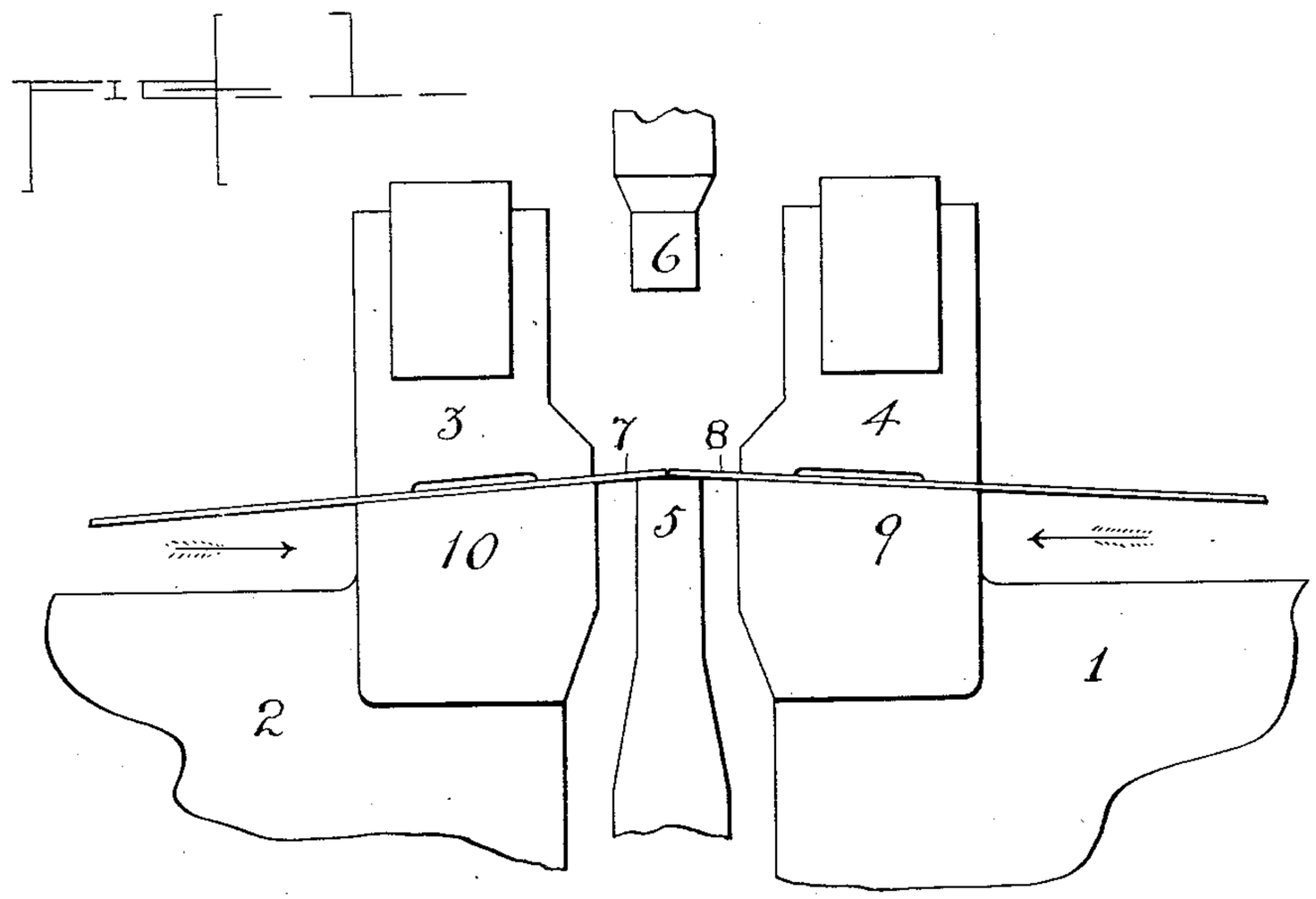
No. 870,847. PATENTED NOV. 12, 1907.

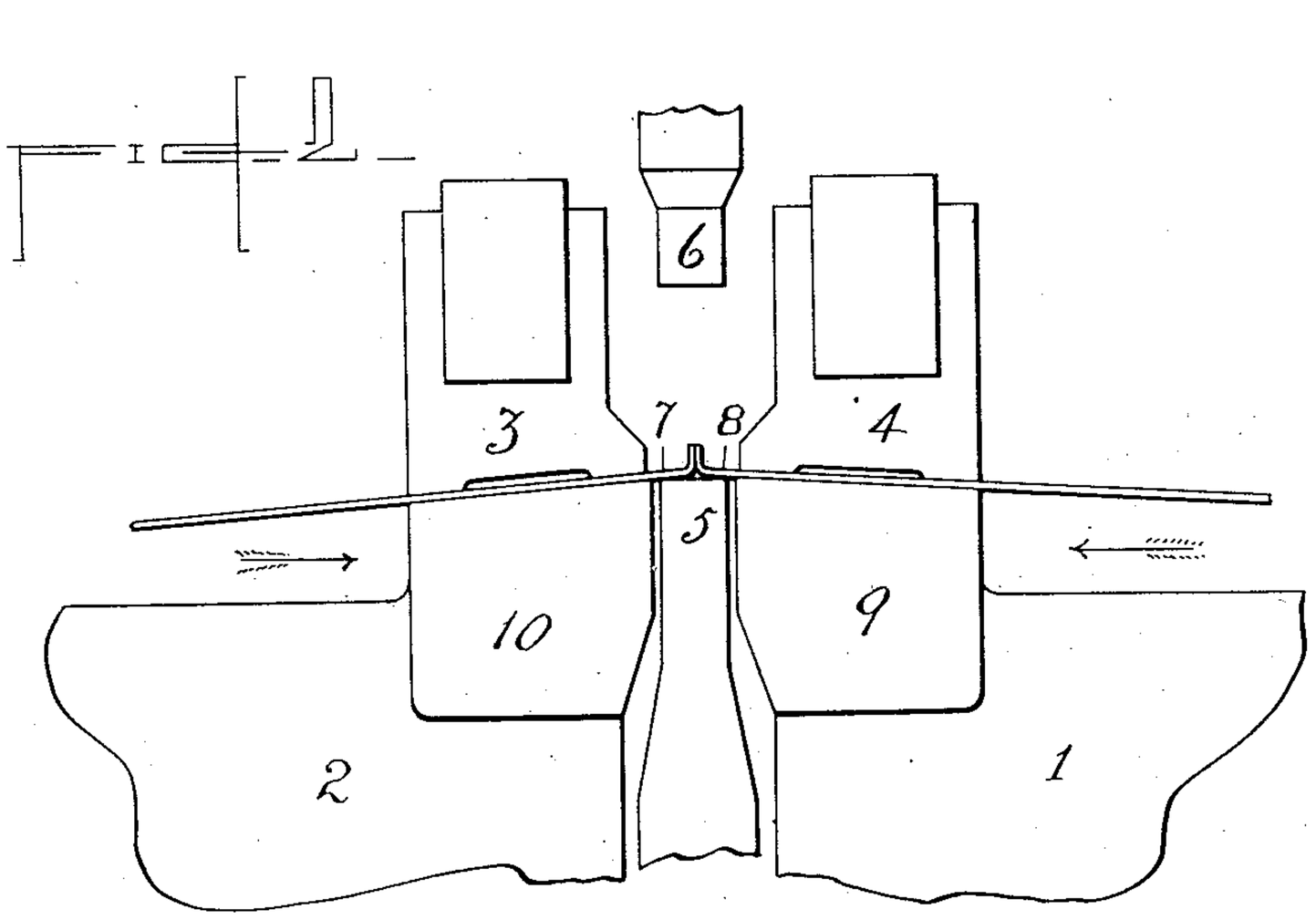
A. F. RIETZEL.

METHOD OF MAKING A JOINT IN THIN FLAT MATERIAL.

APPLICATION FILED OCT. 15, 1903.

2 SHEETS—SHEET 1.





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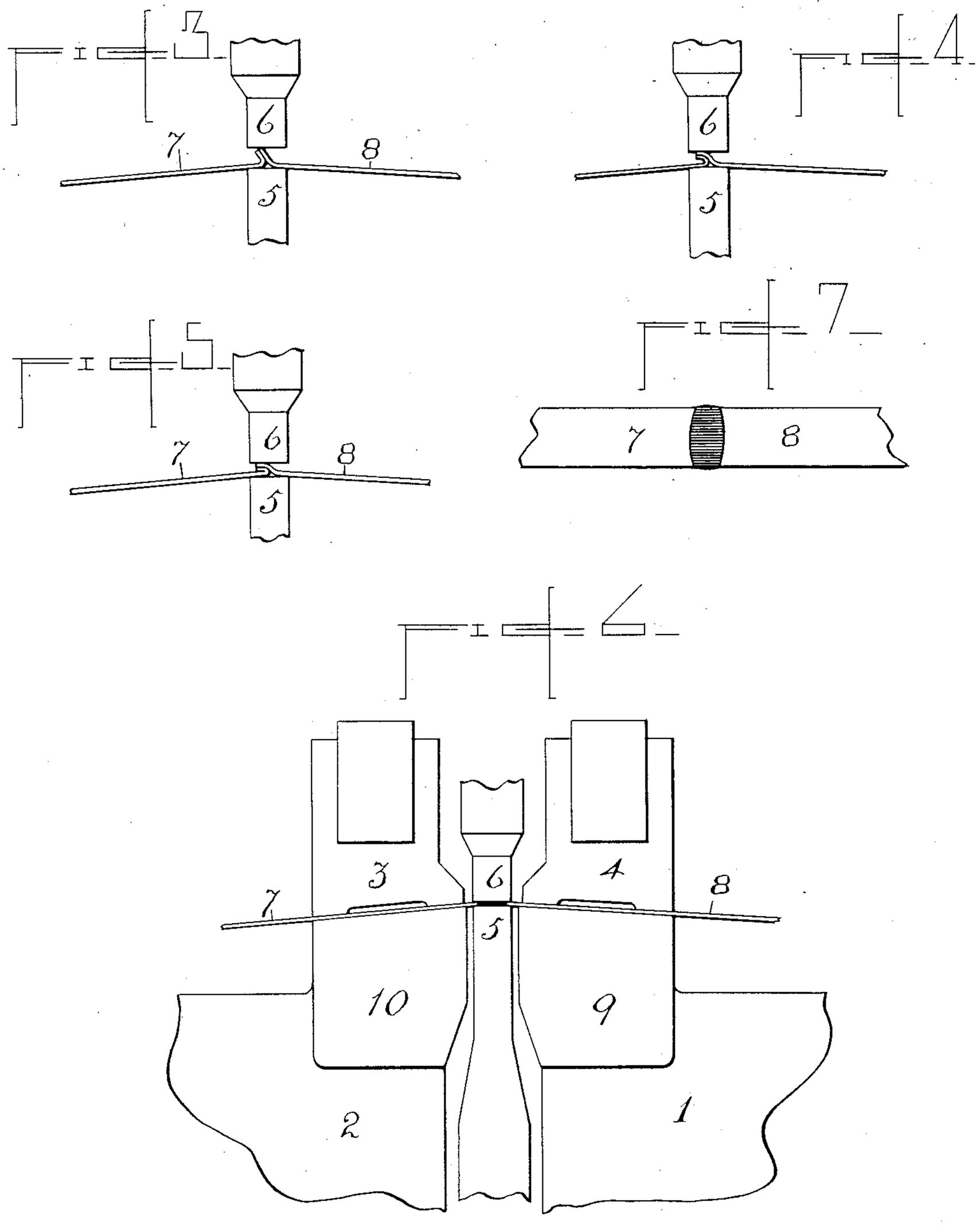

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METHOD OF MAKING A JOINT IN THIN FLAT MATERIAL.

No. 870,847. Specification of Letters Patent. Patented Nov. 12, 1907.

Application filed October 15, 1903. Serial No. 177,139.

To all whom it may concern:

Be it known that I, ADOLPH F. RIETZEL, a citizen of the United States, and a resident of Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Methods of Making a Joint in Thin Flat Material, of which the following is a specification.

My invention relates to an improved method or process of forming joints in thin metal, such for instance, as thin metal strips employed in making hoops, bands, cotton ties or similar objects. It has heretofore been proposed to make joints of this kind of material by lapping and riveting or other means, and sometimes by a butt welding, which latter method has been practically accomplished by the electric welding process. The methods heretofore employed and the joint resulting therefrom are objectionable for various reasons, among others on the score of cost, but mainly, for some uses of the welded joint, because of the presence of a fin or upset at the joint, which should be removed, particularly in the case of hoops or bands used for barrels or other packages, in order that the hoop or band may be readily driven or forced into place.

The object of my invention is to permit the joint to be quickly made and to obtain a resultant joint that will be even stronger than the material itself.

A further object is to permit thinner material to be used than is possible in the case of riveted joints, and yet at the same time to secure the necessary or desired strength. Moreover, as compared with the riveted joints, a joint made by my improved process would have a more finished appearance.

Briefly stated, my invention consists in the novel process or method of forming joints in thin, flat material such for instance, as sheet metal, or in metal bands by bringing the metal edges into abutment, heating the edges and the contiguous portions, applying pressure to cause the heated abutted margins or portions to turn up and to bring the turned up portions into contact by their plane surfaces and completing the union of the heated parts by a suitably applied mechanical force in the shape of a hammering action, or of pressure exerted upon the turned-up portions, and preferably in such manner as to cause them to bend down on one side on the contiguous portion of the material and so as to weld the three superposed layers of material together forming in effect a triple lap joint which may, if desired, be consolidated and reduced to a homogeneous mass by the application of further condensing or compressing force.

In the preferred manner of carrying out my invention, I use an electric current to heat the abutted edges and contiguous parts, although I do not limit myself to the employment of such a heating agent. The upturning of the edges and contiguous margins or borders and so as to bring the plane surfaces of the borders into contact, is preferably brought about by a deforming pressure exerted in the general line of the plane of the material, or a line slightly diverging therefrom. It would, however, be within my invention to make the weld by first deforming or turning up the margins or borders of the material while cold or while held in a machine or holding device independent of that used in the welding operation, then to clamp the pieces in suitable holders adapted to be moved one toward the other, to then bring the up-turned portions into contact by their plane surfaces by moving one of said holders toward the other, and after the parts have been properly heated, to apply a proper mechanical force laterally to complete the joint as herein described.

My invention consists further in the special processes and sub-processes involved in the general operation hereinafter described and which are more specifically set forth in the various claims.

The accompanying drawings illustrate a form of apparatus that may be used in carrying out my invention, together with the form that the material assumes in various stages of the operation. The drawings show elemental parts of apparatus adapted to perform the operation by an electric welding process.

Figure 1 shows in elevation the elemental parts of the holding devices, current supplying devices and hammering or compressing devices, with the material as arranged at the first stage of the operation when the upturning of the edges is effected by softening the parts by heat and then applying longitudinal pressure to deform them and cause them to assume the shape shown in Fig. 2, which illustrates the second stage of the operation; Figs. 3, 4 and 5 illustrate consecutive stages of the operation, and Fig. 6 the final stage when the operation is carried to the point of fully consolidating the parts into a homogeneous mass. Fig. 7 shows in plan the finished joint.

Referring to Fig. 1; 7, 8, indicate the pieces or portions of thin metal to be joined, while 1 and 2 indicate blocks or supports which may form the terminals of a source of heating electric current and which carry or support the jaws of the work-holders. 9 and 10 indicate the lower jaws of the work-holder, and 3 and 4, the upper or movable clamping jaws which may be operated to compress or hold the work consisting of pieces 7, 8, or to free the same after the weld has been completed. These work-holders are one or both movable in a direction to shorten the space between them, while at the same time furnishing, preferably, an electric current for heating the work, which current passes from one jaw to the other through the work, as well understood in the art of electric welding or heating. This

movement of one jaw toward the other may be effected by a movement of one or the other, or both, but preferably both of the terminals 1, 2, toward one another.

The means for condensing or compressing or consolidating the work is here shown as comprising a stamp, hammer or press 6, and a coöperating bed or anvil 5, adapted to support the work. This bed or anvil 5 if of conducting material, or of a substance which would readily conduct the heat away from the work, would preferably be depressed from the position shown in Fig. 1, and only brought into the position shown in Fig. 2 and 6 after the work has reached the proper temperature for completing and perfecting the joint. Preferably the jaws of the work-holder have their holding surfaces so arranged that when the material is clamped therein the plane of each of the two pieces of material 7, 8, held therein shall be slightly oblique to the line of movement of one or both of the work-holders when moved to bring them into the welding position shown in Fig. 2. By this arrangement the borders or margins of the material by meeting at a slight angle will tend more readily to deform or buckle into the shape shown in Fig. 2, upon the application of pressure applied through moving the work-holders one toward the other.

In the operation of forming a joint, pieces of metal being placed in the work-holders and suitably clamped are brought together at an angle as illustrated in Fig. 1, and with preferably a light pressure. They are then heated at the abutted edges of the contiguous parts, which may be readily done in an electric welding machine by causing electric current to pass from one work-holder to the other through the portions of work between them, as is the usual practice in electric welding. As the parts heat a following pressure is applied by moving one work-holder to the other, which causes an extension of the weld of the abutted edges and finally causes the parts to buckle and the edges to upturn as shown in Fig. 2. The plane faces of the margins or borders are now in contact with one another and by preference the heating is continued to heat the parts to a higher temperature, or one which will permit the surfaces to be readily welded together. When the parts have assumed the proper temperature, a hammering, condensing or other consolidating mechanical force is applied transversely to the up-turned edges by bringing the support or anvil 5 and the hammer or press 6 to work upon the same in a vertical line and so as to turn or fold the abutted turned-up edges down upon the contiguous material through a movement the consecutive stages of which are indicated in Figs. 3, 4, 5, respectively.

In the position shown in Fig. 5, it is obvious that there are three superposed layers of material adapted to be welded together, the lower layer being that portion of one or the other of the pieces 7, 8, which lies outside of the up-turned borders or margins, but contiguous thereto, and which lower layer is also properly heated to the welding temperature by the electric current passing through the work while in the position indicated in Fig. 2. By the application of a hammer or press the three layers are firmly welded together and, if desired, this consolidating, hammering or condensing force may be applied to such extent as to produce the joint such as indicated in Figs. 6 and 7, in which the material will be practically homogeneous; or, if desired, the condensing or compressing action may be carried along to the point only where there will be three thicknesses or layers of material that upon section of the joint would show more or less defined lines of stratification. By preference, however, the three thicknesses of material are compressed or consolidated into practically one thickness so as to give a smooth, neat surface and appearance upon the side of the joint.

As will be obivous from an inspection of Fig. 5, there is no special tendency to the formation of a projection, bur or fin on the underside of the joint, which is especially desirable if the work is a hoop or band that is to be driven on to a barrel or other package.

In the consolidating or hammering process it is preferable to withdraw the current before bringing the compressing, hammering or consolidating devices 5, 6, into contact therewith, although this is not absolutely necessary.

When this invention is carried out by the electric welding or heating process, it possesses the further superiority over an electric butt welding in that it obviates the necessity of carefully cleaning the stock and of accurately or nicely clamping the parts to bring the surfaces under uniform clamping pressure. It also has the advantage that less power is required, than in the case of electric butt welding processes.

What I claim as my invention is:

1. The herein described process of forming a joint in thin metal, consisting in pressing the upturned margins or borders of material into contact with one another by pressure applied to the clamping or holding devices, so as to cause them to be in contact throughout substantially the whole plane surface of said upturned portion and applying a lateral condensing or compressing force while they are in a heated condition, as and for the purpose described.

2. The herein described process of forming a joint in thin metal, consisting in securing the metal in suitable clamps, bringing the edges of the metal into contact, passing an electric current from one to the other of said clamps so as to heat the edges in contact, moving one clamp toward the other to cause the heated edges to turn up and to come into contact on their plane surfaces and then applying a lateral compressing or condensing force.

3. The herein described method of forming a joint in thin metal, consisting in abutting the edges of the parts, heating the edges and contiguous parts applying pressure to cause the heated abutted margins or borders to turn up and at the same time bring the turned-up portions together and then consolidating the joint by any suitable condensing force applied transversely to the line of said pressure.

4. The herein described process of forming a joint in thin metal, consisting in heating abutted metal edges and parts contiguous thereto, applying pressure to cause the heated margins or borders to turn up and at the same time bring the turned up portions into surface contact throughout their approximated plane surfaces and then folding down the approximated metal and welding the three superposed layers together.

5. The herein described process of forming a joint in thin metal, consisting in passing a heating electric current through abutted metal edges and parts contiguous thereto, applying pressure to cause the heated margins or borders to turn up and at the same time bring their surfaces into contact, and then folding down the approximated metal and welding the three superposed layers together.

6. The herein described process of forming joints in thin metal, consisting in abutting the surfaces of heated upturned margins or borders, bending the two abutted margins down to one side, and completing the union by a mechanical force to form a triple lap joint.

7. The herein described process of forming joints in thin metal by electrically welding abutted metal edges together, continuing the welding pressure to turn up the heated margins or borders and bring their contiguous faces into abutment, folding down said turned up borders and welding the three superposed layers of material together to form a triple lap joint.

8. The herein described process of forming joints in thin metal by welding abutted metal edges together, continuing the welding pressure to turn up the heated margins or borders and bring their contiguous faces into abutment and then applying a laterally acting condensing or compressing force to the heated parts.

9. The herein described process of forming a joint in thin metal, consisting in abutting the edges, passing an electric current across the joint to heat the edges and border, applying pressure in a line transverse to the meeting line thus welding the edges and deforming the heated metal to cause the faces of the borders or margins contiguous to the meeting line to meet, and then applying a laterally acting condensing or welding force to the heated parts.

10. The herein described method of forming a joint in thin metal, consisting in bringing the borders or margins together at an angle, passing a heating electric current across the joint, applying edgewise pressure to cause the heated metal to buckle and then applying a laterally acting, condensing or welding force to the heated parts.

Signed at Lynn in the county of Essex and State of Mass. this 28th day of Sept. A. D. 1903.

ADOLPH F. RIETZEL.

Witnesses:
GEO. W. N. CHADWELL,
E. F. P. SMITH.