

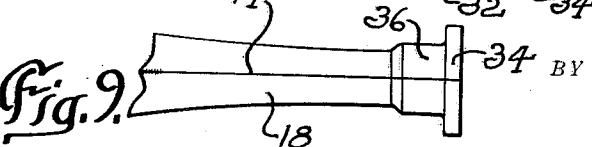
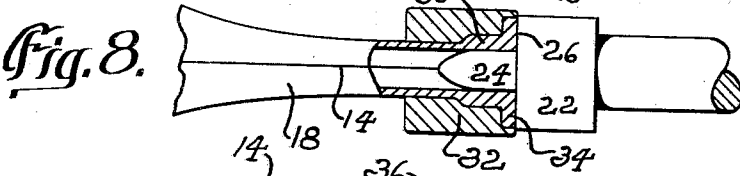
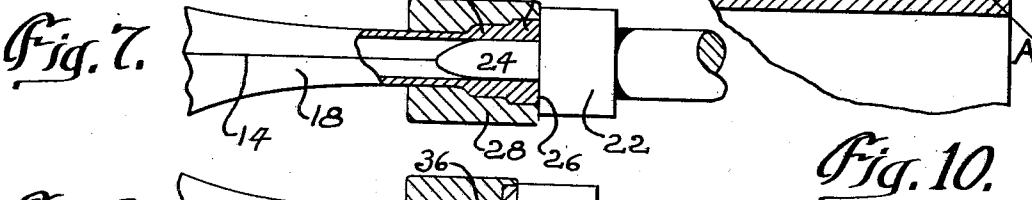
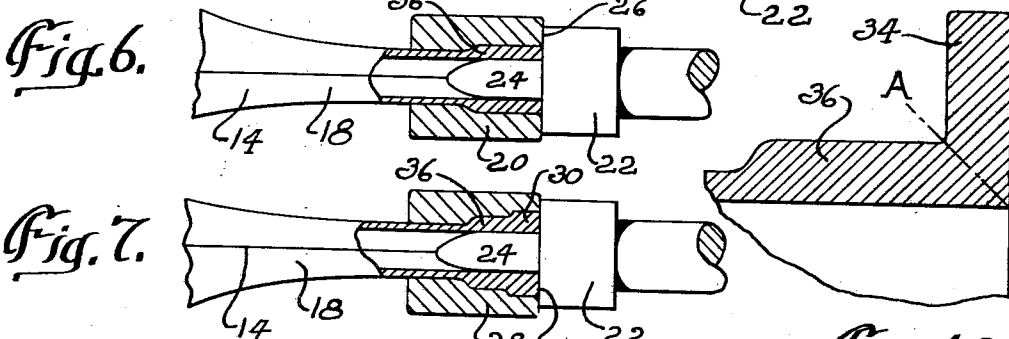
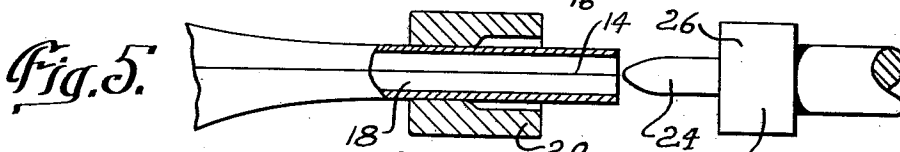
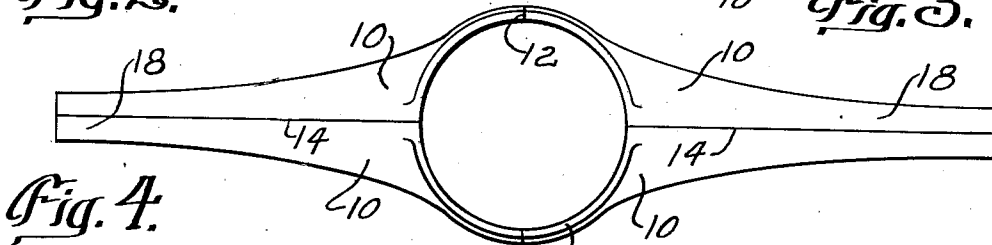
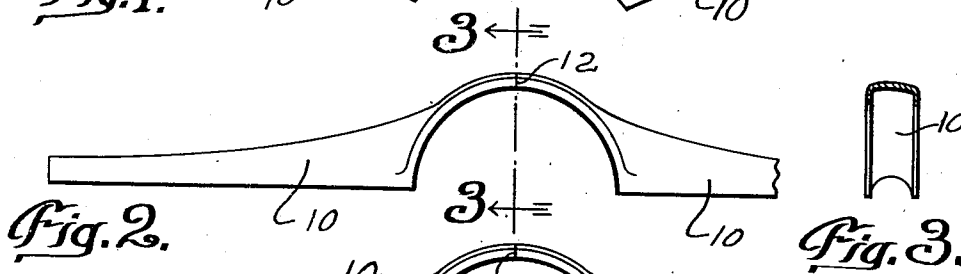
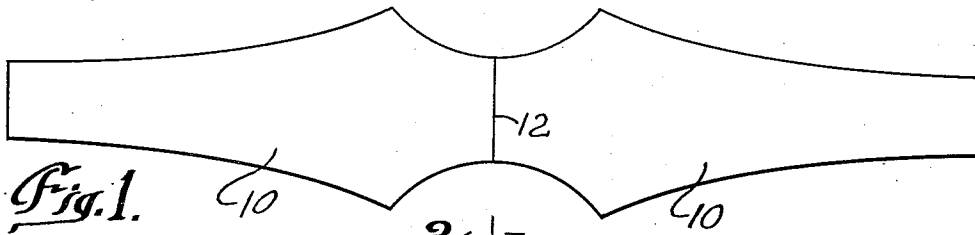
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C. W. EISELE

1,991,199

METHOD OF FORMING REAR AXLE HOUSINGS

Filed Jan. 19, 1929



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## UNITED STATES PATENT OFFICE

1,991,199

METHOD OF FORMING REAR AXLE  
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ration of Delaware

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27 Claims. (Cl. 29—153.1)

My invention relates to a method of forming an axle housing whereby the same may be produced from sheet metal.

An important object of the invention is to produce an axle housing from two stamped members, U shaped in cross section, united along their longitudinal edges, forming a pair of tubular portions. The opposite ends of the tubular portions are provided with radial flanges which receive other parts of the axle housing. Heretofore this flange has been formed by stamping each member before the members are welded together. No attempt has been made to form a flange after the parts have been united and great care has been taken to avoid stamping or forging the end of the axle housing after the parts have been united and particularly to avoid the distortion of the metal along the united edges.

It is, therefore, another object of my invention to weld a pair of members together along their free edges and form the metal at the ends thereof; preferably by forging, into a radial flange. More specifically stated, the invention consists in forming flat blanks, uniting the blanks, bending the blanks into U shaped segments, uniting a pair of segments along their longitudinal edges and upsetting the extreme end portions of the united segments through the united edges.

Other objects and advantages of the invention will more fully appear from the following description taken in connection with the accompanying drawing, in which:

Fig. 1 is a plan view of a pair of united flat sheet metal members.

Fig. 2 is a side view of the united members after they have been stamped into a U shaped segment, forming one half of the axle housing, a portion thereof being broken away.

Fig. 3 is a sectional view taken on line 3—3 of Fig. 2.

Fig. 4 is a side elevation of the axle housing showing the two U shaped elements united along their longitudinal edges.

Figs. 5, 6, 7, and 8 are views, partly in elevation and partly in section, illustrating the steps in forming the radial flange at the ends of the axle housing.

Fig. 9 is a side elevation of a portion of the finished axle end.

Fig. 10 is an enlarged sectional view of a portion of the outer end of the axle housing.

Referring to the drawing wherein I have illustrated one application of my invention a pair of sheet metal members 10 are joined together as at 12 along their adjacent ends. This flat

stamping is placed in suitable dies, not shown, and pressed into a U shaped segment, as shown in Figs. 2 and 3. A pair of such segments are placed in suitable welding dies and their longitudinal edges are welded together as at 14, shown in Fig. 4. The unit thus formed consists of a central annular portion 16 and a pair of tubular portions 18 at the opposite ends of the united segments.

Each tubular portion 18 is placed in suitable dies 20 with a portion of the end projecting beyond the dies, as shown in Fig. 5. A punch 22 having a guiding portion 24 and a shoulder 26 is adapted to strike the end of the tubular portion and upset the end thereof into the form shown in Fig. 6. This first operation is to increase the thickness of the wall adjacent the end of the tubular portion and it will be apparent that the welded portion is thickened as well as the other portions of the metal, the weld extending throughout the entire length of the tubular portion. The tubular portion as shown in Fig. 6 is then placed in another die 28 and is further upset, increasing the wall thickness at the extreme end of the tubular portion, as shown at 30 in Fig. 7.

The tubular portion as shown in Fig. 7 is then placed in another die 32 and in this die the enlarged end 30 is further upset forming an annular flange 34 at the extreme end of the tubular member extending radially therefrom as shown in Fig. 8. The thickness of the flange 34 is equal to the wall thickness of the enlarged portion adjacent the flange.

I am aware of the fact that tubular portions have been folded back before welding, forming radial flanges, and that the thickness of the flange has been increased by folding the metal back upon itself. Such constructions, however, have had a wall thickness at the bend equal to the wall thickness of the tubular portion and the flange is weak at the point where it is joined on to the tubular portion. Heretofore, folding the welded seam has been avoided, the folding being done before the edges are welded together.

Referring to Fig. 10, I have shown the thickened flange 34 and the thickened end portion 36 on a larger scale and the line A—A indicates the thickened metal at the junction of the flange 34 and the end 36. It will be readily understood that this construction is much stronger than the folded material of prior practices and can be machined more accurately than the constructions heretofore used.

It will be understood that various changes, in-

cluding the size and arrangement of parts, may be made without departing from the spirit of my invention and it is not my intention to limit its scope other than by the terms of the appended claims.

What I claim is:

1. The method of forming axle housings, which consists in forming flat blanks, bending the blanks into segments having longitudinal edges, uniting a pair of segments along their longitudinal edges, and upsetting the extreme end portions of said united segments to form radial flanges.

2. The method of forming axle housings, which consists in forming flat blanks, bending the blanks into segments having longitudinal edges, uniting a pair of segments along their longitudinal edges and upsetting the united edge portions at the extreme ends of said united segments to form radial projections.

3. The method of forming axle housings, which consists in forming flat blanks, bending the blanks into segments having longitudinal edges, uniting a pair of segments along their longitudinal edges, upsetting the opposite ends of said united segments to form thickened end portions, upsetting the extreme end of said thickened end portions to form further thickened portions at the extreme end of said segments, and finally upsetting the last named thickened end portion into a radial flange.

4. The method of forming axle housings, which consists in forming flat blanks, bending the blanks into segments having longitudinal edges, uniting a pair of segments along their longitudinal edges, upsetting the opposite ends of said united segments to form thickened end portions, upsetting the extreme end of said thickened end portions to form further thickened portions at the extreme end of said segments, and finally upsetting the last named thickened end portion into a radial flange having a thickness equal to the thickness of the first mentioned thickened portion.

5. The method of forming axle housings, which consists in uniting a pair of sections, substantially U shaped in cross section, along their longitudinal edges, and upsetting the extreme ends of the united sections to form radial flanges.

6. The method of forming axle housings, which consists in uniting a pair of sections, substantially U shaped in cross section, along their longitudinal edges, and upsetting the extreme ends and the united edge portions adjacent the ends thereof to form radial flanges having a thickness greater than the thickness of said segments.

7. The method of forming axle housings, which consists in uniting a pair of sections, substantially U shaped in cross section, along their longitudinal edges, forming the ends of the sections and the united edge portions adjacent the ends into thickened end portions, and forming the extreme ends of the thickened end portions into radial flanges.

8. The method of forming axle housings, which consists in uniting a pair of sections, substantially U shaped in cross section, along the full length of their longitudinal edges, forming the ends and the united edge portions adjacent the ends into thickened end portions, and forming the extreme ends of the thickened end portions into radial flanges, having a thickness equal to that of the thickened portion.

9. The method of forming a tubular member having a radial flange at its end, which consists in forming a pair of sections semi-cylindrical in cross section, uniting the longitudinal edges of

said sections to form a tubular portion having a uniform wall thickness throughout its length, and upsetting the end of the tubular portion, including the united edge portions, to form a homogeneous radial flange at the end of the tubular portion.

10. The method of forming a tubular member having a radial flange at its end, which consists in forming a pair of sections semi-cylindrical in cross section, uniting the longitudinal edges of said sections to form a tubular portion having a uniform wall thickness throughout its length, upsetting the end of the tubular portion, including the united edges, to increase the wall thickness at the end, and upsetting the thickened wall to form a radial flange.

11. The method of forming a tubular member having a radial flange at its end, which consists in forming a pair of sections semi-cylindrical in cross section, uniting the longitudinal edges of said sections to form a tubular portion having a uniform wall thickness throughout its length, upsetting the end of the tubular portion, including the united edges, to increase the wall thickness at the end, and upsetting the thickened wall to form a radial flange having a thickness corresponding to the thickness of the thickened end portion.

12. The method of forming a tubular member having a radial flange at its end, which consists in forming a pair of sections semi-cylindrical in cross section, uniting the longitudinal edges of said cross sections to form a tubular portion having a uniform wall thickness throughout its length, upsetting the end of the tubular portion, including the united edges, to increase the wall thickness at the end thereof, upsetting a portion of the thickened wall at its extreme end to form a further thickened wall portion, and finally upsetting the last mentioned thickened portion into a radial flange.

13. The method of forming a tubular member having a radial flange at its end, which consists in forming a pair of sections semi-cylindrical in cross section, uniting the longitudinal edges of said sections to form a tubular portion having a uniform wall thickness throughout its length, upsetting the end of the tubular portions, including the united edges, to increase the wall thickness at the end thereof, upsetting a portion of the thickened wall at its extreme end to form a further thickened wall portion, and finally upsetting the last mentioned thickened portion into a radial flange having a thickness corresponding to the thickness of the first mentioned thickened portion.

14. The method of forming a tubular member having a radial flange at its end which consists in forging the end of a tubular member having a longitudinal weld throughout its length into a thickened end flange extending radially from said tubular portion.

15. The method of forging, which consists in uniting two adjacent metal edges, and forming a flange by upsetting a portion of the metal, including the united edges, and forging the metal at right angles to and through the united edges.

16. The method of forming an axle housing, which consists in electro-welding two adjacent metal edges together to form a tubular portion having a longitudinal weld, and upsetting the end of the tubular portion, including the welded edges, into a radial flange.

17. The method of forming an axle housing, which consists in electro-welding two adjacent

metal edges together to form a tubular portion having a longitudinal weld, and upsetting the end of the tubular portion, including the welded edges, into a radial homogeneous flange having a thickness greater than the wall thickness of the tubular portion from which it was formed.

18. In a method of forming axle housings, the steps which consist in forming a banjo-type axle housing having oppositely extending tubular ends clamping one tubular end of said housing in a die and forcing a suitably shaped heading tool into the interior of said end to form a preliminary upset, placing said end in a second clamping die and forcing a second heading tool into the interior thereof to form a flare at the extremity of said end and to shape said first flare into an intermediate shoulder, and placing said end in a third clamping die and forcing a third heading tool thereinto to shape said flare into an annular flange.

19. In a method of forming axle housings, the steps which consist in forming a banjo-type axle housing having oppositely extending tubular ends clamping one tubular end of said housing in a die and forcing a suitably shaped heading tool into the interior of said end to form a preliminary upset, placing said end in a second clamping die and forcing a second heading tool into the interior thereof to form a flare at the extremity of said end and to shape said first flare into a thickened intermediate shoulder, and placing said end in a third clamping die and forcing a third heading tool thereinto to shape said flare into an annular flange.

20. In a method of forming axle housings, the steps which consist in forming a banjo-type axle housing having oppositely extending tubular ends clamping one tubular end of said housing in a die and forcing a suitably shaped heading tool into the interior of said end to form a preliminary upset, placing said end in a second clamping die and forcing a second heading tool into the interior thereof to form a flare at the extremity of said end and to shape said first flare into a thickened intermediate shoulder, and placing said end in a third clamping die and forcing a third heading tool thereinto to shape said flare into a thickened annular flange.

21. In a method of forming axle housings, the steps which consist in forming a banjo-type axle housing having oppositely extending tubular ends, clamping one of such ends in a die and forcing a heading tool thereinto to form a preliminary upset spaced from the extremity of said tubular end.

clamping said end in a second die and forcing a second heading tool thereinto to form said preliminary upset into a shoulder and to form a flare at the extremity of said tubular end, and clamping said tubular end in a third die and forcing a third heading tool thereinto to form said flare into a thickened annular flange, the plane of which is perpendicular to the axis of said tubular end.

22. As a new article of manufacture, a banjo-type axle housing formed at its ends with thickened, solid, integral flanges, said flanges being formed by upsetting the metal of said housing ends to a thickness greater than that of the remainder of said ends.

23. In a method of forming banjo-type axle housings, the steps which consist in forming a housing having oppositely extending ends of tubular cross section and upsetting the metal at the extremity of said ends to provide thickened, solid, integral, annular flanges at each extremity of the housing.

24. In a method of forming banjo-type axle housings, the steps which consist in forming a housing having oppositely extending ends of tubular cross section, clamping one tubular end of such housing in a die and forcing a suitably shaped heading tool into the interior of said ends and upsetting the metal thereof to form an integral annular thickened flange on said end.

25. The method of making a tubular product which consists in bending up sheet metal blanks to form segments, welding such segments together along longitudinal edges to form a thin-walled tubular blank and upsetting an end of said tubular blank by an end-wise pressure to increase its thickness without diminishing its diameter.

26. The method of making a tubular product which consists in bending up sheet metal blanks to form segments, welding such segments together along longitudinal edges to form a thin-walled tubular blank and upsetting an end of said tubular blank by an endwise pressure to increase its thickness and to bend it outward to form a flange.

27. A hollow article having a comparatively thin walled body portion made of sheet metal segments welded together along longitudinal joints and having a thickened end of at least as great a diameter as that of the adjacent unthickened portion, said thickened end being formed by an upsetting pressure in the direction of the joints.

CHARLES W. EISELE.

### DISCLAIMER

1,991,199.—*Charles W. Eisele*, Detroit, Mich. METHOD OF FORMING REAR AXLE HOUSINGS. Patent dated February 12, 1935. Disclaimer filed April 25, 1936, by the assignee, *Chrysler Corporation*.

Hereby enters this disclaimer to claims 18, 19, 20, 21, 22, 23, and 24 of the specification.

[*Official Gazette May 19, 1936.*]