

"The operation of coating or plating lead with tin, or coating or plating alloyed lead with tin, or with alloyed tin, to make Albion metal, I perform by various methods, as hereafter described; that is to say, I take a plate or ingot of lead, or alloyed lead, and a plate of tin, or alloyed tin, of equal or unequal thicknesses, and laying them together, their surfaces being clean, pass them between the rolls of a flattening or rolling mill with what is technically called a hard pinch, so as to make the metals cohere. If after the first passage of the plates or pieces of metal between the rolls, the plates or pieces do not sufficiently cohere, I pass them a second or third time, or more, between the rolls, until a sufficient degree of cohesion is produced.

"N.B.—It will be useful, if not necessary, to have the rolls and the metals hot when the cohesion of the metals is to be effected by their passage between the rolls, especially when the alloyed pieces or plates are used. When lead or alloyed lead is required to be coated or plated on both sides with tin or alloyed tin, I apply a plate of tin or alloyed tin on each side the plate or piece of lead, or alloyed lead, and pass them between the rolls of a mill under the circumstances aforementioned; or the same may be effected by taking a plate which is already coated or covered on one side with tin, or alloyed tin, which I double with the lead side inwards, and pass it through the rolls, as before described, to obtain the proper degree of cohesion. I also make Albion metal by the following method: I cast a plate or ingot of lead, or alloyed lead, and as soon as it is set or congealed, I cast tin or alloyed tin upon it, or under, or on all sides of it, which will cohere with the piece of metal first cast, and the Albion metal thus prepared may be wrought or flattened, by the usual means of rolling, hammering, or pressing."

The material parts of the plt.'s specification, dated in 1849, were as follows:—"The new manufacture of a material to be employed in the manufacture of capsules and for other purposes, consists in combining lead with tin, by covering the lead with tin over one or both surfaces of the lead, and reducing the two metals in their conjoined state into thin sheets, of a thickness suitable for the purposes to which they are to be applied. And, for the purpose of so preparing lead by covering the same with tin, as aforesaid, I first cast the molten lead in an ingot mould of cast-iron, or other suitable material, and constructed in the usual manner of ingot moulds for metal, and of suitable internal dimensions for producing ingots of lead which (for the manufacture of the material for capsules) may be between four and five inches wide by about three quarters of an inch thick, and about thirty inches in length, with a few inches at one end of each ingot gradually reduced in thickness in the manner of a wedge. I also cast tin either in similar ingots, of the same or nearly the same dimensions as the aforesaid ingots of lead, or the tin may be cast into long thin strips of nearly the same width as the aforesaid ingots of lead, and between one-quarter and one-sixteenth of an inch in thickness and several feet in length. And, having thus obtained the lead and the tin in suitable states for beginning the rolling, or laminating, each of the two metals separately, between a pair of pairs of revolving cylindrical flattening rollers, of the construction usually employed for rolling or laminating ductile metals, I pass and re-pass the lead, one or more times, through or between such rollers; that is to say, rolling and re-rolling the ingot of lead as many times as may be requisite for reducing the lead to about one-fourth of an inch in thickness, and thereby the ingot of lead will become greatly elongated. And in like manner I roll and re-roll the tin as many times as (according to its original thickness when cast as aforesaid) may be requisite for reducing it to about one-twentieth part of the thickness to which the lead is reduced by rolling as aforesaid, whatever that thickness may be. The lead and the tin having been thus reduced to their proper relative thicknesses, and their widths being nearly alike, and even surfaces of each of the two metals having been obtained by the aforesaid rolling, then, in case it is intended to cover both sides of the lead with tin, I extend a long strip of the thin tin (so reduced to relative thickness as aforesaid) flatways upon a smooth table, and lay a shorter strip of the lead (so reduced to relative thickness as aforesaid) very evenly upon the extended tin, with one end of the said strip of lead conforming with one end of the said long strip of tin, and then I fold back the tin over the other end of the lead (being that end

thereof which still retains some of that wedge-like form of the original casting of the ingot of lead already mentioned) and, consequently, the tin when so folded will apply to both surfaces of the lead; I then cut off the long strip of folded tin to correspond with the length of the lead, and I smooth down the tin with any convenient wooden rubber, or otherwise, so as to take out all wrinkles in the tin, and bring it very evenly into superficial contact with the lead, and with the two bordered edges of the strip of tin, conforming everywhere with the two bordered edges of the lead, so as to insure that the tin shall cover the lead as completely as can be done; I then take up the lead and tin together from off the said table, and present the folded end of the tin to a pair of revolving flattening rollers, which are set so as to subject the two metals to a very considerable pressure, and that pressure, at the same time that it reduces the thickness and elongates the two metals, will also cause their surfaces to adhere together, and then I re-pass the conjoined metal again and again between the said rollers for further reduction and elongation, and at every succeeding time of so re-passing the adhesion of the two metals will become more complete, and when the strip of conjoined metals is thus become elongated to a considerable length, I find it is convenient, for further repetitions of the rolling, to gather up the said strip (as fast as it comes out from between the said pair of flattening rollers) into a spiral coil, by means of a roller which is suitably disposed behind that pair of rollers, and is turned round by an endless strap motion, so as that the said roller will wind and coil up the strip around it into such a coil; and then that roller, with the said coil thereon, can be removed to the front of another pair of flattening rollers, which by their motion will draw off and unwind the strip from its said spiral coil as fast as the conjoined metal passes through between the said flattening rollers, which rollers should be made of hard cast iron, in the manner of what are called chilled rolls, and highly polished, in order to give a very smooth surface to the tin of the conjoined metals by the rolling or flattening action of the said pair of flattening rollers. And note, I provide a small cistern of water beneath the said roller which has the said coil around it, so that when the same is removed to the front of the pair of flattening rollers, as aforesaid, the lower part of such coil will be immersed in the said water, in order that the conjoined metal may become wetted on its surfaces before it enters between the said pair of flattening rollers; and such wetting tends to prevent the tin on the surface of the conjoined metal from adhering to the rollers, as it might otherwise do occasionally. And I repeat such rolling of the strip of conjoined metals between the same or another like pair of chilled and highly polished flattening rolls, two, three, or more times, as may be requisite for reducing the said strip of conjoined metals to the required thinness. . . . And the mode of proceeding, when only one side of the lead is to be covered with tin, is the same in all respects as hereinbefore described, except as to applying the tin to only one side instead of both sides of the lead at the time when a thin strip of tin is applied to a thicker strip of lead, as hereinbefore described, but that strip of tin should be folded back a short distance over that end of the lead which has the wedge-like form, and the folded end of the tin should be presented between the pair of revolving flattening rollers when the lead and tin together are to be subjected for a first time to the pressure of those rollers, and make the two metals adhere together, as already explained, for the said folded end of the tin around the wedge-like end of the lead will insure that the two metals will enter properly together between the rollers. And my said new material being made in plates or sheets of adequate thickness and size, may be employed for other purposes for which thin sheet lead or tinned iron or sheet zinc or sheet tin have been commonly employed, such, for instance, as lining cisterns or wine coolers, which are to contain water, and for lining boxes, chests, or cases for packing or safe keeping of articles which require to be kept dry or protected from insects; or on a still larger scale for lining larger water cisterns, and other purposes, in substitution for the thicker sheet lead used by plumbers. In most such cases it will be sufficient to have one side only of the lead covered with tin. And the perfection of my said new material will depend in a great measure upon the soundness of the casting of the tin in the ingots to avoid specks of sand or dirt flaws or honeycomb hollows in the ingots; and the same, in some