

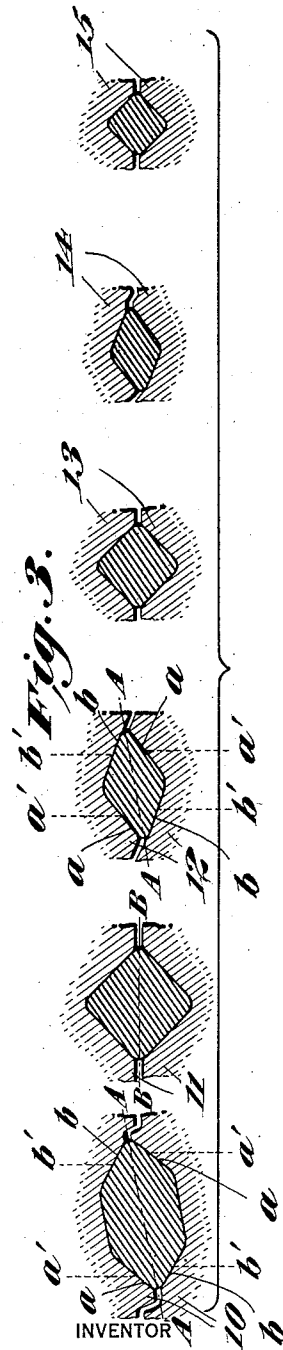
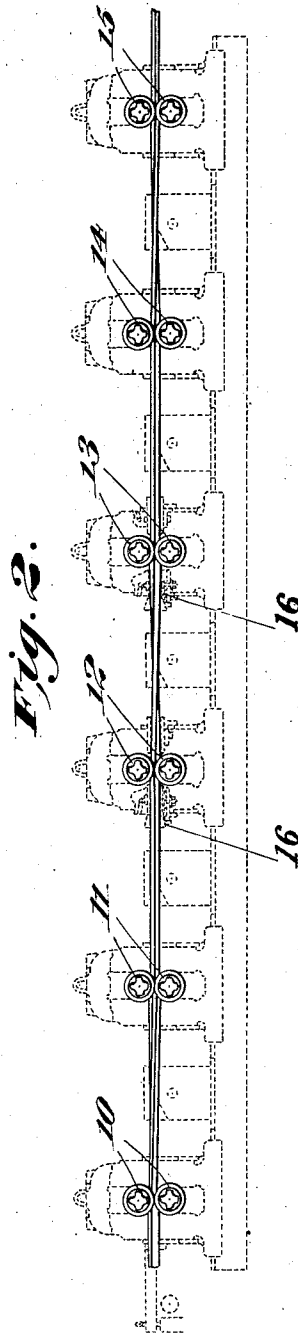
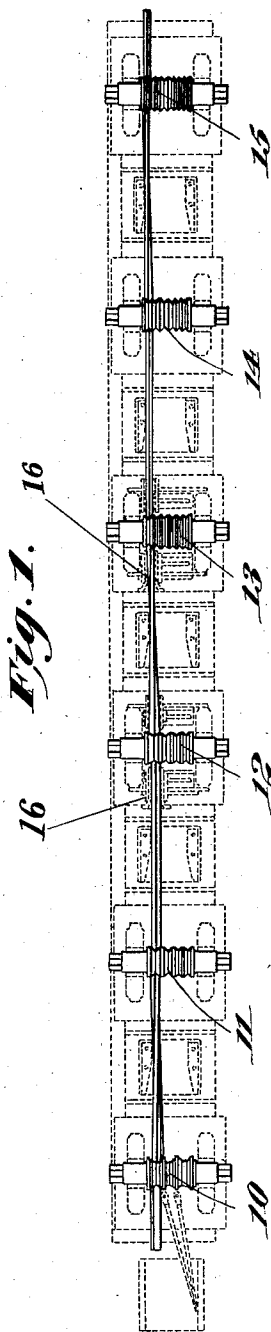
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PROCESS FOR ROLLING METAL

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PROCESS FOR ROLLING METAL

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The invention relates generally to metal rolling and more particularly to reducing and forming metal blooms, billets, bars and other shapes by a continuous process and to apparatus whereby the said metal is operated upon successively by a series of rolls, which preferably have the passes between each pair of rolls substantially in line, and having the stands so spaced as to operate on different parts of the metal. For the purpose of obtaining work on all sides of the bar to avoid fins and for obtaining the most convenient method of rolling, the bar is twisted a quarter turn between every other pair of rolls.

The object of my invention is to provide for automatically twisting a bar while it is being rolled without the use of special guides for that purpose.

Heretofore, special guides have been set up between the stands for forcibly twisting the bar during its passage from one pass to the next. These guides are of treated steel, requiring special attachments to rigidly hold them in place and are found to be very expensive to maintain in operation. Furthermore, when forcibly twisting a bar by means of guides, contact of the bar therewith causes deep scratches or grooves in the surface of the bar which must be removed, for example, by chipping, before subsequent working of the bar, to avoid seams in the rolled product.

A rolling mill has been suggested wherein the bottom rolls are placed at right angles with the line of travel of the metal and all of the top rolls, except the last, are placed obliquely with respect to the bottom rolls. This construction requires a specially designed mill and is not readily adaptable to the ordinary mill.

The present invention comprises generally a continuous mill for rolling metal bars having a plurality of stands of usual construction, and the usual conveyor means for moving a bar to and from the stands. The first pass is preferably substantially of diamond shape and the center line thereof is disposed at an angle to the axes of the rolls so that the bar emerging therefrom will twist. The amount of angularity of the center line of the first pass with reference to axes of the rolls together with the distance between the first and second stands governs the amount the bar is twisted prior to the bar being received by the second pass. Preferably, these two factors are arranged so that the bar is twisted a quarter turn during its travel from the first to the second stand. The second pass is preferably rectangular in shape, having the center line parallel to the axes of the rolls, so that the bar is reduced in cross section and leaves the latter set of rolls exactly straight without any twist or wind and enters the third set of rolls. The pass of the third stand is canted in a manner similar to that of the first stand to impart a twist to the bar; and, thereafter each alternate pass is canted.

Guides are provided between the passes to guide the bar so that it is correctly aligned with the subsequent pass. The guides on the delivery side of the canted passes are constructed with a normal twist. I do not use these guides for twisting; however, at times, blooms of irregular shape are fed to the mill, and then again the temperature of the metal varies at times from the normal rolling temperature, under which circumstances a canted pass, as designed, would not produce the desired twist in a bar, and, therefore, guides may be required under these extraordinary circumstances to twist or untwist a bar in order to produce the twist required for the bar to correctly enter the subsequent pass. Under normal rolling conditions the bar passes through these guides unaffected. Thus the bar is given a quarter turn during the passage between an alternate pair of stands, the bar leaving the finishing pass exactly straight and having a smooth surface devoid of scratches and grooves.

The novel features will be more fully un-

derstood from the following description and claims taken with the drawings:

Fig. 1 is a diagrammatic plan view of a series of stands of two-high rolls, which operate successively upon the bar, as shown;

Fig. 2 is a side elevation of the apparatus shown in Fig. 1;

Fig. 3 represents a series of passes, somewhat enlarged, formed in the rolls shown in Fig. 1.

Referring to the drawings, 10 indicates the rolls of the first pass, which is of substantially diamond shape elongated laterally to accommodate the large bloom or billet with which the rolling operation begins. The center line A—A of the first pass is oblique to the axes of the rolls to automatically impart a twist to the bar as it emerges therefrom in such degree as to bring its long axis from horizontal to a vertical position when it enters the second pair of rolls.

11 indicates the rolls of the second pass which is rectangular in shape and which has the center line B—B parallel to the axes of the rolls.

The distance between the first pass and the second pass is sufficient to allow the twist imparted by the first pass to develop into a quarter turn as it is received by the second pass, which, in turn, works on the bars in a direction different from the working of the first pass, changing the shape of the bar from diamond to rectangular and, at the same time, reducing the cross sectional area. Thus the bar is turned in the act of reduction and any fins formed in the first pass are entirely obliterated in the following pass.

In like manner, the rolls 12, 14 of the third and fifth passes are grooved to provide canted passes to reduce and twist the bar before being received by the rolls 13 and 15 of the fourth and sixth passes, respectively.

The piece to be rolled enters between the rolls 10 and it travels in a substantially straight line through the stands of the mill; and it issues from the last stand as a finished bar, thus making but one pass through each stand of rolls.

The usual driving means (not shown) are provided and arranged so that the surface speeds of the different sets of rolls are so proportioned that each set will travel at a speed greater than the preceding one as the lengthening of the piece requires.

The temperature of the bar rolled seems to exert some effect on the degree of twist due to the factors of spacing and of the degrees of canting. A bar seems to twist more with increases in temperature. Hence, I may employ guides of the twist character for imposing a rectifying influence, either to twist or to untwist, on a bar so that it may correctly enter a succeeding pass. By way of example, I show twist guides 16 of this character in connection with the third and

fourth stands in Figs. 1 and 2; and it is to be understood that rectifying guides may be associated with each of the canted passes.

From the foregoing, the operation of my improved mill and the steps involved in my process of rolling, whereby twist guides and their attendant evils are avoided, will be apparent. A blank or billet is passed alternately through canted and straight passes, and it preferably first enters a canted pass. Each canted pass is defined by grooves on opposed rolls, and each groove is defined by conical surfaces (a) and (b) so disposed that the medium radius a' of surface (a) is greater than the median radius b' of surface (b). The opposed grooves define a substantially diamond-shaped pass, the sides a, a and b, b being substantially parallel. The difference in average rolling velocities of the sides (a) and (b) results in the bar being rolled with a twist. This is advantageous, as hereinbefore pointed out, for the reason that this twist and the distance to a succeeding stand may be coordinated to obtain a turning of a bar substantially 90° between stands. Sometimes, particularly when temperatures of the metal vary, it is desirable to install fixed guides after the rolling and twisting stand in order to rectify the degree of twist so that a bar may enter a succeeding stand correctly. My improved mill and process therefore permits of rolling material and twisting it between stands without the employment of twist guides solely for this purpose and thereby permits of a very desirable mode of rolling without the attendant disadvantages of scratches and seams in the product ordinarily due to such guides.

The invention is not limited to the twisting of bars through a quarter turn, nor is it confined to the rolling of a bar of diamond or rectangular form. It is obvious to one skilled in the art that by merely varying the cant of the twisting pass, with or without varying the distance between the passes the bar may be caused to twist through any desired degree of angularity, or, with the same degree of canting, this result may be achieved by varying the distance between stands. It should also be understood that the invention may be embodied in a continuous mill adapted to roll various shapes.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

Having thus described the invention what I claim as new and desire to secure by Letters Patent is:

1. The process of rolling bars which con-

sist in passing a billet through rolls which simultaneously twist and reduce the metal and then passing such twisted metal through a pass to reduce but not twist the metal.

5 2. In a process of rolling metal, the steps of alternately rolling to reduce the metal without twisting the metal and rolling to twist the metal.

10 In testimony whereof I hereunto affix my signature this 6th day of February, 1925.
WILLIAM T. MILLER.

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