered. A suitable worm shaft 23 is journaled at its ends in bearings 24 which extend upward from the adjacent portions of the housings 12. The worms 25 and 26

upon this shaft are arranged to operatively engage with the teeth of the worm wheels 22. As clearly illustrated in Fig. 1, the worm 25 is associated with the single worm wheel 22, and the worm 26 is associated with the pair of worm wheels 22. In the case of the screws 21 associated with this latter pair of worm wheels 22, one screw is a right-handed screw and the other a left-handed screw. When the shaft 23 is rotated, as it may be by any suitable driving means, the wheels 22 are rotated and the screws 21 either raised or lowered. Upon the rotation of the shaft 23 in one direction, the screws are raised, and upon rotation of the shaft in the opposite direction, the screws are lowered. The movement of the screws results in producing the desired adjustment of the upper boxes 18, and by means of the counterweights commonly employed in mills of this type, the upper roll 19 is kept in bearing engagement upon the boxes 18. The rolls 16 and 19 are driven through the couplings 27 and 28 from any suitable source of power, as an electric motor, steam engine, or other prime mover.

The rolls 16 and 19 are each provided with overhanging portions 29 and 30, respectively, and may be termed "overhung rolls". The overhanging portions 29 and 30 are provided with work-engaging surfaces for engaging the material to be worked upon. In the present instance these rolls are shown as cylindrical. Other shapes of work-engaging surfaces might of course be employed. The shape of the surface would depend upon the particular shape to be given the material worked upon, just as in the case of any pass. In the present instance these cylindrical work-engaging surfaces on the overhanging ends of the rolls 16 and 19 constitute the only work-engaging surfaces upon these rolls.

In using the mill constituting this embodiment of the invention, the screwdown mechanism would be operated to allow the roll 19 to be raised far enough to permit the ring or perforated piece of metal constituting the blank, to be slipped over the end of one of the rolls, for example, roll 16. By then operating the screwdown mechanism to lower the boxes 18, pressure may be applied to the material through the work-engaging faces of the rolls, and, as the latter are rotated, the blank will be gradually enlarged until it reaches a length sufficient to enable it to be looped over the wheel 31 or equivalent member of the trolley device 32. As the material is still further reduced and the loop of the article being worked upon, enlarged, the device 32 is drawn away from the rolls so as to take up the slack in the loop and prevent its distortion or entanglement during the continued reduction of its thickness. When the loop reaches its proper length, it may be readily withdrawn from the rolls after slightly raising the upper roll 19 and easing up the pulling weight 33.

Where the wheel 31 is used as the loop-engaging member of the pulling device, it is mounted on a pin or shaft projecting laterally from a member 34 adjustably mounted upon the frame 35 of the device. The adjustment of member 34 is brought about by giving it threaded engagement with a threaded rod 36 journaled in the frame 35 and provided with an adjusting wheel 37. By operating the wheels 37, the frame 34 may be shifted laterally to shift the pulling wheel 31 laterally to bring it into more accurate alinement with the work engaging faces of the rolls 16 and 19. The frame 35 of the trolley device is provided with four flanged wheels 38 which travel upon the rails 39 of a track which extends in the direction of travel of the material as it passes through the rolls of the mill. The trolley device 32 may be drawn along the track away from the rolls by any suitable means. In the present case a cord or cable 40 is secured at one end to the frame 34 and at the other end to a weight 33, previously referred to. At an intermediate point the cord 40 passes over a pulley wheel 42. By this arrangement the weight 33 exerts a pull upon the trolley device and thereby upon the loop 43 of the material being operated upon.

If desired, the frame 35 may carry a pointer 44 for coöperation with a scale 45 upon one of the rails 39, to be used in determining when the loop 43 has reached the approximately desired length.

The loop-engaging wheel 31 may be replaced by other loop-engaging members. In Figs. 4^a and 4^b, a rigid loop-engaging member 46 is illustrated. This member is rigidly secured to the outer end of the supporting member 34 by any suitable means, such as the pins 47 extending through a plate or yoke 48 into the member 34. In operation the loop 43 slides over its surface which is also preferably bounded by flanges the same as wheel 31.

Referring to the second embodiment of the invention, 50 designates the shoes upon which the feet 51 of the housings 52, 53 and 54 rest. These housings are similar in construction to those previously described. The housings 52 and 53 are of the same height and are spaced apart and held in spaced relation by the separators 55. These separators consist, in each instance, of a spacing sleeve interposed between the housings and a bolt passing through the housings and sleeve and provided with nuts at its opposite ends. Similar separators 56 maintain the housings 53 and 54 in spaced relation. The housing 52 is provided with a lower box 57 and an upper box 58 which form bearings for one end of the upper roll 59. The hous-

ing 53 is provided with a lower box 60, an upper box 61 and an intermediate box 62. A dust shield 63 covers the neck of the bottom roll 64. The boxes 61 and 62 form a bearing for the coupling end of the upper roll 59. The box 60 forms a bearing for the overhung end of the lower roll 64. The coupling end of this roll is journaled between the box 65 and cap 66 of the housing 54. In the latter housing, bolts 67, provided with nuts 68, serve to hold the cap 66 in place. In this instance the rolls 59 and 64 are coupled at their ends to spindles 69 and 70, respectively. Couplings 71 and 72 are used for this purpose. The upper box 58 of housing 52, and the upper box 61 of housing 53, are provided with breakers 73, screws 74, and screwdown wheels 75, which are similar in construction and in operation to the corresponding parts 20, 21 and 22 of the first embodiment of the invention.

In this construction, the upper roll 59 is provided with a work-engaging surface 76 which is adjacent to the housing 53. This surface coöperates with a surface 77 upon the overhung portion of the lower roll 64. As in the case of the previous form of the invention, these surfaces are cylindrical, but the specific configuration to be employed will depend upon the requirements as to shape and size of the article to be produced. In operation the screwdown wheels 75 may be turned so as to cause the screws 74 to rise and thereby allow the upper roll 59 to be elevated. The separation of the surfaces 76 and 77 which will result from this operation, will enable the ring or perforated blank of material to be slipped over the overhung end of the roll 64. The screwdown mechanism may then be operated to bring the surface 76 into engagement with the material, and then as the rolls 59 and 64 are rotated, the material will be gradually reduced in cross-section and lengthened in the manner described in connection with the first embodiment of the invention. In this form of the invention the housing 53 is made considerably larger than the other two housings because of the additional strain which is brought upon it, due to the proximity of the work-engaging faces 76 and 77. Obviously other arrangements of housings and rolls might be employed. Those illustrated will furnish sufficient examples of this invention for the purposes of this disclosure.

The upper roll in both forms of the invention may be forced upward against the reacting force of the screwdown mechanism by any suitable means. I prefer, however, to employ the well-known counterweight arrangement for this purpose. In connection with the housing 52, I have therefore shown in rather diagrammatic form, a counterweight 78 for exerting the desired pressure upon the boxes 57 and 58 of the upper roll. The weight 78 is mounted at one end of a lever 79 fulcrumed to a suitable support 80, and pivotally connected at its unweighted end to a link 81, which in turn is pivotally connected to the lower end of a bar 82, which is connected at its upper end to the box 57. In this arrangement bar 82 slides through a suitable passage in the housing 52, and by reason of the weight 78, a constant upward pressure is exerted on the underside of one end of the roll 59, which tends to force it upward whenever the screw 74 is moved upward by the control wheel 75. In the case of the housing 53, two counterweight bars 83 are provided, and these act upon the box 62 to force the corresponding end of the upper roll 59 in an upward direction whenever permitted to do so by the upward movement of the screwdown screw 74. In the first embodiment of the invention these counterweight bars are not illustrated, but it will be understood that suitable bars operate in a similar manner to force the upper roll 19 upward as the screwdown mechanism is operated to raise the breakers 20.

In this second form of the invention, as in the first, a suitable trolley device for drawing out the loop of the material, should be employed where a loop of sufficient size is being operated upon to require its use. The arrangement for mechanically rotating the screws of the screwdown mechanism shown in the previous figures, may also be employed.

It will be understood that in practice the ring or blank of perforated material may be hot when placed in the mill, and that as the mill is operated the blank will have very little lateral flow, but will have a considerable longitudinal flow. As a result, the blank soon becomes long enough to be threaded over the pulling wheel of the trolley device. As soon as the pulling wheel is entered into the loop, the counterweight can be freed to allow sufficient pull to be applied to maintain the loop in proper condition. In some instances the material may require reheating during the process of reducing it to its proper thickness and length, and in such case it will be seen that the upper roll may be easily and quickly raised and the material slipped over the overhung end of the associated roll, for the purpose of reheating it, and when reheated, may be as readily replaced thereon. Cold rolling may be done also.

From the above description it will be seen that I have produced a mill construction in which the material worked upon may be either a bar or other straight piece of metal, or an endless ring or loop of metal, and that when the latter is being rolled it may be readily slipped on and off of the projecting end of the overhung roll. This construction

therefore has the advantage of enabling an endless loop of material to be worked fast. This is especially advantageous because a greater reduction can be obtained for each heating of the metal. It will also be seen that I have devised a type of mill which does not require the removing of any rolls in order to enter or remove the loop of material being worked upon.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A mill for rolling endless articles including a roll having an overhung work-engaging surface, an overhung member for engaging the loop of material being worked upon, a movable frame, a supporting arm for said member connected at one end to said member and to said frame at a point in line with said member and in the plane of said loop, and means for moving said frame so as to maintain said point in the plane of said loop.

2. A mill for rolling endless articles including a roll having an overhung work-engaging surface, an overhung member for engaging the loop of material being worked upon, a movable frame, a supporting arm for said member connected at one end to said member and to said frame at a point in line with said member and in the plane of said loop, means for moving said frame so as to maintain said point in the plane of said loop, and means for adjusting said point laterally of said frame to initially set it in the plane of said loop.

3. A mill for rolling endless articles, including a roll having an overhung work-engaging surface, a member for engaging the loop of material being worked upon, said member having an overhung loop-engaging surface, and means for applying a force to said loop-engaging member in the plane of said loop to draw said member outward as said loop lengthens under the action of said roll.

In testimony whereof I have hereunto subscribed my name this 30th day of October, A. D. 1915.

WILLIAM C. CORYELL.