July 31, 1951 E. L. ROSS 2,562,213

APPARATUS FOR DETERMINING STRAIGHTNESS OF AXLE HOUSINGS

Filed Jan. 31, 1947 3 Sheets-Sheet 1

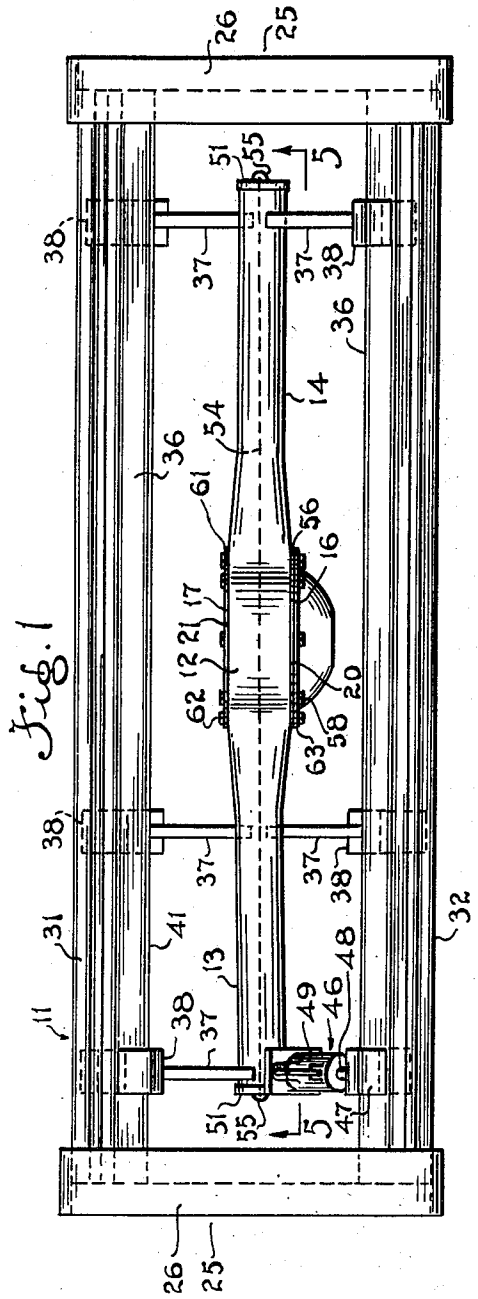


Fig. 1

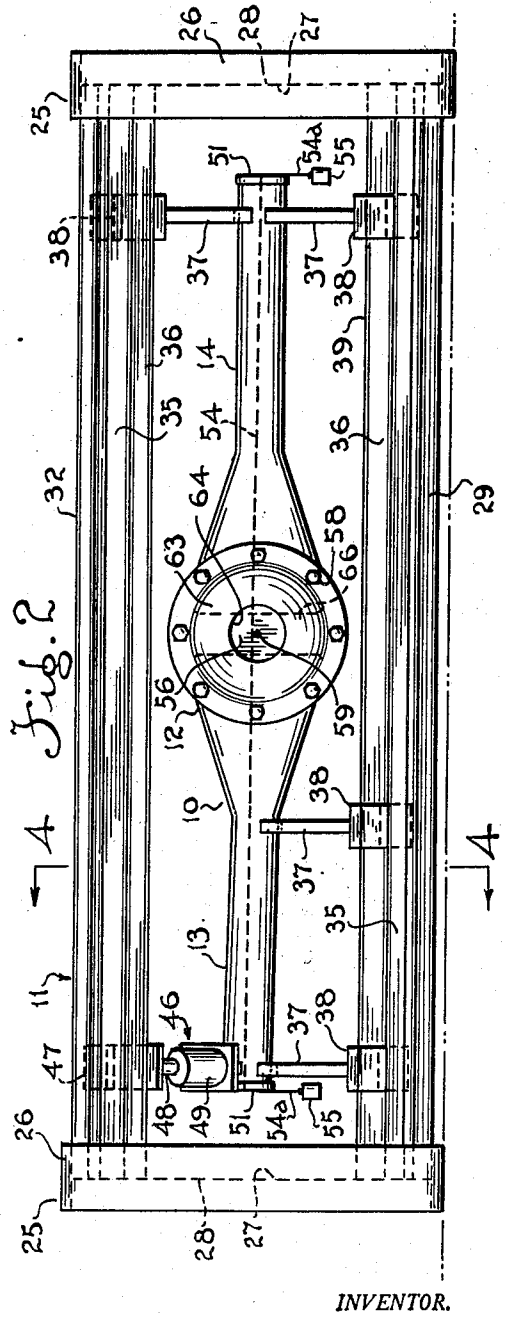


Fig. 2

INVENTOR.
Emmet L. Ross
BY
William Cleland
Attorney

July 31, 1951 E. L. ROSS 2,562,213

APPARATUS FOR DETERMINING STRAIGHTNESS OF AXLE HOUSINGS

Filed Jan. 31, 1947 3 Sheets-Sheet 2

Fig. 3

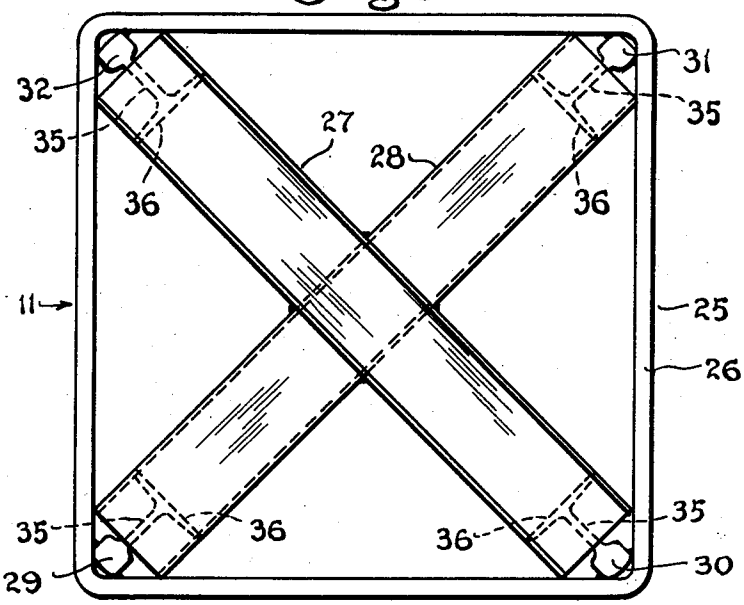
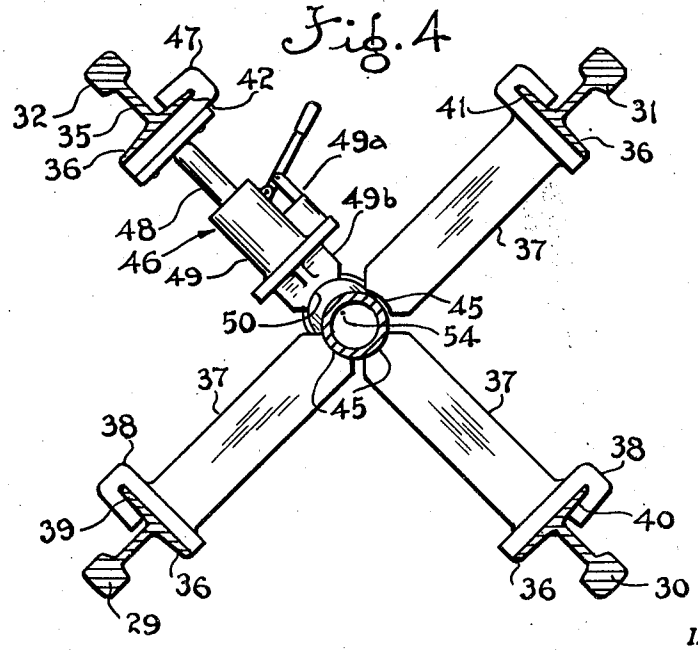


Fig. 4



INVENTOR.
Emmet L. Ross

BY
William Cleland
Attorney

July 31, 1951 E. L. ROSS 2,562,213

APPARATUS FOR DETERMINING STRAIGHTNESS OF AXLE HOUSINGS

Filed Jan. 31, 1947 3 Sheets-Sheet 3

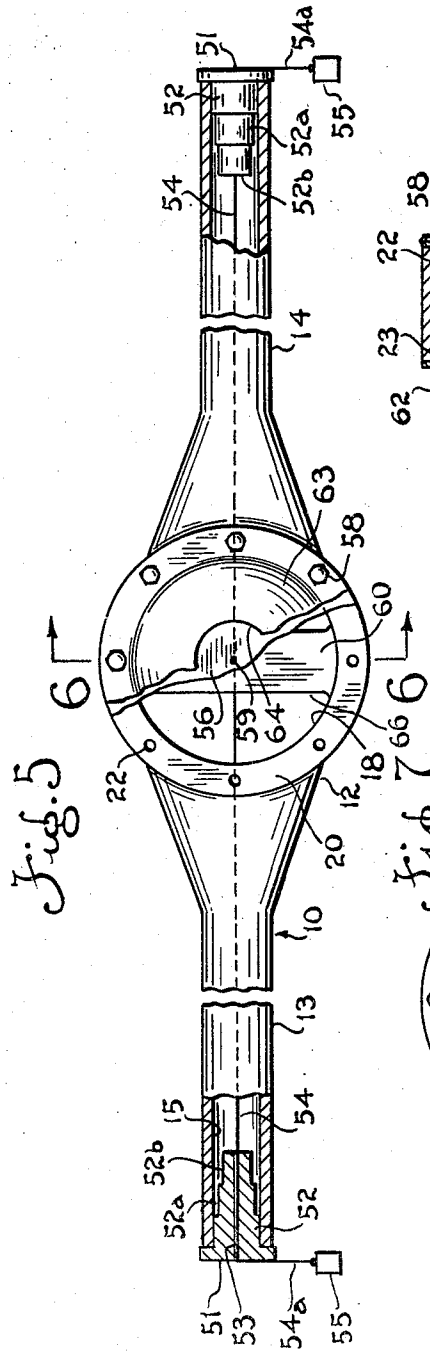


Fig. 5

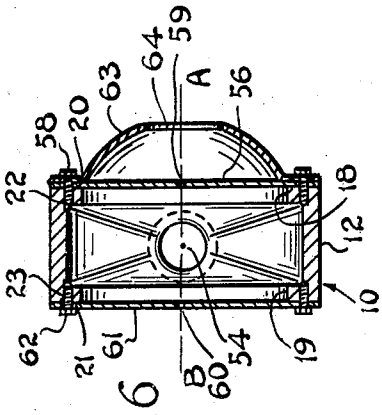


Fig. 6

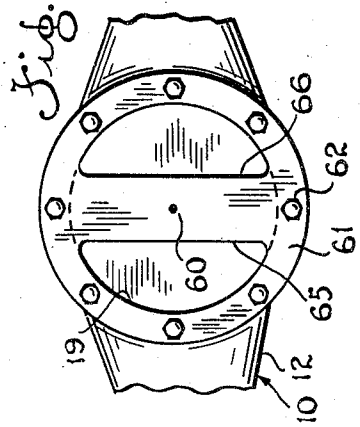


Fig. 7

INVENTOR.
Emmet L. Ross
BY
William Cleland
Attorney

Patented July 31, 1951 2,562,213

UNITED STATES PATENT OFFICE

2,562,213

APPARATUS FOR DETERMINING STRAIGHTNESS OF AXLE HOUSINGS

Emmett L. Ross, Akron, Ohio

Application January 31, 1947, Serial No. 725,503

7 Claims. (Cl. 33—84)

1

This invention relates to apparatus for straightening vehicle axle housings.

In the past, cold straightening of vehicle axle housings has been generally avoided because of the unavailability of satisfactory straightening equipment, and particularly because of the difficulty encountered with respect to checking the axle housing to determine when it had been properly straightened. It has been a general practice in repair or service garages, therefore, to replace bent housings with new ones.

One object of the present invention is to provide a powerful straightening device for the purposes described, which is readily accessible for positioning a housing therein for straightening, and which is readily adjustable to accommodate axle housings of varying sizes and proportions as well as those in a wide range of damaged or bent conditions.

Another object of the invention is to provide improved means for use in conjunction with such straightening apparatus for conveniently and accurately determining when the axle housing has been satisfactorily straightened.

These and other objects of the invention will be manifest from the following brief description and the accompanying drawings.

Of the accompanying drawings:

Figure 1 is a top plan view illustrating an axle housing straightening apparatus in accordance with the invention.

Figure 2 is a front elevation thereof.

Figure 3 is an end view, on a larger scale, taken at either end of Figure 2.

Figure 4 is a transverse cross-section taken substantially on the line 4—4 of Figure 2.

Figure 5 is an enlarged view, partly broken away and in section, taken substantially on the line 5—5 of Figure 1, and particularly illustrating improved means for checking the alignment of the axle housing after straightening the same.

Figure 6 is a transverse cross-section taken substantially on the line 6—6 of Figure 5.

Figure 7 is a fragmentary rear view of the central portion of the axle housing as viewed from the left of Figure 6.

Referring particularly to Figure 1 to 4 there is illustrated a vehicle axle housing 10 mounted in a straightening device, indicated generally at 11, for a straightening operation thereon. The housing 10 is of known type having an enlarged central portion 12, sometimes referred to as a "banjo," and tubular ends 13 and 14 extending in opposite directions therefrom, these extensions normally being in axial alignment and there being a passage 15 extending longitudinally through the housing for reception of an axle of known construction (not shown). The opposite front and rear sides 16 and 17 of the enlargement 12 have aligned circular openings 18 and

2

19, respectively, therein defining annular seats 20 and 21 for seating fittings or associated parts (not shown) of the axle housing. These seats have the usual circumferentially spaced threaded apertures 22, 22 and 23, 23 normally used for securing said fittings or parts in place, the apertures, however, being utilized for a special purpose in conjunction with the present invention in a manner to be described later.

The straightening device 11 includes a framework having spaced end frames 25, 25, each formed of a rectangular band of metal 26 cross-braced by means of a pair of channels 27 and 28 in back-to-back relation, and guide elements 29 and 30, 31 and 32 extending in parallelism between corresponding opposite corners of the spaced frames 25, the various parts of the frame being welded to each other or otherwise rigidly secured in known manner. The guide elements may be standard railroad track sections arranged with central web portions 35 thereof extending radially with respect to a central longitudinal axis of the framework, to present the usual bases 36 of the sections at right angles to radials from said axis of the framework and with the flat sides of said bases presented inwardly of the framework. In other words, the bases 36 of the guide elements will each be inclined angularly of the horizontal (see Figure 4).

To facilitate insertion and removal of some types of housings having obstructing portions, the cross-brace of one end frame 25 may be made removable endwise from its band 26, as by omission of the welded connections between the ends of channels 27 and 28 and the band and cooperating ends of the guide elements.

For supporting and maintaining the housing 10 in desired horizontal position for straightening the same in framework 11, a plurality of radial arms 37, 37 are provided with hooked members 38 on outer ends thereof for downward engagement over the upper marginal edge portions 39, 40, 41, and 42 of the track bases 36, the arrangement being such that the arms 37 are supported by said marginal portions of the bases 39 and backed by the flat bottoms thereof against outward forces applied to the arms during axle straightening operations. The ends of the arms 37 may have arcuate seats 45, 45 which in the case of those arranged on lower guide elements 29 and 30 will receive the tubular portions 13 or 14 of the axle housing as shown to support the housing, while the arms on the upper guide members 31 and 32 are utilized for retaining the axle housing against accidental displacement during said straightening operations. At least one radial arm 46 is provided with a hook member 47 on a relatively fixed part 48, similar to the hook members 38, and a relatively movable

part 49 may be operable by hydraulic jack means 49a. A head 49b provided on the free end of the movable part 49 of the jack has an arcuate seat 50 for engagement with the tubular portion 13 or 14 of the axle housing 10 (see Figure 4). A screw jack or other jack means having similar mountings may be utilized in place of a hydraulic jack. The arrangement is such that the arms 37 may be variously arranged along the guide elements, somewhat as shown in Figures 1, 2 and 4 to support the housing while the jack 46 is operated to move the part 49 thereof and apply requisite pressure, as for example, against tubular end 13 to straighten the same toward axial alignment with the tubular end 14. It is to be understood that the relatively fixed arms 37 and the extensible jack arm 46 may be arranged along the guide elements 29 to 32 in wide variety of combinations of relative positions thereof, according to the location and particular type of bend to be corrected.

Referring particularly to Figures 5, 6 and 7 there is illustrated in conjunction with the axle housing 10, improved means for accurately determining when the housing has been straightened in the apparatus described above. Caps or plugs 51, 51 are provided with a reduced portion 52 for slidable but snug reception within the ends of the tubular portions 13 and 14 of the housing, these caps having elongated central guide apertures 53, 53 therethrough adapted to be in alignment when the axle housing is straight. Stepped reduced portions 52a, 52b, may be provided on the caps 51 for similarly positioning the caps within tubular ends 13 and 14 of varying diameters. A fine wire 54 is passed through the apertures 53 of the opposite caps 51, and made taut between the same within passage 15 by means of weights 55, 55 depending from the free ends 54a, 54a of the wire.

When the axle housing 10 is straight, therefore, the taut wire 54 will coincide with the normal longitudinal center line of the housing, so that if the wire is in proper position it may be utilized to check the accuracy of the straightening work as by sighting it through predetermined sighting means through the openings 18 and 19 of the housing enlargement 12. To this end, a flat adaptor plate or disc 56 is secured against the seat 20 by means of bolts 58 threaded into the apertures 22, this plate having a predeterminately centrally located, relatively small aperture 59 aligned with a similar sighting aperture 60 in the center of a plate or spider 61, which is secured to the rear seat 21 by means of bolts 62 threaded in the apertures 23. As the enlargement 12 may be materially weakened by the removal of certain parts normally secured to the seats 20 and 21, the front plate 56 may be reinforced by welding or otherwise securing thereto a dome-shaped reinforcing plate 63 provided with a relatively large central opening 64 for maintaining the sighting apertures 59 and 60 unobscured. For this reinforcing plate, 63, a standard new or used housing part may be utilized. The rear sighting plate 61 may be open at 65 and 66 as shown for insertion of a measuring rule or the like to determine the transverse location of the wire 54 with respect to the predetermined normal axis of the housing, this location being readily determined by fixing a point between the inner surfaces of the sighting plates 56 and 61.

It is to be understood that series of adaptor plates 56 and 61, and series of caps 51, may be provided to accommodate axle housings of various types and sizes.

In the use or operation of the apparatus, as for example, to straighten tubular portion 13 of axle housing 10 into alignment with the tubular end 14 thereof, as best shown in Figures 1 and 2, the housing is supported on a series of arms 37 arranged along the guide elements 29 and 30, as previously described, one or more of said arms 37 also being placed along the top guide elements 31 and 32 in positions to prevent accidental displacement of the housing during straightening operations thereon. The extensible jack arm 46 is next moved to proper location along the guide element 32 and operated to apply requisite leverage to the tubular portion 13 to straighten the same into approximate alignment with the tubular portion 14. This operation may be repeated upon turning the housing within the framework 11 and rearranging the jack arms as required to complete the straightening operation. Upon reaching an approximation of the desired straightened condition of the housing, such straightness is checked by the operator sighting by eye through the apertures 59 and 60 of the sighting plates 56 and 61. If the wire 54 lies within the line of sight A—B (see Figure 6) through the apertures 59 and 60, the tubular ends 13 and 14 will be in alignment in a plane passing through said line of sight A—B and coextensive with the longitudinal axis of the housing. To determine if the central axis is properly located transversely of the housing, the operator measures the location of the wire 54 from the inner faces of the sighting plates 56 and 61, with reference to a desired given location as previously described. If the wire 54 is not in the predetermined vertical and transverse locations, the straightening and checking operations are repeated. When the housing is satisfactorily straightened, the sighting or adaptor plates 56 and 61, and the caps 51 are removed, together with the wire 54.

Thus has been provided improved means for effectively cold straightening axle housing as well as accurate means for determining when the axle housings have been satisfactorily straightened.

Modifications of the invention may be resorted to without departing from the spirit thereof or the scope of the appended claims.

What is claimed is:

1. Apparatus for determining the straightness of an axle housing of the type having a longitudinal passage therethrough and having a central portion provided with transversely opposite communicating openings defining outwardly presented seats, comprising means for supporting the housing, an elongated flexible element, means applicable to opposite ends of the housing for maintaining said flexible element in taut condition through said passage, adaptors for seating on said opposite seats of the housing, and means for fastening said adaptors on said seats, said adaptors having aligned apertures arranged to be in a line of sight with said taut flexible element when the axle housing is predeterminately straight.

2. Apparatus for determining the straightness of an axle housing of the type having a longitudinal passage therethrough and having a central portion provided with transversely opposite communicating openings defining outwardly presented seats, comprising means for supporting the housing, an elongated flexible element, means applicable to opposite ends of the housing for

maintaining said flexible element in taut condition through said passage, adaptors for seating on said opposite seats of the housing, and means for fastening said adaptors on said seats, said adaptors having aligned apertures arranged to be in a line of sight with said taut flexible element when the axle housing is predeterminately straight, said adaptors including means for measuring the location of said taut element in the direction of said line of sight.

3. Apparatus for determining the straightness of an axle housing of the type having a longitudinal passage therethrough and having a longitudinally central portion provided with transversely opposite communicating openings, and being supported at spaced points for applying opposed straightening pressure thereto, comprising an elongated flexible element, orienting means applicable to opposite ends of the housing for maintaining said flexible element in taut condition through said passage, adaptors for seating on said opposite sides of the housing, and means for fastening said adaptors on said opposite sides of the housing in cooperation with opposite communicating openings, said adaptors having aligned apertures arranged to be in a line of sight with said taut flexible element when the axle housing is predeterminately straight.

4. Apparatus for determining the straightness of an axle housing of the type having a longitudinal passage therethrough and having a longitudinally central portion provided with transversely opposite communicating openings, and being supported at spaced points for applying opposed straightening pressure thereto, comprising an elongated flexible element, orienting means applicable to opposite ends of the housing for maintaining said flexible element in taut condition through said passage, adaptors for seating on said opposite sides of the housing, and means for fastening said adaptors on said opposite sides of the housing in cooperation with opposite communicating openings, said adaptors having aligned apertures arranged to be in a line of sight with said taut flexible element when the axle housing is predeterminately straight, said adaptors including means for measuring the location of said taut element between the same in the direction of said line of sight.

5. Apparatus for determining the straightness of an axle housing of the type having a longitudinal passage therethrough and having a longitudinally central portion provided with transversely opposite communicating openings defining outwardly presented seats having spaced bolt apertures therein for the usual axle housing fittings or parts, and being supported at spaced points for applying opposed straightening pressure thereto, comprising an elongated flexible element, orienting means applicable to opposite ends of the housing for maintaining said flexible element in taut condition through said passage, adaptors for seating on said opposite seats of the housing, and means for fastening said adaptors on said seats through said bolt apertures, said adaptors having aligned apertures arranged to be in a line of sight with said taut flexible element when the axle housing is predeterminately straight, said adaptors including means for measuring the location of said taut element between the same in the direction of said line of sight.

6. Apparatus for determining the straightness of an axle housing of the type having a longitudinal passage therethrough and having a central portion provided with transversely opposite communicating openings defining outwardly presented seats having spaced bolt apertures therein for the usual axle housing fittings or parts, comprising means for supporting the housing, caps having means thereon for removably mounting the same at opposite ends of a housing to be straightened, guide means on said caps, a flexible element receivable through said passage and over said guide means of said caps, means at opposite ends of said flexible element for maintaining the same in taut condition between the caps, adaptors for seating on said opposite seats of the housing, and means for fastening said adaptors on said seats through said bolt apertures, said adaptors having aligned apertures arranged to be in a line of sight with said taut flexible element when the axle housing is predeterminately straight, said adaptors including means for measuring the location of said taut element in the direction of said line of sight.

7. Apparatus for determining the straightness of an axle housing of the type having a longitudinal passage therethrough and having a central portion provided with transversely opposite communicating openings defining outwardly presented seats having spaced bolt apertures therein for the usual axle housing fittings or parts, and being supported at spaced points for applying opposed straightening pressure thereto, comprising caps having means thereon for removably mounting the same at opposite ends of a housing to be straightened, centering guide means on said caps, a flexible element receivable through said passage and over said guide means of said caps, means at opposite ends of said flexible element for maintaining the same in taut condition between said guide means, adaptors for seating on said opposite seats of the housing, and means for fastening said adaptors on said seats through said bolt apertures, said adaptors having aligned apertures arranged to be in a line of sight with said taut flexible element when the axle housing is predeterminately straight, said adaptors including means adaptable for measuring the location of said taut element between the same in the direction of said line of sight.

EMMETT L. ROSS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
529,315	Snyder	Nov. 13, 1894
740,975	Driver et al.	Oct. 6, 1903
831,862	Hamilton	Sept. 25, 1906
1,239,534	Sponsel	Sept. 11, 1917
1,314,945	Camp	Sept. 2, 1919
1,503,609	Smith	Aug. 5, 1924
1,616,084	Guillet	Feb. 1, 1927
1,647,864	Halphen	Nov. 1, 1927
2,219,191	Merril et al.	Oct. 22, 1940
2,241,401	Haskell	May 13, 1941

FOREIGN PATENTS

Number	Country	Date
492,899	France	Apr. 7, 1919