

Dec. 7, 1926.

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T. E. MURRAY ET AL

METHOD OF MAKING FLANGED TUBES

Filed July 3, 1922

3 Sheets-Sheet 1

Fig. 1.

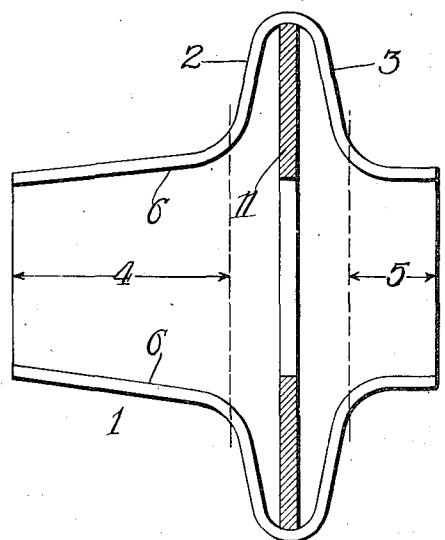


Fig. 2.

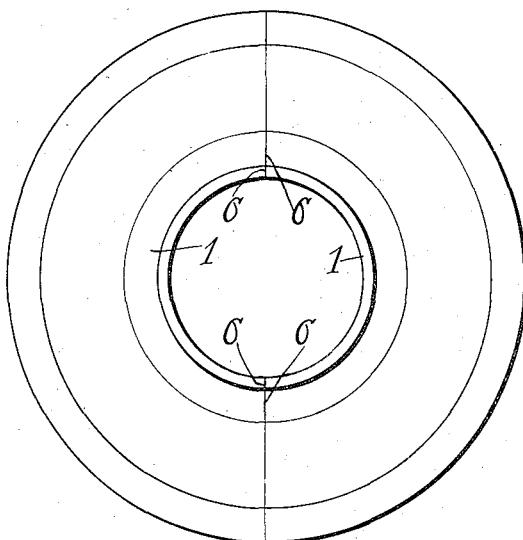


Fig. 3.

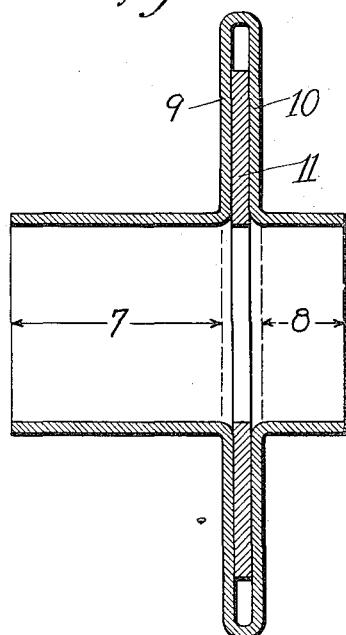
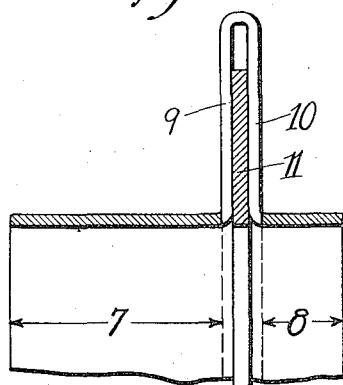


Fig. 4.



INVENTORS.

THOMAS E. MURRAY
HERBERT H. WILLIAMS

REED & CO. LTD.

ATTORNEY.

Dec. 7, 1926.

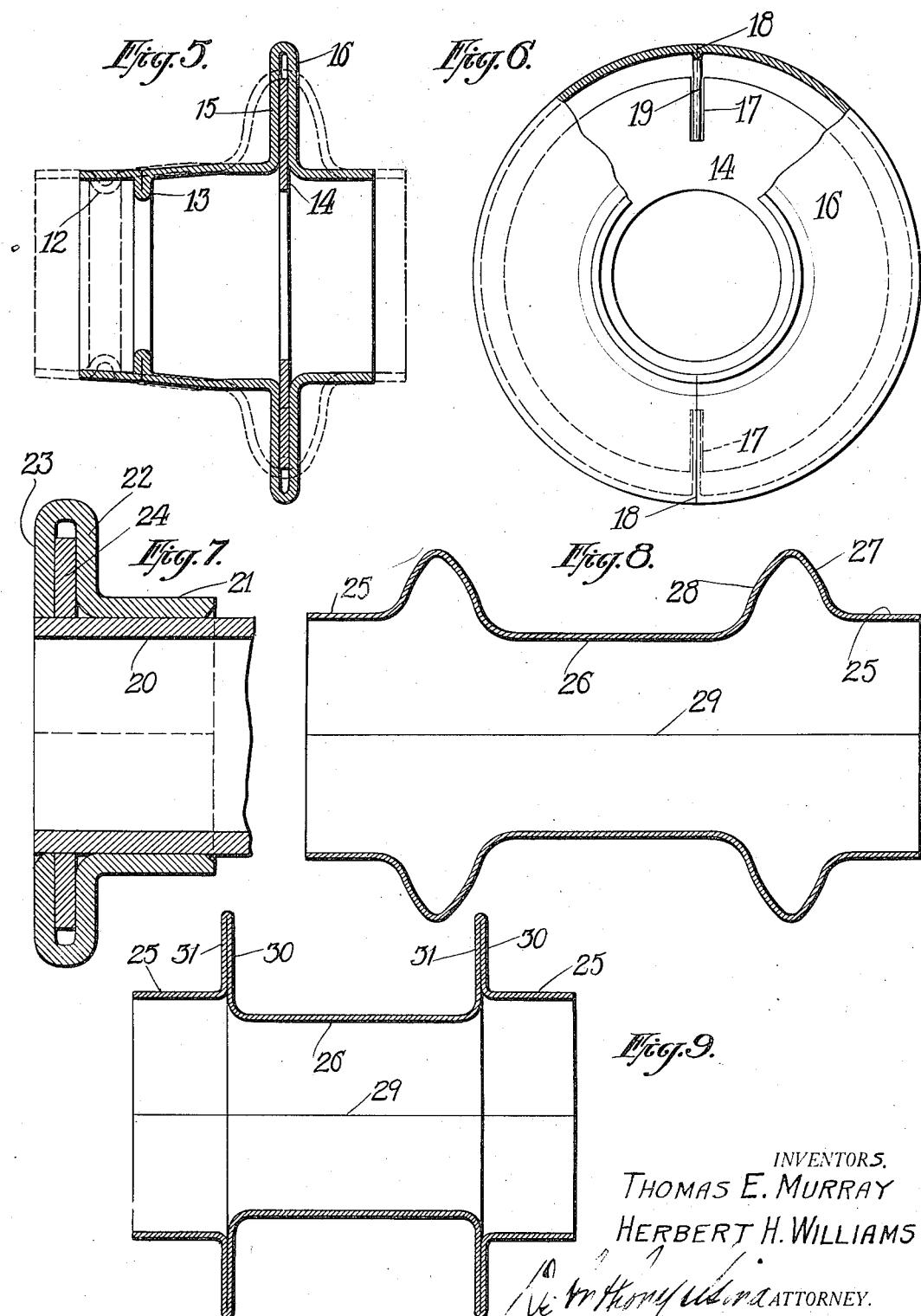
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Fig. 10.

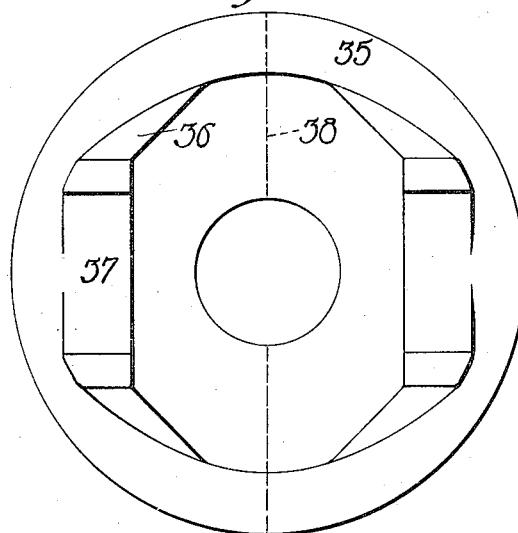


Fig. 11.

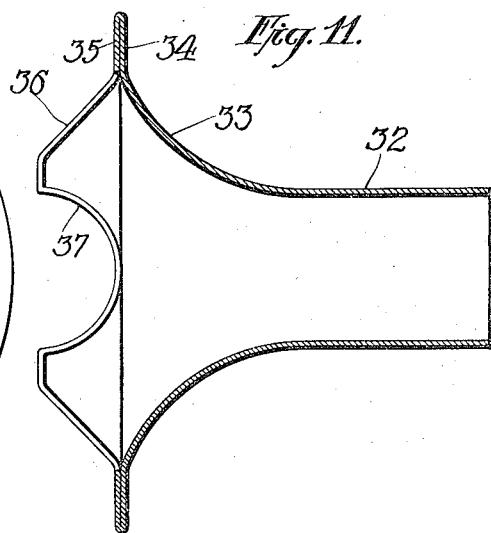


Fig. 12.

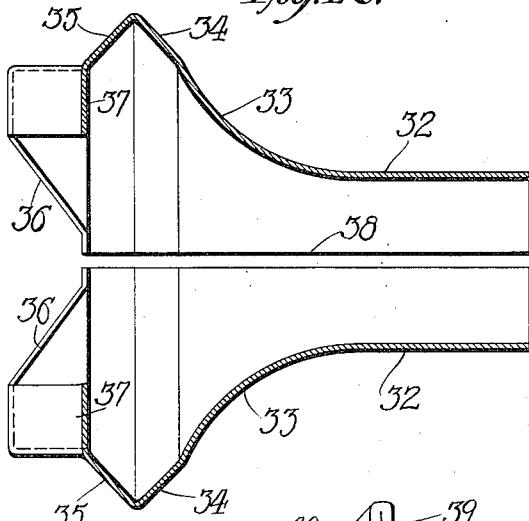


Fig. 13.

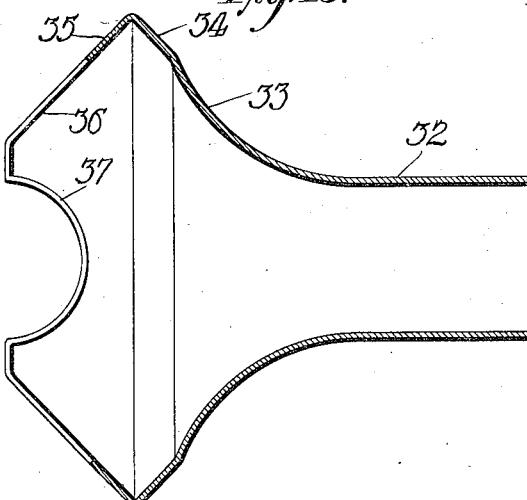
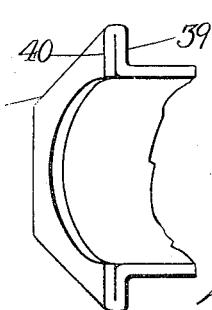


Fig. 14.



INVENTORS.

THOMAS E. MURRAY

1 HERBERT H. WILLIAMS

LEONARD F. KELLY ATTORNEY.

Patented Dec. 7, 1926.

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UNITED STATES PATENT OFFICE.

THOMAS E. MURRAY AND HERBERT H. WILLIAMS, OF NEW YORK, N. Y.; SAID WILLIAMS ASSIGNOR TO SAID MURRAY.

METHOD OF MAKING FLANGED TUBES.

Application filed July 3, 1922. Serial No. 572,394.

Our invention aims to provide an improved method of making wheel hubs, differential carriers and other articles with or without a flange or flanges and to provide an article of this sort which can be made very rapidly and cheaply.

The accompanying drawings illustrate embodiments of the invention.

Fig. 1 is a plan of a segment used in making the product;

Fig. 2 is an end elevation of a pair of such segments in position to be welded together;

Fig. 3 is a horizontal section through the finished product;

Fig. 4 is a similar section illustrating a modification;

Fig. 5 is a section similar to Fig. 3 of a differently shaped product, with the shape of the blank shown in dotted lines;

Fig. 6 is an end elevation of the finished product of Fig. 5, partly broken away;

Fig. 7 is a section of another product made in accordance with the invention;

Figs. 8 and 9 represent successive operations in forming a pair of flanges in one series of operations;

Figs. 10 and 11 are respectively an end view and a section of a differential carrier;

Figs. 12 and 13 are sections on planes at right angles to each other of an intermediate product.

Fig. 14 is a perspective view of another modification.

Referring to the embodiment of the invention illustrated, the product is made of segments, preferably two semi-circular segments, bent up from sheet metal to provide the necessary transverse curvature and also formed with a bend in the length of the segment at an intermediate point. A segment bent or drawn in this way is indicated at 1 in Fig. 1. For ease of drawing, the bends 2 and 3 in the length of the segment form a fairly wide V-shape in longitudinal section, and for a similar reason the end portions 4 and 5 of the segment are tapered from the parts 2 and 3 to the points of smallest diameter. The segments 1 thus formed are assembled as in Fig. 2 with their longitudinal edges 6 in contact and are welded along such edges into a tubular intermediate product, the longitudinal section of which will be as in Fig. 1, and the joints of which will follow the contour of the edges 6 illustrated in Fig. 1. Any usual or suit-

able method of welding may be used such as ordinary arc welding. Preferably, however, we would use the Murray method of butt welding by placing the edges together and passing a current of very high density 60 for a very brief period of time. To prevent the extrusion of a fin on the inside of the joints of the parts 2 and 3, where it would interfere with the subsequent operations contemplated, an inside form may be used 65 which will cause the fin to be extruded entirely to the outside, as is understood by persons skilled in this art.

After the welding operation described, the tubular product thus formed is swaged to 70 compress the tapered end portions 4 and 5 to form the cylindrical portions 7 and 8 of Fig. 3, and to compress the parts 2 and 3 flat so as to form the opposite leaves or sheets 9 and 10 which constitute an intermediate 75 flange. Both these parts may be brought to a right angle with the tubular portions 7 and 8, and this will generally be true for wheel hubs. But either or both of them may be bent to some other angle than the 80 exact right angle illustrated.

The parts 9 and 10 alone may be used to constitute the desired flange. But where a heavier or stiffer flange is desired there may be provided intermediate rings 11. The 85 ring is inserted by assembling the segments as in Fig. 1 with the bends thereof embracing the ring, so that when the segments are welded together the ring will be held in place, and so that in the final swaging operation the parts 9 and 10 of the flange will be pressed against the ring 11.

It is not essential that the welding of the edges be continuous from end to end. There are a number of articles, such for example 95 as wheel hubs, in which it will not be necessary to have the segments of the flanges welded to each other. Such a case is illustrated in Fig. 4, which is a section similar to Fig. 3; in which, however, the tubular 100 portions 7 and 8 are shown to be welded along the edges but the flange portions 9 and 10 are not so welded.

By welding together the segments in the intermediate form the final bending and 105 shaping of the flange and tubular parts is made easy. It is not essential, however, that the welding be done first. Each segment, shaped as in Fig. 1, may be subjected to a second bending operation to bring it 110

to the shape, in longitudinal section, shown in Fig. 3; after which the welding of the segments together will produce the finished shape desired.

5 Figs. 5 and 6 illustrate a tube which is of different diameters at different points in its length. A variety of such shapes may be produced by correspondingly shaping the swaging tools which give to the article its 10 final contour.

Fig. 5 illustrates also the application of the invention to the making of an internal flange. In this case the segments are first shaped with an internal bend 12 in longitudinal section and when the endwise compression is effected this transverse bend in the metal is converted into an internal flange 13 of double thickness similar to the external flanges of the other figures.

20 The inserted plate or ring 14 may also be of such internal diameter as to form an inward flange as in Fig. 5, (which represents in contour a standard section of a certain automobile wheel hub). The two thicknesses 25 of metal 15 and 16 which form the outer flange will naturally be of greater diameter than the reinforcing ring 14. The ring must be set in place between the two blank segments before the welding operation. The 30 welding may be omitted over the portions of the plates 15 and 16, which bear against the inserted ring 14. Or the ring 14 may be provided with slots 17, Fig. 6, in line with the welded joints 18 so as to leave room for the formation of an inside fin indicated roughly at 19. In making the hub of Figs. 35 5 and 6, it has been assumed that the segments were first formed and then welded together and then swaged to the shape of the finished product. The order of these steps may be changed however; first swaging or compressing the segments endwise to the final shape desired in longitudinal section and then welding them. In this case, if a 40 reinforcing ring 14 is to be used, it will be omitted until after the segments are first bent to the shape shown in full lines in Fig. 5 and will be inserted when the parts are assembled to be welded. Even where the parts 45 are compressed endwise before welding, they may be subjected to additional swaging or shaping operations after welding.

The invention is of particular value in producing tubular articles with a flange or 55 flanges at intermediate points in their length. It may be used, however, to produce articles with flanges on their ends. In Fig. 7 a plain pipe 20 has mounted thereon a ring 21 with a flange formed integrally of two thicknesses 22 and 23 with an intermediate reinforcing ring 24. These parts may be welded or otherwise fastened to the pipe 20. The ring 21 and flanges 22 and 23 are first formed 60 up of segments stamped out of sheet metal of circular transverse section and of a de-

sired flanged shape in longitudinal section and welded and swaged to the ultimate tubular flanged form desired.

According to Fig. 8 a pair of blanks of semi-circular cross section is provided with cylindrical end portions 25 and a cylindrical intermediate portion 26, with oblique bends 27, 28 between each end portion and the intermediate portion. The segments are then welded along their edges as at 29 and are 70 compressed endwise and swaged into the form shown in Fig. 9 with flanges formed of the two thicknesses of metal 30 and 31. There is thus produced a hub with outward 75 annular flanges and with axial flanges 25 extending from the outer faces of the annular flanges.

In Figs. 10 and 11 we illustrate a tubular construction such as is used in making a carrier for the differential bearing of automobiles. A straight tubular portion 32 merges into a flared portion 33 at the edge of which and extending clear around it is a flange formed of the two thicknesses of metal 34 and 35. From the face of the latter there are provided extensions 36, not continuously around, but in two separate extensions, one at each side as shown in Fig. 10, and bent back in the middle to form bearing portions 37 for a shaft. The complete carrier is made in two halves welded together along the dotted line 38.

The first step in the manufacture of the carrier consists in bending up two half round, or approximately half round, segments of the longitudinal sections shown in Fig. 12, with the parts 34 and 35 bent only partially toward the ultimate position desired and with the end projections 36 and 37 as shown. While this is referred to as the 105 first step of the process, it will be understood that in making this as well as the other articles illustrated, the first step may involve a succession of bending and drawing operations to convert the flat blank of sheet metal to the desired segmental shape. Similarly 110 each of the other steps referred to in the production of the desired article may in itself consist of a succession of operations.

The final bending to the shape of Fig. 11 is effected in a subsequent step as is the welding of the segments along the line 38, either of which may be performed before the other according to convenience.

Fig. 14 shows in finished shape the end 120 of a segment used in forming a pipe, a coupling, a T or the like. The flange is formed in two thicknesses 39 and 40 on the end of the article. In the swaging operation or series of operations the flange is also shaped with a polygonal or non-circular edge 41 for engagement by a wrench. We have shown the completely shaped flange formed on a half round segment which is to be united to a similar segment by welding on the edges, 125 130

It will be understood, however, that the segments may be welded together before completing the formation of the flange, as we have described in connection with some of the previous figures.

There are various other ways of adapting the segments to yield at a determined point when subjected to endwise pressure, besides the partial bending of the flanges as above described. For example, the segments might be drawn out or otherwise brought to a reduced thickness at the parts of their length which are intended to yield and form the flange. The drawing operation described in connection with Figs. 1 and 8 for example may be so conducted as to considerably reduce the thickness of the metal in bends 2, 3 and 27, 28; so that in this case we would have both the bending and the reduction in thickness to facilitate the formation of the flange by endwise pressure. The metal, of course, must be sufficiently soft to permit the drawing and bending operations referred to. The operation may be facilitated by the application of heat to the parts which are to be formed into the flange; or, indeed to the entire length of the segments.

The product will generally be circular in cross-section. But we use the word tubular here to refer to a figure of any closed cross-section, circular or non-circular.

The method of first welding the parts in one shape and then re-shaping them after welding is applicable also to a variety of other products than the flanged tubes described. There are many products which in their final shape are not so well adapted to production by welding operations but which can be made of parts which initially are of a shape better adapted for welding than the desired finished shape, the joint being welded and the work being then re-shaped as desired.

Though we have described with great particularity of detail certain specific embodiments of our invention, yet it is not to be understood therefrom that the invention is restricted to the particular embodiments disclosed. Various modifications thereof in the details of the article and in the steps of the process may be made by those skilled in the art without departure from the invention as defined in the following claims.

What we claim is:

1. In the making of a tubular article with a flange at an intermediate point in its length, the method which consists in forming tapered segments of sheet metal with a transverse V-shaped bend at a point intermediate the ends thereof, welding said segments into a tube, compressing the tapered portions radially and compressing said V-shaped portions longitudinally to form a flange of double thickness.

2. In the making of a tubular article with a flange at an intermediate point in its length, the method which consists in forming segments of sheet metal, each of which has its opposite ends different from each other and has a transverse V-shaped bend at a point intermediate the ends thereof, welding said segments into a tube and compressing said V-shaped portions longitudinally to form a flange of double thickness.

3. In the making of a tubular article with a flange at an intermediate point in its length, the method which consists in forming segments of sheet metal of different radii at opposite sides of a transverse V-shaped bend, welding said segments into a tube and compressing said V-shaped portions longitudinally to form a flange of double thickness between the two portions of different radii.

In witness whereof, we have hereunto signed our names.

THOMAS E. MURRAY.
HERBERT H. WILLIAMS.