Jan. 14, 1930. A. P. STECKEL 1,744,017

ROLLING METAL STRIP

Filed Sept. 13, 1923

Fig. 1.

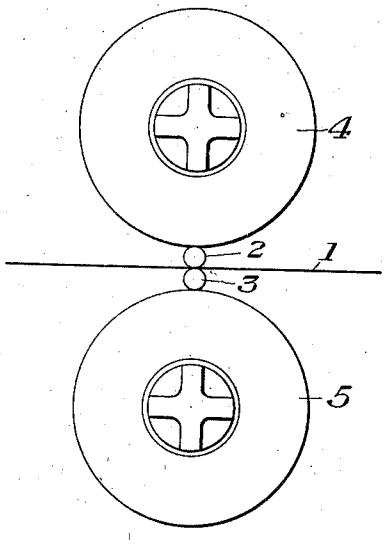


Fig. 2.

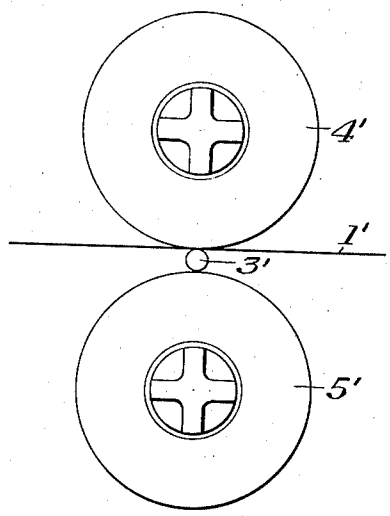


Fig. 3.

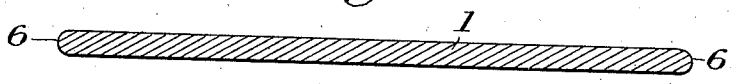
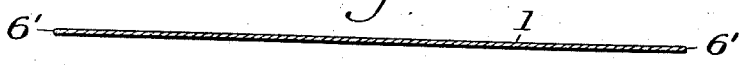


Fig. 4.



INVENTOR

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by his attorneys

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UNITED STATES PATENT OFFICE

ABRAM P. STECKEL, OF YOUNGSTOWN, OHIO, ASSIGNOR TO THE COLD METAL PROCESS COMPANY, OF YOUNGSTOWN, OHIO, A CORPORATION OF OHIO

ROLLING METAL STRIP

Application filed September 13, 1923. Serial No. 662,426.

The present invention relates to rolling metal strip, and more particularly to cold rolling iron or steel strip so as to preserve the edge of the strip.

My copending application, Serial No. 648,761, filed June 30, 1923, describes and broadly claims the process of rolling by pulling a strip of metal past a relatively small reducing roll having an anti-friction backing roll, a large part of the power being supplied by tension on the delivered strip. Such application also describes and claims the improved product thereby obtained.

In the present practice of cold rolling strip, there is serious trouble with the cracking of the edges of the material. The use of rounded edge strip for cold rolling lessens the trouble somewhat, but the trouble is still serious even with rounded edge strip. The ordinary cold rolling mill employs rolls of relatively large diameter, usually from six to twenty-four inches in diameter. The enormous pressure required for rolling with these large diameter rolls apparently causes the metal at the edge of the strip to flow laterally and develop cracks in the edge of the strip.

I have discovered that strip may be cold rolled and a smooth and finished edge retained, even with large reductions in thickness, by employing a strip having an initially round edge, and by subjecting such round edge strip to cold rolling with sufficiently small rolls. The small rolls apparently give the necessary reduction in thickness by elongating the metal lengthwise and without the sidewise extrusion or flow caused at the edge of the strip incident to the use of relatively large rolls. For example, by using rolls of two and one-half inches in diameter, I have reduced a medium carbon steel strip from a thickness of one-eighth to four-thousandths of an inch (about one-twenty-fifth of the original thickness) without intermediate annealing, and preserving the edge of the strip without cracking.

In the drawings, which illustrate conventionally my rolling mill and the reduction in the strip thickness:

Figure 1 is an elevation showing diagrammatically the small rolls, together with their backing rolls;

Figure 2 is a similar view showing a single small roll employed with its backing roll and a large roll opposing it;

Figure 3 is a cross section illustrating the strip before rolling, and

Figure 4 is a similar section illustrating the strip after partial or complete reduction.

In the drawings Figure 1 illustrates diagrammatically a rolling mill for carrying out my process. A strip 1 is passed between rolls 2 and 3 of relatively small diameter, (a few inches in diameter). The rolls 2 and 3 are of necessity too small to withstand the rolling pressure when a strip of several inches in width is to be rolled, and are, therefore, backed up by larger backing rolls 4 and 5 which are strong enough to withstand the rolling pressures.

In Figure 2 is illustrated a modification, in which the strip 1 is rolled between a single small roll 3′ and a large roll 4′, the small roll 3′ being backed up by a large roll 5′. While it is preferred to use two small rolls, as shown in Figure 1, since a greater angle of divergence of the rolls can be obtained, it is possible to use a single small roll as shown in Figure 2, since a relatively large angle of divergence can be obtained between it and the opposing roll.

The rolls can be used in any convenient form of roll support. In my copending application Serial No. 648,761, filed June 30, 1923, I have illustrated in more detail roll stands for carrying small rolls for cold rolling, such as here employed. For rolling the strip according to the present invention, however, it is not necessary that the rolls be provided with an anti-friction mounting to permit the strip to be drawn through as described in detail in my copending application above referred to. The round edge will be preserved on the strip, even though the rolls be power driven and mounted in the usual relatively large friction brasses.

The strip 1 is hot rolled to the form shown in Figure 3, its edges being rounded as indicated at 6. The strip is then passed through the rolling mill, where it is subjected to re-

duction by a relatively small roll or rolls until it is reduced to the desired thinness. The rounded edges of the strip are preserved uncracked, and rounded as indicated in Figure 4, although the strip may be reduced as much as to one-twenty-fifth of its original thickness by cold rolling.

I prefer to use rolls of a few inches in diameter (2 to 3 inches). However, the roll diameter may vary somewhat depending on the character of the rolling and of the material being rolled. In all cases I prefer to keep the roll diameter sufficiently small so as not to cause cracking of the strip edge and, where all the advantages of the invention are to be realized, sufficiently small to prevent widening of the material.

A great advantage of using rolls sufficiently small as to eliminate widening is that the metal stock which is to be rolled may be made of the exact desired width before rolling, either by a previous rolling operation or by trimming. This greatly reduces the work of trimming, since the stock is only a fraction of the length of the finished product, and in many cases also results in a saving of material. Another advantage which results from trimming of the stock rather than the final product is that the stock is of uniform width when it is fed to the mill, thus making possible accurate side guiding and resulting in a perfectly straight finished product.

The present invention is not limited to the details above described, but may be otherwise embodied within the scope of the following claims.

I claim:

1. The process of cold rolling metal strip which consists in passing cold round edged strip through a rolling mill having at least one roll of but a few inches in diameter whereby the edge of the strip is kept from cracking.

2. The process of cold rolling metal strip which consists in passing cold round-edged strip through a rolling mill having one roll whose diameter is not more than about two and one-half inches whereby cracking of the strip edge is eliminated.

3. The process of cold rolling metal strip which consists in passing cold round-edged strip between rolls whose diameter is not more than about two and one-half inches whereby cracking of the strip edge is eliminated.

4. The process of cold rolling metal strip which consists in passing cold strip through a plurality of passes without any intermediate annealing, each pass having at least one roll of a diameter not more than two and one-half inches whereby cracking of the strip edge is eliminated.

5. The process of cold rolling metal strip which consists in passing cold strip through a plurality of passes without any intermediate annealing, each pass having two rolls between which the strip is engaged, the diameter of the rolls being not more than two and one-half inches whereby cracking of the strip edge is eliminated.

6. The process of making metal strip, which includes hot rolling metal to form a strip having rounded edges and cold rolling such strip in a plurality of passes with the rounded edges disposed sidewise of the metal as it is cold rolled, at least one roll in each of the cold rolling passes being of such size that intermediate annealing of the strip is eliminated.

7. The process of making metal strip which includes cold rolling a strip having rounded edges, which rounded edges are disposed sidewise of the metal as it is cold rolled, and reducing the metal by the cold rolling to at least 1/25 of its original thickness, at least one roll in each of the cold rolling passes being sufficiently small to eliminate annealing of the strip during the cold rolling.

8. The process of making metal strip which includes subjecting the metal to cold rolling in a plurality of passes embodying small supported rolls, and thus reducing the metal to materially less than half its original thickness, the rolls being of sufficiently small diameter to substantially eliminate widening of the material.

9. The process of making metal strip which includes subjecting the metal to cold rolling in a plurality of passes embodying small supported rolls, and thus reducing the metal to materially less than half its original thickness, the rolls being of sufficiently small diameter to substantially eliminate lateral flow of the material.

10. The process of making metal strip which includes subjecting the metal to cold rolling in a plurality of passes, embodying small supported rolls, and subjecting the metal to tension during the rolling operation, thus reducing the metal to materially less than half its original thickness, the rolls being of sufficiently small diameter to substantially eliminate widening of the material while rolled under such tension.

In testimony whereof I have hereunto set my hand.

ABRAM P. STECKEL.

DISCLAIMER

1,744,017.—*Abram P. Steckel*, Youngstown, Ohio. ROLLING METAL STRIP. Patent dated January 14, 1930. Disclaimer filed September 1, 1939, by the assignee, *The Cold Metal Process Company*.

Hereby enters this disclaimer to claims 6, 7, 8, 9, and 10 in said specification.

[*Official Gazette September 26, 1939.*]