No. 827,696.

PATENTED JULY 31, 1906.

W. P. LEWIS.

ART OF MAKING SHEETS FOR TINNING.

APPLICATION FILED NOV. 23, 1905.

Fig. 5.

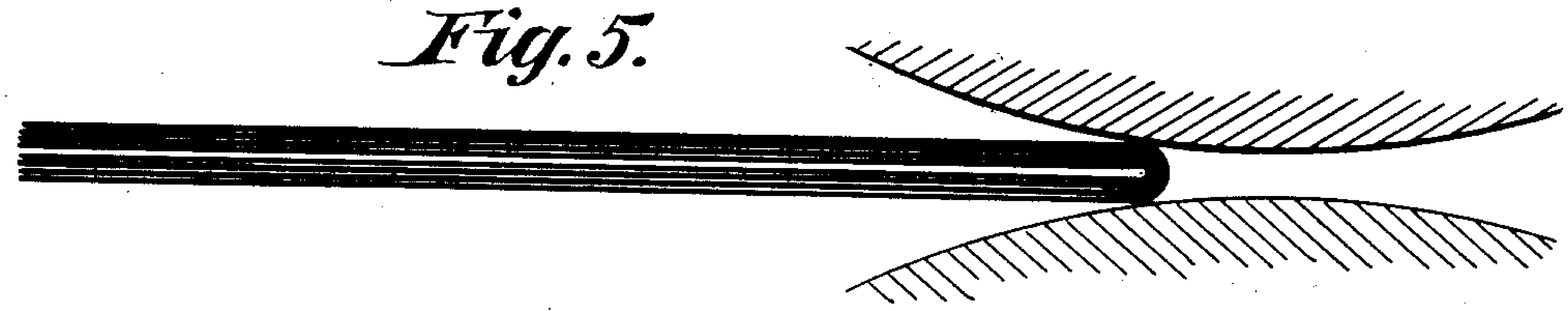


Fig. 4.

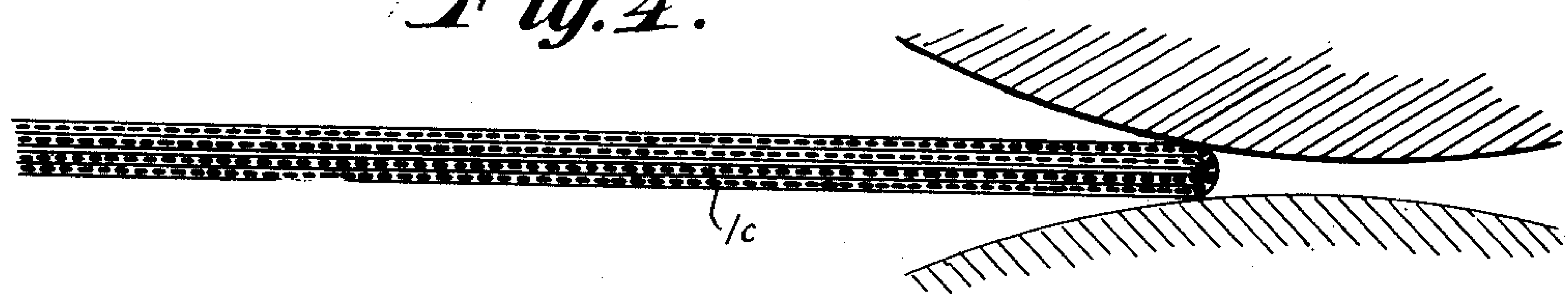


Fig. 3.

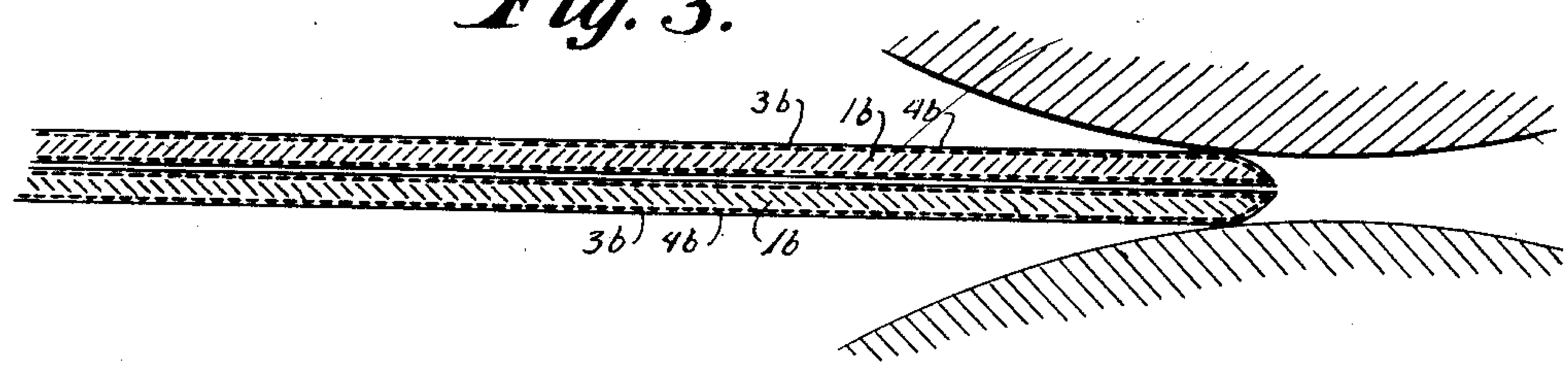


Fig. 2.

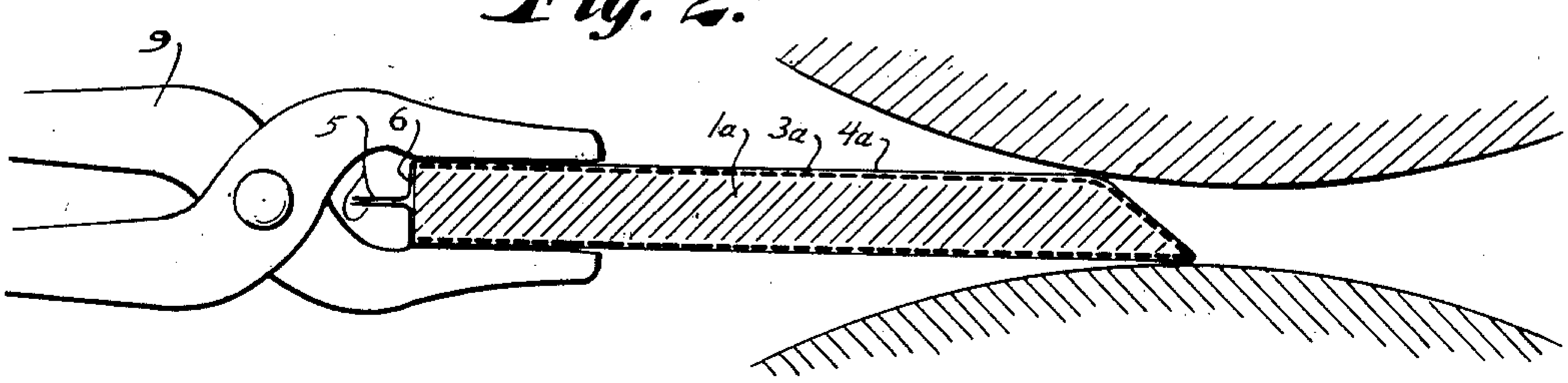
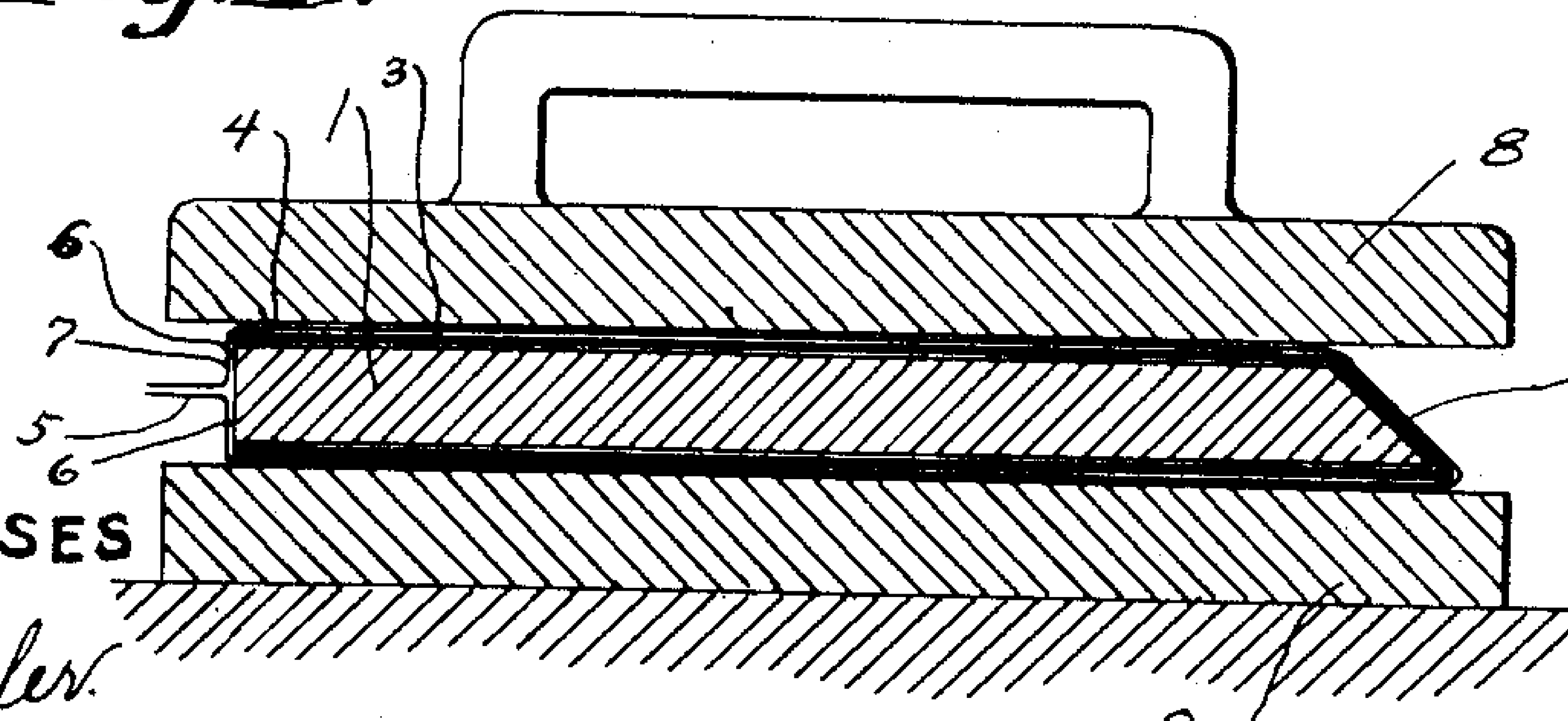


Fig. 1.



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ART OF MAKING SHEETS FOR TINNING.

No. 827,696. Specification of Letters Patent. Patented July 31, 1906.

Continuation of application Serial No. 240,453, filed January 10, 1905. This application filed November 23, 1905. Serial No. 288,653.

To all whom it may concern:

Be it known that I, William P. Lewis, a citizen of the United States, residing at Canton, in the county of Stark and State of Ohio, have invented a new and useful Improvement in the Art of Making Sheets for Tinning, of which the following is a specification.

The invention relates to a method of making sheets to be coated with tin or the like for use in architectural and other arts; and the object of the improvement is to roll a copper sheet on the sides of a base-bar of iron or steel and to reduce the same to sheets of the thinner gages usually required for the body of a tinned sheet.

When copper sheets are welded or united on the sides of an iron or steel base-bar, hereinafter referred to as "steel," and the composite bar is then reduced by rolling, the gage to which the sheets can be made is limited to the action of the rolls on a single sheet, because if one sheet is placed upon another or doubled upon itself, like steel sheets are usually manipulated for rolling to the thinner gages, the copper faces will adhere to each other or to the rolls, and the sheets will sometimes be partly welded together, which result is no doubt due to the fact that the copper becomes considerably softer than the steel when heated sufficiently for the rolling, and for the same reason if copper-coated plates are reduced to sheets by rolling the copper is liable to be ruptured by the action of the rolls on the comparatively thin and soft coating, and the steel is thus exposed, and, furthermore, any roughness or projections there may be on the face of either the steel bar or the rolls is liable to puncture the copper and likewise expose the steel, and, again, if steel sheets are coated with copper by an electrolytic process there are usually spots on the surface of the steel to which the copper will not adhere, at which places the steel is similarly exposed. For these reasons it has heretofore been practically impossible to make a thin steel sheet having thereon an absolutely continuous coating of copper, and any exposure of the steel, however slight, is manifestly a serious defect, whether the sheet is to be used with the copper exposed or is to be utilized as the body of a tinned sheet. This difficulty is overcome by rolling a sheet of iron or steel, hereinafter referred to as "iron," upon the exposed side of the copper sheet at the same time the latter is rolled upon the steel base, by means of which method the steel and the copper and the iron cover can be completely united together at a considerably less heat than is usually required for welding, and during the reducing-rolling the composite sheets can be freely manipulated just like ordinary steel sheets are rolled, which object is attained by the process hereinafter more fully described, some of the features thereof being illustrated in the accompanying drawings, in which—

Figure 1 is a cross-section of the steel bar, showing the preferred manner of folding and flattening the copper and iron sheets thereon for the first heating; Fig. 2, a similar section illustrating the composite bar at the beginning of the rolling; Fig. 3, a similar section showing the manner of reducing two sheets together; Fig. 4, a similar section showing the two sheets doubled for further reducing; and Fig. 5, a similar section showing the doubled sheets again folded for the final rolling.

Similar numerals refer to similar parts throughout the drawings.

The base-bar 1 may be either of iron or steel or other suitable metal and is preferably formed with one side edge 2 beveled. A convenient size for the bar is ordinarily eight inches wide by one-half inch thick and of such a length—say twenty inches—as is desired for the width of the finished sheet. The copper sheet 3 is of the same length as the bar and is of such width that it can be folded over the beveled edge of the bar and will then completely cover both sides thereof, as shown in Fig. 1. A twenty-six-gage sheet is a desirable thickness of copper to use in connection with a half-inch base-bar. The cover-sheet 4 may be either of iron or steel or other suitable metal and is of the same length as the base-bar and copper sheet and of such width that when it is folded over the copper sheet like the same is folded over the base-bar the free edges 5 will overlap and project some distance beyond the similar edges 6 and 7 of the other sheet and bar, as shown in the same figure. A thirty-gage sheet is a desirable thickness of the iron to use in connection with the bar and sheet described above, and the overlapping of the free edges is necessary to compensate for the greater elongation of the relatively thicker steel bar and copper sheet by the action of the rolls before they adhere together, so that the iron will entirely cover the copper in the finished sheet.

The bar and the sheets are first cleaned by "pickling" or otherwise to be free from oxids on the surfaces to be united, and the sheets are then folded over the beveled edge of the bar, as described above, and then flattened against the sides of the bar, preferably between the opposing faces of the blocks 8 and 8^a, which flattening excludes the air from between them. The bar and sheets thus assembled and flattened together are heated in a suitable furnace to a cherry-red degree, or the heat to which steel bars and plates are usually brought for rolling and reducing, which heat is sufficient to soften the metals, but not to the extent usually required for welding or uniting them in the processes heretofore used. The bar and sheets are then removed from the furnace, as by means of the ordinary tongs 9, applied on the sides over the free edges, and are passed several times, folded edge first, between hot compressing-rolls, as shown in Fig. 2. This compression completely expels all air which may have entered between the contiguous surfaces while passing from the furnace to the rolls, and, furthermore, it impresses particles of the softened copper into the softened steel of the bar and particles of the likewise softened iron of the covering-sheet into the copper, as a result of which the sheets and bar adhere firmly to each other, and the composite bar thus formed is adapted to be again heated to a cherry-red and then reduced between hot compressing-rolls and then again heated and reduced by rolling in the same manner that an ordinary steel bar is manipulated. The compressing-rolls used for reducing the composite bar may be the ordinary hot rolls commonly used in rolling-mills, which obtain and retain their heat from the hot bars which are passed between them as distinguished from the so-called "cold" rolls, which are likewise commonly used in rolling-mills, but which do not become heated, because cold sheets only are passed between them. If cold rolls were used in carrying out this process, they would chill the thin sheets of iron and copper on the relatively thick base-bar of steel, and thus prevent a proper uniting of the several laminations. When the composite bar has been reduced to a sheet of about fourteen gage, two sheets are placed flatwise together in the usual manner for further reducing, as shown in Fig. 3. In this relation they are heated as before and rolled down to sheets of about twenty gage, when the two sheets are first separated to permit an oxidation of the iron coating and replaced together and folded in the usual manner, as shown in Fig. 4, and then heated and rolled as before down to sheets of about twenty-six gage. The sheets are then opened up and again replaced together, and after trimming off the first folded edge to prevent buckling are again folded, as shown in Fig. 5, and then heated and rolled as before down to sheets of about thirty gage, which assembling and doubling of sheets can be varied to suit the gages desired. By such successive heating and rolling the copper is, as it were, rolled into the steel base, and the iron cover is in the same way rolled into the copper, and the several metals are in this manner as intimately and completely united together as if a flux had been used between them and they had been brought to a white or welding heat and then rolled or hammered together in the ordinary manner. After cutting off the folded edges the several sheets are free to be separated one from another, because the covering of iron prevents the copper of one sheet from coming into contact with the copper of an adjoining sheet, and the oxidation of the iron prevents the contiguous sheets from adhering. This cover of iron also protects the copper from being ruptured or punctured by the operation of the rolls and insures an absolutely continuous coating thereof on the steel, and, furthermore, the copper sheet is less liable to be ruptured or punctured in this process, because the moderate heat used does not soften the metal as much as the white or welding heat required by other processes. A coating of tin, zinc, or other similar metal or composition can be applied on the sides of the composite sheet thus made in the same manner and by the same means usually employed for similarly coating an ordinary iron or steel sheet after removing the iron oxid by the usual chemical bath, as of dilute sulfuric or other suitable acid, and if it is desired to use the sheet without tinning and with the copper exposed the thin cover of iron can be entirely removed by a more extended chemical bath.

The sheets are not necessarily folded over the edge of the base-bar; but it is desirable that the iron sheet at least should be so folded, because the several sheets are thus conveniently held in proper place on the bar before the first rolling and it is evident that other metals than steel and copper can be united and reduced to thin sheets by the process herein described, and also that a composite sheet having various numbers and arrangements of alternate steel and copper laminations can be rolled and reduced in the same manner—as, for instance, a sheet may be made having a layer of copper between two covering iron or steel laminations, in which event the steel laminations perform the functions of the iron covering-sheet in the arrangement of the laminations herein described.

The process of folding a copper sheet over the edge and then flattening it on the sides of a steel base-bar and of then uniting or welding the sheet and bar together by heating and rolling and also the method of using a base-bar with a beveled edge in such process, which are described and illustrated, but not claimed herein, are included in the subject-matter of another application for Letters Patent which is filed herewith, and the improved tinned sheet having a body made of alternate laminations of iron or steel and copper described, but not claimed herein, is made the subject-matter of another application for Letters Patent filed January 10, 1905, Serial No. 240,452.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In making a laminated sheet, the process of folding a copper and an iron sheet with the iron outside over the edge of a steel bar and flattening them on the sides thereof, then bringing all to a rolling heat and passing them folded edge first between hot compressing-rolls, and then reducing to the desired gage.

2. In making a laminated sheet, the process of flattening a copper and an iron sheet with the iron outside on the side of a steel bar, then bringing all to a rolling heat and passing them between hot compressing-rolls, and then reducing to the desired gage.

3. In making a laminated sheet, the process of flattening together alternate layers of steel and copper with an iron sheet outside folded over one edge, then bringing all to a rolling heat and passing them folded edge first between hot compressing-rolls, and then reducing to the desired gage.

4. In making a laminated sheet, the process of flattening together alternate layers of steel and copper with an iron sheet outside, and then bringing all to a rolling heat and passing them between hot compressing-rolls.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM P. LEWIS.

Witnesses:
HARRY FREASE,
OBED C. BILLMAN.