No. 647,468. Patented Apr. 17, 1900.

W. M. BROWN & G. H. McFEATERS.

UNITING METAL ARTICLES.

(Application filed May 5, 1899.)

(No Model.) 2 Sheets—Sheet 1.

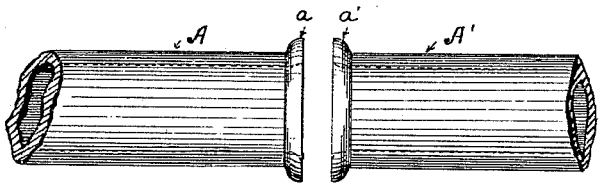

Fig. 1

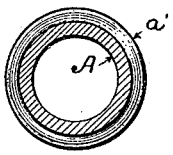

Fig. 2

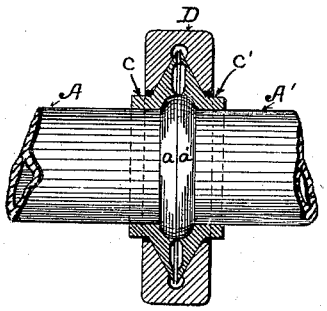

Fig. 3

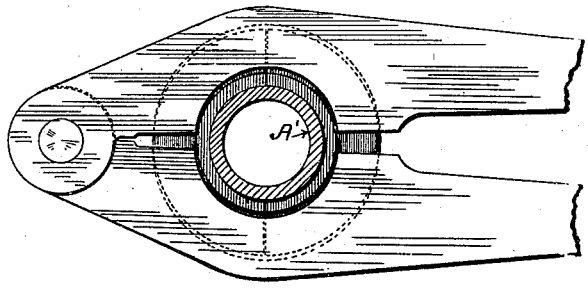

Fig 4

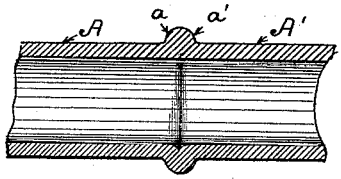

Fig 5

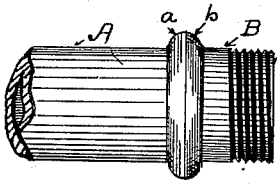

Fig. 6

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No. 647,468. Patented Apr. 17, 1900.

W. M. BROWN & G. H. McFEATERS.

UNITING METAL ARTICLES.

(No Model.) (Application filed May 5, 1899.)

2 Sheets—Sheet 2.

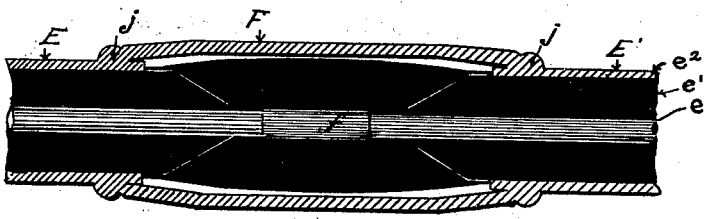

Fig. 7

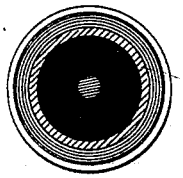

Fig. 8

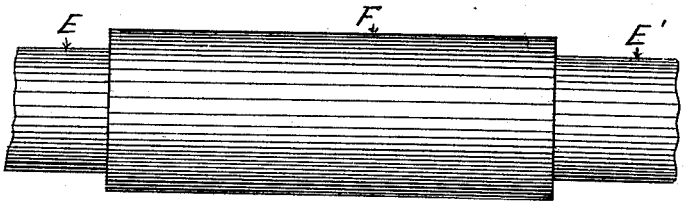

Fig. 9

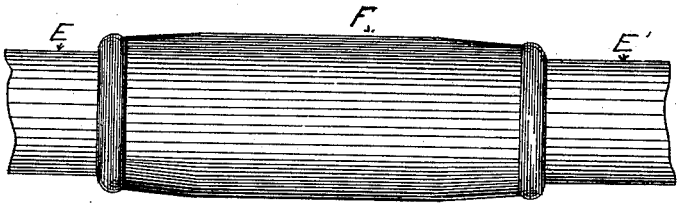

Fig. 10

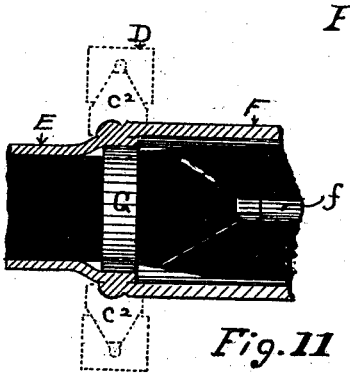

Fig. 11

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WILLIAM MILT. BROWN AND GEORGE H. McFEATERS, OF JOHNSTOWN, PENNSYLVANIA.

UNITING METAL ARTICLES.

SPECIFICATION forming part of Letters Patent No. 647,468, dated April 17, 1900.

Application filed May 5, 1899. Serial No. 715,678. (No specimens.)

To all whom it may concern:

Be it known that we, WILLIAM MILT. BROWN and GEORGE H. McFEATERS, of Johnstown, in the county of Cambria and State of Pennsylvania, have invented a new and useful Improvement in Uniting Metal Articles, 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 the joining of metal articles; and it consists of a novel process of connecting pipes, cables, and other articles, as hereinafter set forth.

Our novel process may be used to connect together lead pipes or the lead covering of two cables or tin pipes or lead to tin, or either lead or tin to any other metal—such, for example, as brass—which may be provided with a tinned surface. We do not mean by this to say that our process is limited to the specific applications we have mentioned, as doubtless many other metals can be advantageously connected together by our improved process. It will thus be seen that our invention has a wide range of action; but we know it to be specifically of great value when used to replace the wiped joint which is ordinarily used in all plumbing connections and for the connecting of lead-covered electric cables.

The important steps of our novel process consist in applying a coating of mercury to the surfaces to be united and then applying heat and pressure. We prefer to apply a drop of mercury to the surface and then spread the mercury over the surface by any suitable means, so that a thin film of mercury may be left on the surface. We also prefer to apply the heat to the surface from heated dies (the ordinary heat given a soldering-iron has been found very satisfactory) and to apply the pressure to the heated dies. The effect of the mercury seems to be (probably from its amalgamation with the other metal) to cause a very thin film of metal at the surface to melt or soften at an abnormally-low temperature, so that when pressure is applied the two surfaces are readily united without softening the main body of the metal. When, however, the joint has been completed, the metal remaining at the joint will not melt or soften at any lower temperature than that at which the metal will ordinarily melt or soften, the low-melting metal having been apparently substantially removed at the time of making the joint. The resultant joint is, we believe, a perfect weld between the two articles, the metal forming the joint not being different from that throughout the body of the structure.

Other features of our invention, which we will set forth hereinafter, are more specially applicable to particular forms of articles to be united.

Referring to the drawings, Figure 1 represents a pair of lead pipes about to be joined together; Fig. 2 a section through one of these pipes, and Fig 3 a longitudinal section of a joint just being completed. Fig. 4 is an end view, the body of the pipe being in section, of Fig. 3. Fig. 5 is a longitudinal section of the completed joint. Fig. 6 illustrates a completed joint between a lead pipe and a brass fitting. Fig. 7 is a longitudinal section of a joint between two lead-covered electric cables, and Fig. 8 a section therethrough. Fig. 9 is a side elevation of the joint of Fig. 7 before the heat and pressure have been applied, and Fig. 10 a similar view of the completed joint. Fig. 11 is a section illustrating a slightly-modified joint in process of being united.

A A′ represent two ordinary lead pipes, each of which have had their ends flared outwardly to form collars or flanges *a a′*. This may be done in many ways known to the art, the particular method of forming the collars being immaterial to our present invention. We prefer to have these collars, as it affords a ready means, as will be seen hereinafter, to apply pressure through heated dies to the surfaces to be connected and also increases the area of the united surfaces. They are not, however, indispensable to the practice of our invention, even for the connecting of pipes. The opposing faces of the flanged pipes A and A′ are now coated with mercury. This may readily be done even when the pipes are at not very accessible positions by carrying drops of mercury on a metal pencil and transferring it therefrom to the end of the pipe, the drops being spread over the surface in any suitable manner, as by the said pencil

or even by the finger of the operator. This leaves a thin film of mercury on the surface. The amalgamating may be hurried somewhat by first applying "soldering-acid" to the lead surfaces.

C C′ represent two pairs of dies which have been heated in any suitable manner to the required temperature. We have generally in practicing our process heated the dies after they are in place, their heat being gained by contact with the heated jaws of the compressing-tool. Of course either the tool or dies might be heated from an outside source, this being merely a matter of preference. Each die is semicircular and embraces the end of one of the pipes, engaging the flanges thereof. The periphery of each die is partially inclined, so that when the dies are in position the jaws D of the compressing-tool will engage oppositely-inclined die-surfaces and move the dies toward each other, pressing the ends of the pipes together. In making a joint with ordinary house-pipes—say one inch in diameter—we ordinarily apply the heat from the compressing-tool through the medium of the dies for about one minute. During this period we keep a gentle pressure on the jaws of the tool, and at the end of that time we increase the pressure and then remove the tool and dies. The heat should not be great enough to melt or materially soften the metal, except where amalgamated, if the best results are to be obtained. The particular arrangement of dies and compressing-tool is not claimed by us in the present application, but forms in part the subject-matter of another application filed by us on an even date herewith, Serial No. 715,679.

Fig. 6 illustrates a completed joint between pipe A and a brass fitting B. In this case the fitting is formed (by casting or otherwise) with the flange or collar *b*. The surface of the flanged fitting B is tinned, the mercury applied in the manner already described to the tinned surface of B and the surface of pipe A, and the process may then be practiced as already described.

Referring now to Sheet 2 of the drawings, which illustrates another use of our improved joint, E and E′ represent two lead-covered cables, each comprising the copper conductor *e*, the insulation *e′*, and the lead covering e^2. The insulation and lead covering may be removed from the ends of the two cables, the insulation tapered, as indicated by white lines in Fig. 7, the ends of the copper conductors connected by a sleeve *f*, and insulation placed about the sleeve. These are the ordinary steps for connecting cables by wiped joints. A lead sleeve F may then be connected by our process to the ends of the lead covering of the cables, joints being shown at *j*, Fig. 7. It will of course be obvious that the mercury will have been applied to the interior of the ends of sleeve F and the said sleeve slipped over the end of one of the cables before the conductors *e* have been connected by sleeve *f*.

In Fig. 11 we have illustrated a modified form of joint for electric cables, in which a metal ring G is slipped over the insulation and under the lead covering of the cable, so as to form an internal die. This relieves the insulation and allows of obtaining a more effective pressure at the surfaces to be united. In this figure we have shown in dotted lines the dies C^2 and the jaw D of the compressing-tool. It is obvious that in this case the pressure desired is in a radial direction and not in a longitudinal direction and therefore the dies are shown adapted for radial movement.

From the foregoing description it will be obvious that our process has a wide range of action, and our improved joints may be of many different specific types, and we do not therefore limit ourselves to the specific embodiments of our invention, nor to those details of the process which we have described merely for the purpose of fully explaining the preferred way of carrying out the process, but which are not essential to our broad invention.

The novel joint herein shown and described is broadly claimed in a divisional application filed by us, Serial No. 728,380, and the cable-joints shown in Sheet 2 of the drawings and herein described are specifically claimed in a second divisional application now pending, Serial No. 728,381.

Having thus described our invention, what we claim, and desire to protect by Letters Patent, is—

1. The process of joining metal articles having their surfaces to be joined of a nature to form an amalgam which consists in applying mercury to the surfaces to be united abutting the same and then applying heat and pressure to said surfaces.

2. The process of joining metal articles having their surfaces to be joined of a nature to be amalgamated, which consists in applying a thin film of mercury to the surfaces to be united abutting the same and then applying heat and pressure to said surfaces.

3. The process of joining metal articles which consists in amalgamating the surfaces to be joined, abutting the same placing the metal in proximity to said surfaces into contact with heated blocks, and applying pressure to said blocks in a direction to press said surfaces together.

4. The process of joining metal articles which consists in amalgamating the articles at the surfaces to be united, then heating and pressing together said articles.

5. The process of joining metal articles which consists in amalgamating the articles at the surfaces to be united, then applying heat and pressure to said surfaces.

6. The process of joining metal tubes having their surfaces to be joined of a nature to

form an amalgam, which consists in first forming a flange at the end of each tube, applying a coating of mercury to the ends of the flanged tubes, heating said flanges by contact with heated dies engaging the flanges, and pressing said dies toward each other.

7. The process of joining metal tubes which consists in forming a flange at the end of each tube, amalgamating the ends of the flanged tubes, abutting said amalgamating ends, applying heated dies to the said flanges, and applying pressure to said dies.

8. The process of joining lead pipe which consists in applying a coating of mercury to the ends of the pipes, abutting said ends, and applying heat and pressure thereto.

9. The process of joining lead pipe which consists in forming a flange on the ends of each of said pipes, applying a coating of mercury to said flanged ends, abutting said flanged ends with heated dies in contact with said flanges, and applying pressure to said flanges.

10. The process of joining metal articles whose surfaces to be joined are of a nature to form an amalgam, which consists in applying a film of mercury to the surfaces to be united, applying dies to the articles near said surfaces, imparting heat to said dies and through them to the metal at and near said surfaces, simultaneously imparting a gentle pressure to said dies, and finally increasing said pressure to complete the joint.

In testimony whereof we have affixed our signatures in presence of two witnesses.

W. MILT. BROWN.
GEORGE H. McFEATERS.

Witnesses:
H. W. SMITH,
M. E. SHARPE.