

F. L. O. WADSWORTH.

UNITING METALS.

APPLICATION FILED FEB. 6, 1911. RENEWED DEC. 2, 1912.

1,050,880.

Patented Jan. 21, 1913.

2 SHEETS—SHEET 1.

FIG. 1.

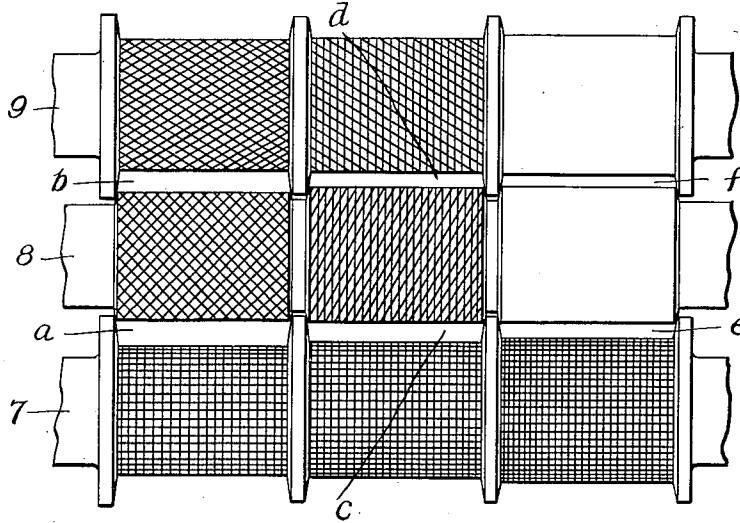
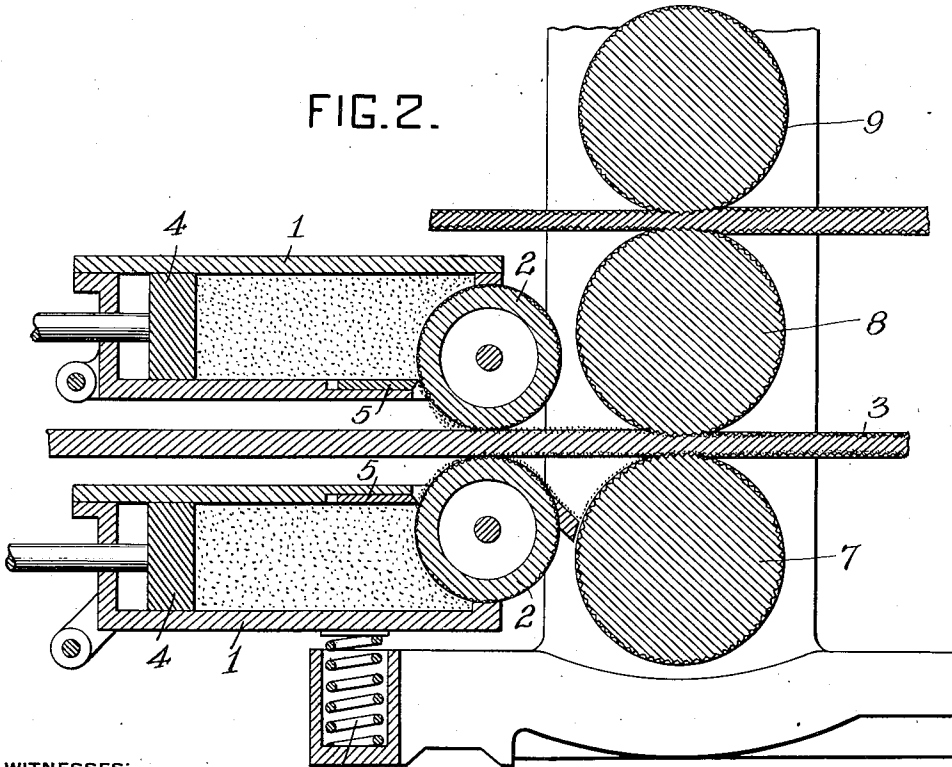


FIG. 2.



WITNESSES:

J. Herbert Bradley. 6
Francois J. Tomason

INVENTOR

Frank L. O. Wadsworth,
by Christy & Christy
Attys

P. L. O. WADSWORTH.

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2 SHEETS—SHEET 2.

FIG. 3.

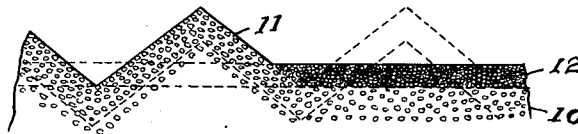


FIG. 4.

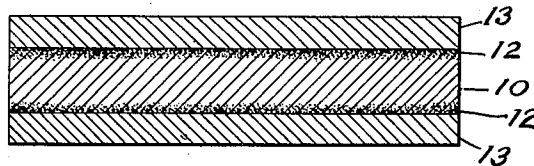
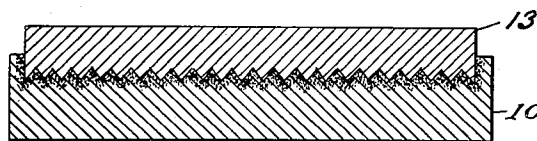


FIG. 5.



WITNESSES:

J. Herbert Bradley
Francis J. Tomason

INVENTOR

Frank L. O. Wadsworth
by Christie & Christie
Atty's

UNITED STATES PATENT OFFICE.

FRANK L. O. WADSWORTH, OF SEWICKLEY, PENNSYLVANIA.

UNITING METALS.

1,050,880.

Specification of Letters Patent.

Patented Jan. 21, 1913.

Application filed February 6, 1911, Serial No. 606,897. Renewed December 2, 1912. Serial No. 734,624.

To all whom it may concern:

Be it known that I, FRANK L. O. WADSWORTH, residing at Sewickley, in the county of Allegheny and State of Pennsylvania, a citizen of the United States, have invented or discovered certain new and useful Improvements in Uniting Metals, of which improvements the following is a specification.

It is the object of the invention to unite or weld together bodies of different metals, or more or less kindred metals differing in chemical composition, and the invention consists in an improved process for that purpose.

In the practice of the invention a body of one of the metals to be welded is first heated to a high temperature so as to sufficiently soften it, and there is then applied to its surface or surfaces, in finely divided or powdered form, a substance which will assist in the final welding, and this substance is mechanically worked or kneaded into a mixture or alloy with the surface particles of the metallic body. The other metal is then applied to and welded upon the so-treated surface or surfaces in any well-known or suitable manner. It is preferred that the powdered substance shall be of the same or similar chemical composition as that of the metal to be finally applied, but the invention permits of variation in this respect, and in welding some metals a powdered substance different from both of them may be employed. If, for example, it is desired to weld upon the surface of a steel bar or plate a coating or body of copper, powdered metallic copper or copper salt is applied to the surface of the steel, and mechanically worked into the surface, during the operation of rolling the steel to the desired form, producing upon the surface of the piece what is essentially an alloy of the steel and copper. This may be effectively accomplished by the use of apparatus like that shown and described in Letters Patent No. 936,389, to be presently referred to. The alloyed surface of the piece should then be cleaned, and if necessary pickled in a bath of suitable composition, and there is then applied to the clean alloyed surface the final copper coating. This copper coating may be applied in solid form, or in molten condition, or it may be deposited electrolytically by any of the well known methods. If applied in solid form, the plate of copper is placed upon the alloyed surface of the steel, and the two are

placed together in a heating furnace and brought to a proper welding temperature, a little below the melting point of copper, the plates being held together in any suitable way. The heated pile is then withdrawn from the furnace and subjected to the action of welding rolls or a suitable press, by means of which a perfect union is obtained. In case the copper is applied in molten form, or electrolytically, a perfect weld will be obtained, but it is preferred to subsequently roll the product as is usual.

If it is desired to coat an iron or steel plate with zinc or tin, the process is essentially the same, the powdered substance employed being zinc dust or finely divided lead or tin as the case may be.

In the accompanying drawings there is illustrated an apparatus like that shown and described in the Letters Patent above referred to, and suitable for applying the powdered substance to the surface to be ultimately coated and for incorporating it therewith.

Figure 1 shows conventionally in elevation a three-high stand of rolls for this purpose. Fig. 2 is a sectional elevation showing means for feeding and applying the powdered substance to both surfaces of a plate being rolled. Fig. 3 shows conventionally a portion of one surface of the plate in the process of being rolled smooth. Figs. 4 and 5 show in cross-section plates with impregnated surfaces, with layers of the other metal applied thereto preparatory to welding.

The powdered substance is shown as contained in the boxes 1, from which it is fed by means of rollers 2, which should be slightly corrugated or roughened, upon the opposite surfaces of the plate 3 just before the latter enters the pass in the reducing rolls. The powdered substance is pushed forward by pistons 4, and the quantity carried out by the rollers may be regulated by gates 5. A spring 6 is shown beneath the lower box in order to hold the lower roller firmly against the plate.

In order to embed and thoroughly knead the powdered substance in the surface of the plate, as well as for other purposes to be mentioned, the operating surfaces of the reducing rolls 7, 8 and 9 in the first four passes *a*, *b*, *c* and *d* are roughened by cutting there- in closely adjacent grooves and cross-grooves, the pattern being somewhat differ-

ent in successive passes, so that all parts of the surface of the piece shall be effectively worked and the powdered substance be incorporated therein to a considerable depth.

- 5 In the fifth pass *e* the lower roll 7 only is marked, so that the rough upper surface of the piece is rolled smooth, while in the sixth pass *f* the operating surfaces of both rolls 8 and 9 are smooth. In these final passes the
10 alloyed surfaces of the piece are considerably reduced in area, and the composite surface portions are materially crowded together and densified in lines parallel with the plane of the general surface of the piece.
15 This final reduction in area and consequent densification of the surface produces a layer of alloy on the outside of the plate which is of very uniform composition, and of such character as to enable the other metal to be
20 readily and effectively welded thereto, in any of the ways above mentioned.

Fig. 3 shows on an enlarged scale a fragmentary section of a plate or bar 10, say of steel, in the process of being rolled smooth, the roughened impregnated surface being
25 indicated at 11, and the smooth densified surface at 12.

In Fig. 4 there is shown in section the plate 10, having opposite impregnated surfaces 12, with plates of other metal 13 applied to said surfaces preparatory to welding.
30

In order to increase the effective area of the welding surfaces the contacting surfaces
35 of the two plates to be united may in some instances be given a corrugated form, as shown in Fig. 5, by being passed through the same set of grooved rolls, after one or both of such surfaces have been alloyed and
40 densified in the manner above described.

Many forms of apparatus may be employed for incorporating the powdered substance into the surface of one of the metals to be welded, and the present invention is not limited to the employment of any particular apparatus for that purpose. Neither

is the invention limited with respect to the manner in which the second metal is applied to the prepared surface of the first metal, that is, whether in solid or molten form, or deposited electrolytically, or in any other way.

I claim as my invention:

1. The process of uniting different metals, which consists in heating a body of one of the metals, mechanically kneading into the surface of said heated body a finely divided substance of a nature to facilitate welding, and then welding the other metal upon said prepared surface.

2. The process of uniting different metals, which consists in heating a body of one of the metals, densifying the surface of said heated body and mechanically kneading therein a finely divided substance of a nature to facilitate welding, and then welding the other metal upon said densified and composite surface.

3. The process of uniting different metals, which consists in mechanically kneading into the surface of a body of one of the metals a finely divided metal of a nature to cause the composition of said surface to partake of the character of both of the metals to be united, and then welding the other metal upon said prepared surface.

4. The process of uniting different metals, which consists in heating a body of one of the metals to a forging temperature, forging a roughened surface upon said body and simultaneously incorporating in said surface a finely divided metal of a nature to cause the composition of said surface to partake of the character of both of the metals to be united, smoothing said surface, and then welding the other metal thereto.

In testimony whereof I have hereunto set my hand.

FRANK L. O. WADSWORTH.

Witnesses:

ALICE A. TRILL,

FRANCIS J. TOMASSON.