

UNITED STATES PATENT OFFICE.

LOUIS ARONSON, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO JAMES H. HOFFMAN, OF SAME PLACE.

PROCESS OF ELECTRO-TIN-PLATING.

SPECIFICATION forming part of Letters Patent No. 497,621, dated May 16, 1893.

Application filed January 31, 1893. Serial No. 460,445. (No specimens.)

To all whom it may concern:

Be it known that I, LOUIS ARONSON, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Processes of Electro-Tin-Plating, of which the following is a specification.

My invention has reference to improvements in the process of and in the means for producing tin-plate by electro-deposition, and while not limited to the production of tinned iron or steel plates, it is more particularly adapted to such manufacture.

In the production of tin-plate by electro-deposition, it has heretofore been found that the tin deposited upon the iron did not adhere to the latter with sufficient tenacity to allow the plate to be worked into articles of merchandise. The tin would peel off in flakes, more especially, when the plate was bent angularly, thus leaving irregular patches of the iron exposed and subject to the corroding influence of the atmosphere or of other agencies which would come into contact with the plate. It was also found that electrically deposited tin was very much softer than ordinary commercial tin, and a portion of it would rub off in the polishing process to which such plates should be subjected after the electrical deposit has been made. For these reasons, electro-plated tin-plate, although considerably cheaper than the ordinary tin-plate, has not come into use.

It is the object of my invention to overcome these difficulties and to produce tin-plate by electro-deposition, in which the tin shall adhere to the iron or other base, with the same tenacity as it does in the ordinary tin-plate, and in which the tin shall be as dense and hard, if not denser and harder than on the ordinary tin plate.

My invention involves the use of an aqueous electrolytic bath of special composition and at a comparatively high temperature.

It also involves the practice of a peculiar pickling process for preparing sheet iron for the reception of the electro-deposit of tin. All this will more fully appear from the following detail description, which is intended to be

sufficiently full and clear to enable others skilled in the art to practice the invention.

I prepare the electrolytic tin bath as follows: One pound of ammoniacal alum is dissolved in five gallons of water, and to this solution are added four to eight ounces of chloride of tin; only a portion of this chloride of tin will be dissolved, another portion remaining suspended and eventually accumulating at the bottom. To this compound are added eight ounces of pyro-phosphate of sodium, which produces a considerable precipitate. The fluid is then stirred and caustic soda is added in small quantities until the precipitate together with the undissolved portion of the chloride of tin is taken up. If more than eight ounces of chloride of tin are used, a proportionately greater amount of pyro-phosphate of sodium must be used. The compound thus produced constitutes my electrolytic tin bath, and while the same may be used at ordinary temperature, I have found that a considerable advantage is secured when the bath is heated to a temperature of 150° Fahrenheit and more. One of the advantages secured by the elevated temperature of the bath is that its conductivity is thereby increased and that for this reason the electro-motive force of the current employed need not be so high as when the bath is cold. The lower the electro-motive force of the electric current employed, the greater is the density and the more uniform is the thickness of the deposit obtained.

The iron plates may be prepared for their reception in the bath by any of the well known pickling processes, but the process which I have found to be particularly adapted when my electrolytic bath is used, is as follows: The ordinary black sheet iron is immersed in a bath composed of one part of hydro-chloric acid to fifteen parts of water, and is allowed to remain therein until by the appearance of the iron, it becomes evident that the oxides have been removed. By preference the sheet iron is moved about in the bath or the bath is agitated. The sheet iron is then removed and washed in water and is then annealed in the ordinary manner. After annealing the sheets are passed between smooth polished

rolls, whereby they are made smooth and receive a bright finish. In the annealing process the plates become again superficially oxidized, and this oxide is now removed by immersion of the plates in a solution of one part of hydro-chloric acid to twenty parts of water. In this diluted acid bath the plates are left from ten to fifteen minutes. They are then withdrawn and are placed in clear running water and are scoured by scratch brushes, or otherwise. The plates are now ready to be received in the electrolytic bath above described. The electro-deposit is produced in the ordinary manner, using cast tin anodes and a uniform current from any suitable source and preferably of low electro-motive force. This is quite practicable when the bath is heated and maintained hot as above described. A layer of any desired thickness of tin may be deposited, and if the bath is sufficiently hot and the electro-motive force of the current sufficiently low, the deposit is very uniform and shows very little, if any, granulation. It adheres tenaciously to the iron and and is very hard.

When a sufficient deposit has been produced, the sheets are withdrawn from the electrolytic bath and are passed first through cold water, then through hot water, and are then dried in coarse, hard wood sawdust, and then polished with flannel and whiting, or by any other convenient means.

It is evident, that by this process not only tin plate, but a great variety of other articles may be made; nor is the process confined to the tinning of iron or steel, but is applicable to the tinning of a variety of other metals, which may be prepared, for the bath in any desired manner.

The proportions of the ingredients composing the electrolytic bath may be varied without departing from my invention.

Other metals than iron may be tinned by means of my electrolytic bath and by the general procedure hereinbefore described, except that the pickling process must be adapted to the metal.

Having now fully described my invention,

I claim and desire to secure by Letters Patent—

1. The process of tinning metallic articles, which consists in depositing tin upon such articles, by the electrolysis of an aqueous electrolytic bath, containing ammoniacal alum, chloride of tin, pyro-phosphate of sodium and caustic soda, substantially as described.

2. The process of tinning metallic articles, which consists in depositing tin upon such articles by the electrolysis of a hot aqueous electrolytic bath, containing ammoniacal alum, chloride of tin, pyro-phosphate of sodium and caustic soda, substantially as described.

3. The process of tinning metallic articles, which consists in depositing tin upon such article from a hot aqueous bath, containing ammoniacal alum, chloride of tin, pyro-phosphate of sodium and caustic soda, by the passage therethrough and between tin anodes and the article of a current of electricity of low tension, substantially as described.

4. The process of making tin plate, which consists in pickling sheet iron or steel, and then depositing tin upon the same by the electrolysis of an aqueous electrolytic bath, containing ammoniacal alum, chloride of tin, pyro-phosphate of sodium and caustic soda, substantially as described.

5. The process of making tin plate, which consists in depositing tin upon pickled sheet iron or steel by the electrolysis of a hot aqueous electrolytic bath, containing ammoniacal alum, chloride of tin, pyro-phosphate of sodium and caustic soda, substantially as described.

6. An electrolytic tinning bath composed of water, ammoniacal alum, chloride of tin, pyro-phosphate of sodium, and caustic soda, substantially as described.

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

LOUIS ARONSON.

Witnesses:

CHR. STRAUS,

JAS. H. HOFFMAN.