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METHOD OF ROLLING BIMETALLIC ARTICLES

Filed March 19, 1929

Fig.1.

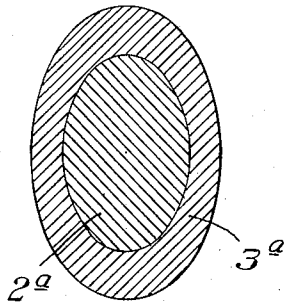


Fig. 2.

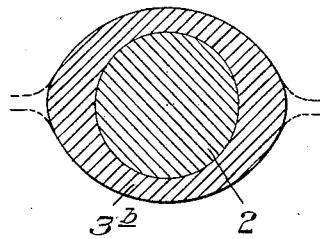


Fig. 3.

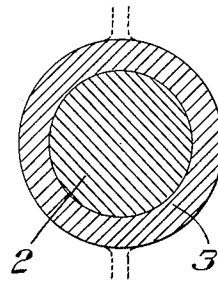
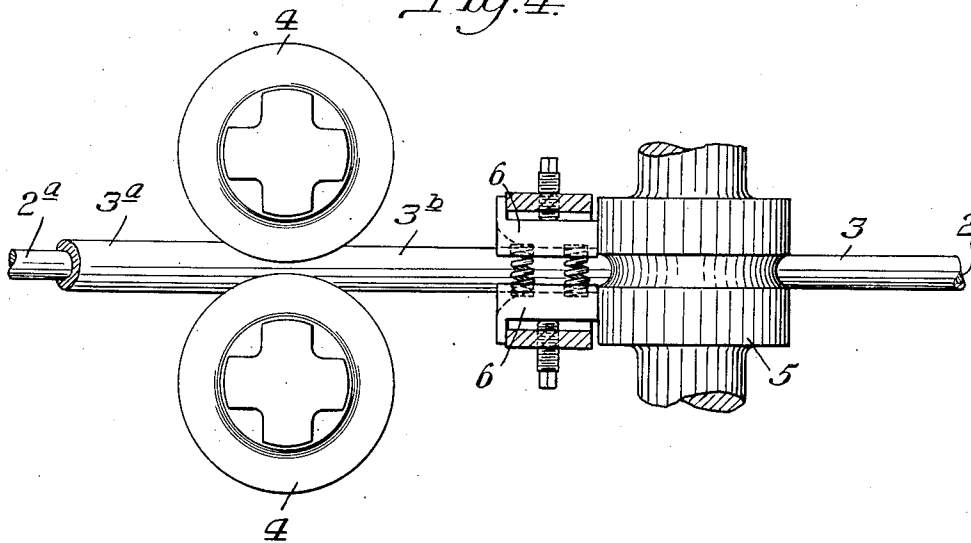


Fig. 4.



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METHOD OF ROLLING BIMETALLIC ARTICLES

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This invention relates to the rolling of bimetallic articles and is herein particularly described as applied to the rolling of round bars having a steel core and a copper envelope, although it has numerous other applications.

In the rolling of bimetallic articles it is necessary to have both metals at a sufficiently high temperature to permit of proper rolling. Due to the fact that the steel core must be hot enough to roll, the copper is at higher temperature than is ordinarily used for the rolling of copper alone. At such high temperature, the copper is subject to scratching and also tends to spread unduly during rolling. By reason of this fact it has heretofore been difficult to control the rolling as closely as has been desired. If the rods are to be drawn into wire it is important that the core and the envelope of the rolled bar both be truly circular and that they be concentric. Difficulty has been encountered in making both the core and the envelope circular.

I overcome these difficulties by so rolling the metal as to impart substantially the final desired shape to the core and then subjecting the article to further rolling to re-shape the envelope. Preferably the core is substantially finally shaped in the leader pass and the work of the finishing pass is substantially if not entirely a re-shaping of the envelope only.

In this manner the final shaping of the core can be accurately determined without any necessity for imparting a particular shape to the envelope in the same pass, and concentricity of the core and the envelope is assured.

Preferably the finishing pass is effected by rolls having their axes extending at a substantial angle to the axes of the rolls in the leader pass, the leader pass and the finishing pass being spaced only a short distance apart. Ordinarily the leader pass and the preceding passes will be effected with horizontal rolls while a vertical roll will be employed for finishing. The vertical roll will be placed as close as possible to the mill in which the leader is formed.

This arrangement is particularly valuable in the rolling of rounds. Ordinarily there will be only a slight degree of re-shaping re-

quired in the finishing pass. The eccentricity of the oval produced in the leader pass will be so slight that difficulty will be encountered in edging it and guiding it through a finishing pass which is entirely independent of the leader pass. Difficulty is encountered in the rolling of bimetallic articles because of the fact that the copper is at a temperature materially above that employed for rolling solid copper articles. This high temperature is necessary because of the presence of the steel core, but the fact that the copper is at high temperature materially increases the danger of guide scratches and the like. It is therefore necessary to employ loose guides. Since there is danger of guide scratches and since the eccentricity of the oval produced in the leader pass is very slight, the problem of guiding the leader into the finishing pass is particularly acute. It is therefore especially desirable in the rolling of bimetallic articles, such as rounds, to have the finishing pass and the leader pass operate as a continuous mill, since the material as it issues from the leader pass is directed thereby into the finishing pass through its entering guides with a minimum of danger of guide scratches and with a maximum insurance that the leader will be properly presented to the finishing rolls.

In the accompanying drawing, illustrating the present preferred embodiment of the invention, Figures 1 to 3 inclusive are transverse sections showing a bimetallic round in different stages of production, Figures 2 and 3 also indicating the parting line of the rolls; and

Figure 4 is a diagrammatic view of the leader rolls and the finishing rolls employed.

Figure 1 represents the oval which is fed into the leader pass; Figure 2 represents the bar as it is shaped in the leader pass, the parting lines of the horizontal rolls being shown, and Figure 3 represents the final article as it issues from the finishing rolls. This article comprises a circular core 2 having a circular envelope 3. The core 2 is of steel and the envelope 3 is of copper.

In practice a bimetallic ingot is reduced through successive passes to the shape of the

oval in Figure 1. This oval comprises an elliptical core 2^a and an elliptical envelope 3^a. It is supplied on edge to the leader pass where both the core and the envelope are re-shaped. The core 2^a is rolled to substantially circular cross-section in the leader pass as indicated at 2 in Figure 2. The copper envelope 3^a is reduced to an oval having a major axis extending horizontally, as indicated at 3^b in Figure 2.

By comparison of Figures 2 and 3 it will be seen that the core has been reduced to substantially its final shape in the leader pass but that the copper envelope, when it leaves the leader pass, is elliptical in cross section and must be re-shaped. This re-shaping of the envelope is effected in the finishing pass.

Referring to Figure 4 there is shown a leader pass comprising a pair of horizontal rolls 4. The oval of Figure 1 is supplied to these rolls and the oval of Figure 2 is produced thereby. A pair of vertical finishing rolls 5 is placed as close to the leader rolls 4 as possible so that the oval of Figure 2 is fed directly thereto. The vertical rolls 5 re-shape the oval of Figure 2 to the final bar of Figure 3.

By reason of the fact that the steel must be hot enough to roll, the copper is excessively hot and is therefore exceedingly susceptible to marring or scratching by the guides. For this reason only a slight guide pressure is effected. In Figure 4 I have illustrated diagrammatically loose guides 6. By reason of the fact that the leader of Figure 2 is fed directly from the leader rolls 4 to the finishing rolls 5, the problem of guiding and properly presenting the leader to the finishing rolls is materially simplified and the direction of compression of the finishing rolls is, as desired, along the major axis of the leader shown in Figure 2.

The finishing rolls 5 are preferably driven independently of the leader rolls 4 so that the proper speed relationship between the stands may be secured.

I have illustrated and described the present preferred embodiment of the invention. It will be understood, however, that it is not limited to such form but may be otherwise embodied and practiced within the scope of the following claims.

I claim:

1. In the method of rolling bimetallic articles having a core and an envelope, the steps consisting in rolling the metal while the core and the envelope are hot and plastic to impart substantially the desired final shape to the core, and then re-shaping the envelope while leaving the core substantially unaffected.

2. In the method of rolling bimetallic articles having a core and an envelope, the steps consisting in subjecting the metal while the core and the envelope are hot and plastic to

a plurality of rolling passes and substantially finally shaping the core in a pass preceding the final pass.

3. In the method of rolling bimetallic articles having a core and an envelope, the steps consisting in subjecting the metal while the core and the envelope are hot and plastic to a plurality of rolling passes and substantially finally shaping the core in the leader pass.

4. In the method of rolling bimetallic articles having a core and an envelope, the steps consisting in subjecting the metal while the core and the envelope are hot and plastic to a plurality of rolling passes and substantially finally shaping the core in the leader pass, the final pass being an edging pass.

5. In the method of rolling bimetallic articles having a core and an envelope, the steps consisting in subjecting the metal while the core and the envelope are hot and plastic to a plurality of rolling passes and substantially finally shaping the core in the leader pass, the final pass being through rolls whose axes extend at a substantial angle to the axes of the rolls in the leader pass.

6. In the method of rolling bimetallic articles having a core and an envelope, the steps consisting in subjecting the metal while the core and the envelope are hot and plastic to a plurality of rolling passes and substantially finally shaping the core in the leader pass, the final pass being through rolls whose axes extend at a substantial angle to the axes of the rolls in the leader pass, the rolls of the leader pass and of the final pass simultaneously engaging the article.

7. In the method of rolling bimetallic circular articles having a core and an envelope, the steps consisting in rolling the metal while the core and the envelope are hot and plastic to form a leader having a substantially circular core surrounded by a non-circular envelope, and rolling the leader to reduce the envelope to circular cross section while leaving the core substantially unaffected.

8. In the method of rolling circular bimetallic articles having a core and an envelope, the steps consisting in rolling the metal while the core and the envelope are hot and plastic so as to form a leader having a substantially circular core and a non-circular envelope, and engaging the leader in a finishing pass while a portion thereof is still in the leader pass to re-shape the envelope while leaving the core substantially unaffected.

9. In the method of rolling circular bimetallic articles having a core and an envelope, the steps consisting in rolling the metal while the core and the envelope are hot and plastic so as to form a leader having a substantially circular core and a non-circular envelope, and engaging the leader in a finishing pass while a portion thereof is still

in the leader pass to re-shape the envelope, the finishing pass being an edging pass.

10. In the method of rolling bimetallic articles having a steel core and an envelope of softer metal, the steps consisting in rolling the metal while the core and the envelope are both hot and plastic, so shaping the bimetallic body that the steel core assumes substantially the desired final shape, and then re-rolling the body so as to re-shape the envelope while leaving the shape of the core substantially unaffected.

In testimony whereof I have hereunto set my hand.

FREDERICK A. WHITEHEAD.