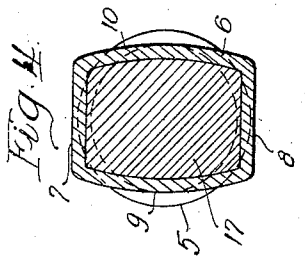
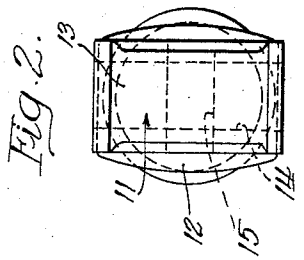
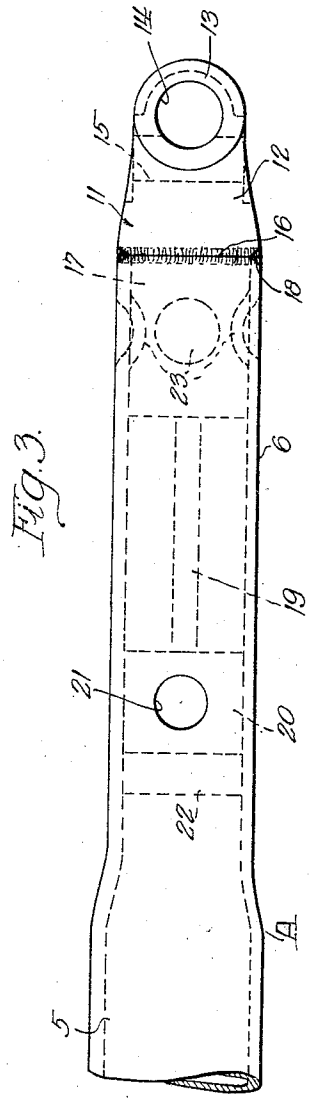
Jan. 24, 1933. E. B. CLARK 1,895,311

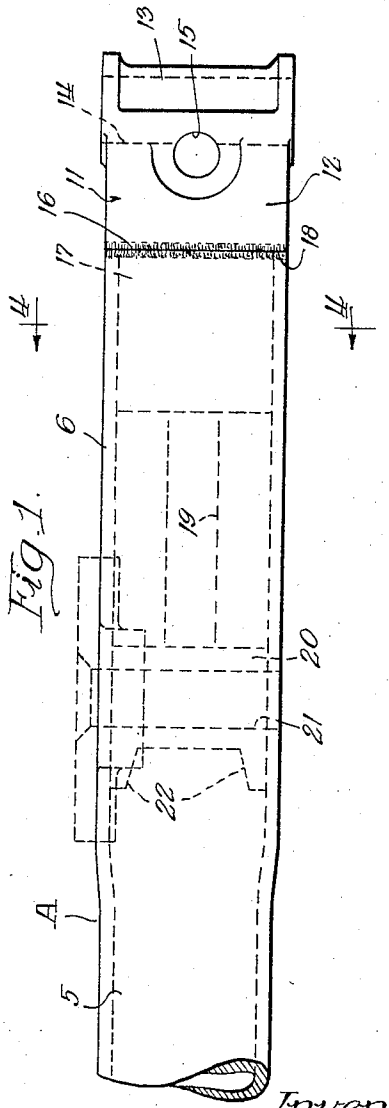
AXLE

Filed June 13, 1930









Inventor:
Eugene B. Clark.
By Brown, Jackson, Boettcher & Dennen.
Attys.

Patented Jan. 24, 1933 1,895,311

UNITED STATES PATENT OFFICE

EUGENE B. CLARK, OF BUCHANAN, MICHIGAN, ASSIGNOR TO CLARK EQUIPMENT COMPANY, OF BUCHANAN, MICHIGAN, A CORPORATION OF MICHIGAN

AXLE

Application filed June 13, 1930. Serial No. 460,818.

This invention relates to the manufacture of axles for motor vehicles, and more particularly front axles designed for the attachment thereto of dirigible wheels.

The object of the invention is to provide an axle that will possess the requisite strength to withstand the stresses to which it is subjected, and yet will be light in weight and simple in design, so that it may profitably be manufactured and sold at a price that will be a factor in reducing the cost of the vehicle.

It is well recognized as desirable to manufacture front axles from seamless steel tubing, and in the practice of my invention such tubing is used, but many of the operations heretofore found necessary in the fashioning of an axle from such tubing are eliminated, with consequent reduction in cost. The nature of the invention will clearly appear from the following description thereof in connection with the accompanying drawing, in which—

Fig. 1 is a side view of one end portion of the completed axle;

Fig. 2 is an end view thereof;

Fig. 3 is a plan view of the parts shown in Fig. 1; and

Fig. 4 is a vertical cross-section on line 4—4 of Fig. 1.

It will be understood that the drawing does not show the knuckle bracket that carries the steering wheel spindle, since that is of the usual type and constitutes no part of the present invention. Therefore, it is unnecessary to illustrate it.

In manufacturing my improved axle, I start with a piece of round seamless steel tubing 5 of such length that after the knuckle pieces hereinafter mentioned have been applied to its ends the axle as a whole will be of standard length. The diameter of the tubing 5 and the thickness of its wall are optional, but I preferably employ tubing having an external diameter of about $2\frac{3}{16}$ths inches and a wall thickness of $\frac{3}{16}$ths of an inch. The end portions 6 of this tubing from a point a short distance inside of the position of the usual spring seats or pads, as at the point A, are then fashioned, preferably by a drawing operation, to substantially the shape shown in Fig. 4,—that is to say, are given a shape oblong in cross-section with flattened top and bottom surfaces 7, 8 and rounded side portions 9, 10, so that the vertical diameter of the end portions of the tubing is slightly greater than the original diameter of the tube, and the horizontal diameter is somewhat reduced from that of the original tube. Preferably, the finished external vertical diameter of the end portions of the tubing is $2\frac{1}{4}$th inches and its horizontal external diameter at the median line is approximately $1\frac{13}{16}$ths inches. These dimensions may, of course, be varied according to the ideas of the manufacturer as to what is best. Also, I wish it to be understood that my invention does not essentially require the formation of the end portions of the tubing to the exact contour shown in Fig. 4, as the top and bottom surfaces need not be perfectly flat, and the curvature of the side portions may be varied from that shown, although the curvature of such side portions should be comparatively flat and the horizontal diameter of the tubing should be less than its vertical diameter, to obtain the requisite strength to resist the greater vertical stresses to which the axle is ordinarily subjected in the operation of the vehicle.

After fashioning the tubular portion of the axle in the manner above described, I apply to each of its ends a knuckle piece 11 in the form of a forging. This knuckle piece comprises what may be termed an external head 12 provided with a cylindrical sleeve portion 13 having a vertical bore 14 to receive the usual knuckle pin. The head 12 is also provided with a transverse hole 15 that cuts the bore 14 at one side, for the reception of a locking pin or key to hold the knuckle pin against endwise movement. Projecting from the vertical face 16 of the head 12 is a block or plug 17, the cross-sectional shape and dimensions of which are such that it will fit snugly within the end portion of the axle tube, as indicated by the dotted lines in Figs. 1 and 3. Also, the external diameter of the head 12 adjacent to its vertical face 16 is the same as that of the axle tube at its end por-

tions, as indicated in said figures, and consequently a shoulder 18 is formed around the head 12 by the juncture therewith of the plug 17, which shoulders abut against the end portions of the axle tube.

From the inner end of the plug 17 projects a web 19, which is alined with the axis of said plug. The vertical diameter of this web is somewhat greater than its horizontal diameter or thickness, to give it greater rigidity to resist vertical stresses without undue increase of weight. At its inner end the web 19 is provided with a plug 20 which also conforms in shape to the cross-sectional shape of the end portion of the axle tube and fits snugly therein at a point coincident with the position of the usual spring seat. The plug 20 has a central vertical bore 21, as shown in Figs. 1 and 3, to receive a bolt by which the spring seat is secured upon the axle tube over said plug. This bolt serves also to secure the knuckle piece firmly in the axle tube. Obviously, instead of a bolt a rivet may be used for the purpose of securing the knuckle piece, and a spring seat of the type that embraces the tube and is secured thereon by clamps may be employed. As best shown in Fig. 1, at its inner end the plug 20 is preferably provided with wings or flanges 22 at top and bottom that extend inwardly therefrom and bear against the upper and lower walls of the axle tube to further support it.

In addition to the bore 21, the knuckle piece 11 may be further secured to the axle tube by welding together in any suitable way the abutting marginal portions of the head 12 and axle tube, in which case the shoulders 18 and the end surfaces of the axle tube would be beveled to facilitate the making of a welded joint. Also, if desired, the knuckle piece may be secured to the axle tube by providing the plug 17 with one or more peripheral recesses indicated by the dotted line 23 in Fig. 3, and indenting the axle tube at corresponding points to force the material of the tube into such recesses.

By the construction described I provide an axle structure comprising a tubular axle member and a knuckle piece that are firmly united so that they become practically integral, without the necessity of using any welding operation that would tend to weaken the axle tube. In practice it has been found that welding operations on comparatively thin axle tubing is objectionable because they have the effect of weakening the tubing, in many cases the tubing being burnt through because of the difficulty of controlling the work. By providing the two plugs 17, 20 spaced apart and connected by the web 19, the end portion of the axle tube is reenforced and given the requisite strength to properly resist the strains to which it is subjected, the strength of the axle under the spring seats is increased, and the knuckle piece is rigidly and permanently secured to the axle tube. The web 19 not only reenforces the axle tube against vertical and lateral strains, but also serves as a tension member to resist outward stresses on the knuckle piece and hold it against endwise movement with respect to the axle tube.

It will be seen that in the formation of the axle tube no forging is necessary, and that the only operation to which it is subjected is the drawing down of its end portions to the desired cross-sectional shape, so that that part of the operation is a very simple and inexpensive one, and does not involve materially modifying the thickness of the walls of the tube, which is substantially uniform from end to end thereof. The knuckle piece, including the two plugs and their connecting web, is an integral forging comparatively simple in design, and the work of assembling the knuckle pieces with the axle tube is also one that may be cheaply and expeditiously performed.

The term "seamless steel tube" as used in the specification and claims hereof is intended to include tubing continuous in cross-section whether formed by welding together the margins of a rolled blank or by a process that results in the production of a tube without a welded joint or seam.

My invention includes not only the axle shown and described, as a new article of manufacture, but also the method herein described by which it is produced.

What I claim is—

1. An axle comprising a seamless steel tube having its end portions formed to generally oblong shape in cross-section, and correspondingly shaped knuckle pieces each comprising spaced members inserted into and fitting closely the end portions of the tube, and fixedly secured thereto.

2. An axle comprising a seamless steel tube having its end portions formed to generally oblong shape in cross-section, and knuckle pieces inserted into and fitting closely the end portions of the tube, and fixedly secured thereto, said knuckle pieces comprising plugs spaced apart and integrally connected together.

3. An axle comprising a seamless steel tube having its end portions formed to generally oblong shape in cross-section, knuckle pieces inserted into and fitting closely the end portions of the tube, and fixedly secured thereto, said knuckle pieces comprising plugs spaced apart and integrally connected together, and means securing the inner plugs to the axle tube under the spring seat positions.

4. An axle comprising a seamless steel tube having walls of substantially uniform thickness throughout, and knuckle pieces each having integral spaced apart members in-

serted into and fitted closely within the end portions of said tube, and fixedly secured thereto.

5. An axle comprising a seamless steel tube having walls of substantially uniform thickness throughout, and knuckle pieces secured to the end portions of said tube, each of said knuckle pieces comprising a head and plugs integral therewith and fitting closely within the end portion of the tube, said plugs being spaced apart to support the axle tube at separated points.

6. An axle comprising a seamless steel tube having walls of substantially uniform thickness throughout, and knuckle pieces secured to the end portions of said tube, each of said knuckle pieces comprising a head and plugs integral therewith and fitting closely within the end portion of the tube, said plugs being spaced apart to support the axle tube at separated points, and an axially disposed web connecting said plugs together.

7. An axle comprising a seamless steel tube, and knuckle pieces secured to the end portions thereof, each of said knuckle pieces comprising a head and plugs integral therewith, said plugs being spaced apart from each other lengthwise of the axle tube to support the same at separated points, said knuckle pieces being secured fixedly to the axle tube.

8. An axle comprising a seamless steel tube having walls of substantially uniform thickness throughout, and knuckle pieces inserted into the end portions of said tube, each of said knuckle pieces comprising a head and plugs integral therewith and fitting closely within the end portion of the tube, said plugs being spaced apart to support the axle tube at separate points, the innermost one of said plugs having a transversely extending bore, and means passing through said bore for securing said knuckle pieces in said axle.

9. An axle comprising a seamless steel tube having its end portions formed to receive correspondingly shaped knuckle pieces, said knuckle pieces being inserted into and fitting closely the end portions of the tube, each of said knuckle pieces comprising a plug spaced from the end of said axle and substantially underlying the spring seat position, means for securing said plug to the axle tube, a second plug inserted into the end of said axle tube, said latter plug adapted to be connected to a wheel supporting member, and means connecting said plugs together whereby said second plug is rigidly held in said axle.

In witness whereof I hereunto subscribe my name this 11th day of June, 1930.

EUGENE B. CLARK.