

April 22, 1941.

N. C. RENDLEMAN

2,239,202

FORGING BLANK FOR STEERING KNUCKLES

Filed July 9, 1933

2 Sheets-Sheet 1

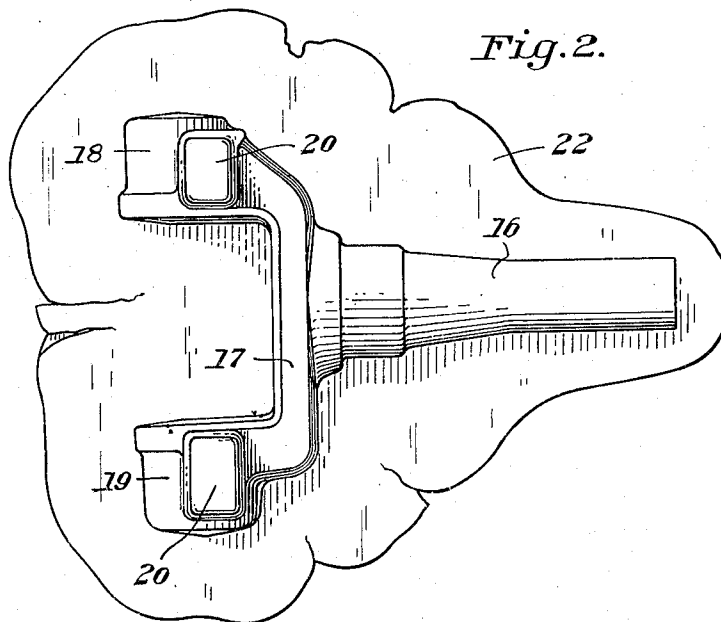
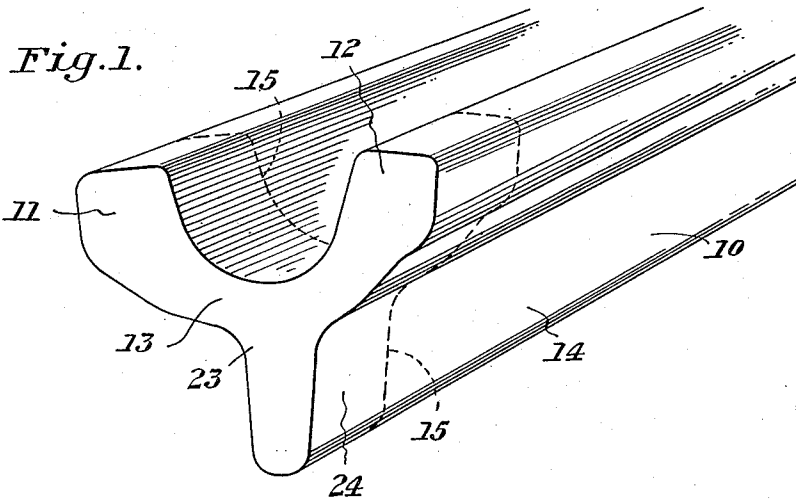
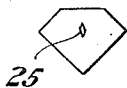
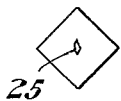


Fig. 6. Fig. 7. Fig. 8 Fig. 9.



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2 Sheets-Sheet 2

Fig. 3.

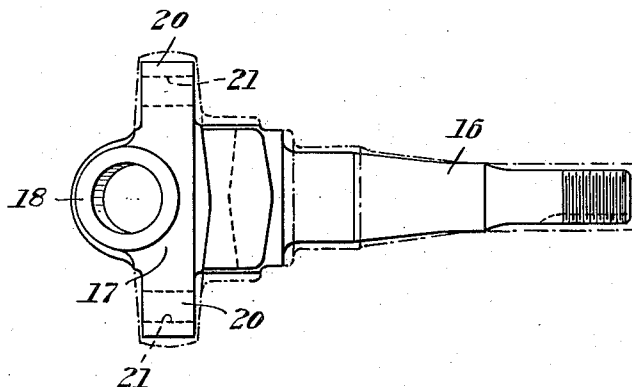


Fig. 5.

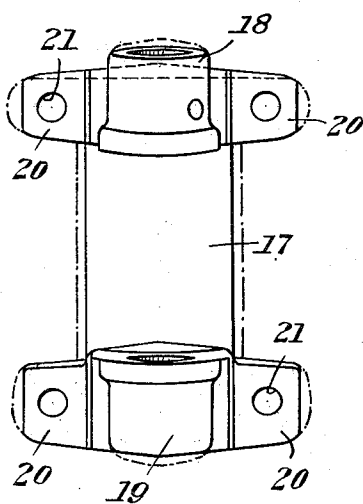
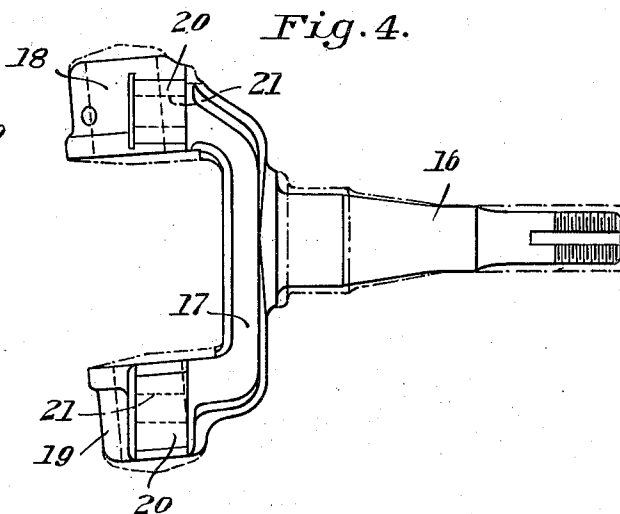


Fig. 4.



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FORGING BLANK FOR STEERING KNUCKLES

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Application July 9, 1938, Serial No. 218,454

2 Claims. (Cl. 29—148)

This invention relates to the manufacture of forged articles, and, in particular to a blank adapted to be forged into a steering knuckle.

Steering knuckles have been manufactured heretofore by a series of forging operations performed on a work piece which is originally in the form of a short length of a billet of square section. The length is first reduced at one end to provide a tong hold and is then subjected to a series of forging operations in a plurality of different shaping dies. Twelve forging blows in all are necessary for making a forged knuckle by the prior method and, of the weight of the initial work piece, forty-four per cent is removed as scrap.

I have invented a novel blank for making steering knuckles by forging. By my invention, I am able to convert a blank into a forged steering knuckle with one or two forging blows and the amount of scrap to be removed is only about fourteen per cent of the initial weight of the blank. In a preferred form, the blank comprises a short length of a rolled section of substantially Y-shape, the upper ends of the section being enlarged to provide spaced metal masses connected by a web of relatively reduced section, with a rib or stem projecting from the web in the opposite direction from said masses. The blank is formed by rolling a bar of suitable shape and cutting it into appropriate lengths. The method of making knuckles disclosed herein is claimed in my copending application, Ser. No. 366,160, filed November 18, 1940, which is a division hereof. For a complete understanding of the invention, reference is made to the accompanying drawings illustrating a preferred embodiment and practice of the invention. In the drawings:

Fig. 1 is an end view in perspective of a bar in accordance with my invention adapted to provide a plurality of short lengths having metal masses spaced appropriately for the forging of steering knuckles;

Fig. 2 is a side elevation of a forged steering knuckle with the forging flash thereon;

Fig. 3 is a plan view of a finished steering knuckle;

Figs. 4 and 5 are side and end views thereof; and

Figs. 6, 7, 8 and 9 show roughly the successive steps in the manufacture of the bar shown in Fig. 1.

Referring in detail to the drawings, the first step in the manufacture of steering knuckles, in accordance with the invention, is the rolling of

an elongated bar 10 of suitable sectional shape to provide masses of metal appropriately spaced to fill the dies wherein steering knuckles are forged. As shown in Fig. 1, the bar 10 is roughly of Y-shape, the upper ends of the section being enlarged as at 11 and 12, and connected by a relatively thin web 13. A rib 14 projects outwardly from the web 13 in a direction opposite from the masses 11 and 12. The rib 14 is disposed substantially centrally of the web 13 although not precisely so.

Considered in a slightly different light, the bar 10 might be described as a special bar the section of which is of generally Y shape, wider than it is deep, with enlarged, bulbous, upper extremities thicker than the mid-portion, and a rib extending downwardly from the mid-portion. Regardless of how the bar 10 is described, it will be recognized that it constitutes roughly a channel section with flanges thickened adjacent their outer edges and a rib projecting outwardly from the web.

The bar 10 may be produced in convenient lengths by known methods of rolling so it is unnecessary to make a detailed disclosure of the successive rolling operations. It will suffice to refer to Figs. 6-9 showing roughly the steps by which a billet of square section may be reduced by ordinary rolling procedure to a bar such as shown at 10. The important feature of this portion of the invention is that the center of the billet shown at 25, which contains the segregations and defects from the parent ingot is so distributed as shown in Fig. 9, that such defects are almost obliterated and without adverse effect upon the resulting blank or the knuckle forged therefrom. This is in contrast to the prior practice according to which the center of the billet extends axially of the knuckle spindle.

Short sections, of a length indicated by dotted lines 15, when cut from the bar 10, constitute blanks from which steering knuckles such as shown in Figs. 3 through 5 may readily be formed by one or two forging operations. Referring for a moment to the figures last mentioned, it will be observed that the knuckle there shown comprises a spindle 16 and a yoke portion 17 substantially at right angles thereto terminating in bearing sockets 18 and 19 adapted to receive the king bolt of a tilting wheel mounting. Lugs 20 extend outwardly from the sockets and are drilled as at 21 to receive bolts for securing the brake drum and assembly to the knuckle. The dotted lines in Figs. 3 through 5 show the portion of the forged knuckle that is removed in machining it to accu-

rate dimensions and performing other finishing operations thereon.

Fig. 2 shows a steering knuckle forged from a blank cut from a bar such as shown at 10, before the forging flash indicated at 22 has been trimmed therefrom. The forged knuckle is produced by one or two blows on a blank such as that indicated generally at 23, by the forging dies used heretofore to perform the finishing forging operation. A single blow of such dies usually suffices to reduce the blank 23 to the condition illustrated in Fig. 2, although a second blow may be desirable in some cases. The shape of the blank 23 is such as to provide sufficient flash to cause the dies to fill fully and completely and to avoid cold shuts. It will be understood that the spaced masses 11 and 12 provide metal for forming the bearing sockets 18 and 19 and the lugs 20. The web 13 furnishes the metal necessary to form the yoke 14 while the rib or stem portion of the blank indicated at 24 furnishes the metal necessary to form the spindle 16.

It will be noted that in forging the blank 23, the pressure exerted by the dies is parallel to the rolling direction of the blank. Forging blanks have heretofore been compressed between forging dies along a line transverse to the rolling direction of the blank but I believe I am the first to adopt the procedure of disposing a blank in the dies with its direction of rolling in the line along which forging pressure is exerted. This procedure appears to result in the production of a sounder and stronger forging than would be produced by the former practice. Forgings made by the prior practice exhibit irregular flow lines indicating excessive distortion. Forgings made in accordance with the invention show smooth flow lines indicating a minimum distortion consistent with the desired shaping effect.

When the forging shown in Fig. 2 has been subjected to a flash trimming operation, it is then ready for the machining and other finishing operations necessary to convert it into final form as shown in Figs. 3 through 5.

It will be apparent that the invention is characterized by numerous advantages over the use of a length of a billet of square section for the formation of steering knuckles. Perhaps the most important of these is the great reduction in the amount of scrap which has already been mentioned, viz., from forty-four per cent by the old method to about fourteen per cent by the practice described herein. This means that the original blank from which the knuckle is forged weighs less than the starting blank used in the prior method. Likewise a greater number of blanks may be produced from a given weight of metal. The reduction in the weight of the blank means that the blank can be heated more quickly, thus making it possible to obtain greater production with the same blank heating equipment.

The reduction in the number of forging blows from fourteen under the old method to one or

two under the practice described is another highly important advantage since it reduces the labor cost per unit as well as the die cost. The wear on the dies per forging is reduced in proportion to the reduction in the number of blows and only a single set of dies is necessary to convert the blank into a finished forging as compared with several sets used under the old method. The reduction in the number of forging blows required further increases the output obtainable with existing forging equipment.

A further advantage of the invention has already been mentioned, viz., the disposition of the defects of the parent ingot such as segregations, pipes, etc., which, despite all efforts to the contrary, persist in the product of the final rolling, being located at the axial center of the mass of metal regardless of its shape. Such defects are shown exaggerated in Figs. 6 through 9 at 25. The forging operations to which the blanks of my invention are subjected, bring the defective center to the surface of the forging and tend to spread it along the length of the portion of the forging which is to form the yoke 17 of the finished knuckle. The metal of which the spindle is formed is sound and free from all defects.

In contra-distinction to the foregoing, the ingot defects carried over into the billets used heretofore for forging knuckles remains unaffected in about the same location, even after the final forging. Instead of being brought to the surface of the yoke 17, the defects lie at the center of the spindle portion of the knuckle where they may seriously impair the strength of the finished knuckle.

Blanks for various designs of knuckles may be made of bars differing somewhat in shape from the bar 10, depending on the requirements of any given design of knuckle.

Although I have illustrated and described but a preferred embodiment and practice of the invention, it will be understood that changes in the article or procedure disclosed may be made without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. A blank for the manufacture of steering knuckles having bearing sockets and a spindle, said blank comprising a short length of a rolled bar generally Y-shaped in section, the section having rolled, bulbous enlargements at the bearing socket end of the blank, and a rolled rib projecting from the mid-portion of the section, said rib tapering toward the end of the spindle portion of the blank.

2. A blank for the manufacture of steering knuckles having bearing sockets and a spindle, said blank comprising a short length of a rolled bar generally Y-shaped in section, the section having rolled, bulbous enlargements at the bearing socket end of the blank, and a rolled rib projecting from the mid-portion of the section.

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