

W. G. GREY & W. GRIFFITH.  
METHOD OF UNITING METALS.  
APPLICATION FILED FEB. 23, 1910.

976,455.

Patented Nov. 22, 1910.  
2 SHEETS—SHEET 1.

FIG. 1

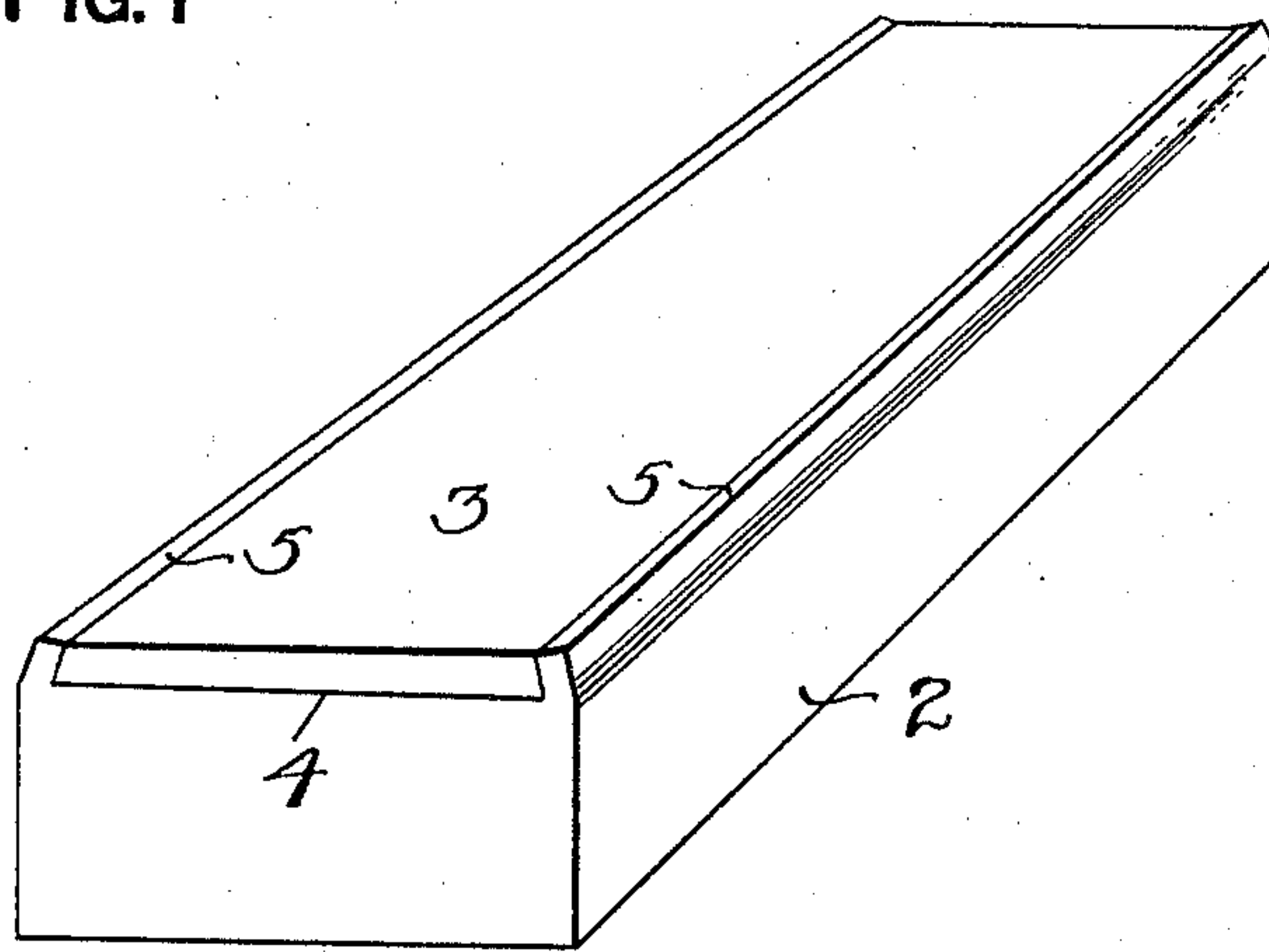
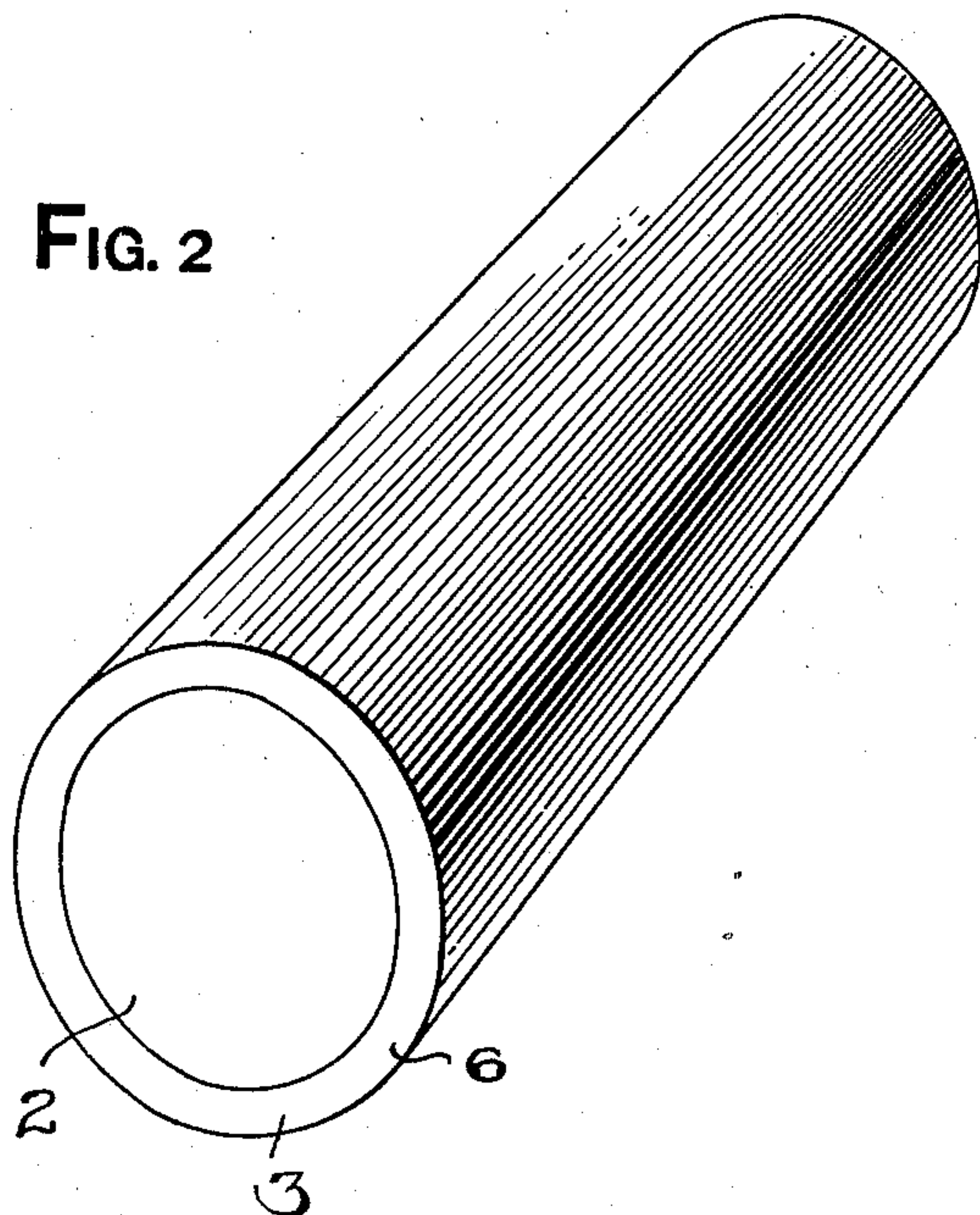


FIG. 2



WITNESSES

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FIG. 3

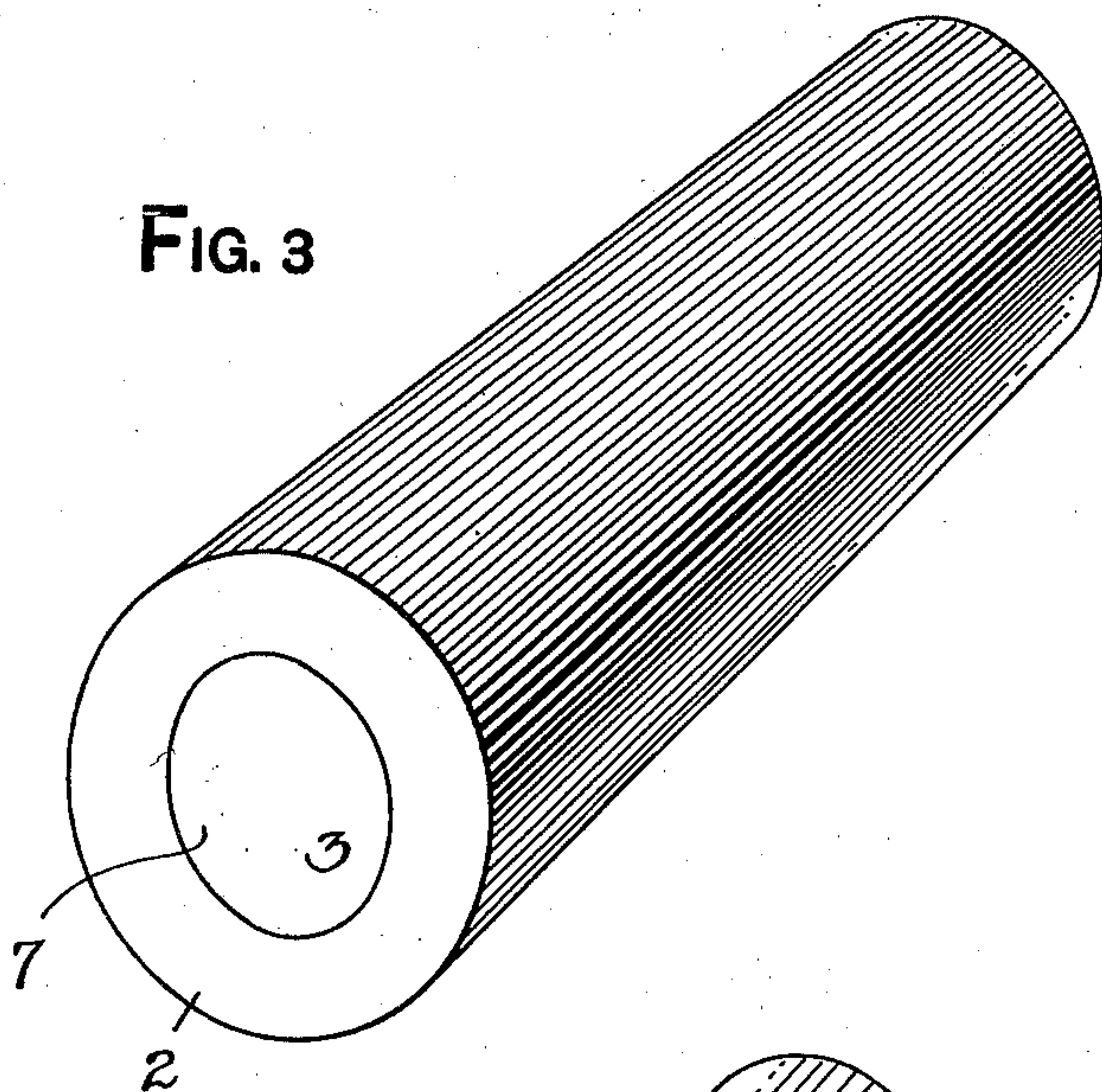
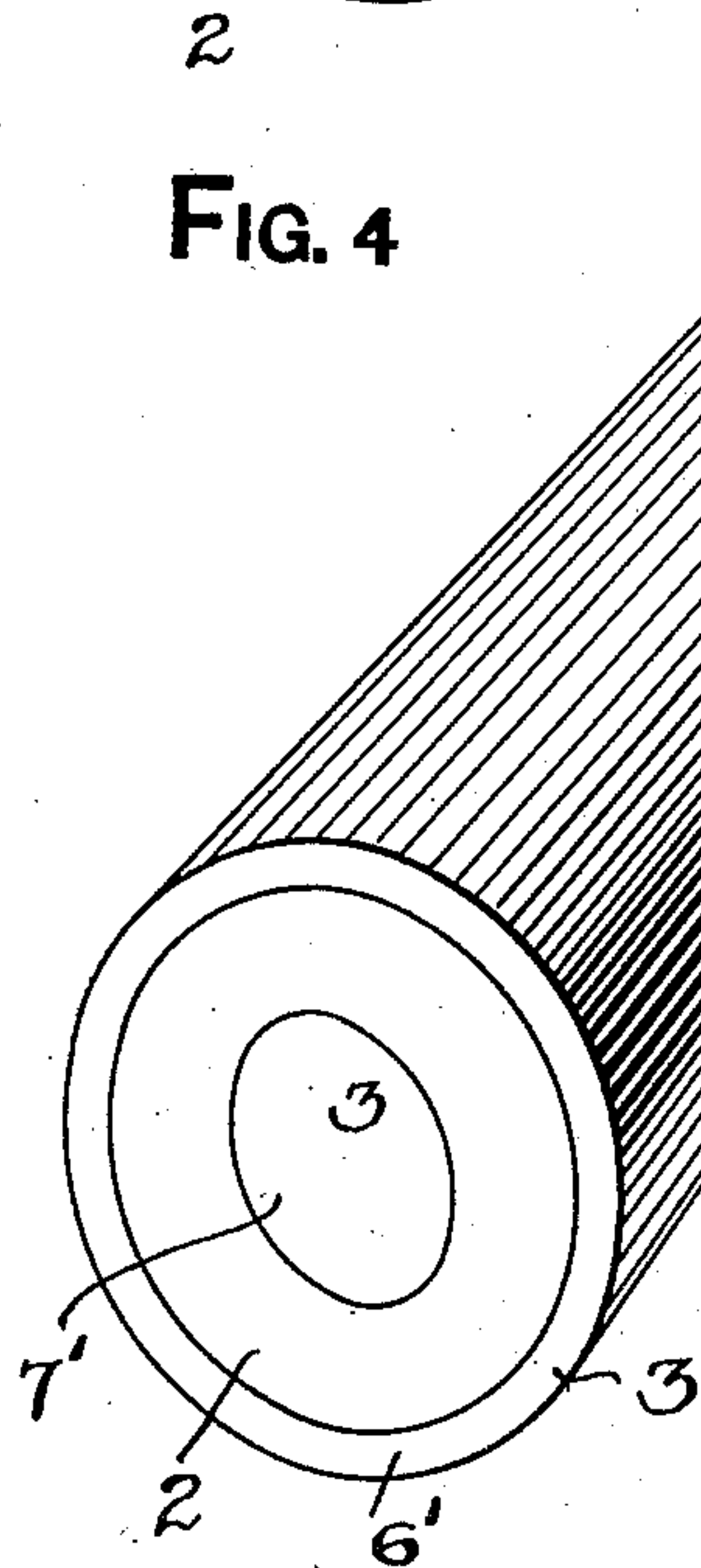


FIG. 4



WITNESSES

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# UNITED STATES PATENT OFFICE.

WILLIAM G. GREY AND WILLIAM GRIFFITH, OF PITTSBURG, PENNSYLVANIA.

## METHOD OF UNITING METALS.

976,455.

Specification of Letters Patent.

Patented Nov. 22, 1910.

Application filed February 23, 1910. Serial No. 545,326.

*To all whom it may concern:*

Be it known that we, WILLIAM G. GREY and WILLIAM GRIFFITH, of Pittsburg, county of Allegheny, and State of Pennsylvania, have invented a certain new and useful Improvement in Methods of Uniting Metals, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

Our invention relates to a method of uniting metals of different kinds, such as iron and steel, with copper, brass, bronze, aluminum, or other metal or alloy; and it consists, generally stated, in first subjecting the harder metal to a cleaning and other preparatory treatment, applying the softer metal, bringing the two metals to a heat, and then uniting by pressure, as will be herein-after more fully described.

We will now describe our invention so that others skilled in the art to which it appertains may understand and practice the same, referring to the accompanying drawings in which we have shown our invention applied to the preparation of ingots, billets, or bars. We do not, however, desire to limit ourselves to the preparation of any particular shape. For convenience, however, in describing our invention we will hereinafter refer to the iron or steel shape as the "harder" body of metal.

Figure 1 is a perspective view of an ingot, billet, or bar of hard metal, having a body of softer metal united thereto, in accordance with our invention; and Figs. 2, 3 and 4 are similar views showing modified forms of shapes to be hereinafter more fully referred to.

In carrying out our invention, the body of harder metal 2 is first subjected to a cleaning or preparatory bath to remove the scale and oxid from the surface or surfaces to which the softer metal is to be united. This cleaning bath may be the ordinary acid solution used for this purpose. After the above treatment, the body 2 may be given a coating of alkali solution, such as chromate potassium or chromate sodium, so as to prevent ready oxidation of the surface or surfaces thus cleaned.

After the body 2 of harder metal has received the above treatment, it is placed in a solution of metallic salt, sulfuric acid, and alum. The particular salt which we prefer to use is sulfate of copper. This solution is

prepared and proportioned preferably as follows, although it may be proportionately varied without departing from our invention, and we do not therefor desire to limit ourselves to the specific amounts stated:  $1\frac{3}{4}$  lbs. sulfate of copper, 2 ounces sulfuric acid, 2 ounces alum, to 1 gallon of water. The body 2 is allowed to remain in this solution until it has received a deposit of copper.

After receiving the above preparatory treatment the body 3 of softer metal is then applied to the copper coated surface or surfaces of the body of harder metal 2, and the metals thus united are heated to a temperature slightly below the fusing point of the softer metal, in which state the two metals are welded by subjecting to suitable pressure device, such as rolls or presses. The metals having been welded, may then be rolled or otherwise worked as desired.

Any suitable manner of attaching the body of softer metal to the body of harder metal may be employed. In Fig. 1 the body 2 of harder metal is shown as having the recess 4 in which is placed the body of softer metal 3, which is to be united thereto in the manner above described. In this construction the edges or flanges 5 formed by this depressed surface serve, when pressed against the edge of the body of softer metal 3 to rigidly hold the body 3 in position on the shape 2.

In Fig. 2 the body of softer metal is shown in the form of a shell or continuous coating 6. It will be seen that the shell 6 may be readily placed in position on the bar 2 preparatory to being united therewith. A further form or shape of the body 2 of harder metal is shown in Figs. 3 and 4. Fig. 3 shows the body of softer metal in the form of the core 7, while in the latter, Fig. 4, is shown both a core 7' and an outside shell or coating 6'. These latter shapes, that is, the shapes shown in Figs. 2, 3 and 4, are such as may be employed in the production of wire rods and the like.

The advantages of our invention will be appreciated by those skilled in the art. The addition of the alum to the solution of metallic salt conduces to a rapid incremental homogeneous deposit of the copper on the body adapted to receive it; this homogeneity of the coating resulting in a perfect union of the metals when subsequently united in the manner above described.

Having thus described our invention,



what we claim and desire to secure by Letters Patent is:

1. The herein-described method of uniting relatively hard metals, such as iron or steel with relatively soft metals such as copper, brass, bronze, aluminum, or other metal or alloy, which consists in first cleaning the harder metal, subjecting it to a solution of metallic salt and alum, applying the softer metal to the treated surface of the harder metal, bringing the metals to a heat, and then uniting by pressure.

2. The herein-described method of uniting relatively hard metals, such as iron or steel with relatively soft metals such as copper,

brass, bronze, aluminum, or other metal or alloy, which consists in first cleaning the harder metal, applying to its surface a coating of alkali solution, subjecting it to a solution of metallic salt and alum, applying the softer metal to the treated surface of the harder metal, bringing the metals to a heat, and then uniting by pressure.

In testimony whereof, we have hereunto set our hands.

WILLIAM G. GREY.  
WILLIAM GRIFFITH.

Witnesses:

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