Nov. 13, 1928. 1,691,522

F. P. KOBERT

METHOD OF ELECTRIC RIVETING

Original Filed Jan. 22, 1921

Fig. 1

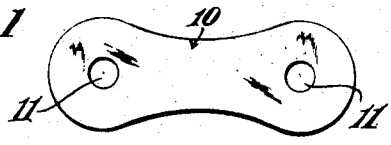


Fig. 1a

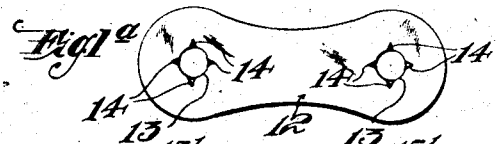


Fig. 1b

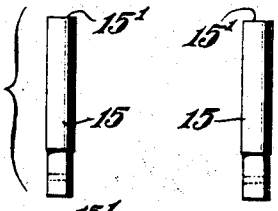


Fig. 2

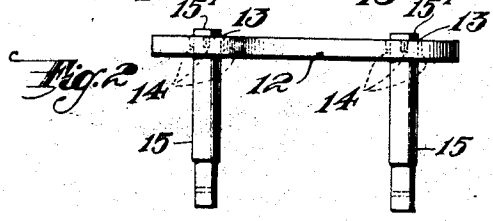


Fig. 7

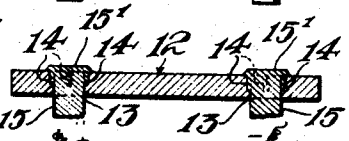


Fig. 4

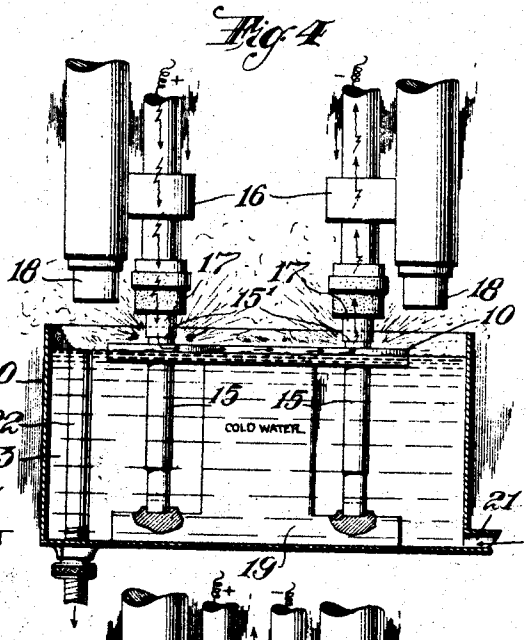


Fig. 3

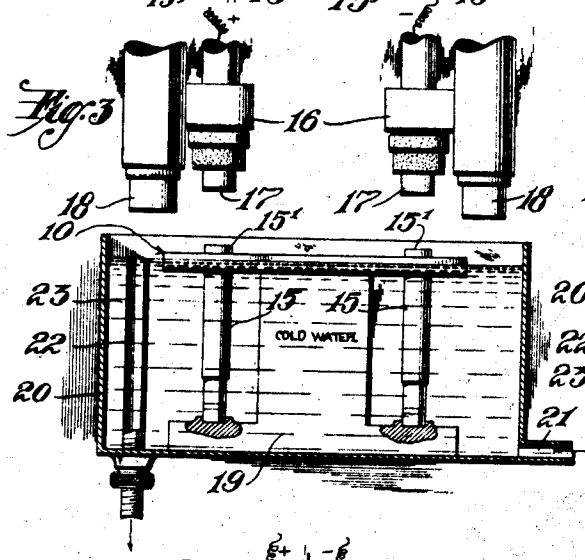


Fig. 5

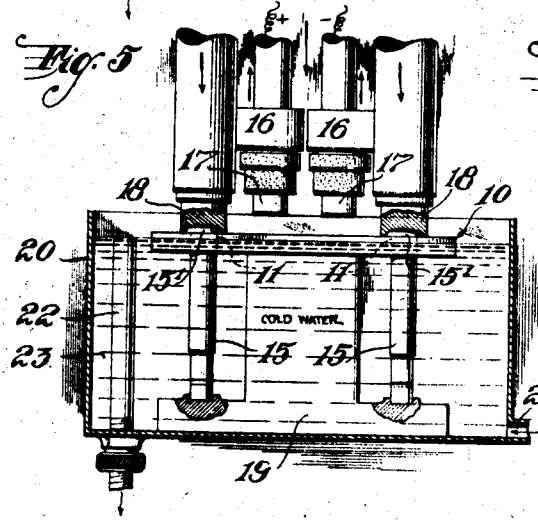
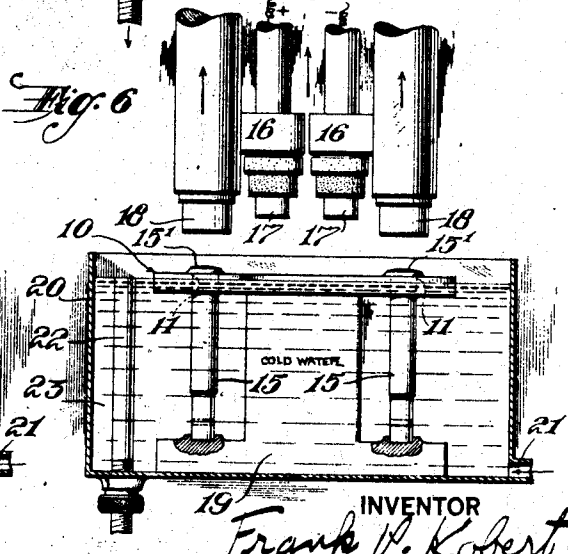


Fig. 6



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Patented Nov. 13, 1928. 1,691,522

UNITED STATES PATENT OFFICE.

FRANK P. KOBERT, OF AMITYVILLE, NEW YORK.

METHOD OF ELECTRIC RIVETING.

Application filed January 22, 1921, Serial No. 439,191. Renewed March 23, 1928.

My present invention relates to methods and means for fabricating metal articles and to the resulting products. In particular, my invention relates to methods and means for assembling or fabricating metal articles, as by riveting, for example, in such a manner that the articles produced by my invention are much more economically and expeditiously manufactured and in a much superior form and condition than hitherto. Preferably the heating operation, or operations, where required in accordance with my invention, are carried out by electrically heating the desired portions of the metal, preferably locally, as more fully set forth hereinafter. It is an object of the present invention to provide methods and means of the general character indicated above whereby the fabrication and assembling of metal articles are rendered more convenient and more rapid than before and articles of much superior quality produced.

In the accompanying specification I shall describe several illustrative embodiments of the method, means and product of the present invention, it being clearly understood, however, that my invention is not limited to the illustrative embodiments thereof which are herein set forth for purposes of illustration only.

Referring to the drawings wherein I have diagrammatically illustrated an illustrative embodiment of the process of my present invention, and also diagrammatically illustrated an illustrative embodiment of the apparatus of my present invention, and wherein I have also shown an illustrative embodiment of an article comprising one form of the product of my present invention:

Figure 1 is a plan view of a metal piece, comprising in this instance a side-piece for a "pin" for a roller chain for chain-drives, this metal piece forming one part of the metal article to be fabricated or assembled in accordance with the present invention;

Figure 1^a is a view similar to Figure 1 of a side-piece, the perforations of which are provided with slots so that the rivets will be keyed in the perforations when the article is completed;

Figure 1^b is a side elevation of the two rivets which are to be combined with the side-piece shown in Figure 1 or Figure 1^a for the fabrication of the illustrative article herein shown and described;

Figure 2 is a side elevation, partly in section, of the two rivets assembled in the side-piece shown in Figure 1^a;

Figure 3 is a somewhat diagrammatic view of the riveting or other fabricating or assembling device before the heating is commenced;

Figure 4 is a similar view of this device during the heating operation;

Figure 5 is a similar view of this device during the heading operation;

Figure 6 is a similar view of this device after the heating and heading operations have been completed; and

Figure 7 is a longitudinal sectional view of the completed article.

Referring to the illustrative embodiment of the article shown in the accompanying drawings, it may be desirable to point out, in this particular instance, the disadvantages of the procedures and products of the prior art, and the remedies for these disadvantages afforded by the present invention. In making "pins" for roller chains for chain-drives, to be used in connection with automobile trucks and similar devices, it has been customary, hitherto, to use a side-piece provided with a plurality, as two, perforations, in which are positioned a plurality of unheaded rivets generally consisting of case-hardened nickel steel. It has not been possible, hitherto, to hot forge the heads of the rivets into the side-pieces, since such an operation, as hitherto carried out, would inevitably result in the annealing of the rivets and in thus drawing their temper and making them wholly unfit for use. This is particularly so since, with the use of the case-hardened nickel steel rivets commonly employed in this art, the temper would be drawn at as low as 350° F., and surely at 520° F. After annealing the head of the rivet to make the riveting operation possible, it has hitherto been necessary to anneal said head by grinding the same on an emery or other friction wheel, or to anneal the same by a heat treatment, as by means of a flame. The rivets are now headed, as by cold hammering or by spinning.

The disadvantages of this mode of operation are obvious. Not only is this operation laborious and tedious, requiring much hand labor and expensive equipment, but the operation itself is very expensive and slow, and the product, for these reasons, very costly. Furthermore, by the procedure hitherto followed in the art, it has not

been feasible to key the rivets in the side-pieces. The products of the prior art are, moreover, very inferior, the rivets turning in the side-pieces after slight wear, and thus introducing friction into the drive, and consequently rendering this from of drive comparatively inefficient. Furthermore, the heads of the rivets wear loose and the chain is easily broken. These various factors are, to a considerable extent, responsible for the waning popularity of the chain-drive.

By my invention these disadvantages and defects are to a very large extent, and, in many cases, almost entirely, overcome. In practicing the above-mentioned illustrative embodiments of my invention, I take a side-piece 10 of the usual form, provided with perforations 11, as shown in Figure 1. Or, and preferably, especially where the rivets are desired to be keyed in the side-piece, I take a side-piece 12, as shown in Figure 1ª, provided with perforations 13, which perforations are in turn provided with the slots 14. The side-pieces 10 and 12 may be of ordinary soft steel.

I next provide a plurality of rivets 15 of a proper size to fit snugly into the perforations 14. Preferably these rivets are of steel, such as nickel steel, which may be case-hardened. The rivets 15 are now assembled in the side-piece 12, as more particularly shown in Figure 2 of the drawing.

While various arrangements and means for carrying out the requisite heating operations may be employed, I prefer to electrically heat the rivets locally, adjacent their heads, by the means somewhat diagrammatically illustrated in Figures 3 to 6, inclusive, of the drawing. Such means comprises a plurality of supporting arms 16, each of which carries an electrode 17, preferably of copper, which is reciprocatable in the supporting arm 16. Each arm 16 also carries a header 18, preferably of steel. The arrangement of arms 16, electrodes 17 and headers 18 is such that the electrodes can be reciprocated by any suitable means to bring the same into and out of contact with the heads of the rivets. Thereafter the arms 16 can be swung, or otherwise moved, to bring the headers quickly into contact with the heated heads of the rivets to head the same.

As a gig or supporting means for the "pins" during the assembling or riveting operation, I provide any suitable support 19 for suitably positioning the assembled side-piece and rivets. Preferably, means are provided for cooling the shanks of the rivets during the heating and heading operations. For this purpose I prefer to place the support 19, carrying the assembled side-piece and rivets, within a receptacle or other work-holder 20 having an inlet 21 for the water, or other cooling medium, and a regulatable over-flow 22 for the spent or waste water. By means of the regulatable over-flow 22, the level of the cooling medium in the holder 20 may be regulated at will so as to maintain the level substantially at the point shown in Figures 3 to 6 of the drawing.

The assembling or riveting operation is substantially as follows: With the electrodes and headers, and the article to be assembled or fabricated, in the positions shown in Figure 3, the electrodes 17 are reciprocated, as by being depressed, so as to be brought into contact with the respective heads 15′ of the rivets 15. The electrodes 17 are suitably connected to a source of heating current. Accordingly, upon contact being established between the electrodes and the respective heads 15′ of the rivets 15, a heavy heating current passes from one electrode 17 through one head 15′, through the portion of the side-piece 12 between the rivets, and out through the other head 15′ and the remaining electrode 17, as indicated by the dotted line in Figure 4 of the drawing. The arrangement is such that the heating of the rivets occurs locally in the heads of the rivets and in so much only of the rivets as is slightly above the surface of the side-piece and contained in the perforations 13, but practically not at all in the shanks of the rivets.

This localized heating of the heads of the rivets, which may be accomplished in about two seconds, heats the rivets to a temperature of incandescence, to thereby enable the heads of the rivets to be readily headed in the subsequent operation of the device. By the high localization of the heating current, substantially no heating of the shanks of the rivets takes place. Furthermore, by means of the contact between the cooling medium 23 in the work-holder 20 and the shanks of the rivets 15, these shanks are not permitted to be heated to a temperature which would anneal them and thus deprive them of their temper.

The electrodes 17 are now reciprocated out of contact with the heads of the rivets when such heads have been heated to the desired temperature, and the arms 16 carrying the electrodes 17 and the headers 18 are now swung, or otherwise moved, to bring the headers very quickly into the position shown in Figure 5 of the drawings, in which position the headers act to head the rivets and to thus hot forge and key the heads of the rivets in the slotted perforations 13 of the side-piece 12. Preferably the heading operation takes place within a fraction, as one-fifth, of a second after the heating operation is completed, in order to minimize the chance of unduly heating the shanks of the rivets and thus annealing them and drawing their temper. As already suggested, this op-

eration takes place without any substantial or undesirable heating of the shanks of the rivets and without in any way annealing and drawing the temper of the shanks of the rivets.

The supporting arms 16 are now operated to bring the headers out of contact with the headed rivets, and these arms are swung, or otherwise manipulated, to bring them back into the position shown in Figure 3 of the drawing, in which position they are ready to repeat the series of operations described above on another assembled side-piece and rivets.

The advantages of the foregoing illustrative embodiments of my invention are numerous and of great importance. By means of my present invention the "pins" are perfectly riveted and the shanks of the "pins" maintain their initial degree of hardness unimpaired. By means of the present invention, also, the heads of the rivets are not only hot forged into the perforations in the side-pieces, but may also be keyed in the same operation of hot forging. The shanks of the rivets are unannealed and retain their original temper unimpaired. This highly desirable condition results from the fact that the heating of the heads of the rivets is almost completely localized and from the further fact that the heads are formed and the heat dissipated before any annealing effect can take place in the shanks of the rivets. The cooling means for the shanks of the rivets further assists in bringing about this highly desirable effect.

The foregoing invention can be applied with equal success to a wide variety of metal articles of manufacture, since it can be used for forging the heads of bolts and screws into devices of very many types. As another example of a class of articles to which the present invention may be applied with great success, I may mention the manufacture of cap-screws.

It is of course to be understood that my invention is not limited to the particular embodiment thereof which are herein described for purposes of illustration only.

What I claim is:

1. The method of assembling metal articles by electric riveting which comprises positioning a plurality of metal rivets in a metal piece, passing electric current through the heads of said rivets and through said piece so as to heat said heads locally without substantially heating the shanks of said rivets while dissipating the heat from said shanks by cooling the same, and thereafter heading said rivets so as to hot forge said heads over and into said piece.

2. The method of assembling metal articles by electric riveting which comprises positioning a plurality of metal rivets in a metal piece, passing electric current through the heads of said rivets and through said piece, bringing electrodes into contact with said heads so as to heat said heads locally without substantially heating the shanks of said rivets while dissipating the heat from said shanks by keeping the same in contact with a cooling medium, and thereafter heading said rivets so as to hot forge said heads over and into said piece.

3. The method of assembling metal articles by electric riveting which comprises positioning a plurality of steel rivets in a metal piece, passing electric current through the heads of said rivets and through said piece so as to heat the heads locally without substantially heating the shanks of said rivets while dissipating the heat from said shanks by keeping the same in contact with water, and thereafter heading said rivets so as to hot forge said heads over and into said piece.

4. The method of assembling metal articles by electric riveting which comprises positioning a plurality of steel rivets in a metal piece, passing electric current through the heads of said rivets and through said piece, bringing electrodes into contact with said heads so as to heat said heads locally without substantially heating the shanks of said rivets while preventing said shanks from becoming heated to an annealing temperature by keeping the same in contact with a cooling medium, and thereafter heading said rivets so as to hot forge said heads over and into said piece.

In testimony whereof, I have signed my name to this specification this 15th day of January, 1921.

FRANK P. KOBERT.