

UNITED STATES PATENT OFFICE.

WILLIAM BETTS, OF WHARF ROAD, CITY ROAD, ENGLAND.

METALLIC CAPSULE.

Specification forming part of Letters Patent No. **33,179**, dated September 3, 1861.

To all whom it may concern:

Be it known that I, WILLIAM BETTS, have invented a new manufacture of capsules and of a material to be employed therein, and for other purposes; and I do hereby declare that the following is a full, clear, and exact description of the principle or character which distinguishes it from all other things before known, and of the usual manner of making, modifying, and using the same—that is to say—

The capsules herein referred to are metal covers used for closing or stopping or for securing the closure or stopping of the mouths of bottles and certain other vessels, which metal covers have been hitherto made of tin by bending up a suitable piece of a thin sheet of that metal into a hollow form or cup or cap of a suitable size for applying closely over the mouth of a bottle or other vessel, and over any such cork or other kind of stopper as may have been previously inserted into the said mouth. In case of a cork or other stopper being used, the sides of the said metal cover, cup, or capsule also reaching downward around the outside of the upper part of the neck of the bottle so as to envelop the whole of such upper part in the manner of an inverted cup, or of a case or hood or cap, or metal cover or capsule, the said sides thereof, after having been so applied over and around the said upper part, are closely collapsed or closed in or compressed laterally on all sides around that said upper part in such manner as that the said metal cover, cap, or capsule will become securely fastened around and upon the said upper part suitably for closing or stopping or for securing the previous closure or stopping of the said mouth of the bottle or other vessel in such manner as that the said mouth cannot be opened without cutting or tearing the metal and manifestly disfiguring the metal cover, cap, or capsule.

Metal covers, caps, or capsules made of tin are well known under the designation of "Betts' patent capsules," and are now in common use, great numbers having been made and sold under certain Letters Patent granted at three several times by her present Majesty to my late father, John Thomas Betts—namely, on the 11th day of August, 1842, and on the 16th day of March, 1843, and on the 27th day of June, 1843.

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 to 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-mold of cast-iron (or other suitable material) and constructed in the usual manner of ingot-molds 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 of one end of each ingot gradually reduced in thickness in the manner of a wedge. I also cast tin either into 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 or pairs of revolving cylindrical flattening-rollers of the construction usually employed for rolling or laminating ductile metals. I pass and repass the lead one or more time or times through or between such rollers—that is to say, rolling and rerolling 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 reroll 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) flat-

wise 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 border-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 repass the conjoined metal again and again between the said rollers for further reduction and elongation, and at every succeeding time of so repassing 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,) with 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 thickness.

For the manufacture of capsules, the material so prepared is cut into disks or pieces of the required size. These disks are then carefully examined, for the purpose of rejecting any in which the lead is not perfectly covered by the tin, which will be at once discovered in a good light from the difference of appearance of the surface where the lead is not perfectly covered. The disks of the said new material are made into capsules and the manufacture thereof conducted in the manner described in the specification of the said Letters Patent of the 16th day of March, 1843, and which process is now well understood. The said new material, or compound metal of lead, combined and covered with tin on one or both sides, in manner aforesaid, may also be employed for other purposes—such, for instance, as for making into very thin sheets as a substitute for what is called "tin-foil," and which has been hitherto made, or professed to be made, of tin alone; but has been more commonly made of tin alloyed with lead, by mixing those two metals together while both are in a state of fusion in the first instance before casting the mixed metal into ingots, whereas my new material will be pure tin on the surface exposed to view, but will be lead in its interior thickness, and the said pure tin on those surfaces being unalloyed by the lead, which it covers over, will exhibit a brilliant metallic luster; and when my said new material is to be made into thin leaves or foil, which will serve as a substitute for tin-foil, I take a long strip of the conjoined metal, which has been already rolled and reduced in manner hereinbefore described, and I fold such strip several times upon itself, of a length equal to the width of the foil required, and then by cutting off the two folded ends I obtain a packet consisting of between two and three dozen strips, but all alike, and I pass and repass such packet repeatedly through between a pair of highly-polished flattening-rollers with the lengthwise of the said packet parallel to the axis of the said rollers, so that the rolling and laminating action thereof will be transverse to the direction of the previous rolling of the long strip, and, by repeated rolling and rerolling such packet of strips transversely, they are reduced in thickness and extended in width by degrees, so as to become broad leaves of thin foil; but during the progress of such repeated rolling and rerolling I occasionally separate the leaves one from another to prevent any adhesion that might otherwise take place between their adjacent surfaces. The thin leaves of my new material, after having been reduced very thin by rolling and rerolling, as aforesaid, may afterward be still further reduced in thickness, if that is required, by hammering a great number of the thin leaves together on a flat table

in the usual mode of treating tin-foil; and my new material, when laminated by rolling and rerolling the same into leaves of moderate thickness, according to the size of the leaves, may be employed for various purposes in addition to those purposes for which tin-foil has been commonly used, and thin leaves of my new material may be ornamented by embossing such leaves with ornamental patterns in the same manner as is commonly practiced for embossing cloth, leather, or paper by passing the said leaves through between a pair of revolving rollers. One is a metal roller engraved on its cylindrical surface with the pattern either sunk below that surface or raised in relief above the same, the other roller of the said pair of revolving rollers being of paper or other substance, which will become sufficiently impressed with a counterpart to the pattern by the pressure against the other engraved roller; and such thin leaves of my new material of suitable size and thickness may be printed in the manner of ordinary or ornamental letter-press printing on sheets of paper, and may be so printed either with black or with colored ink, and with inscriptions or words to be read, or with ornamental devices of any kind—such as are or may be printed on paper—and the aforesaid embossing or printing appearing on the bright-tin surface of my new material as a ground will be very distinct and well defined; and, for preservation of the brightness thereof, the whole surface may be varnished over with any suitable transparent varnish which will resist damp—such as is sometimes applied over gilding, over paper-hangings or the walls of apartments, staircase, &c.—or varnish colored with light and transparent color may be used; and such thin leaves of my new material, being suitably ornamented in manner aforesaid, may be used in the manner of paper-hanging for the walls of apartments, or for ornamenting particular parts of such walls, or of compartments thereof where the metallic brightness of the tin will have a good effect as a ground for the pattern; and instead of the tin covering both sides of the lead, it will be sufficient for many purposes to have the tin on one side only of the lead. For instance, when thin leaves of my new material are employed in place of tin-foil for lining dressing-cases or other purposes requiring the leaves to be glued, pasted, or otherwise stuck upon any surface which is to be covered by the leaves, the aforesaid employment of such leaves for hangings of the walls of apartments being in another instance; or in case it may be required to stick such leaves down upon paper or upon cloth previous to or subsequent to embossing or printing upon the tin surface, as aforesaid, or for covering, or partly covering, over the outsides of books, fire-screens work, or other ornamented articles. In all or any such cases it will be unnecessary to have any tin upon that side which is to be so glued, pasted, or otherwise stuck, 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 degree of the lead, for, as the conjoined metals are to be very much extended in the operations of laminating, and the tin on the surface or surfaces will be reduced extremely thin by those operations, any minute defects in the soundness of the casting will become extended so as to cause visible blemishes in the tin surfaces of the conjoined metals. Hence the casting of the ingots should be conducted with every care and precaution commonly practiced for obtaining soundness, and, the same of the laminating operations; and in particular, care should be taken to avoid dirt getting between the tin and the lead when they are pressed together for the first time between the pair of flattening-rollers for obtaining the adhesion of the two metals; also, any air which cannot make its escape from between them will remain imprisoned so as to form blisters, which will render the adhesion imperfect at the places of such blisters.

To avoid blisters the tin should be carefully smoothed down upon the lead, as already mentioned, without leaving wrinkles containing air, of which portions may get imprisoned, and the surfaces of the said pair of rollers between which the lead and the tin are passed together for the first time, as aforesaid, should move with a slower motion than is suitable for the other pair or pairs of rollers between which the subsequent lamination of the conjoined

metals is to be performed after their adhesion has been produced by repeated operation of the first-mentioned pair of rollers, the slower motion of which will better allow the air to make its escape from between the lead and the tin.

The fragments of my new material left unworked into capsules or otherwise beneficially employed are carefully reserved for melting down along with lead for casting future ingots, which will thereby acquire a very small portion of tin, but not enough to make any material difference from pure lead.

I am aware that it has been proposed to cover lead with tin by applying the tin when in a state of fusion to the lead, when adequately heated, so that the adhesion of the two metals would be produced by agency of heat with complete fusion of the tin; but the adhesion of the two metals in my new material is produced by agency of mechanical pressure. And I wish it to be understood that I do not claim the exclusive use of the several processes, hereinbefore described or referred to, of casting, cutting, and rolling, except when the same are employed for the purposes of my said invention.

What I claim as my invention is—

The new manufacture of capsules and of a material to be employed therein, as hereinbefore described, and for other purposes hereinbefore stated, that new material being laminated plates, sheets, or leaves of lead covered with tin on the surface or surfaces of one or both sides of such laminated plates, sheets, or leaves, the application of the tin to the lead being performed in the manner hereinbefore described, and the adhesion of one metal to the other being obtained by agency of the same mechanical pressure whereby the lamination of the new material is performed in the manner hereinbefore described.

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

W. BETTS.

Witnesses:

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