Feb. 28, 1933. A. METCALF 1,899,288

MEANS FOR FORMING FORKED HEADS ON METAL BARS

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Fig. 1.

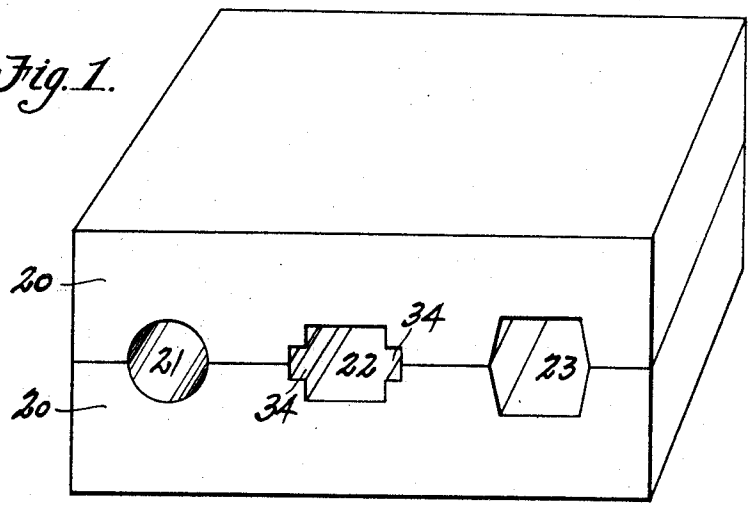
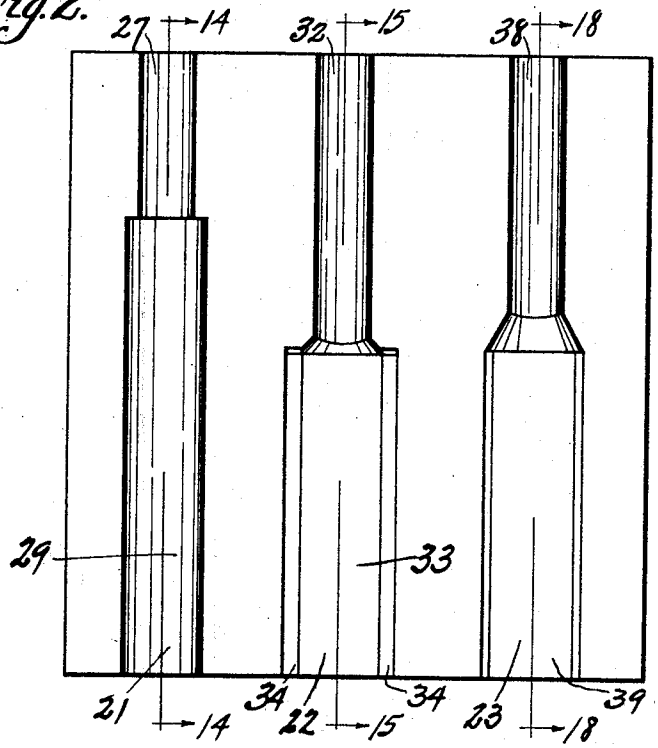



Fig. 2.




INVENTOR.

Abram Metcalf.

BY George J. Utsch

ATTORNEY.

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MEANS FOR FORMING FORKED HEADS ON METAL BARS

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Fig. 3.

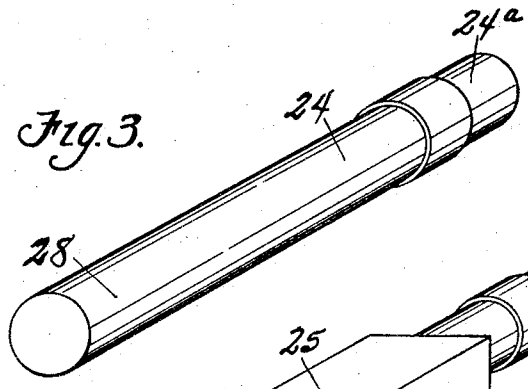



Fig. 4.

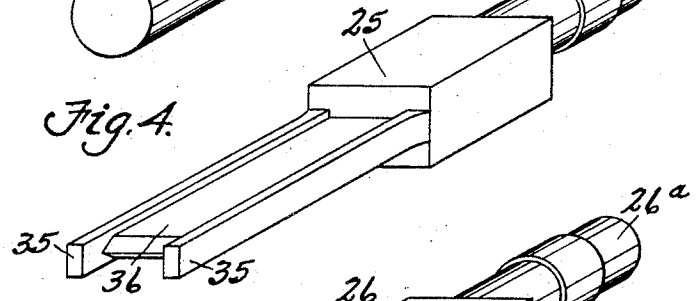



Fig. 5.

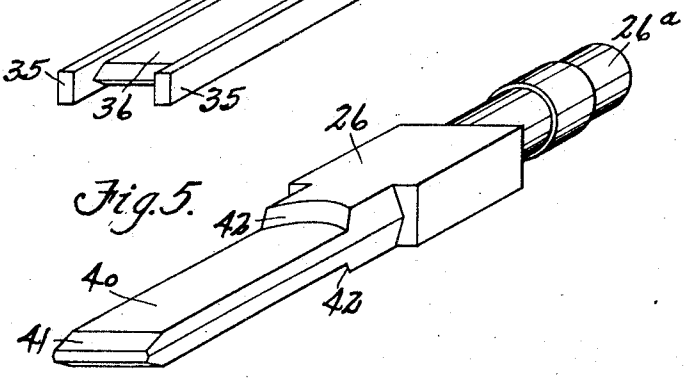
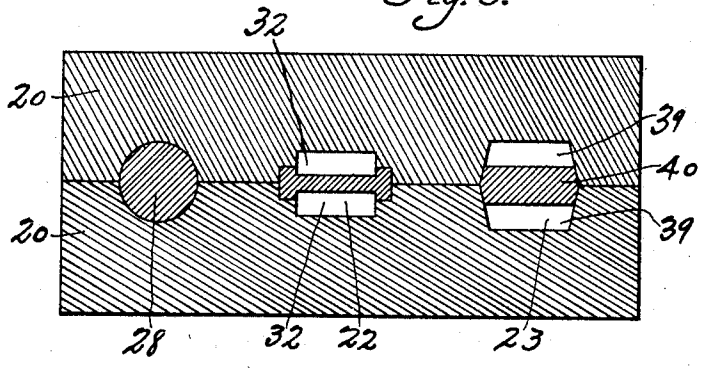



Fig. 6.




INVENTOR.

Abram Metcalf.

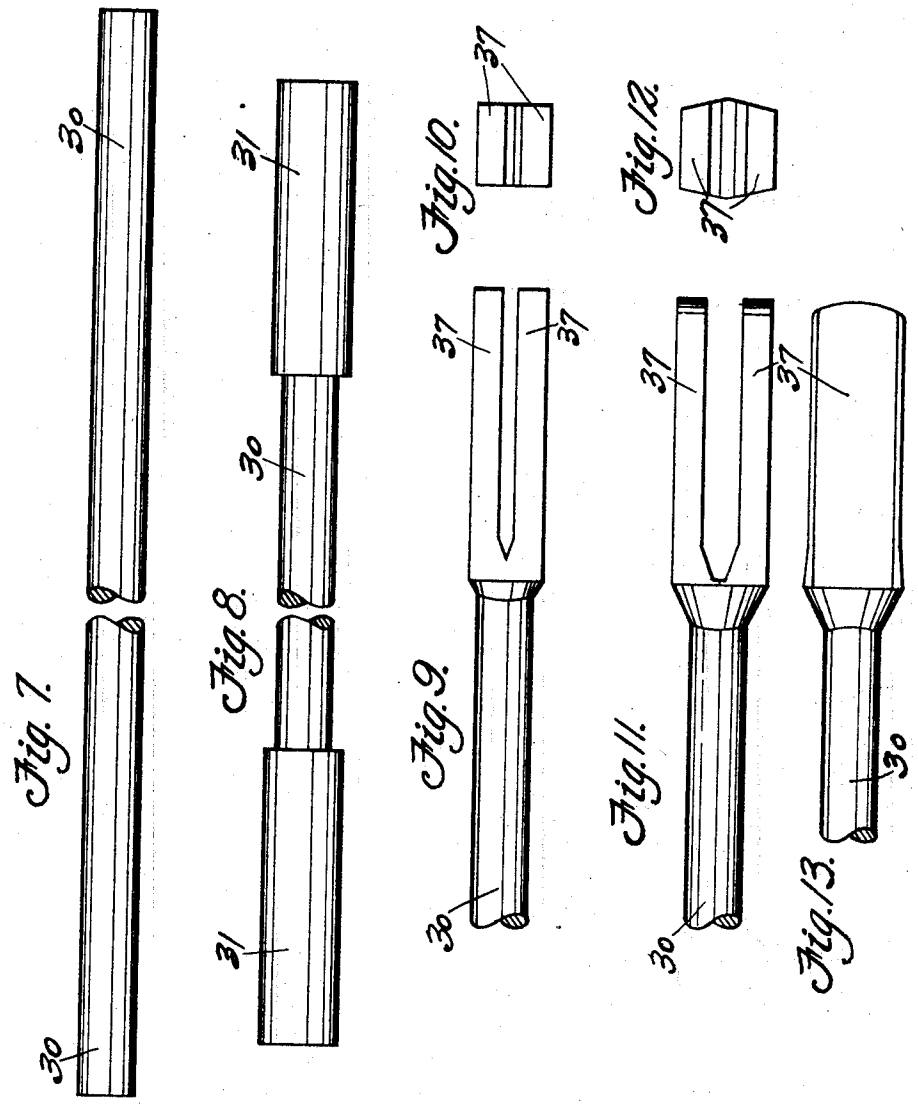
BY George J. Utech

ATTORNEY.

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MEANS FOR FORMING FORKED HEADS ON METAL BARS

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INVENTOR.

BY Abram Metcalf.

Geo. J. Ostach

ATTORNEY.

Feb. 28, 1933. A. METCALF 1,899,288

MEANS FOR FORMING FORKED HEADS ON METAL BARS

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Fig. 14.

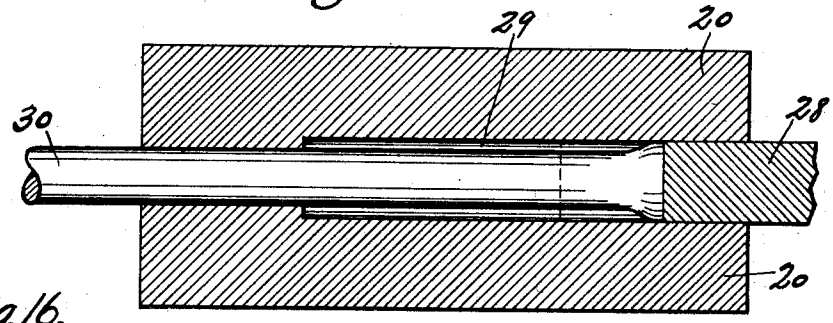



Fig. 16.

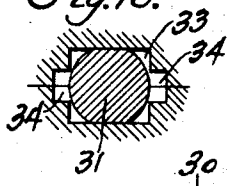



Fig. 15.

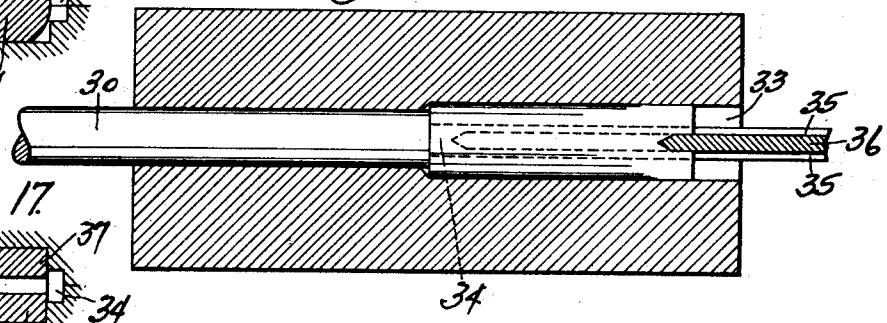



Fig. 17.

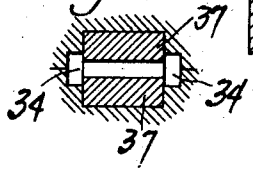
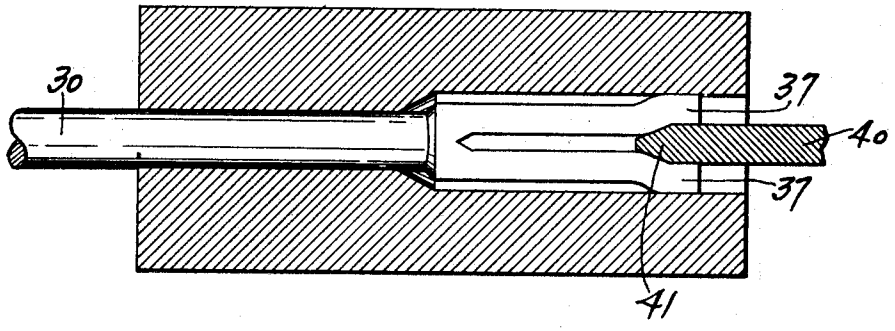



Fig. 18.




INVENTOR.

Abram Metcalf.

BY George J. Utech

ATTORNEY.

Patented Feb. 28, 1933 1,899,288

# UNITED STATES PATENT OFFICE

ABRAM METCALF, OF HAMMOND, INDIANA

## MEANS FOR FORMING FORKED HEADS ON METAL BARS

Application filed September 19, 1929. Serial No. 393,738.

The invention relates to methods and means of forming forked heads on metal bars, such as the heads of coupling rods for railroad air brakes, and has for its object to provide a simple method of splitting and reshaping the end of a metal bar, by the use of a forging machine provided with suitably impressed dies and cooperating plungers, to form a forked head.

A further object is to provide a method of this character in which the end of a metal bar is upset, thence split, and thence spread, said operations being performed in a forging machine.

A further object is to provide a method of this character employing a forging machine to upset, split and spread the end of a metal bar, and in which the transverse pressure produced incident to said operations forces the metal into die impressions whereby the desired cross sectional configuration of head is also produced by said operations and without additional means.

A further object is to provide a method of this character in which a forked head is integrally formed on a metal bar to eliminate welding operations, and in which the metal bar is simply reshaped, all sawing, cutting, or other metal wasting operations being eliminated.

A further object is to provide a device adapted to form a forked head on a metal bar by the aforementioned method.

With the above and other objects in view, the invention resides in the combination and arrangement of parts as hereinafter set forth, shown in the drawings, described and claimed, it being understood that changes in the precise embodiment of the invention may be made within the scope of what is claimed without departing from the spirit of the invention.

In the drawings:

Figure 1 is a perspective view of the dies employed in carrying out the method.

Figure 2 is a top plan view of one of the dies showing the die impressions.

Figure 3 is a perspective view of the upsetting plunger.

Figure 4 is a perspective view of the edged splitting plunger.

Figure 5 is a perspective view of the spreading plunger.

Figure 6 is a transverse sectional view of the dies showing the manner in which the plungers fit into their respective cooperating die impressions.

Figures 7, 8, 9, 10, 11, 12 and 13 are views showing the metal bar and its shape during the successive steps of the method; Figure 7 showing the bar at the beginning of the operation; Figure 8 showing the bar after having its ends upset; Figures 9 and 10 showing one end of the bar after being split and reshaped; and Figures 11, 12 and 13 showing one end of the bar as spread and shaped in final completed form.

Figure 14 is a longitudinal sectional view of the dies taken on line 14—14 of Figure 2 and showing the manner in which the upsetting plunger cooperates with the die impression to upset the end of the bar.

Figure 15 is a longitudinal sectional view of the dies taken on line 15—15 of Figure 2 and showing the manner in which the splitting plunger cooperates with the die impression to split the end of the bar.

Figures 16 and 17 are fragmentary transverse sectional views of the dies showing the bar in the splitting impression of the dies, before and after the splitting operation, respectively.

Figure 18 is a longitudinal sectional view of the dies taken on line 16—16 of Figure 2, and showing the manner in which the spreading plunger operates in its die impression to spread the arm of the bar.

Referring to the drawings, the numeral 20 designates a pair of cooperating dies adapted for use in a conventional forging machine, one of said dies being adapted to be mounted in stationary position in such a machine, and the other being adapted to be movably mounted in such a machine. Formed in the adjacent faces of the dies 20, in registering cooperating relation, are die impresions 21, 22, and 23, respectively, said die impression extending from end to end of the dies. Heading tools or plungers 24, 25, and 26, are

adapted to cooperate with the die impressions 21, 22 and 23, respectively, and are provided with suitable shanks $24^a$, $25^a$ and $26^a$, by means of which said plungers are adapted to be secured in operative position in the forging machine.

The first step in the method is to suitably heat a bar 30, or the end of it to be worked, to a suitable forging temperature. Then the heated bar is positioned upon the stationary die of the forging machine in die impression 21, a portion 27 of which is of the same dimension as the bar, and the movable die is brought into bearing contact with the stationary die. The upsetting plunger 24, whose head 28 is of the same shape and dimension as the working portion 29 of the die impression 21, is then forced lengthwise into the working portion of the die impression and exerts an endwise pressure upon the heated metal bar, which is firmly held in the die in desired position; and the bar is thus spread or upset to make it conform to the working portion 29 of the die impression and to form an upset end 31 on the bar, the length of said upset end 31 being determined by the length of the portion of the bar protruding into the working portion 29 of the die impression.

The upset end 31 having been formed, the bar 30 is removed from the die impression 21, and if the upset end of the bar is still at a forging heat it is then disposed in die impression 22, but said bar must be heated again if it has been cooled by the first operation to a point where it may not be safely forged. The die impression 22 has a portion 32 of the same dimension as the bar 30 into which the unworked shank of the bar is placed, and the upset end 31 is positioned in the working portion 33 of the die impression 22 at the inner end thereof. The working portion 33 of the die impression 22 is provided with a centrally disposed guide-way 34 at each side thereof, said working portion 33 of the die impression being preferably rectangular, as best shown in Figure 6. The plunger 25, which cooperates with the die impression 22, is provided with guide members 35 which have the same width and shape as, and which fit into, the guide-way 34 of the die impression; and extending between the guide members 35, but set back from the end thereof and positioned in the center thereof, is a relatively thin, edged, splitting blade 36. The depth of the working portion 33 of this die impression 22 is preferably less than the diameter of the upset end of the bar 30, and consequently, when the movable die is brought into bearing contact with the stationary die, the upset end 31 is slightly flattened, as shown in Figure 16. Then the plunger 25 is forced lengthwise into the die impression and the blade 36 splits the upset end 31 of the bar, and also slightly spreads it, said spreading action setting up transverse forces in the metal, which force the metal of the upset head into the die impression, as shown in Figure 17, thus forming two arms or forks 37 of rectangular cross-section on the end of the bar 30, as shown in Figures 9 and 10.

The forks 37 having been formed, the bar 30 is removed from the die impression 22 and must again be brought to forging heat, after which it is disposed in the die impression 23, which is provided with a bar shank receiving portion 38 of the same dimension as the bar 30, and a working portion 39. The working portion 39 of the die impression 23 is formed of the shape it is desired to give the forked head of the bar when completed, and preferably, as shown in Figures 1 and 6, its upper and bottom faces are parallel, and the sides of the impression are slightly divergent from the top and bottom faces whereby the center of the impression is wider than the top and bottom faces, thus forming an impression hexagonal in cross-section. The plunger 26 cooperates with the working portion 39 of the die impression 23 and is provided with a head 40 whose outer end 41 is tapered to form a wedge, the thickness of the head 40 being determined by the spacing desired between the forks 37 of the bar 30. The center of the plunger head 40 is of a width equal to the width of the center of the die impression, and the sides taper therefrom at the same angle as the sides of the die impression, thus forming guiding means to operatively hold the plunger head in the center of the die impression. The arms 37 are placed in the working portion 39 of the die impression at the inner end thereof, and the plunger 26 is forced lengthwise into the die impression with its wedge shaped head 41 inserted between the arms 37 of bar 30, thus causing it to spread the arms 37 to the desired spacing; and by the transverse pressure set up by the spreading action, forcing the metal of the arms into the die impression to give the desired cross-sectional configuration thereto. At the inner end of the head 40 of the plunger 26, and on each side thereof, are formed shoulders 42, which may be curved as shown in Figure 5, and which are adapted to engage and press against the outer ends of the arms 37 at the end of the plunger stroke, whereby the ends of the arms may be rounded, as shown in Figure 13. The forked end of the bar is then completely formed, as shown in Figures 11, 12 and 13.

It will thus be seen that a forked head is formed on a metal bar by the use in a forging machine of suitable dies and cooperating plungers to upset the end of the bar, split the upset end to form arms, and to spread the arms; the transverse pressures created by said operations forcing the forked head of the bar to assume the shape of the die impressions. It will also be seen that each die impression

must be formed so that the free cross-sectional area thereof which the metal occupies is the same as that of the other die impressions.

It will be obvious that the steps of the process may be somewhat modified from those particularly set forth; for instance, the shape of the dies might be changed so that in only one of the operations is the head of the bar reformed or reshaped, the other of said operations performing only their primary functions; viz., upsetting, splitting or spreading. Also in some cases the reforming or reshaping might be entirely dispensed with, leaving only the primary functions of upsetting, splitting, and spreading to be performed. The particular shape and size of forks required may also eliminate the upsetting operation, as where only small forks are desired; or may eliminate the spreading operation when the forks are to be closely spaced, or may provide two or more plungers where more than two forks are desired, and the like. But in each modification the basic idea of splitting and reshaping the end of a bar to form a forked head by the use of dies and plungers is employed.

The invention having been set forth, what is claimed as new and useful is:

1. The combination with a die having a die impression and guide ways extending along the opposite sides of said impression, of an I-shaped edge plunger operable in said die impression and guide ways, the center portion of said plunger forming the working element thereof and the side portions of said plunger forming guide elements operable in said guide ways.

2. The combination with a die having a die impression including a guide way extending longitudinally of said impression, of an edged plunger operating in said die impression, and a guide member carried by said plunger and operable in said guideway with its inner face forming a complement of said impression, said plunger being adapted to longitudinally split and reshape a blank disposed in said die impression.

3. The combination with a die having a die impression including a guide way, of an edged plunger operating in said impression, and a guide member integral with said plunger and operable in said guide way, said plunger being adapted to simultaneously split a blank disposed in said die impression and to reshape said blank to conform with the contour of said impression.

4. The combination with a die having a die impression and a guide way, an edged plunger operating in said die impression to act upon a blank disposed in said impression, and means operable in said guide way to guide said plunger in said impression, said means forming a complement of said impression.

In testimony whereof I affix my signature.

ABRAM METCALF.