April 2, 1929. W. P. WITHEROW 1,707,778

METHOD OF MAKING METAL ARTICLES

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Fig. 1.

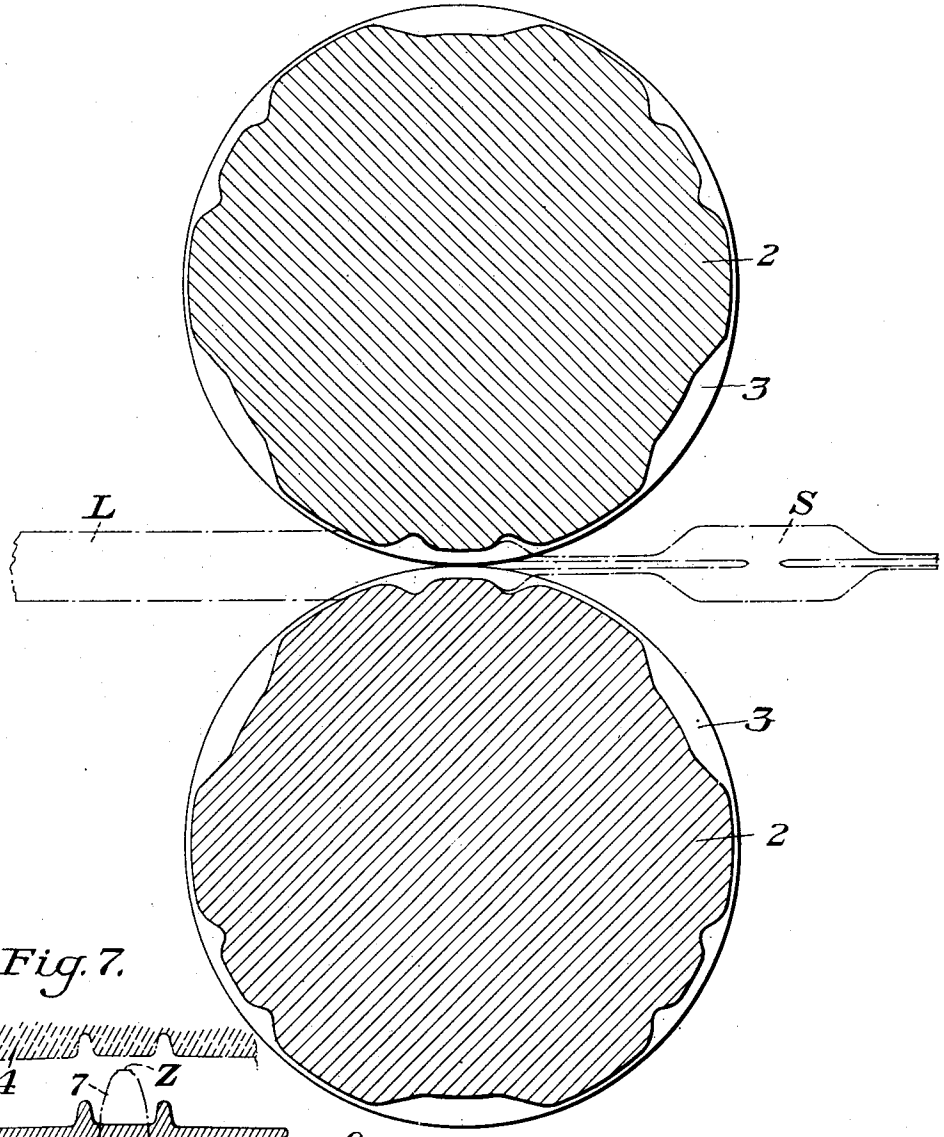


Fig. 7.

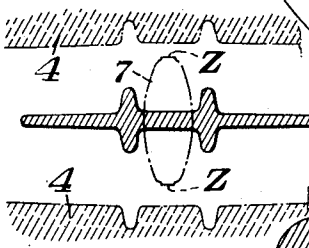
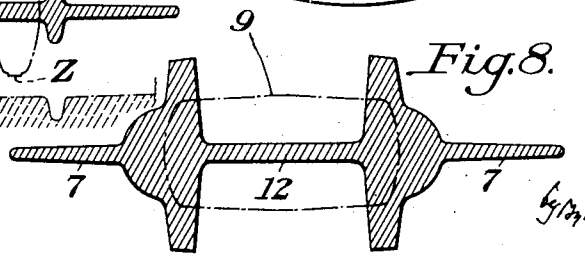


Fig. 8.



INVENTOR

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by Bacon Stebbins & Farnsler

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Fig. 2.

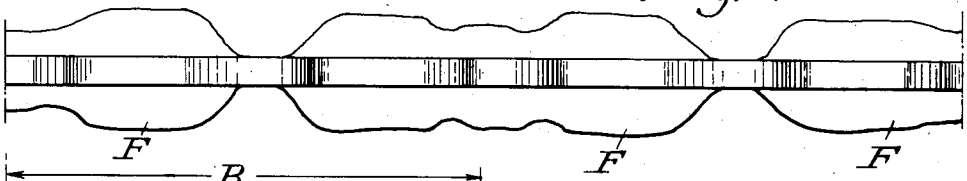


Fig. 3.

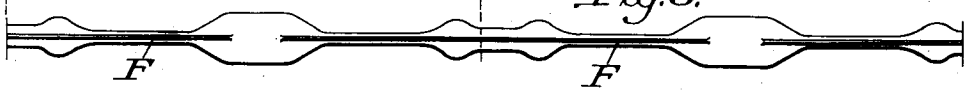


Fig. 4.

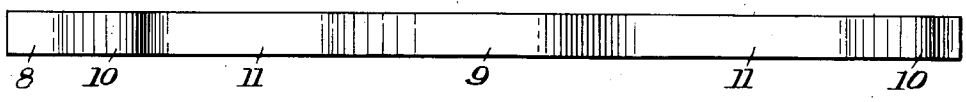


Fig. 5.

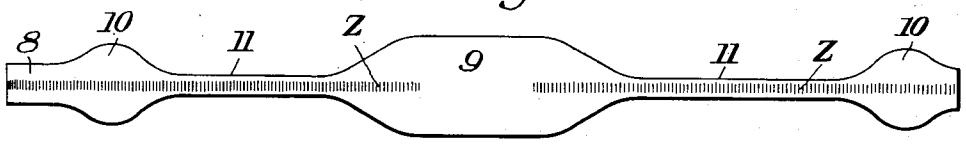


Fig. 6.

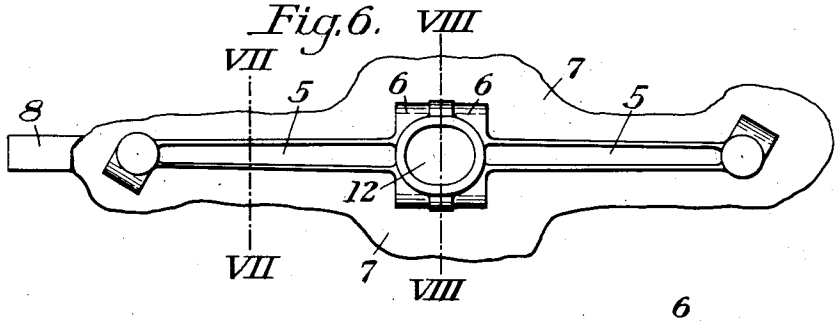
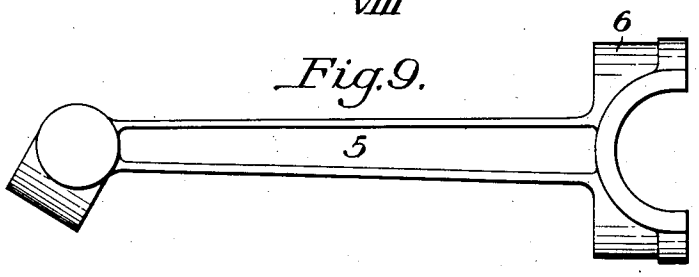


Fig. 9.



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by Byrnes Skeffington & Parmelee

his attys

Patented Apr. 2, 1929. 1,707,778

UNITED STATES PATENT OFFICE.

WILLIAM P. WITHEROW, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO COLONIAL TRUST COMPANY, TRUSTEE, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

METHOD OF MAKING METAL ARTICLES.

Application filed January 5, 1926. Serial No. 79,393.

This invention relates to a method of making metal articles, and particularly to the making of articles in which forging, pressing or the like constitutes one of the later operations.

In ordinary drop forging practice, it is customary to form a blank by a drawing or blocking operation in which a piece of stock, which is uniform in cross-section from end to end, is put through a preliminary operation to secure a blank having varying masses of metal suitably disposed therealong. Lately the blocking operation has been replaced in many plants by die rolled blanks manufactured in acccordance with the methods disclosed in my Patent 1,572,343, Feb. 9, 1926.

As disclosed in that patent, the blanks having masses of metal suitably disposed thereon are rolled in a mill with integral flash appearing at various points along the article. The flash is trimmed and the blanks are then ready for forging.

As heretofore proposed, the blanks have been placed in the forging dies in such position that the flash zones lie substantially in the parting line of the forging dies. In other words, the blanks occupy the same position relative to the dies as they occupied relative to the rolls in which they were produced.

I have found that a material improvement results in edging the blanks in the forging dies so that the flash zones lie at an angle to the parting line of the forging dies rather than in such parting line. By making this change I am enabled to materially simplify the rolling problem in many cases and to cut down, to a very large extent, the amount of flash produced. The flash is of great value during rolling because of the control of length which it affords, but after trimming it is waste metal, and since many articles of the character herein contemplated are made from high priced alloy steel, any reduction in waste which can be effected is of material importance. The die rolling operation is effective for producing blanks wherein the masses of metal are properly disposed in every blank thereby substantially eliminating rejects in the forging operation, while the edging step herein disclosed makes it possible to initially die roll a blank having a relatively small amount of flash while still providing the desired disposition of the metal.

Preferably the blank is ground at the flash zone so as to eliminate any splinters or tears which might arise from the shearing of the flash, thus doing away with any possibility of cold shuts or laps in the forged article.

In the illustrated embodiment of the invention there is shown by way of example only the various steps in the production of a connecting rod in accordance with my invention.

In the drawings:

Figure 1 is a vertical section through a pair of die rolls for producing a blank;

Figures 2 and 3 are, respectively, top and side views of a portion of a string of blanks with integral flash thereon produced by the die roll shown in Figure 1;

Figures 4 and 5 are, respectively, top and side views, to an enlarged scale, of a single blank formed from the string shown in Figures 2 and 3 by trimming and shearing;

Figure 6 is a top plan view of the untrimmed forging produced by edging the blank of Figures 4 and 5 in a suitable pair of forging dies and forging the same;

Figure 7 is a section taken on the line VII—VII of Figure 6 and also indicating the forging dies in dotted lines and the position of the blank therein in chain lines;

Figure 8 is a section taken on the line VIII—VIII of Figure 6 and showing in chain lines the corresponding section of the blank; and

Figure 9 is a view showing a completed connecting rod.

In the illustrated embodiment of the invention there is shown a pair of die rolls 2 having corresponding matrix portions 3 for the production of a die rolled blank. A suitable billet or leader L is supplied to the die rolls as indicated in dotted lines in Figure 1 and a string of die rolled blanks having flash thereon is thereby produced. This string of blanks is indicated in dotted lines S in Figure 1.

Figures 2 and 3 show the string of blanks.

This string consists of portions of a length B as shown on Figure 3, each of these lengths comprising a blank having metal flash F integral with the blanks. This flash is formed in the die rolling operation. The flash is trimmed in any desired manner and the blanks are sheared to length resulting in the trimmed blanks shown in Figures 4 and 5.

The flash is sheared as close to the blank as possible, but like any shearing operation there is a certain amount of variation and also a certain amount of tearing and splintering of the metal at the line of severance. I preferably grind or otherwise remove this condition of roughness or rawness existing at the flash zone so that the finished blank presents a relatively smooth surface at the flash zones as indicated at Z in Figure 5. This is found to be of material value in the subsequent forging operation.

The blank is heated and placed between suitable forging dies 4 indicated more or less diagrammatically in Figure 7 with the blank on edge as best shown in Figure 7. It will be noted that the line of the flash zones, instead of lying in the parting line of the dies, is at right angles thereto. In the die rolling of certain blanks, it may be possible that flash would be produced on one side only of the article, but by the present invention I contemplate the utilization of such blank by so placing it in the dies that a line connecting the axis of the blank with the flash zone lies at an angle to the parting line of the dies.

The forging dies 4 are operated to produce the forged blank shown in Figure 6. This consists of a pair of connecting rods 5 joined together at their big ends 6 and completely surrounded by flash 7. It will be noted that a tong hold 8 has been provided on the blank to assist the drop forger. The production of two articles at once in the forging dies as shown in Figure 6 is exceedingly desirable in connection with the use of die rolled blanks as it materially simplifies the cutting of the rolling matrices and also makes a better blank from a production viewpoint. As shown in Figure 5 the blank consists of a central portion 9 comprising a relatively large mass of metal from which the big ends 6 of the connecting rods are forged; relatively smaller masses of metal 10 from which the small ends of the connecting rods are forged and thin connecting portions 11 from which the body of the connecting rod is made. The portion 11 is indicated in the dies in Figure 7 while the portion 9 is shown in comparison with the section forged therefrom in Figure 8. It will be noted that the flash zones Z extend across the several portions of the blank.

The flash 7 is trimmed from the connecting rods 5 and they are sawed apart on the line VIII—VIII. The thin metal portion 12 of the blanks lying inside the eyes of the big end portions is cut out and the connecting rod blank is then in the form shown in Figure 9. The body portion is completely finished and it requires only the machining operations and the provision of bearing metal to make a completed rod.

The flash shown in Figure 2 is very small relative to the flash which would be produced if it were attempted to roll the blanks in such manner that they occupy the same position relative to the rolls as they occupied relative to the forging dies. The edging step, therefore, represents a material saving in the manufacture of the blank. The grinding step is highly desirable in that it prevents laps or cold shuts in the finished article. In forging certain articles, the metal adjacent this flash zone may be a part of the finished article, whereas in the ordinary operations the metal adjacent the flash zone of the die rolled blank has gone into the flash produced during the forging operation. Because of this difference the importance of the grinding step will be appreciated. An improvement in the quality of the product may also be secured by the practice of my invention, as the metal is worked in the dies at right angles to the direction it is worked in the rolls.

While I have shown the steps in the production of a connecting rod, it will be understood that this is merely by way of example as the invention is not limited to the illustrated embodiment but may be otherwise embodied or practiced within the scope of the following claims.

I claim:

1. The method of making metal articles, which includes die rolling a blank having flash on a side thereof, trimming the flash, edging the blank and forging the blank to form an article of varying size or shape in cross section.

2. The method of making metal articles, which includes die rolling a blank having flash on a side thereof, trimming the flash, grinding the flash zone, edging the blank and forging the ground blank to form an article of varying size or shape in cross section.

3. As a new article of manufacture, a die rolled blank having a plurality of portions differing from one another in size or shape and adapted to provide metal for the different portions of a finished article in a subsequent forging operation, and a flash zone extending over more than one of such portions, said flash zone being ground.

4. The method of making metal articles, which includes die rolling a blank having flash on each side thereof, trimming the flash, placing the blank in the forging dies so that the line of the flash zone is at an angle to the parting line of the forging dies, and

forging the blank to produce an article of varying size and shape.

5. The method of making metal articles which includes forming a die rolled blank of different cross section in different parts and having a single portion providing sufficient metal for the forging of adjacent parts of connected articles and simultaneously forming a plurality of connected articles each of varying size and shape from said blank in a forging operation.

In testimony whereof I have hereunto set my hand.

WILLIAM P. WITHEROW.