Sept. 24, 1929 L. YOUNG 1,729,410

METAL ROLLING MILL

Filed July 5, 1928 2 Sheets-Sheet 1

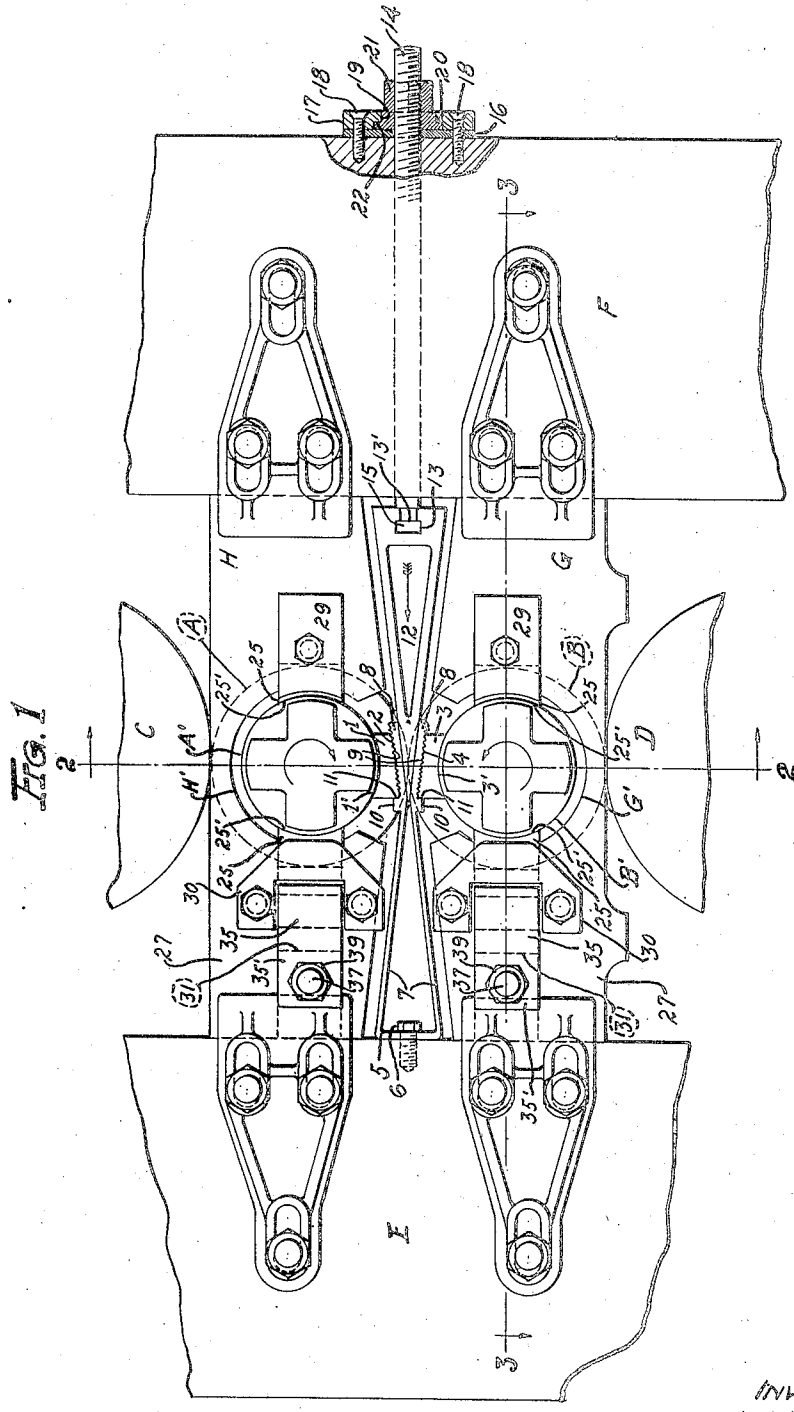


FIG. 1

INVENTOR
L. YOUNG
BY J. A. G. Cook
ATTORNEY

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FIG. 2

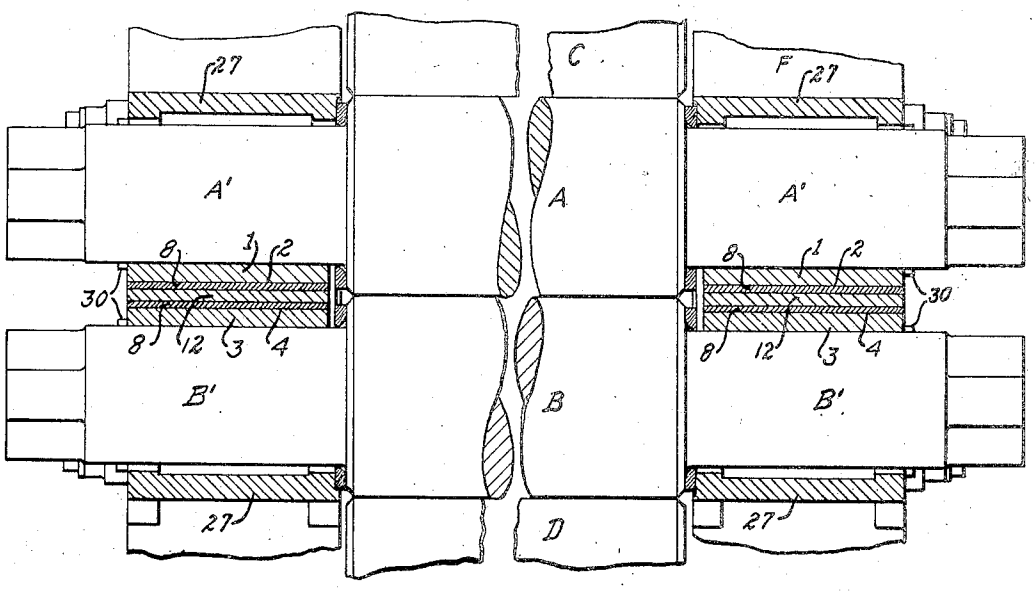
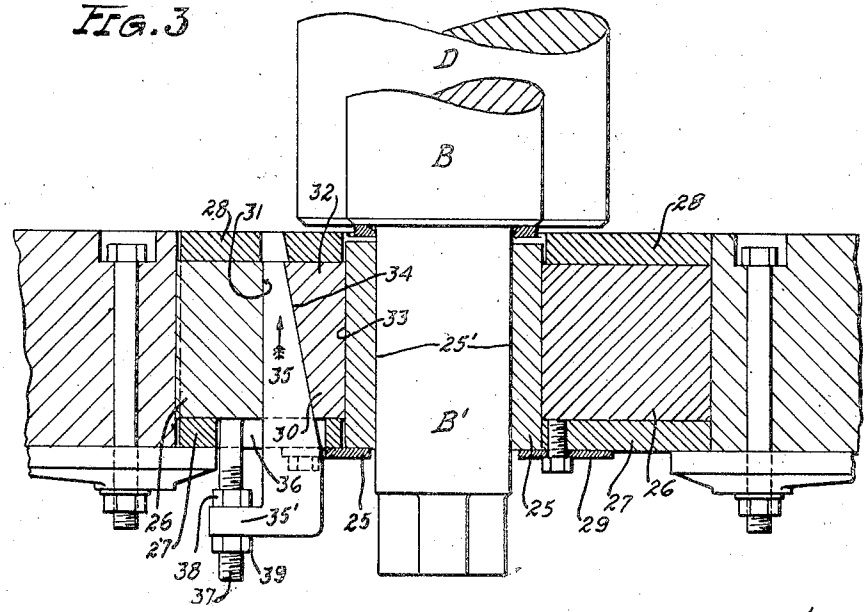


FIG. 3



INVENTOR
L. YOUNG
BY J. H. S. Cook
ATTORNEY

Patented Sept. 24, 1929 1,729,410

UNITED STATES PATENT OFFICE

LAFAYETTE YOUNG, OF ALTON, ILLINOIS, ASSIGNOR TO LACLEDE STEEL COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF MISSOURI

METAL-ROLLING MILL

Application filed July 5, 1928. Serial No. 290,467.

This invention relates generally to improvements in metal rolling mills, and more specifically to improved means adapted for association particularly with a so called "four-high" metal rolling mill, whereby the working rolls thereof are forced into very firm contact with the back-up rolls of the mill thus properly positioning and controlling the action of said working rolls so that the maximum efficiency of which the mill is capable is attained.

Briefly stated, the invention contemplates an improved device which will exert pressure against the neck portions of both of the working rolls of the four-high mill simultaneously and, by so doing, force the said working rolls firmly against the back-up rolls associated with said working rolls. By exerting pressure against the neck portions of the working rolls in the manner and for the purpose contemplated by this invention the action of the mill is improved in that the rolls rotate evenly against their respective back-up rolls and, as a result, the material passing between the working rolls is delivered in a better condition and is more uniform in thickness than was the case when independent means or gravity alone was relied upon to maintain contact between the cooperating working and the back-up rolls.

Heretofore in the operation of four-high metal rolling mills it was found to be almost impossible properly to control the direction of movement of the front end of a strip or bar of material passing through the mill. It was discovered that there was a strong tendency for the strips of material as they passed between the working rolls of the mill to dart from one side to the other. It was discovered that the greatest contributing cause of this movement of the front end of the strips of material arose from the fact that the two working rolls of the mill were not in as intimate contact with the associated back-up rolls and quarter brasses as they should be, hence slight changes in the relative positions of the working rolls caused the movement of the strips of material referred to.

Another matter which was the cause of considerable annoyance in the operation of a four-high mill was the hammering and back lash occasioned when a strip or bar of material entered between the cooperating working rolls of the mill.

The present invention eliminates the movement referred to of the front end of the strip or bar of material as same is passing between the working rolls of the mill, and does away with the annoyance incident to the hammering and back lash of the working rolls of the mill as the material being rolled enters between the cooperating working rolls of the mill and, as previously stated, these advantages are obtained by exerting pressure enough in opposite directions between the neck portions of the cooperating working rolls so as to force said working rolls into very firm contact with the back-up rolls associated with the respective working rolls. In this manner the cooperating working rolls are maintained permanently in their proper positions whereby shifting thereof as the strip or bar of material enters between or passes between said working rolls is prevented.

In addition to maintaining intimate contact between the working rolls of the mill and the associated back-up rolls the invention disclosed includes means whereby the quarter brasses of the mill are maintained in very close and intimate contact with the neck portions of the associated working rolls.

In the drawings

Fig. 1 is a fragmentary side elevation of a four-high mill having my improved means associated therewith.

Fig. 2 is a vertical section taken approximately on the line 2—2 of Fig. 1.

Fig. 3 is a horizontal section taken approximately on the line 3—3 of Fig. 1.

In the drawings which illustrate one embodiment of the invention and wherein is shown only enough of a four-high mill to disclose the application of the invention to one of said four-high mills, A designates the upper working roll of the mill and B the lower working roll thereof. The working rolls A and B each are provided at its opposite ends with neck portions A′ and B′, said neck portions, as is ordinarily the case,

being of less diameter than the body of the rolls. Associated with the upper working roll A is a back-up roll C and associated with the lower working roll B is a back-up roll D, said working roll A being in intimate contact with the back-up roll C at the upper portion of said working roll, and said working roll B being in intimate contact with the back-up roll D at the lower portion of said roll B. The mill structure includes certain frame members E, F, G, and H, but as these elements form no important part of the invention disclosed herein, they will not be disclosed in detail.

Arranged in contact with the peripheral faces of the neck portions A′ at opposite ends of the working roll A and at the lower portions of said neck portions A′ is a pair of bearing blocks, there being one of these bearing blocks associated with the neck portion at each end of said working roll. Each of the bearing blocks is provided with a concave face 1′ which contacts with the curved circumferential face of the associated neck portions A′, and the face of each of said blocks opposite the concave face 1′ thereof is arranged at a slight angle with respect to the true horizontal and is provided with teeth or serrations 2 (Fig. 1).

In like manner the neck portions B′ of the working roll B have a pair of bearing blocks 3 associated therewith, each of the last mentioned bearing blocks being provided with a concave face 3′ which contacts with the circumferential face of the associated neck portion B′ at the upper portion thereof, and a face which is opposed to said concave face, which last mentioned face is arranged at a slight angle to the true horizontal and is provided with teeth or serrations 4. As stated in connection with the bearing blocks 1 one of the bearing blocks 3 is associated with the neck portion B′ of the working roll B at each end thereof and the pair of bearing blocks 1 and 3 at each side of the mill that is at the opposite ends of the associated working rolls A and B are arranged one above the other, so that an approximately wedge-shaped space is provided between the angular faces of the opposed blocks on which faces the teeth or serrations 2 and 4 are formed.

5 designates a member which is secured by a suitable fastening device 6 to the frame member E of the mill. The member 5 is formed of resilient material and includes a pair of opposed convergent and yieldable arms 7 which approach each other at a point adjacent to the bearing blocks 1 and 3 illustrated in Fig. 1. At the ends of the convergent arms 7 adjacent to the bearing blocks 1 and 3 said convergent arms are provided with divergent portions 8, said divergent portions 8 being inclined outwardly from the points at which they are joined to the respective arms 7, and being provided on their outer faces with teeth or serrations 9 which cooperate with the teeth or serrations 2 and 4 on the bearing blocks 1 and 3. At the points where the divergent portions 8 join the convergent arms 7 the member 5 is provided with outwardly extended portions 10 providing shoulders 11 against which faces of the bearing blocks 1 and 3 bear, whereby said bearing blocks are prevented from being moved by the working rolls A and B when said working rolls are rotated in the direction indicated by the arrows in Fig. 1. By reference to Fig. 2 it will be noted that the invention includes the arrangement of one of the members 5 at each side of the mill and the divergent portions 8 of said members are arranged between the bearing blocks 1 and 3 at the opposite ends of the associated working rolls A and B.

12 designates a pair of wedges, one of which is associated with each of the members 5 (Fig. 2). The pointed or smaller end of each of the wedges 12 is introduced into the more or less wedge-shaped space between the divergent portions 8 of the associated members 5 as shown in Fig. 1, and the opposite or larger end of each of the wedges 12 is provided with a T-shaped opening 13. Each of the wedges 12 has a shaft or bar 14 associated therewith, and said shaft or bar having an end portion 15 of a shape corresponding approximately with the shape of the T-shaped opening 13 in the associated wedge 12, and said end portion of the shaft or bar being fitted into said T-shaped opening in the associated wedge 12. The portion 13′ of the opening 13 in each of the wedges is preferably non-circular in cross section, and the portion of the shaft or bar 14 which fits into said portion 13′ is likewise noncircular and it is plain, therefore, that the shaft or bar 14 may not rotate with respect to the associated wedge. It is obvious also that shoulders of the T-shaped portion of the shaft or bar 14 contacting with portions of the wedge will cause said wedge to move with the shaft or bar 14 when said shaft or bar moves longitudinally of its major axis.

Associated with each of the shafts or bars 14 adjacent to the outer end thereof is a plate 16 (Fig. 1), and arranged in contact with the outer face of said plate is a second plate 17. The plates 16 and 17 are provided with alined apertures through which screws, or other suitable fastening devices, 18 are extended, whereby the associated plates 16 and 17 are fastened to the mill frame member F.

The plate 17 is provided with a central opening 19 having a shoulder 20 and arranged in this opening is a nut 21, said nut being provided with a shoulder 22 which contacts with the shoulder 20 within the central opening 19 formed through the plate 17. The nut 21 is, of course, provided with a

screw threaded opening through which the associated shaft or bar 14 extends, said shaft or bar being provided with screw threads on the portion thereof adjacent to the nut 21, as shown in Fig. 1. The portions of the nuts 21 which extend beyond the associated plates 17 are preferably noncircular in shape so that said nuts may be conveniently rotated.

In the use of the invention when it is desired to force the working rolls A and B into very close contact with the associated back-up rolls the nuts 21, associated with the shafts or bars 14 cooperating with the wedges 12 at the opposite sides of the mill, are rotated whereby the shafts or bars 14 will be moved longitudinally of their major axes in a direction to cause the wedges to be moved in the direction indicated by the arrow on the wedge shown in Fig. 1. This movement of the wedges 12 will cause the divergent portions 8 of the member 5 associated with each of the wedges to be forced in a direction away from each other, and the bearing members 1 and 3 associated with said divergent portions 8 will move outwardly with said divergent portions. This pressure being exerted against the neck portions of the working rolls A and B at the opposite ends of said working rolls will result in the upper working roll A being forced upwardly into very firm contact with the back-up roll C, and the lower working roll B being forced downwardly into very firm contact with the back-up roll D, and because the respective wedges remain in the positions to which they have been adjusted close contact between the working rolls and the back-up rolls is maintained at all times.

The mechanism already described forces the working rolls A and B into firm contact with the back-up rolls C and D so as to maintain said working rolls in their proper vertical positions. The invention also includes means whereby the working rolls may be maintained in fixed horizontal positions, and this means will now be described.

Associated with each neck portion of the working rolls A and B is a pair of quarter brasses 25, the quarter brasses associated with each neck portion being located at opposite sides of the associated neck portion and being alined with each other horizontally. Each quarter brass is provided with a concave face 25′ which contacts with the circumferential face of the associated neck portion (Fig. 1). The frame members G and H of the mill comprise, each, an inner member 26 and a pair of outer members 27 and 28, said inner members and said outer members of each of the frame members G and H being cut away to provide said frame members with circular openings G′ and H′ through which the neck portions of the working rolls extend. The frame members G and H are attached to the frame members E and F in any convenient manner. Fixed to the outer members of the frame members G and H are plates 29 and 30, said plates being arranged to overlap the quarter brasses 25 as shown in Fig. 3 to prevent said quarter brasses from moving outwardly with respect to the neck portions of the working rolls.

The inner member 26 forming a part of each of the frame members G and H is cut away to the left of the working rolls, as illustrated in Figs. 1 and 3, to provide an opening, said opening being extended from the face 31 of said inner member to the adjacent quarter brass 25. Arranged in each of the openings mentioned is a backing member 32 (Fig. 3), each of said backing members having a straight face 33 which contacts with the adjacent quarter brass and an inclined face 34 arranged at the opposite side of the backing member to the straight face 33 thereof. Interposed between the face 31 of the inner member 26 of each of the frame members G and H and the inclined face 34 of the backing member 32 arranged adjacent to said face 31, is a wedge-shaped member 35, said wedge-shaped members having a straight face which contacts with the face 31 of the inner member 26 and an inclined face which contacts with the inclined face 34 of the associated backing member. The wedge-shaped members 35 extend outwardly beyond the outer faces of the frame members G and H, as shown in Fig. 3, and at the outer end of each of said wedge-shaped members is provided with an angular portion 35′. The members 27 associated with the frame members G and H are provided with elongated openings 36 through which the wedge-shaped members 35 extend, and 37 designates screw threaded elements which are fixedly attached to the inner members 26 of said frame members and extend outwardly therefrom through said openings 36. The screwthreaded elements 37 extend through smooth openings formed through the angular portions 35′ of the wedge-shaped members, and screwed on each of said screwthreaded elements and arranged at opposite sides of the angular portion 35′ of the associated wedge-shaped members 35 is a pair of nuts 38 and 39.

In the use of that portion of the invention just described the quarter brasses 25 and the neck portions of the working rolls A and B may be forced into firm contact with each other by screwing the nuts 38 away from the associated angular portions of the wedge-shaped members, and screwing the nuts 39 inwardly on the screwthreaded elements 37, so as to force the wedge-shaped members in the direction of the arrow in Fig. 3. The movement of the wedge-shaped members will force the backing members 32 against the adjacent quarter brasses, thus forcing said quarter brasses firmly against the neck portions of the associated working rolls, while

at the same time forcing said neck portions of the working rolls firmly against the quarter brasses at the opposite side of said neck portions of said working rolls. The result of this will be that both of the quarter brasses associated with each of the neck portions of a working roll will be maintained in close contact with said neck portions, whereby horizontal movement of the working rolls in a direction at a right angle to the major axes thereof is prevented.

It is obvious, of course, that one of the organization of parts which includes the wedge-shaped members 35 is arranged at each of the opposite ends of each of the working rolls, whereby said rolls are very accurately and positively held in the positions to which they are adjusted by said wedge-shaped members.

I claim:

1. A metal rolling mill including a pair of oppositely disposed working rolls, back-up rolls arranged adjacent to said working rolls, and means whereby said working rolls may be forced into firm contact with said back-up rolls, said means including bearing members arranged in contact with the neck portions of said working rolls, a member having yieldable portions in contact with said bearings, a wedge-shaped member movable between the yieldable portions of said member to move same together with the bearing members in contact therewith away from each other whereby the working rolls are moved toward said back-up rolls.

2. A metal rolling mill including a pair of oppositely disposed working rolls, back-up rolls arranged adjacent to said working rolls, and means whereby said working rolls may be forced into firm contact with said back-up rolls, said means including bearing members arranged in contact with the neck portions of said working rolls, serrations formed on said bearing members, a member having yieldable portions arranged in contact with said bearing members, said yieldable portions being provided with serrations adapted to cooperate with the serrations formed on said bearing members, and a wedge-shaped member movable between the yieldable portions of said member to move same together with the bearing members in contact therewith away from each other whereby the working rolls are moved toward the back-up rolls.

3. A metal rolling mill including a pair of oppositely disposed working rolls, back-up rolls arranged adjacent to said working rolls, and means whereby said working rolls may be forced into firm contact with said back-up rolls, said means including bearing members arranged in contact with the neck portions of said working rolls, serrations formed on said bearing members, a member having yieldable portions arranged in contact with said bearing members, shoulders formed on said yieldable portions against which said bearing members bear, said yieldable portions being provided with serrations adapted to cooperate with the serrations formed on said bearing members, and a wedge-shaped member movable between the yieldable portions of said member to move same together with the bearing members in contact therewith away from each other whereby the working rolls are moved toward the back-up rolls.

4. A metal rolling mill including a pair of oppositely disposed working rolls, back-up rolls arranged adjacent to said working rolls, and means whereby said working rolls may be forced into firm contact with said back-up rolls, said means including bearing members arranged in contact with the neck portions of said working rolls, yieldable elements in contact with said bearings, a wedge-shaped member movable between said yieldable elements to move same together with bearing members in contact therewith away from each other whereby the working rolls are moved toward said back-up rolls.

In testimony that I claim the foregoing I hereunto affix my signature.

LAFAYETTE YOUNG.