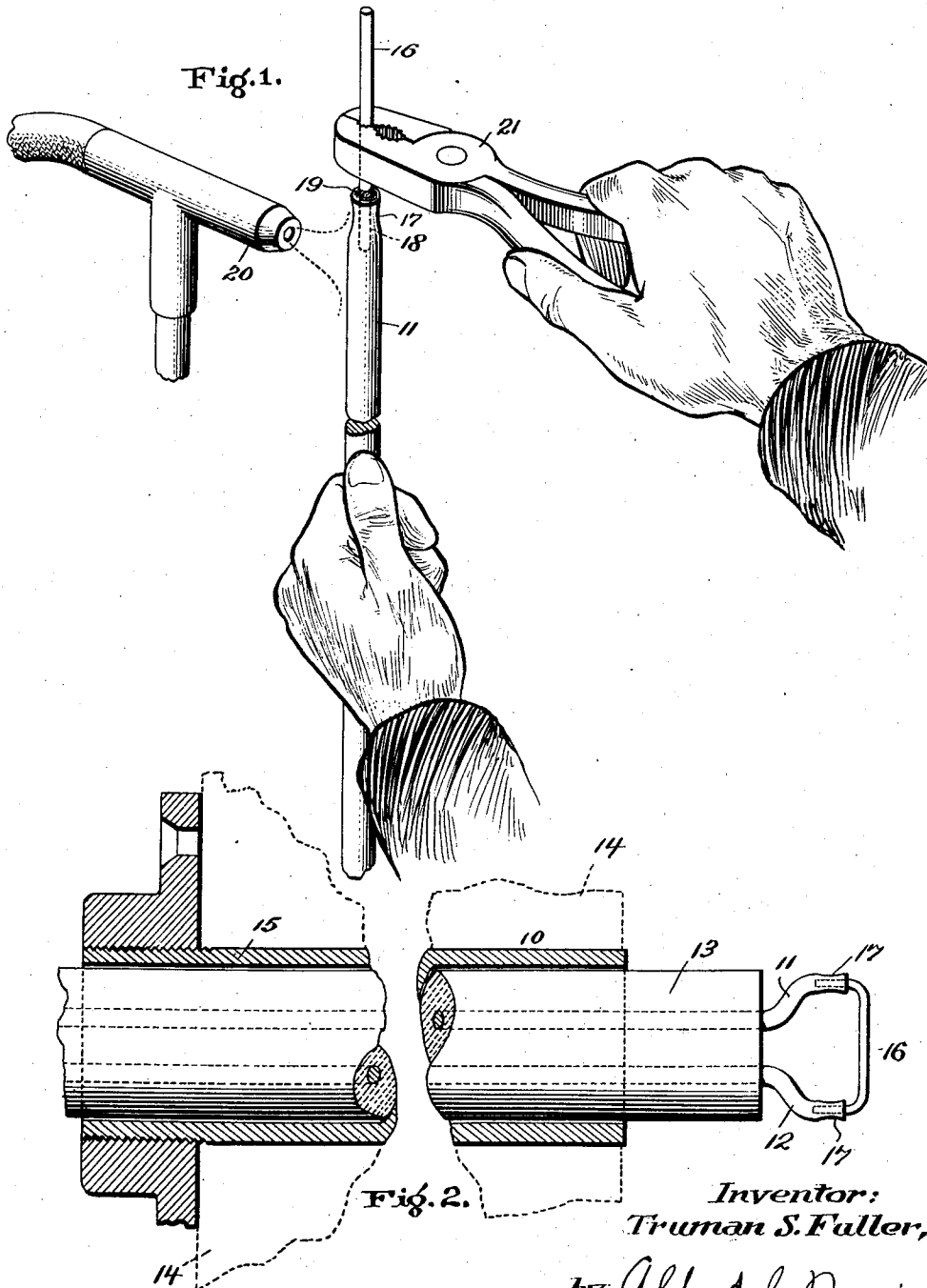


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T. S. FULLER
METHOD OF WELDING
Filed May 20, 1922



Inventor:
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UNITED STATES PATENT OFFICE.

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METHOD OF WELDING.

Application filed May 20, 1922. Serial No. 562,308.

To all whom it may concern:

Be it known that I, TRUMAN S. FULLER, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Methods of Welding, of which the following is a specification.

My invention relates to a method of welding and has for its object the provision of a simple, reliable and efficient method whereby two dissimilar metals may be welded.

In one of its aspects my invention has application to protective devices used in electric furnaces, for example, such as described and claimed in a copending application of Tycho Van Aller, Serial No. 556,782, filed April 26, 1922, assigned to the same assignee as this invention. In such devices a fusible element is supported in the interior of the furnace by two insulated leads made of electrically conducting, heat refractory material which extend through the wall of the furnace. My invention has for one of its objects the provision of a method whereby a good electrical connection can be made between the fusible element and the leads in these devices. Obviously, however, my invention has a general application in the welding of dissimilar metals.

In effecting a weld in accordance with my invention, I first make a mechanical joint or connection between the parts to be welded, then apply a flux to the joint, and finally heat the joint until the metal having the lower melting point fuses and unites with the other.

For a better understanding of my invention reference should be had to the accompanying drawing in which Fig. 1 illustrates a method of welding metals in accordance with my invention, while Fig. 2 shows a furnace fuse in the construction of which my invention is particularly applicable.

Referring to the drawing, the fuse comprises two electrically conducting leads 11 and 12 made of a suitable heat refractory material, such as nickel chromium resistance alloy, which are held in parallel relation and insulated from each other in a suitable insulator 13. The insulator 13 extends through the wall 14 of the furnace and may be conveniently mounted in the wall in a sheath 15. Connecting the inner ends of the leads 11 and 12 is a short link 16 made of a

suitable non-oxidizable material fusible at approximately the maximum allowable temperature in the furnace. In furnaces such as used for annealing and hardening purposes the wire 16 is preferably constructed of gold or silver. The outer ends of the wires 11 and 12 project from the furnace for connection in the heating circuit of the furnace or in a suitable control circuit therefor, as desired.

My invention has for its object a method of forming a simple and reliable electrical connection 17 between the fusible element 16 and the leads 11 and 12. This joint is preferably welded so as to provide for a permanent electrical connection which is not affected by the temperatures to which it is exposed. Obviously the usual methods of making welded joints are impracticable for the reason that it would be extremely difficult if not practically impossible to carry them out due to the fact that the melting points of the materials forming the leads and the fusible element are dissimilar.

In making this welded joint in accordance with my invention, I provide a recess 18 in the end of one of the conducting leads 11. The gold or silver fusible element 16 is then inserted in the recess 18 and the walls of the recess reduced or contracted, such as by swaging, tightly onto the element 16 so as to secure it in place. This results in a good mechanical joint. A small amount of flux 19, such as borax, is next applied to the joint at the line of contact between the element 16 and the lead 11, the lead being held in a vertical position as shown in the drawing. Heat is then applied to the joint, for example, by means of a gas torch 20, and the temperature of the joint raised to the melting point of the element 16. Obviously, care must be taken not to overheat the fusible element as its melting point is approached; otherwise, the element will flow or melt down. The precise period at which the melting point of the portion of the element 16 in contact with lead 11 is reached may be conveniently ascertained by applying a pressure tending to force the element 16 further into aperture 18. This pressure may be applied through the agency of a pair of pliers 21. Under these conditions, when the melting point of the portion of the element 16 at the joint 17 is reached, a very slight yielding or collapse of the ele-

ment will be felt. This signifies that the portion of the element inserted in aperture 18 has melted sufficiently to unite with the material forming the lead 11, whereby a welded joint having good electrical conductivity is formed. Immediately thereafter the source of heat 20 is removed and the parts allowed to cool. It will be understood that the lead 12 will be connected to the opposite end of element 16 in a similar manner. The joints are now boiled in water for several hours for the purpose of removing all traces of the borax used as a flux. This treatment is necessary due to the fact that the borax has a tendency, when exposed to high temperatures in the furnace, to attack the nickel chromium alloy forming the conducting leads. In the final operation the leads and the element are bent in the hair-pin form shown in Fig. 2 and inserted in the insulator 13.

It will be observed that in carrying out my method of making a welded joint, a good mechanical connection is first made. This brings the parts to be welded into intimate contact and maintains them in intimate contact during the completion of the weld. Oxidation is thus prevented, the parts are held in a definite relation, and the making of the weld is otherwise facilitated so that its successful completion is assured. By means of my invention the welding operation, formerly very difficult to perform and often resulting in failure, is made possible of performance by the ordinary skilled worker. By the use of my invention waste of material may be avoided which is very desirable on account of the precious metals, such as gold or silver, used for the fusible element.

While I have described my invention as embodied in concrete form and as operating in a specific manner in accordance with the provisions of the patent statutes, it should be understood that I do not limit my invention thereto, since various modifications thereof will suggest themselves to those skilled in the art without departing from the spirit of my invention, the scope of which is set forth in the annexed claims.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. The method of joining two metallic

rods having dissimilar melting points which consists in forming a recess in the one having the higher melting point, inserting the other in said recess, securing the two by compressing the walls of said recess, applying a flux to the joint thus formed, and then heating the joint until the rod having the lower melting point fuses at the joint and unites with the other while holding said rods in such position that said recess forms a receptacle for the portion of the rod inserted therein.

2. The method of welding a non-oxidizable fuse wire to a heat refractory conductor, which consists in forming a recess in the conductor, inserting the wire in said recess, compressing the walls of said recess to secure the wire therein, applying a flux to the joint thus formed, heating the joint until the wire fuses at the joint and unites with the rod while holding said rod with the recess uppermost and then dissolving off the excess flux.

3. The method of welding two metallic members having dissimilar melting points which consists in forming a mechanical joint between said members such that the member having the higher melting point forms an enclosing receptacle for a portion of the other member, and then heating the joint until said portion fuses and unites with the surrounding metal of the receptacle.

4. The method of welding two metallic rods having dissimilar melting points, the rod having the higher melting point being of greater diameter, which consists in forming a longitudinally extending recess in one end of the rod having the higher melting point, inserting a portion of the rod of lower melting point in said recess, compressing the sides of said recess on said portion to form a mechanical joint, holding said rod of higher melting point in a substantially vertical position with the joint uppermost whereby said recess forms an enclosing receptacle for said portion, and then heating said joint until the metal of lower melting point fuses in said receptacle and unites with the walls thereof.

In witness whereof, I have hereunto set my hand this 19th day of May, 1922.

TRUMAN S. FULLER.